Committee for the Environment

Report on the Committee's Inquiry into Wind Energy Volume 2

Written submissions relating to the report

Ordered by the Committee for the Environment to be printed 29 January 2015

Mandate 2011/16 **Seventh Report - NIA 226/11-16**

Membership and Powers

The Committee for the Environment is a Statutory Departmental Committee established in accordance with paragraphs 8 and 9 of the Belfast Agreement, section 29 of the Northern Ireland Act 1998 and under Standing Order 48.

The Committee has power to:

- Consider and advise on Departmental budgets and annual plans in the context of the overall budget allocation;
- Consider relevant secondary legislation and take the Committee stage of primary legislation;
- Call for persons and papers;
- Initiate inquires and make reports; and
- Consider and advise on any matters brought to the Committee by the Minister of the Environment

The Committee has 11 members including a Chairperson and Deputy Chairperson and a quorum of 5. The membership of the Committee since 9 May 2011 has been as follows:

Ms Anna Lo MBE (Chairperson)
Ms Pam Cameron (Deputy Chairperson)[1]
Mr Cathal Boylan
Mr Colum Eastwood[2]
Mrs Sandra Overend[3, 4]
Mr Alban Maginness[5, 6]
Mr Ian McCrea[7, 8, 9, 10]
Mr Barry McElduff[11, 12]
Mr Ian Milne[13, 14]
Lord Morrow
Mr Peter Weir

1 With effect from 10 September 2013 Ms Pam Cameron replaced Mr Simon Hamilton as Deputy Chairperson
2 With effect from 18 June 2012 Mr Colum Eastwood replaced Mr John Dallat
3 With effect from 23 April 2012 Mr Tom Elliott replaced Mr Danny Kinahan
4 With effect from 04 July 2014 Mrs Sandra Overend replaced Mr Tom Elliott
5 With effect from 23 April 2012 Mrs Dolores Kelly replaced Mr Patsy McGlone
6 With effect from 07 October 2013 Mr Alban Maginness replaced Mrs Dolores Kelly
7 With effect from 20 February 2012 Mr Gregory Campbell replaced Ms Paula Bradley
8 With effect from 01 October 2012 Mr Alastair Ross replaced Mr Gregory Campbell
9 With effect from 07 May 2013 Mr Sydney Anderson replaced Mr Alastair Ross
10 With effect from 16 September 2013 Mr Ian McCrea replaced Mr Sydney Anderson
11 With effect from 08 May 2012 Mr Chris Hazzard replaced Mr Willie Clarke
12 With effect from 10 September 2012 Mr Barry McElduff replaced Mr Chris Hazzard
13 With effect from 07 April 2013 Mr Francie Molloy resigned as a Member
14 With effect from 15 April 2013 Mr Ian Milne replaced Mr Francie Molloy

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The Department	Department of the Environment
AM	Amplitude Modulation
AONB	Area of Outstanding Natural Beauty
CIEH	Chartered Institute of Environmental Health
DETI	Department of Enterprise, Trade and Investment
DOE	Department of the Environment
EIA	Environmental Impact Assessment
ETSU	Energy Technology Support Unit
EU	European Union
HSENI	Health and Safety Executive Northern Ireland
MW	Megawatt
NIAPA	Northern Ireland Agricultural Producers Association
NIE	Northern Ireland Electricity
NIRIG	Northern Ireland Renewables Industry Group
NREAP	National Renewable Energy Action Plans
PAD	Pre-application Discussion
PfG	Programme for Government
PHA	Public Health Agency
PPS	Planning Policy Statement
QUB	Queen's University Belfast
RES	Renewable Energy Systems
SPPS	Single Planning Policy Statement
ToR	Terms of Reference
UFU	Ulster Farmer's Union
UU	University of Ulster

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27th February 2014

By email to: committee.environment@niassembly.gov.uk.

Re: Response to Wind Energy Inquiry

Dear Chairperson Lo,

Air Core Limited are a single wind energy developer within Northern Ireland and have to date lodged over 100 planning applications for the proposed developments of 250kW wind turbines. Air Core has developed a significant level of expertise in this sector and is competent with Planning Policy and Guidance for wind energy developments.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our low-carbon energy future.

We support the positions taken by NIRIG and reiterate the following points:

- We believe that the benefits of developing our wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development

- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland

- We strongly believe that the forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond

- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise

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limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments

- Buffer zones or separation distances are not required by statute in the UK or Ireland and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions

- We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector may be considered a leader in good practice on community engagement in Northern Ireland

We would also like to highlight the need for positive leadership from across the political spectrum for the development of our substantial renewable energy resources. Our sustainable energy aims as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital. We continue to look forward to and are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind.

In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our low-carbon commitments.

Yours Sincerely,

Gemma Scullion

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SUBMISSION BY AIR CORE LIMITED TO

NORTHERN IRELAND ASSEMBLY

ENVIRONMENT COMMITTEE'S INQUIRY

INTO WIND ENERGY

28TH FEBRUARY 2014

Air Core Limited

4th Floor

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Company Introduction

Air Core Limited are a locally owned wind energy developer within Northern Ireland and have to date lodged over 100 planning applications for the proposed development of 250kW wind turbines. Air Core has developed a significant level of expertise in this sector and is competent with Planning Policy and Guidance for wind energy developments.

Inquiry into Wind energy Issues

This is a written submission based on the terms of reference outlined in the Environment Committee (the Committee) announcement it would carry out a full inquiry into wind energy issues dated 7th November 201 3.

Whilst Air Core are supportive of the Committee for the Environment's inquiry into wind energy we would like to highlight that we believe all policy decisions on renewable energy should be based on robust, clear and credible evidence.

This submission is written in the context of single wind turbine development up to a maximum of 250kW output, hereinafter referred to as small wind.

Renewable Energy Planning Policy

The European Union has laid down challenging and mandatory targets for increasing the level of renewable energy consumption in all EU member states including Northern Ireland and these are therefore key policy drivers for the development of renewable energy.

The Northern Ireland Renewables Obligation is the main policy mechanism for promoting the generation of electricity from renewable sources in line with the EU Renewables Energy Directive.

The need to increase the contribution renewable energy can make to the overall energy mix in Northern Ireland is set out in the Programme for Government 2011 – 2015 (PfG) and the Regional Development Strategy 2035 (RDS). The PfG target is to reduce greenhouse gas emissions by at least 35% on 1990 levels by 2025.

The RDS is a regional spatial framework which aims to deliver a sustainable and secure energy supply (RG5), and reduce our carbon footprint to mitigate and adapt to climate change (RG9).

DETI's Strategic Energy Framework for Northern Ireland 2010 (SEF) sets the direction for NI's Energy Policy over the next ten years and concentrates on the key areas of electricity, natural gas and renewable energy sources.

In September 2010 while launching the SEF, the DETI Minister confirmed that Northern Ireland was setting itself a new challenging renewable energy target by seeking to achieve 40% of its electricity consumption from renewable sources by 2020.

Renewable Energy Targets formed the backdrop to Planning Policy Statement 18 – Renewable Energy (PPS18) which was published in August 2009. Since then there has been a more recent expression and strengthening of renewable energy consumption targets through the SEF. The Minister made clear that in order to achieve the challenging targets it was important for a number of

government Departments to ensure the right conditions were in place. Planning policy that encourages the sustainable development of renewable energy projects is an obvious and very important cog in the overall joint strategy.

More recently the Department has published its draft Strategic Planning Policy Statement for consultation. The core principles of the SPPS include Sustainable Development. Reducing greenhouse gas emissions and supporting renewable energy sources are seen as being important in helping further sustainable development, mitigate against and adapt to climate change.

Department of Environment has invited comments on the consultation document by close of play on 29th April 2014. This is the appropriate mechanism to inform how renewable energy planning policy develops going forward into the Review of Public Administration (RPA) and it is considered untimely to seek to amend current regional renewable energy planning policy during an already uncertain period of planning policy control in NI. Notwithstanding,

Utilisation of our considerable renewable resources will contribute to a decarbonised electricity system, a more diverse and secure energy supply and act as a hedge against volatile fossil fuel prices. Renewables represent a significant economic opportunity for Northern Ireland and Air Core alone have already created 4 full time jobs within its own business and made significant investment into the local renewable sector totalling c.£4m in a time of otherwise challenging economic conditions. This investment is due to grow to approx. £35m over the next 5 years as long as the sector continues to remain supported by an appropriate planning framework. We believe that current planning policy is fit for purpose and this is considered in detail below.

To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment

Adequacy of PPS18 and Supplementary Guidance

PPS18 sets out the Department of Environment's (the Department) planning policy for development that generates energy from renewable resources. The policy was published off the back of NI's legal targets for the production of energy by renewable means. PPS18's key aims and objectives are to:

- Facilitate the siting of renewable energy generating facilities in appropriate locations in order to achieve NI's renewable energy targets
- Ensure environmental, landscape, visual and amenity impacts are adequately addressed
- In making decisions ensure adequate protection of natural, built, and cultural heritage interests

In line with the aims and objectives of wider Government Renewable Energy policy, renewable energy planning policy has a promotive thrust. However the policy is sufficiently robust to ensure important environmental and planning considerations are carefully considered, there is no presumption to approve development at all costs, there are robust checks and balances inbuilt.

All applications for small wind go through a rigorous examination which includes views being sought from an extensive list of statutory and non-statutory bodies. Small Wind, which typically does not trigger the need for the submission of a formal Environmental Statement, still goes through a process akin to EIA development such is the extensive nature of the assessment of potential impact, consultation and consideration.

The following is a list of areas of considerations which are carried out as routine on all renewable projects:

- Public Safety, Human Health and Residential Amenity
- Visual amenity and landscape impacts
- Biodiversity, nature conservation and built heritage
- Local natural resources, air quality, water quality
- Public access to the countryside

In addition PPS18 has specific detailed areas of consideration for wind energy including small wind which includes:

- Impact on visual amenity and landscape with regard to the number, scale, size, and siting of turbines
- Cumulative visual impact
- Risk of landslide or bog burst
- Electromagnetic Impact on communications installations, radar, air traffic control, emergency services communications and other telecommunications systems such as commercial mobile phone networks
- Impact on road, rail and aviation safety
- Impact on amenity of dwellings, hospitals, schools and churches through noise or shadow flicker from the turbine blades
- Restoration arrangements in the event of energy production ceasing
- Protection of peatland

First-hand experience is that as a direct result of the policy requirements the vast majority of applications for small wind require detailed technical evidence to be submitted in addition to normal planning application papers e.g. Full Noise Impact Assessment carried out with regard to ETSU-R-97.

PPS18 also seeks to ensure that important environmental, economic and social benefits of all renewable energy developments are acknowledged by the decision maker to ensure well-balanced decisions can be reached.

It is vital for decision makers to fully appreciate the overall aims of government policy i.e. to tackle climate change by reducing our dependence on fossil fuels, and helping to diversify and bring security of supply to our energy infrastructure, and to understand the importance planning decisions hold in helping achieve these wider aims and objectives. PPS18 achieves this.

We are of the strong belief that PPS18 and the related guidance documents are more than adequate in delivering balanced planning decisions for wind energy developments across Northern Ireland on a consistent basis and have assisted progress towards meeting the targets laid down in the SEF and overall sustainable development strategies outlined in the RDS, the Sustainable Development

Strategy (SDS) and the PfG. The principles of balanced decision making currently advocated by PPS18 is the correct approach to progress towards the SEF 40% target whilst respecting other important and acknowledged interests.

Emerging Technologies

We recognises the importance of creating a renewables mix to bring about diversity and security of supply. However, it is even more important to acknowledge that onshore wind offers the most cost effective means of renewable electricity generation. The wind is clean and it is free. It is also plentiful given the island of Ireland's unique location on the eastern edge of the North Atlantic. Wind Energy technology is also a mature technology unlike many of its counterpart technologies. Wind is the single biggest renewable energy opportunity and it would be remiss not to exploit this free renewable resource to its full extent. The need to promote Wind Energy as the leading form of renewable energy production remains, and as such Planning Policy needs to continue being promotive of onshore wind.

Small scale wind fits well with the Northern Ireland settlement pattern. Northern Ireland's historical rural development pattern has resulted in the countryside being heavily developed by single rural dwellings. Dwellings are a significant constraint to the development of all wind energy development and it is especially difficult to achieve the necessary separation distances between large scale commercial wind farms and dwellings. However, this presents an opportunity as small wind can integrate more readily into this historical development pattern. Separation distance requirements are more easily met, and due to the rigorous assessment process it is possible to integrate a large volume of small wind projects across NI without resulting in a significant adverse impact on our landscapes. The primary reason for this is the scale of the technology involved.

To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development

In Northern Ireland Noise impact Assessment for all proposed wind turbines is completed in accordance with ETSU-R-97 (ETSU), The Assessment and Rating of Noise from Wind Farms, (September 1996). The BPG to PPS18 identifies ETSU-R-97 as the most relevant guidance on good practice.

ETSU states that noise from the wind farm should be limited to 5 dB(A) above the background level during both daytime and night-time, with the exception of the daytime limits (in low noise environments) 35 – 40 dB(A) or at night-time where there is a fixed limit of 43 dB(A). This night-time noise limit is based on sleep disturbance criteria of 35 dB(A) (an allowance of 10dB(A) has been made for attenuation through an open window and 2dB subtracted to account for the use of LA90,10min, rather than LAeq,10min). For 'financially involved' properties, ETSU recommends that the relevant daytime and night-time noise limit is 45 dB(A).

To put these noise targets into context, the Best Practice Guide compares noise generated by wind turbines to other everyday activities (see table 1 below).

Source / Activity	Indicative noise level dB(A)
Threshold of pain	140
Jet aircraft at 250m	105
Pneumatic drill at 7m	95
Truck at 30mph at 100m	65
Busy general office	60
Car at 40mph at 100m	55
Wind farm at 350m	**35-45**
Quiet bedroom	35
Rural night-time background	20-40
Threshold of hearing	0

Table 1 – Noise Levels Comparison

In May 2013 following a 10 week consultation and two peer reviews, the Institute of Acoustics (IoA) noise working group, published the document 'A Good Practice Guide to the Application of ETSU-R-97 for Wind Turbine Noise Assessment'. This is the most recent expression of guidance on the application of ETSU and has been endorsed by the Environment Minister Mark H Durkan and Government in England, Scotland and Wales.

ETSU-R-97 requires assessments to take account of the following steps:

- Predict noise levels from all turbines (existing and proposed) at the nearest receptors;
- Determine a study area;
- Identify potentially affected properties;
- (If required) Undertake a measurement survey consisting of simultaneous measurement of background noise levels at representative properties with wind speed and direction at the proposed turbine site;
- Analyse the data to remove rain affected and atypical data, and derive the noise limits for the scheme;
- Update noise predictions & assess compliance with the noise limits for a candidate turbine, and
- provide design advice if compliance with the limits is considered unlikely.
-

The main purpose of this procedure is to set out the noise data required, and the subsequent analysis needed to allow a decision maker to make an informed decision to assess compliance with ETSU-R-97.

This scientific assessment (ETSU) and best practice guidance uses existing noise environments to determine the acceptability of wind turbine noise rather than advocating separation distance as a benchmark.

English Planning Policy Statement 22 generally advocates the same approach as PPS18 insofar as noise impact is concerned. Planning Practice Guidance for Renewable and Low Carbon Energy published in 2013 it states:

'Local planning authorities should not rule out otherwise acceptable renewable energy developments through inflexible rules on buffer zones or separation distances. Other than when dealing with set back distances for safety, distance of itself does not necessarily determine whether the impact of a proposal is unacceptable. Distance plays a part, but so does the local context including factors such as topography, the local environment and near-by land uses. This is why it is important to think about in what circumstances proposals are likely to be acceptable and plan on this basis.'

Scottish Policy suggests that within the Spatial Frameworks of Development Plans 'Areas of Search' should be identified where appropriate proposals are likely to be supported. Within such areas a 2km buffer between areas of search and edge of settlements should be adopted in order to guide developments to the most appropriate sites, but decisions on individual developments should take into account specific local circumstances and geography. In September 2013 a review was carried out into the 2km separation distance requirement and concluded there was no supporting evidence to support such a requirement.

Welsh Technical Advice Note 8 (TAN8) advocates 500m as a suitable separation distance to safeguard against noise impact on dwellings however suggests that flexibility is advised as the set distance when applied rigidly can lead to over conservative results.

It is would be inappropriate to adopt an arbitrary approach to separation distances to safeguard against noise impact. There are too many variables to consider when determining appropriate impact from noise which an arbitrary separation distance policy would fail to consider, such as:

- turbine type and number
- background noise levels
- topography
- wind shear effects

In addition, an arbitrary separation distance rule would discriminate against turbines which are quieter than others. In that sense it would also stymie the development of quieter turbines, this would be a regrettable consequence.

Noise Impact Assessment is a technical matter which the Department of Environment Planning seeks advice on from the Environmental Health Department's (EHD) of the local council. Through this consultation process DOE Planning receives the necessary assurance that noise impact has been assessed thoroughly prior to granting planning approval. Indeed, it is our experience that the local council EHOs adopt the most conservative interpretation of the recent IOA guide to the detriment of applications. This ensures an additional layer of protection from noise in the interests of residents.

As part of the decision DOE Planning also attaches conditions to a planning permission which set the noise limits within which wind turbine development is expected to operate. The levels are proposed by the local council and are based on the findings of the Noise Impact Assessment process.

The Committee must also recognise that much of the guidance relating to noise impact from wind energy is written in the context of large scale wind farms, not small scale single wind turbine development.

Air Core supports PPS18, and notes that the use of absolute fixed minimum setback distances, as happens in other jurisdictions, does have drawbacks. The ETSU assessment and best practice guidance uses existing noise environments to determine the acceptability of wind turbine noise rather than advocating separation distance as a benchmark. It is would be inappropriate to adopt an arbitrary approach to separation distances to safeguard against noise impact. There are too many variables to consider when determining appropriate impact from noise which an arbitrary separation distance policy would fail to consider, such as turbine type/ number, background noise levels, topography and wind shear effects.

In addition, an arbitrary separation distance rule would discriminate against turbines which are quieter than others. In that sense it would also stymie the development of quieter turbines, this

would be a regrettable consequence. Continued improvements in wind turbine technology are leading to reductions in noise emissions. Consequently, any setback regulation would start to become unduly restrictive or obsolete as soon as approved. Across the UK and Ireland no separation requirements are written in legislation. Distances are instead suggested in policy and accompanying guidance. Buffer zones or separation distances are not required by statute or required by any national policies.

The Committee must also recognise that much of the guidance relating to noise impact from wind energy is written in the context of large scale wind farms, not small scale single wind turbine development.

To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

Historically the Wind Industry has proven to be a responsible industry and have engaged with local communities prior to lodging planning applications for wind farms. This has been on a voluntary basis rather than being a requirement in planning law.

It is worth noting that the Planning Act (NI) 2011 will put in place a legislative requirement on applicants of major applications to carry out pre-application community consultation. Wind farm development will fall into this category.

The impact of small wind is more localised and impact is not as far reaching as large scale wind farms. As such this type of development will not likely fall into the category of major development and as such it would be inappropriate to lay down in statute a requirement for small scale wind

energy developers to carry out extensive pre-application community consultation. Notwithstanding, in our experience our clients have been willing to engage with local community groups and/or community service providers to ensure there are real community benefits to be realised through their wind turbine developments.

Conclusions

Northern Ireland faces strict and challenging targets for the production of energy from renewable sources. It is on the back of these targets that Government policy has been drawn up. Planning policy is an important part of the overall wider renewable energy policy strategy.

To continue to make progress towards our targets the NI planning policy context needs to maintain the right conditions to foster a strong renewables industry. In that sense the Executive needs to hold firm on the current renewable energy planning strategy to ensure there are meaningful results. Onshore Wind Energy is undeniably the biggest opportunity to help towards delivering the 40% target by 2020. Wind is clean, free and plentiful and the wind industry is a mature and proven industry unlike many new emerging renewable technologies. As such it is important to maintain

faith in onshore wind whilst at the same time allowing a mix of other renewable technologies to provide a supporting role. In addition the importance of small wind in contributing to the overall targets should not be underestimated given the opportunity for this scale of development in the NI countryside.

Air Core's experience is that PPS18 is a robust policy striking the correct balance between the promotion of renewable energy development and protecting other matters of acknowledged importance such as the environment, residential amenity and heritage interests etc. PPS18 is on balance fit for purpose.

The assessment of noise is based on sound scientific assessment and is current having been reviewed and advised on as recently as 2013. To move away from this approach to an arbitrary rule for separation distances would put NI at odds with the remainder of the UK.

Community engagement is generally to be encouraged and is a responsible approach for developers. Proportionality is key. It is already evident that the Department realise this given that pre-application community engagement on major planning applications will be a requirement of the new Planning Act (NI) 2011. It is however unrealistic to place a statutory requirement on applicants for minor planning applications to engage in this process.

Air Core wish to ensure the Committee that the regulatory framework in Northern Ireland is extremely thorough and sets the correct and balanced conditions to progress Northern Irelands Renewable Energy strategy and consequently help meet the 2020 target.

Air Core urge the Committee to consider the comments above and retain the current policy conditions to promote a strong local renewables industry and investment into same.

Andrew White

Inquiry into Wind Energy

RE: Planning Application No. O/2009/0756/F
Erection of Single Wind Turbine 46.5M. Hub Height with Blade Diameter 39.4M.

I will briefly outline my situation. My family have lived at our present address for 37 years. In the autumn of 2010, Rapid International, an engineering company located on Mullavilly Road, erected the above industrial turbine which is 400m from my home. Planning approval had been granted with noise conditions attached. No attempt was made to discuss this development with the community nearby and our opposition was inadequate being in a state of ignorance in 2010 as to how the close presence of a 46m high turbine would blight our lives. There was no Environmental Impact Survey carried out as a result of a decision made by the Planning Office not to carry out such a survey. Because of the intrusive, pulsating tonal noise from this turbine the residential amenity of our home has been lost. We are very keen gardeners, with a one acre garden, which has been opened to support the National Trust on two occasions, and now all pleasure has been lost in the garden because of the intrusive noise of this turbine.

Many other residents in the area have complained of this noise nuisance, shadow flicker and loss of amenity. My home, which we have tried to put on the market, has lost at least 25% of its value because this turbine is so close to our property. No one would want to buy a property with a wind turbine beside it. This is my children's inheritance which has decreased significantly.

I have been acting as Chairman for Mullavilly Residents and we have been very let down by the Planning Department and the Environmental Health Department. These departments in this instance have not looked after the interests of the public in Mullavilly, County Armagh.

My comments in this submission are the result of the sad experience of living beside an industrial turbine.

Policy RE 1 'Renewable Energy Development' states;

Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on;

a. public safety, human health, or residential amenity

b. visual amenity and landscape character

My health has certainly been detrimentally affected and I have lost the pleasure of living in my home and garden because of the intrusive noise.

Planning Policy Statement 18 'Renewable Energy' and 'The Assessment And Rating Of Noise From Wind Farms ESTU-R-97'.

This policy and guidance has afforded me no protection whatsoever from noise nuisance and loss of amenity. PPS 18 and ESTU-R-97 are not fit for purpose.

a. Noise Limits

The current guidelines promote the use of the La90 noise indicator. This is not appropriate. La90 10 mins. is the tenth percentile of the distribution of the Arated sound level measured over a ten minute period. In layman's terms it is calculated by measuring the noise level over a ten minute period, disregarding the noisiest 90% of the time and taking the maximum noise level in the remaining (quietest) 10% of the time. As the human ear does not disregard 90% of the noise experienced, this measurement indicator is considered inappropriate for wind turbine noise assessment. Laeq is the energy average of the noise over a given period. This is the noise indicator which must be used as it quantifies average sound levels as experienced. This is in line with the standards accepted and implemented across the EU.

An Environmental Health officer is continuing to monitor noise at two noise sensitive properties and as the intrusive effect of noise is greater at night these recordings, in some instances, take place at 3.0am. These recordings may be used to ask a court to issue a Noise Abatement Notice.

Your committee would be welcome here to see and hear for themselves our experience of the noise from an industrial turbine nearby.

b. Separation Distances

The interpretation of PPS 18, where Policy RE1 on 'Renewable Energy Development' states that;

> *'For wind farm development a separation distance of 10 X rotor diameter to occupied property, with a minimum distance of 500m. will generally apply'*

It appears to me that both PPS 18 and the Best Practice Guidance use the term 'wind farm' throughout to refer to all wind energy developments, with the possible exception of small single turbines (under 50Kw and under 15m in height). It can therefore safely be concluded that, irrespective of the number of turbines involved in an application, PPS 18 will apply. How did this industrial size turbine get planning approval 180m. from several residential properties? As turbines develop with emerging technologies they will become larger. A more satisfactory separation distance may then become 10X the overall blade tip height which in our instance here at Mullavilly would be 660m. Some properties here are 180m. from the turbine.

c. Shadow Flicker

The guidelines introduce the concept of shadow flicker being an issue within 10 X rotor diameter of a dwelling on the northerly side of the east-west plane of a turbine and which should be dealt with appropriately. A condition should be attached to all planning permissions for wind turbines to ensure that there will be no shadow flicker at any existing dwelling or other existing affected property within 10 X rotor diameter of any wind turbine. A further condition should be included to state that if shadow flicker does occur, then necessary measures, such as turbine shut down during the associated time period will be taken by the energy developer or operator to eliminate the shadow flicker. Presently the language is too loose and does not put any legal obligation on the developer to adhere to this guidance. The guide lines are not based on scientific research and are inadequate to protect the public from a serious menace to health.

Environmental Health officers have no legal framework to allow them to investigate flicker which is very damaging to health.

The guidelines do not prescribe mandatory conditions for eliminating shadow flicker incidence on dwellings. A mandatory requirement is essential

Again your committee would be welcome to visit homes here that are affected by shadow flicker

d. Local Communities

No effort has been made at Mullavilly to involve our community at any stage. Community involvement must only follow proper regulation otherwise community division will follow. It will not be useful here at Mullavilly because the regulation has been flawed from the outset.

e. Human Rights

European Convention on Human Rights:
Right to private life (Article 8) states

Article 8.1: 'Everyone has the right to respect for his private and family life, his home and his correspondence.' THIS RULING IS NOT BEING ADHERED TO.

Andrew White

By email

Anne Flynn

As ESBNG is the MOU between ESB and SONI,and now EirGridplc and SONI are contractually bound, I am voicing my opposition to Northern Ireland's wind energy policies. The more wind energy Northern Ireland takes onto the National grid the more Southern Ireland's energy becomes unstable, unreliable, unpredictable, more subsidised, and the more carbon emissions it releases. It's a fallacy, to acknowledge wind as an alternative energy resource. The fact that wind energy needs conventional fossil fuel plants to be kept idling during wind generation so that they can be turned on when the requirement arises alone cancels out any positive generation we might attribute to them. This idling of plants not only creates greater level of carbon dioxide emissions, because they need to be geared up and down as needed, but it significantly adds to the cost of generation. As well as this the fact that the wind is subsidies through PSO levies, REFIT2 and other loans provided by our government through investment companies make this energy economically unsustainable.

In fact in today's bloomgberg report: 'Germany should scrap its clean-energy subsidies because the system has driven up electricity costs for consumers and hasn't spurred innovation or reduced greenhouse gases, a group of government advisers said. Adding renewable-energy plants in Germany doesn't cut Europe's emissions because they're released elsewhere, the Commission for Research and Innovation said in a report handed to Chancellor Angela Merkel today. The uncapped aid provided by the system known as EEG - - about 23 billion euros ($31 billion) last year – doesn't encourage new technologies, it said.

"The EEG isn't a cost-efficient instrument for climate protection nor does it have a measurable impact on innovation," the commission said in the report. "That's why there is no basis for the continuation of the EEG."http://www.bloomberg.com/news/2014-02-26/merkeladvisers-urge-germany-to-end-clean-energy-subsidy-program.html . How can NI commit to an energy policy that has directly impacted European gas energy cost to 300% more expensive than the US. The EU has agreed that if they don't do anything Europe will lose significant competitiveness, and this is BAD NEWS FOR ECONOMIC GROWTH AND BAD NEWS FOR JOBS..... Ireland's industrial energy costs are at presently some of the highest in Europe.

http://www.vieuws.eu/energy/if-europe-had-one-voice-energy-prices-could-be-reducedclaims-ieas-fatihbirol/?utm_content=buffer7c98d&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

Additionally, the negative impact of wind on tourism, real estate, agriculture, human health and the rezoning of land from agriculture to commercial, all substantially accumulatively impact the South of Ireland because the economies, cultures and histories are so closely tied to each other.

Antrim Borough Council

Our Ref: DMcC/BD/KS

27 February 2014

Environment Committee
NI Assembly
Room 247
Parliament Buildings
Ballymiscaw
Stormont
BELFAST
BT4 3XX

Email: committee.environment@niassembly.gov.uk

Dear Sir / Madam

RE: INQUIRY INTO WIND ENERGY

Your letter dated 9 January 2014 regarding the above refers.

Further to consideration of the matter by Council's Planning & Public Services Committee, please find attached corporate response for your attention.

I would be grateful if you could acknowledge receipt.

Yours faithfully

DAVID McCAMMICK
Chief Executive

Enc

Antrim Civic Centre, 50 Stiles Way, Antrim, BT41 2UB
T. 028 9446 3113 F. 028 9448 1324 Minicom. 028 9448 1343
Text. ABC and your message to 60777 E. info@antrim.gov.uk W. www.antrim.gov.uk

Antrim Borough Council Response (February 2014)

NI Assembly: Environment Committee – Inquiry Into Wind Energy

Antrim Borough Council wishes to thank the Committee for the opportunity to comment in respect of the above matter; the matter is considered by Council as extremely topical and the Inquiry timely.

Council remains fully supportive of the renewable energy targets adopted by the Northern Ireland Executive, but shares the frustrations of its local constituents in relation to the provision of single wind turbines and onshore windfarms.

The presence of Belfast International Airport within the Borough reduces the number of these developments granted planning approval due to stringent safety standards and the current radar technologies available. The Airport quite rightly has a significant, consultative role in the process, and it should be noted from the outset that Antrim Borough Council reiterates its fullest support for air safety requirements and endorses the Airport's decisions to recommend refusal for safety reasons. However, through discussion with both developers and BIA, Council is aware that emerging technology has the potential to minimise radar disturbance. This needs to be fully and quickly explored.

Perceived Adequacy of PPS18:

Antrim Borough Council believes that PPS18 remains an important policy document, but it is important that it is not identified as solely a document overseeing wind energy development. Many reports have highlighted Northern Ireland's geographic location as being ideal for wind power, but it is important to emphasise that the other renewable energies covered by the document are not summarily dismissed.

The renewable energy sector is rapidly evolving and, as such, it is essential that Northern Ireland as both a society and an economy has policies that are deliberately flexible enough to accommodate change and evolution. The fact that Northern Ireland is seen as an ideal location for technologies such as wind and tidal power makes it ever more important that we get the correct policies in place. There are new technologies constantly being developed that may outdate current policy at a stroke, so inbuilt policy flexibility is essential.

Antrim Borough Council therefore embraces the thrust of PPS18 and supporting policy documentation like the Landscape Character Assessment 2000, but offers the above caveat in its remit and discharge. Under the auspices of PPS18, the definition of renewable energy should not simply be taken to mean wind energy, the development such as solar/photovoltaic panels, biomass, anaerobic digesters, combined heat and power units and other evolving technologies must be given equal footing. If this means revising PPS18 to accommodate these and other technologies, or to provide sufficient flexibility to do so, then that is the right direction.

Comparing Impact of Noise and Separation Distances with Other Jurisdictions:

Antrim Borough Council recognises that whilst best practice examples can be used from other jurisdictions, including within Great Britain and Republic of Ireland, there is much room for debate given the young age of this technology. Planning Service should seek to liaise with other agencies elsewhere to see if lessons can be learned.

Extent of Engagement between Wind Energy Providers and Local Communities:

Antrim Borough Council has not been privy to such discussions, so cannot comment.

Antrim Borough Council Response (February 2014)

Additional Comments

In addition, Council wishes to highlight a number of related issues. These are noted below.

- Members recognise air safety requirements but express concerns regarding the continued refusal of renewable energy planning applications within a certain radius of Belfast International Airport when this does not appear to be an issue for other Airports (i.e. George Best Belfast City Airport); - statistical evidence from DoE statistics covering single wind turbine applications received and decided by Planning Service from 2002/03 to 31 December 2013, shows Antrim BC area has seen the second lowest approval rate (79%, exceeding only Limavady BC area, and far below the NI average of 88%). In contrast, those Council areas most directly impacted by the George Best Belfast City Airport - Belfast City Council, Castlereagh BC and North Down BC enjoy approval rates of 91%, 96% and 92% respectively in terms of single wind turbines.
- Planning Service and local airports should be encourages to work closely together to produce a publicly available model/map that demonstrates where wind turbines are likely to be acceptable, and conversely where they will be unlikely. This would be of benefit to both applicants and the airports.
- The terms of reference for the Inquiry are considered too narrow and need to take account of the electricity distribution infrastructure as a whole, particularly as generated energy is not being transmitted from the west of the region to the east satisfactorily. This is primarily due to the capacity limitations of an outdated electricity infrastructure. Accordingly, it is recommended that NI Electricity/Viridian should be consulted by the Committee to ascertain the issues facing the current infrastructure system. Without an infrastructure with excess capacity, there is little justification in approving additional turbines.
- Wind speed, noise, distance from (residential) properties and health matters should be fully investigated and monitored to ensure that wind turbines, whether single or as part of a larger windfarm, are being erected in the optimal locations.

Conclusion and Recommendations:

Antrim Borough Council remains a strong advocate of renewable energy and supporter of the renewable energy targets set by the Northern Ireland Executive. The policy document must be effective enough to balance environmental and economic interests, and the impact of all forms of renewable energy technologies need to be assessed equally. As planning powers transfer to local government sector, this may offer the opportunity to review the wider policy to ensure that a solid foundation for this is provided.

ABO Wind NI Ltd

From: Aoife Legear [

Sent: 28 February 2014 16:54

To: +Comm Environment Public Email

Cc: Tamasin Fraser; Gerry McDevitt

Subject: Environment Committee Call for Evidence

Dear Sir/Madam,

Please find attached a copy of the ABO Wind N.I Response to the Environmental Committee Call for Evidence. ABO Wind N.I. Ltd is a subsidiary of the German-based ABO Wind, one of Europe's most experienced wind energy developers. The company was founded in 1996 and has over 250 employees in Germany, France, Spain, Scotland, Ireland and Argentina, with interests in Portugal, Belgium and Bulgaria. ABO Wind has been successful in developing, constructing and maintaining wind farms with over 750 MW of rated capacity in Europe. We plan a long-standing commitment to the local Northern Ireland market and economy over the coming years and will contribute substantially to the UK renewable energy targets.

ABO Wind N.I welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our lowcarbon energy future.

If you have any questions regarding the attached document please do not hesitate to get in touch.

Yours faithfully,

Aoife

Aoife Legear
Development Project Manager

ABO Wind NI Ltd
Adelaide House
Hawthorn Business Centre
Falcon Road
Belfast
Northern Ireland
BT12 6SJ

Phone: + 44 (0) 28 9038 7068

Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

27 February 2014

Dear Chairperson,

Response to Wind Energy Inquiry

ABO Wind N.I. Ltd is a subsidiary of the German-based ABO Wind, one of Europe's most experienced wind energy developers. The company was founded in 1996 and has over 250 employees in Germany, France, Spain, Scotland, Ireland and Argentina, with interests in Portugal, Belgium and Bulgaria. ABO Wind has been successful in developing, constructing and maintaining wind farms with over 750 MW of rated capacity in Europe. We plan a long-standing commitment to the local Northern Ireland market and economy over the coming years and will contribute substantially to the UK renewable energy targets.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our low-carbon energy future.

We support the positions taken by NIRIG and reiterate the following points:

- We believe that the benefits of developing our wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development
- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland
- We strongly believe that the forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond

- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments
- Buffer zones or separation distances are not required by statute in the UK or Ireland and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions
- We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector may be considered a leader in good practice on community engagement in Northern Ireland

We would also like to highlight the need for positive leadership from across the political spectrum for the development of our substantial renewable energy resources. Our sustainable energy aims as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital. We continue to look forward to and are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind. In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our low-carbon commitments.

Yours sincerely,

ABO Wind NI Ltd

Armagh City and District Council

Armagh City and District Council...

Our Ref: 11CM13

Your Ref:

John Briggs,
Clerk and Chief Executive

25 February 2014

Environment Committee
Room 247, Parliament Buildings
Ballymiscaw
Stormont
BELFAST
BT4 3XX

Dear Sir/Madam

INQUIRY INTO WIND ENERGY

Armagh City and District Council welcomes the opportunity to respond to the above consultation document.

Please find attached a response prepared by CEHOG for the above consultation which has been endorsed by Armagh City and District Council. In addition, the Council also wishes to raise the issue of grid connection for wind energy proposals. The Council is concerned that Applicants are investing substantial sums of money in the planning application process and wind energy proposals can also cause anxiety and angst in the local community; however both these issues may be needless since many approved proposals may never come to fruition due to high connection costs. The Council would suggest that Applicants be asked to consult with energy providers prior to their application being submitted to ascertain whether a connection to the energy grid would be feasible and to discuss the costs involved.

The Council wishes to be kept informed of developments. It would be helpful if your response could be e-mailed to jennifer.mcaneney@armagh.gov.uk.

Yours faithfully

John Briggs
Clerk and Chief Executive

Enc

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INVESTOR IN PEOPLE

Employer Council for Southern Group Environmental Health Committee

Chief Environmental Health Officers Group (CEHOG) Response to the Stormont Environment Committee – Inquiry into Wind Energy – 2014

1.0 Environmental Health remit

1.1 Environmental Health recognise the benefits of wind energy in the production of renewable power, improved security of supply and local employment. However there are also a number of potential local environmental impacts including, noise, shadow flicker and visual/landscape effects.

1.2 Environmental Health within local government are well placed to rigorously review and provide substantive comments to Planning (NI) with respect to noise impact assessments submitted on behalf of applicants for proposed wind energy developments, as Environmental Health Officers have specialist training in the field of noise assessment and control. Environmental Health provide comment solely with respect to noise impacts, in view of Councils statutory duty in relation to noise nuisance i.e. environmental health do not provide comment on shadow flicker, visual or other impacts as they lie outside of the statutory remit of Environmental Health and are instead considered by Planning (NI) and its other consultees.

2.0 Context in which Environmental Health provide comment to Planning (NI)

2.1 Environmental Health, in providing comments to Planning (NI), do so within the confines of published guidance, *"Northern Ireland Planning Portal – The Role of the Planning Authority and Consultees in the Online Planning Application Consultation System Version 2.0."(Planning (NI) April2013)*

2.2 Matters of relevance,

"Consultees will provide the planning authority with advice on development proposals. They are required to:

- *Provide a substantive response on planning matters in line with published planning policy and Departmental obligations within agreed timescales which is clear, concise, consistent and unambiguous...*
- *Comment only on matters related to material planning considerations, specific to the consultee's area of expertise, and detail any concerns they may have regarding the proposal...*

*The advice and information provided by a consultee **MUST** be set in the context of Departmental policies and obligations.*

***IT IS NOT THE ROLE OF THE CONSULTEE** to recommend or advise that permission should be granted or refused..., it is ultimately for the planning authority to make the decision and decide if an application should be approved (with or without conditions)..."*

2.3 With respect to wind energy developments, the above limits Environmental Health to only providing comment on whether or not noise from the proposed development complies with the requirements of Planning Policy Statement 18: Renewable Energy – August 2009.

2.4 PPS18 'Policy RE1 – Renewable Energy Development' in relation to wind energy states,

"Applications for wind energy development will also be required to demonstrate...(vi) that the development will not cause significant harm to the safety or amenity of any sensitive receptors (including future occupants or committed developments) arising from noise; shadow flicker, ice throw; and reflected light..."

2.5 A 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy – August 2009' was published to supplement PPS18. Paragraph 1.3.46 states,

"The report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97) ... should be used in the assessment and rating noise from wind energy developments."

2.6 Environmental Health in providing comment to Planning (NI) therefore reviews the applicant's noise impact assessment against the requirements of ETSU-R-97.

3.0 ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'

3.1 ETSU-R-97 contains the noise limits which wind energy developments must not exceed in order to control the impact of noise upon those living in the vicinity. It was drafted in 1996, some 18 years ago, when there were relatively few wind farms and when proposed wind turbines of the day typically had hub heights of 30 – 40m and with power outputs of 0.25 to 0.5MW.

3.2 In recent times, turbines proposed for wind farms, generally have hub heights of 60 – 90m with power outputs of 1.5 to 3 MW. As a consequence of taller and more powerful wind turbines, producing noise of a different character, the protection to amenity originally assumed by the ETSU-R-97 noise limits may no longer be appropriate.

3.3 Page 111 of ETSU-R-97 states, *"This report was drafted in the light of the best information available at the time and in the circumstances prevailing at the time. However it is acknowledged that as more experience and information become available and as circumstances develop it may become necessary to revise and improve the contents of this report.*

The Noise Working Group therefore suggests this report and its recommendations are reviewed in 2 years time. We anticipate that the wind industry will itself take the initiative for such a review and that this review will be undertaken by a cross-section of users of the report."

3.4 To date, no such review has been undertaken.

3.5 Institute of Acoustics – A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

3.6 In May 2013 following a request from Department of Energy and Climate Change (DECC), the Institute of Acoustics (IOA) produced a Good Practice Guide to the application of ETSU-R-97, most notably including a commonly applied wind turbine noise prediction methodology. However, it should be highlighted that the terms of reference provided to the Institute of Acoustics explicitly excluded the examination of the increasingly controversial ETSU-R-97 noise limits.

3.7 ETSU-R-97 noise limits

3.8 ETSU-R-97 noise limits are set relative to the prevailing background noise for a given locality. As background noise and wind turbine noise increase with wind speed, so too do the ETSU-R-97 noise limits. ETSU-R-97 considers that noise limits solely set relative to background noise would be unduly restrictive on wind energy developments in otherwise low noise environments remote from other noise sources and hence requires that lower fixed noise limits for daytime (35 – 40 dB L_{A90}) and night-time (43 dB L_{A90}) be applied in such environments .

3.9 Recently, some wind farm developments have been specifically designed to avail of the fixed noise limit at night-time, but have to operate in a curtailed mode during the day to achieve the daytime fixed noise limit which is relatively lower (i.e. the wind farm creates more noise at night than during the day). As people are more sensitive to noise at night-time, this has placed greater focus onto the suitability of the night-time noise limits.

3.10 The ETSU-R-97 noise limits were based on a number of stated assumptions regarding the character of the noise emissions. Recent research from the renewables industry body (RenewablesUK – Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects 16th December 2013) recognises that modern wind energy developments may exhibit noise character not as originally envisaged under ETSU-R-97. This leads Environmental Health to the view that the ETSU-R-97 noise limits, including the night-time fixed limit of 43 dB L_{A90}, require a review to ensure that they remain suitably protective of amenity.

3.11 Noise limits within other jurisdictions

3.12 Renewable energy planning policy within Northern Ireland is in line with other United Kingdom jurisdictions in recommending that noise impacts from wind energy developments be assessed against ETSU-R-97.

3.13 The Department of the Environment, Community and Local Government (Republic of Ireland) is currently undertaking a consultation on proposed amendments to wind energy noise limits. Current Irish noise limits are similar to ETSU-R-97 but it is proposed to simplify these to a single fixed noise limit of 40 dB L_{A90}, day and night, with *'a minimum separation distance of 500m between any commercial scale wind*

turbine and the nearest point of the curtilage of any property in order to provide for other amenity considerations e.g. visual obtrusion.'

3.14 Research undertaken to inform the current Irish consultation (Examination of the significance of noise in relation to onshore wind farms – 29th November 2013) includes within Section 4.0 a list of noise limits as applied across other international jurisdictions. Given the different acoustic descriptors applied across other international jurisdictions, it is difficult to make meaningful comparisons with ETSU-R-97.

4.0 Planning Conditions for single wind turbines

4.1 The IOA GPG has been endorsed in its entirety by the English, Welsh and Scottish governments. In NI the GPG has recently been endorsed (19 Dec. 2013) but concern was raised over some of the suggested 'Example Planning Conditions'. One such condition requires the operator to provide satisfactory evidence to the planning authority demonstrating compliance with the noise limits, in the event of a complaint being made.

4.2 DoE correspondence has stated that they are not minded to attach this condition to individual wind turbine proposals. However, it should be noted that DoE routinely attaches similar conditions to wind farm applications.

4.3 Noise limits as applied to wind farm developments are identical to those applied to individual wind turbine proposals. The noise impact on local residents is identical irrespective of whether the noise is being created by one nearby turbine or numerous more distant ones. Consequently, Environmental Health do not agree with DoE differentiating between the control needed to protect local residents from the noise impact of the two types of wind energy development.

4.4 Furthermore, the current DoE position sits outside rest of UK. Complaint investigation conditions for wind farm and single wind turbine developments are routinely applied by;

- Local Planning Authorities in England, Wales and Scotland
- The Planning Inspectorate for England – Ref: APP/M0933/A/13/2192651 – decision 2nd December 2013
- The Planning Inspectorate and Wales – Ref: APP/T6905/A/13/2198078 – decision 18th December 2013
- The Directorate for Planning and Environmental Appeals for Scotland – Ref: PAA-170-2072 – decision 23rd December 2013

- The Secretary of State for Communities and Local Government – Ref: APP/Y0435/A/10/2140401, APP/K0235/A/11/2149434, APP/H2835/A/11/2149437

  In addition, complaint investigation conditions are also recommended by the Institute of Acoustics and RenewablesUK (Template Planning Condition on Amplitude Modulation: Noise Guidance Notes – 16th December 2013) within their example conditions.

4.5 Merits of the complaint investigation condition

4.6 The measurement of wind turbine noise is time consuming and hence resource intensive. In the absence of a complaint investigation condition, the costs to verify compliance with the noise limits attached to a planning permission would fall solely upon the local ratepayer within the district where the turbine is located. The use of post verification conditions is not uncommon in development control (e.g. contaminated land verification reports) and it is the view of Environmental Health that they remain wholly appropriate in these circumstances where conditions cannot be readily enforced by conventional investigation techniques.

4.7 It is often assumed that Environmental Health nuisance provisions provide the same level of protection as desired through the planning regime. It should be noted that nuisance provisions can only deal with 'excessive emissions', and do not provide the control of noise as required by PPS 18 and ETSU-R-97.

5.0 Conclusion

5.1 Environmental Health welcome the Environment Committee's interest in the important yet often controversial topic of wind energy impacts. Environmental Health consider that a review of the noise limits as derived under ETSU-R-97 is long overdue and should be prioritised along with the other United Kingdom jurisdictions at a national level.

5.2 On a local level, Planning (NI)'s approach in not attaching a 'complaint investigation' condition with respect to single wind turbine applications is likely to place considerable resource burdens on to ratepayers whilst considerable resistance remains from local residents to such developments. Environmental Health respectively request a review of this position.

Ballymena Borough Council

Dear Sir/Madam,

Please find the attached response on behalf of Ballymena Borough Council as agreed at the

Corporate Strategy and Scrutiny Committee meeting, Monday 10th March 2014. Ballymena Borough

Council welcome the opportunity to comment.

Regards

Nicola McCall
Deputy Chief Environmental Health Officer

Ballymena Borough Council

Organisation	Northern Ireland Assembly Environmental Committee
Consultation	Inquiry into Wind Energy
Date Consulted	9th January 2014
Date of Response	
Officer dealing with Response	

1.0 Terms of Reference

1.1 The Terms of Reference (TOR) are as follows:

- To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;
- To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development;
- To review the extent of engagement by wind energy providers with local communities and to ascertain how the engagement may best be promoted.

2.0 TOR Item 1

2.1 To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment.

2.2 Ballymena Borough Council recognises the benefits of wind energy in reducing our dependence on imported fossil fuels and bringing diversity and security of supply to our energy infrastructure. The Council also recognises the benefits of wind energy in working towards achieving the EU targets of 20% reduction in energy use, a 20% share for renewable in the energy mix and a 20% reduction in greenhouse gases by 2020.

2.3 In consideration of a response to the TOR the Council have reviewed the following publications:

- Planning Policy Statement 18 ‘Renewable Energy’

- Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy'
- Wind Energy Development in Northern Ireland's Landscapes : Supplementary Planning Guidance to accompany Planning Policy Statement 18 'Renewable Energy'. NIEA Research and Development Series No. 10/01, Belfast.

2.4 In general the Council are of the view that PPS18 and the related supplementary guidance documents, listed above, are adequate in regulating proposals for wind turbines, however it is considered that improvements could be made.

2.5 The Council would make the following comments:

a) It is considered that a more consistent approach needs to be applied to Planning Decisions in respect of proposed wind farms.

b) Clearer guidance should be provided in respect of the criteria on which a planning decision will be based.

c) Clearer guidance should be provided on the likelihood of achieving connection to the electricity grid.

d) Clearer guidance should be provided in respect of the criteria that will be set by local airports in respect of the siting of wind turbines.

e) Clearer guidance should be provided in respect of the effects of shadow flicker.

3. TOR Item 2

3.1 To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development.

3.2 Environmental Health remit

3.2.1 Ballymena Borough Council Environmental Health Department recognises the benefits of wind energy in the production of renewable power, improved security of supply and local employment. However there are also a number of potential local environmental impacts including, noise, shadow flicker and visual/landscape effects.

3.2.2 Environmental Health within local government are well placed to rigorously review and provide substantive comments to Planning (NI) with respect to noise impact assessments submitted on behalf of applicants for proposed wind energy developments, as Environmental Health Officers have specialist training in the field of noise assessment and control.

3.2.3 Environmental Health provide comment solely with respect to noise impacts, in view of Councils statutory duty in relation to noise nuisance i.e. environmental health do not provide comment on shadow flicker, visual or other impacts as they lie outside of the statutory remit of Environmental Health and are instead considered by Planning (NI) and its other consultees.

3.3 Context in which Environmental Health provide comment to Planning (NI)

3.3.1 Environmental Health, in providing comments to Planning (NI), do so within the confines of the published guidance, "Northern Ireland Planning Portal - The Role of the Planning Authority and Consultees in the Online Planning Application Consultation System Version 2.0" (Planning NI) April 2013)

3.3.2 Matters of Relevance

"Consultees will provide the planning authority with advice on development proposals. They are required to:

- Provide a substantive response on planning matters in line with published planning policy and Department obligations within agreed timescales which is clear, concise, consistent and unambiguous...
- Comment only on matters related to material planning consideration, specific to the consultee's area of expertise, and detail any concerns they may have regarding the proposal...

The advice and information provided by a consultee MUST be set in the context of Departmental policies and obligations.

IT IS NOT THE ROLE OF THE CONSULTEE to recommend or advise that permission should be granted or refused..., it is ultimately for the planning authority to make the decision and decide if an application should be approved (with or without conditions)..."

3.3.3 With respect to wind energy developments, the above limits Environmental Health to only providing comment on whether or not noise from the proposed development complies with the requirements of Planning Policy Statement 18: Renewable Energy - August 2009.

3.3.4 PPS18 'Policy RE1 - Renewable Energy Development' in relation to wind energy states,

3.3.5 A 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy – August 2009' was published to supplement PPS18. Paragraph 1.3.46 states, "The report, 'The Assessment and Rating of Noise from Wind Farms' (ETSUR- 97) … should be used in the assessment and rating noise from wind energy developments."

3.3.6 Environmental Health in providing comment to Planning (NI) therefore reviews the applicant's noise impact assessment against the requirements of ETSU-R- 97.

3.4 ETSU-R-97 'The assessment and Rating of Noise from Wind Farms'

3.4.1 ETSU-R-97 contains the noise limits which wind energy developments must not exceed in order to control the impact of noise upon those living in the vicinity. It was drafted in 1996, some 18 years ago, when there were relatively few wind farms and when proposed wind turbines of the day typically had hub heights of 30 – 40m and with power outputs of 0.25 to 0.5MW.

3.4.2 In recent times, turbines proposed for wind farms, generally have hub heights of 60 – 90m with power outputs of 1.5 to 3 MW. As a consequence of taller and more powerful wind turbines, producing noise of a different character, the protection to amenity originally assumed by the ETSU-R-97 noise limits may no longer be appropriate.

3.4.3 Page 111 of ETSU-R-97 states, "This report was drafted in the light of the best information available at the time and in the circumstances prevailing at the time. However it is acknowledged that as more experience and information become available and as circumstances develop it may become necessary to revise and improve the contents of this report. The Noise Working Group therefore suggests this report and its recommendations are reviewed in 2 years time. We anticipate that the wind industry will itself take the initiative for such a review and that this review will be undertaken by a cross-section of users of the report."

3.4.4 To date, no such review has been undertaken.

3.5 Institute of Acoustics – A Good Practice Guide to the Application of ETSU-R- 97 for the Assessment and Rating of Wind Turbine Noise

3.5.1 In May 2013 following a request from Department of Energy and Climate Change (DECC), the Institute of Acoustics (IOA) produced a Good Practice Guide to the application of ETSU-R-97, most notably including a commonly applied wind turbine noise prediction methodology. However, it should be highlighted that the terms of reference provided to the Institute of

Acoustics explicitly excluded the examination of the increasingly controversial ETSU-R- 97 noise limits.

3.6 ETSU-R-97 noise limits

3.6.1 ETSU-R-97 noise limits are set relative to the prevailing background noise for a given locality. As background noise and wind turbine noise increase with wind speed, so too do the ETSU-R-97 noise limits. ETSU-R-97 considers that noise limits solely set relative to background noise would be unduly restrictive on wind energy developments in otherwise low noise environments remote from other noise sources and hence requires that lower fixed noise limits for daytime (35 – 40 dB LA90) and night-time (43 dB LA90) be applied in such environments.

3.6.2 Recently, some wind farm developments have been specifically designed to avail of the fixed noise limit at night-time, but have to operate in a curtailed mode during the day to achieve the daytime fixed noise limit which is relatively lower (i.e. the wind farm creates more noise at night than during the day). As people are more sensitive to noise at night-time, this has placed greater focus onto the suitability of the night-time noise limits.

3.6.3 The ETSU-R-97 noise limits were based on a number of stated assumptions regarding the character of the noise emissions. Recent research from the renewables industry body (RenewablesUK – Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects 16th December 2013) recognises that modern wind energy developments may exhibit noise character not as originally envisaged under ETSU-R-97. This leads Environmental Health to the view that the ETSU-R-97 noise limits, including the night-time fixed limit of 43 dB LA90, require a review to ensure that they remain suitably protective of amenity.

3.7 Noise limits within other jurisdictions

3.7.1 Renewable energy planning policy within Northern Ireland is in line with other United Kingdom jurisdictions in recommending that noise impacts from wind energy developments be assessed against ETSU-R-97.

3.7.2 The Department of the Environment, Community and Local Government (Republic of Ireland) is currently undertaking a consultation on proposed amendments to wind energy noise limits. Current Irish noise limits are similar to ETSU-R-97 but it is proposed to simplify these to a single fixed noise limit of 40 dB LA90, day and night, with 'a minimum separation distance of 500m between any commercial scale wind turbine and the nearest point of the curtilage of any property in order to provide for other amenity considerations e.g. visual obtrusion.'

3.7.3 Research undertaken to inform the current Irish consultation (Examination of the significance of noise in relation to onshore wind farms – 29th November 2013) includes within Section 4.0 a list of noise limits as applied across other international jurisdictions. Given the different acoustic descriptors applied across other international jurisdictions, it is difficult to make meaningful comparisons with ETSU-R-97.

3.8 Planning Conditions for single wind turbines

3.8.1 The IOA GPG has been endorsed in its entirety by the English, Welsh and Scottish governments. In NI the GPG has recently been endorsed (19 Dec. 2013) but concern was raised over some of the suggested 'Example Planning Conditions'. One such condition requires the operator to provide satisfactory evidence to the planning authority demonstrating compliance with the noise limits, in the event of a complaint being made.

3.8.2 DoE correspondence has stated that they are not minded to attach this condition to individual wind turbine proposals. However, it should be noted that DoE routinely attaches similar conditions to wind farm applications.

3.8.3 Noise limits as applied to wind farm developments are identical to those applied to individual wind turbine proposals. The noise impact on local residents is identical irrespective of whether the noise is being created by one nearby turbine or numerous more distant ones. Consequently, Environmental Health do not agree with DoE differentiating between the control needed to protect local residents from the noise impact of the two types of wind energy development.

3.8.4 Furthermore, the current DoE position sits outside rest of UK. Complaint investigation conditions for wind farm and single wind turbine developments are routinely applied by;

- Local Planning Authorities in England, Wales and Scotland
- The Planning Inspectorate for England – Ref: APP/M0933/A/13/2192651 – decision 2nd December 2013
- The Planning Inspectorate and Wales – Ref: APP/T6905/A/13/2198078 – decision 18th December 2013
- The Directorate for Planning and Environmental Appeals for Scotland – Ref: PAA-170-2072 – decision 23rd December 2013
- The Secretary of State for Communities and Local Government – Ref: APP/Y0435/A/10/2140401, APP/K0235/A/11/2149434, APP/H2835/A/11/2149437

In addition, complaint investigation conditions are also recommended by the Institute of Acoustics and Renewables UK (Template Planning Condition on Amplitude Modulation: Noise Guidance Notes – 16th December 2013) within their example conditions.

3.9 Merits of the complaint investigation condition

3.9.1 The measurement of wind turbine noise is time consuming and hence resource intensive. In the absence of a complaint investigation condition, the costs to verify compliance with the noise limits attached to a planning permission would fall solely upon the local ratepayer within the district where the turbine is located. The use of post verification conditions is not uncommon in development control (e.g. contaminated land verification reports) and it is the view of Environmental Health that they remain wholly appropriate in these circumstances where conditions cannot be readily enforced by conventional investigation techniques.

3.9.2 It is often assumed that Environmental Health nuisance provisions provide the same level of protection as desired through the planning regime. It should be noted that nuisance provisions can only deal with ‘excessive emissions’, and do not provide the control of noise as required by PPS 18 and ETSU-R-97.

3.10 Conclusion

3.10.1 Environmental Health welcome the Environment Committee’s interest in the important yet often controversial topic of wind energy impacts. Environmental Health consider that a review of the noise limits as derived under ETSU-R-97 is long overdue and should be prioritised along with the other United Kingdom jurisdictions at a national level.

3.10.2 On a local level, Planning (NI)’s approach in not attaching a ‘complaint investigation’ condition with respect to single wind turbine applications is likely to place considerable resource burdens on to ratepayers whilst considerable resistance remains from local residents to such developments. Ballymena Borough Council Environmental Health respectfully request a review of this position.

4.0 TOR Item 3

4.1 To review the extent of engagement by wind energy providers with local communities and to ascertain how the engagement may best be promoted.

4.2 The Council is of the view that the extent of engagement by wind energy providers with local communities should be improved upon.

4.3 The Council would recommend that wind energy providers make use of public buildings such as libraries, leisure centres and Council offices to display proposals in respect of wind turbines within the local area. Furthermore it is recommended that information presentations to local communities could be held within public buildings with a view to achieving greater public awareness of the wind turbine proposals.

Basil and Rodica Conn

First of all thank you for the extension time regarding our letter.

Two large Wind Turbines of 250 kW each, Application P/2011/0348/F and Application P/2011/1055/F.

The scale and size of the proposed wind turbines are similar in size to a 24 storey block of flats it will appear enormous, discordant and artificial, a civil engineering construction for an industrial and commercial development on agricultural land at **82.8m from Ninemile Road** which is part of No. 68 Carrigatuke Hill Landscape Character Area (LCA); where the LCA's southern margin overlaps the boundary of the Slieve Gullion (AONB) a scenic quality of landscape with overall sensitivity to wind energy development through its geodiversity and biodiversity profile (NI LCA, SPG to accompany PPS18 'Renewable Energy'). In this regard the wind turbines will have immediate and long term adverse impact on the natural heritage.

These Turbines are too close to our property and dwelling. Under PPS 18 which we are sure you already know states that no turbines should be no less than 500m away from any dwelling. Please note we are not against wind energy but are against them being too close to our property. One is 250m and the other 226m from our dwelling. Our property will in future be used for domestic and recreational purposes and to support wildlife. It will no longer be used as agricultural land for as long as we are the owners. A list of some of the wildlife is as follows: Fox, hedgehog, red squirrel, hare, Irish hare, pygmy shrew, bats, snails, worms,frogs, heath snail. White butterflies, butterfly small tortoiseshell, large variety of moth, insects, bees, dragonflies, bum bees, lady birds; Birds: bullfinch, chaffinch,song thrush, house sparrow, red robin, finch, black bird, blue tit, grey tit, wood pigeon, cuckoo, migrating swifts, migrating starlings, possible Peregrine Falcon and Merlin Falcon.

There will be traffic issues relating to the construction and operation of the site: the access road is 2.7 m wide, built on soft land with poor foundations and may collapse or subside by the use of heavy machinery and equipment inclusive crane, to reach the building site and will cause obstruction for people living on the road and people using the road for recreation i.e. walking, cycling, horse riding, etc. The proposals are in discordance with the principals of Planning Policy Statement 18 'Renewable Energy' PPS18, SPG to accompany PPS18 'Renewable Energy', Sustainable Development in the Countryside Draft PPS21- Polycy CTY 11 - Farm Diversification.

Developers only see a financial gain but don't see the impact on the surrounding area. Applicants again only see financial gain for themselves with no respect for neighbours. We will be hit with 86dB of noise this is the same as a lawnmower going outside the house day and night. It is within our human rights to be able to have a good night sleep and as this is a very quiet rural location if these commercial industrial units are erected than we may have to take lodgings elsewhere therefore leaving our home after 60 years.

With quite an array of wild life in this area including bats and it being an area of outstanding natural beauty (ANOB) we would hope that Government would hold to the Guidelines set in PPS 18. One of the Applicants in our case is 1.2Km away from where his Turbine will be erected and the other is as far away from his house as is possible over 300m. Why are these not put closer to the applicants' houses as they are the people who will benefit from same.

As is the case in every application, the Turbines are always as far away from the Applicants' houses as possible and calculations are always on the side of Applicants and Developers. It is a shame that outsiders can come into an area and destroy relationships between neighbours and get away with placing these turbines in the wrong locations.

We would hope that Government would protect its people and land from wrongful siting of these turbines.

Thank You,

Basil and Rodica Conn

Bord Gais Energy

Committee for the Environment
NI Assembly
Parliament Buildings
Ballymiscaw
Stormont
Belfast BT4 3XX

28 February 2014

Re: **Northern Ireland Assembly Windfarm Inquiry - Call for evidence**

Issued by email to: committee.environment@niassembly.gov.uk

Dear Sirs,

As one of the leading windfarm developers in Northern Ireland, Bord Gáis Energy (BGE) welcomes the opportunity to respond to the Northern Ireland Assembly call for evidence on the wind farm inquiry.

BGE owns and operates 17 operational windfarms across Ireland and Northern Ireland totalling 171 no. turbines and 326 MW, with a further c.350MW of wind energy in development at various stages. Within Northern Ireland specifically, BGE has 10.6 MW of operational wind, 31.8 MW currently at pre-construction stage with a potential for further development opportunities of approximately 80 MW in the short to medium term.

At the outset of this submission we wish to state that as a member of Northern Ireland Renewable Industry Group (NIRIG), BGE fully supports NIRIG's submitted response to this call for evidence.

In line with international and European countries, Northern Ireland has set targets for renewable energy generation. The Department of Enterprise, Trade and Investment (DETI) has published the Strategic Energy Framework (SEF)[1]which sets a target of 40% renewable electricity by 2020, which currently equates to approximately 1600MW. Based on currently available technology and infrastructure, it is widely accepted that meeting this target will depend largely on-shore wind electricity generation.

In addition to the stated targets sets out in the SEF, Planning Policy 18 (PPS 18) (August 2009) outlines the wider additional benefits to Northern Ireland in achieving these targets. PPS 18 states that the *"greater use of renewable energy technologies will reduce our dependence on imported fossil fuels and will bring diversity and security of supply to our energy infrastructure. It will also help Northern Ireland achieve its targets for reducing carbon emissions and will reduce environmental damage such as that caused by acid rain"*

In achieving these targets in Northern Ireland, BGE recognises that there is an essential requirement for all stakeholders to work together, whilst protecting Northern Ireland's most valued habitats, species, landscapes and amenity for local communities. BGE has participated in the Northern Ireland Planning process over the past ten years and strongly believes that the planning processes currently in place provide a robust assessment procedure required to meet both these goals in Northern Ireland.

This submission is presented under the three headings provided by the NI Assembly under the "Terms of Reference" for the windfarm inquiry:

1. To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;

1 Department of Enterprise, Trade and Investment (DETI), Strategic Energy Framework for Northern Ireland - 2010

2. To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development

3. To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted

1. To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment

The Planning Policy Statements in Northern Ireland set out the policies of the Department of the Environment on particular aspects of land-use planning. The contents of the policy statements are material to decisions on individual planning applications and appeals. Specifically PPS 18 Renewable Energy (August 2009), is the main planning policy used in the determination of windfarm applications in Northern Ireland and is supported by the following guidance documents:

- PPS 18 Best Practice Guidance to Planning Policy Statement 18 *'Renewable Energy'* (August 2009)
- PPS 18 is also accompanied by the supplementary planning guidance *'Wind Energy Development in Northern Ireland's Landscapes'* (August 2010)

The stated objective within PPS 18 is *"to ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed, to ensure adequate protection of the Region's built and natural, and cultural heritage features; and to facilitate the integration of renewable energy technology into the design, siting and layout of new development and promote greater application of the principles of Passive Solar Design"*.

Policy RE 1 of PPS 18 sets out the criteria used in the determination of development applications "Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on:

(a) public safety, human health, or residential amenity;

(b) visual amenity and landscape character;

(c) biodiversity, nature conservation or built heritage interests;

(d) local natural resources, such as air quality or water quality; and

(e) public access to the countryside

In addition to PPS 18 the publication Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy' is taken into consideration when assessing proposals.

PPS 18 RE 1 also provides for the following criteria specifically for wind energy development will also be required to demonstrate all of the following:

(i) that the development will not have an unacceptable impact on visual amenity or landscape character through: the number, scale, size and siting of turbines;

(ii) that the development has taken into consideration the cumulative impact of existing wind turbines, those which have permissions and those that are currently the subject of valid but undetermined applications;

(iii) that the development will not create a significant risk of landslide or bog burst;

(iv) that no part of the development will give rise to unacceptable electromagnetic interference to communications installations; radar or air traffic control systems; emergency services communications; or other telecommunication systems;

(v) that no part of the development will have an unacceptable impact on roads, rail or aviation safety;

(vi) that the development will not cause significant harm to the safety or amenity of any sensitive receptors (including future occupants of committed developments) arising from noise; shadow flicker; ice throw; and reflected light; and

(vii) that above-ground redundant plant (including turbines), buildings and associated infrastructure shall be removed and the site restored to an agreed standard appropriate to its location.

Any development on active peatland will not be permitted unless there are imperative reasons of overriding public interest.

For wind farm development a separation distance of 10 times rotor diameter to occupied property, with a minimum distance not less than 500m, will generally apply.

The supplementary planning guidance 'Wind Energy Development in Northern Ireland's Landscapes' will be taken into account in assessing all wind turbine proposals.

Since its adoption in 2009, Bord Gáis Energy has worked within the stringent planning framework set out in PPS 18 and supplementary guidance documents in our site selection process, feasibility assessments, windfarm design and in the preparation of planning applications. Bord Gáis Energy consider the procedures and policy measures currently in place to be adequate and robust and propose that wind energy developments continue to be decided upon on a case-by-case basis, and on the strength of a thorough Environmental Impact Assessment and an Appropriate Assessment (fully accounting for assessment of Cumulative and In-combination effects in line with EU Legislation and Guidance).

PPS18 (Renewable Energy) is currently being replaced by the Strategic Planning Policy Statement for Northern Ireland which is under consultation, therefore BGE would echo the request from NIRIG (as detailed in their consultation submission) that any change to planning policy would have regard to the existing policy. BGE will be submitting separate opinion on the Strategic Planning Policy Statement (SPPS).

With regard to of PPS 18, Bord Gáis Energy does however respectfully raise concerns with regard to the level of restriction currently placed on peatland development. BGE are working in conjunction with NIRIG with regard to ensuring that the emphasis on identification of clear and appropriate mitigation and habitat restoration and management plans is fully taken into account during the assessment of proposed peatland development by both developers and planners alike. BGE will continue to work on this area with NIRIG as part of the review of the upcoming Strategic Planning Policy Statement review which incorporates a review of Planning Policy 2 Natural Heritage. BGE is committed to working with the Northern Ireland Environment Agency (NIEA) and Planning Services in meeting requirements of EU legislation in Northern Ireland whilst working towards achieving renewable energy targets.

In accordance with both European and National legislation, BGE ensures that a comprehensive environmental impact assessment (EIA) is undertaken in respect of each of our proposed windfarm applications. The EIA approach assesses each project on an individual basis in line with the principles outlined in PPS 18 and a cumulative impact assessment in conjunction with existing and permitted windfarm developments.

The requirements for Environmental Impact Assessment in Northern Ireland are set out in the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999 ('The EIA Regulations'), which were legislated in response to the EU Directive (97/11/EC) on Environmental Impact Assessment. The regulations define which projects should be subjected to EIA; what information should be included in an EIA; who should be consulted as part of the EIA process and procedures for submitting and advertising an EIA.

The approach that has BGE have adopted in the preparation of Environmental Impact Assessments involves the following key stages:

1. Consultation with relevant NI statutory consultees and stakeholders to obtain views and input into the environmental impact assessment process.

2. Identification of existing environmental constraints through desktop studies, monitoring and field studies.

3. Assessment and prediction of potential effects on the Environment Assessment of the significance of the effects at the local, regional, national and international level.

4. Identification of measures to avoid or reduce significant negative effects. Identification of residual effects which cannot be avoided through mitigation.

The EIA process follows guidelines to predict and evaluate the impact of a development proposal on the environment in a systematic and transparent manner.

Information about the environmental effects of a project are collected and submitted as an Environmental Statement (ES) which is taken into consideration by the Planning Service and other statutory consultees in forming their judgment as to whether each development should proceed. The process involves extensive information provision to consultees and members of the public, all of whom have the opportunity to comment on the information presented in the ES. The Planning Service must take into account all of this information before determining the planning application.

The Environmental Impact Legislation provides a uniform robust approach to assessing each windfarm proposal and when assessed in conjunction the policy guidance provided for in PPS 18 provides for a very comprehensive assessment process.

As part of the planning determination process the Planning Department currently carry out a comprehensive statutory and non statutory consultation process. The DoE receive expert opinion on various aspects of the windfarm proposal project e.g. Landscape Assessment (Landscape Architects Branch of the DoE) Ecological Assessments (Northern Ireland Environmental Agency, NIEA) Noise Impact Assessment provided by relevant Environmental Health Officers and use this expert feedback system in determining their project.

Bord Gáis Energy strongly believes that the current system in place with the resources of PPS 18, Environmental Impact Assessment, Natura Impact Assessment and statutory consultation process provides a robust, adequate assessment process for both projects on a case by case basis and cumulative assessment.

2. To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development

Bord Gáis Energy continues to use a constraints based approach to planning to ensure best possible layout in line with industry standards. As with other renewable energy development projects, separation distance, impact on adjoining land owner must be taken into consideration. In line with best practice and environmental impact assessment legislation BGE assesses each windfarm application based on the best practice standard ETSU-R-97[2] Assessment and Rating of Noise from Wind Farms. The approach involves identifying environmental and planning constraints at the earliest opportunity and applying these constraints when determining the proposed layout. In conjunction with the assessment of other constraints e.g. avoidance of protected habitats, exclusion zones from archaeological ecological constraints etc the final design layout is based on achieving the noise limits as prescribed in the best practice standard guidance ETSU-R-97.

2 ETSU-R-97 is available at: http://www.hayesmckenzie.co.uk/downloads/ETSU%20Full%20copy%20(Searchable).pdf

Within PPS18, Policy RE1 currently incorporates a separation distance of 10 times rotor diameter to occupied property, with a minimum distance not less than 500m, will generally apply. BGE support the view however that the application of best industry practice ETSU-R-973 is used to provide for the protection to wind farm neighbours. BGE would support the view of NIRIG that the use of ETSU-R- 97 as a criterion for assessment of wind farm noise fulfils the requirements of PPS 18.

Bord Gáis Energy firmly recognises the importance for the protection of the local environment and amenity, and as part of the Environmental Impact Assessment process BGE consider this issue in windfarm development, both individually and cumulatively with other applications.

3. To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted:

Bord Gáis Energy as a windfarm developer recognises the importance of community engagement during all stages of windfarm development, from pre-planning consultation, during construction and including ongoing operational local community engagement. As part of our planning application process, we have protocols in place for meaningful engagement with local communities during the pre-application stage and we continue to engage with local communities that live near our development projects.

BGE have a strong history of achieving planning permission for wind energy projects in both the Republic of Ireland and Northern Ireland and community engagement is an important aspect in our planning process. Direct community engagement is the adopted approach by BGE and as a wind farm company we will continue to engage local community as part of the all future developments.

As part of the pre planning stage engagement process in Northern Ireland we engage with local communities and incorporate the following measures for communication; leaflet drops, community open and meeting local community groups at preplanning stage

In addition, the planning application documentation and environmental impact assessment is made available locally for public consultation. In accordance with planning legislation, a newspaper advertisement indicating the location and availability of the documentation is posted in local newspapers. The information contains contact details and presentations to local councils. The pre-planning consultation process ensures local communities in the vicinity of the windfarm project are well informed of the proposed plan and can participate in and inform the planning process.

In addition to pre-planning consultation with NI Planning Service, BGE engages directly with Council Executives and local councillors as part of District Council consultation at the development provide information on the project.

BGE supports the incorporation of the principles of community consultation outlined in the 2011 Planning Act (NI). In accordance with the 2011 Northern Ireland Planning Bill there is a requirement to comply and submit a pre-application community consultation report as to what has been done to ensure compliance with the principles of community engagement.

Section 27 and 28 of the 2011, Planning Act (Northern-Ireland) 2011 outlines the existing requirement to ensure pre-planning consultation takes place. Bord Gáis Energy is committed to ongoing community stakeholder engagement as part it this planning process.

Bord Gáis Energy supports the concept of ‘An Effective Community Planning Process’ which would involve community consultation from an early stage in the planning process.

Bord Gáis Energy will continue to put in place our procedures for local community engagement and we fully adopt the NIRIG guiding principles in its community protocols. We are fully committed to continued participation in local engagement as part of the planning

process and we look forward to inputting into the NIRIG's best practice guidance document for the wind industry within the coming months.

Conclusion

BGE firmly recognises the importance of local protection our natural heritage, and as part of the Environmental Impact Assessment process wind farm developers do already consider this issue in wind farm development, both individually and cumulatively with other applications.

BGE respectfully submits that, in our view, the current Planning System works well and is in line with European requirements BGE would also submit that any proposed changes under consideration must be assessed in light of the requirement to enable the wind industry to deliver Northern Ireland's future renewable energy targets, whilst protecting Northern Ireland's most valued habitats, species and landscapes.

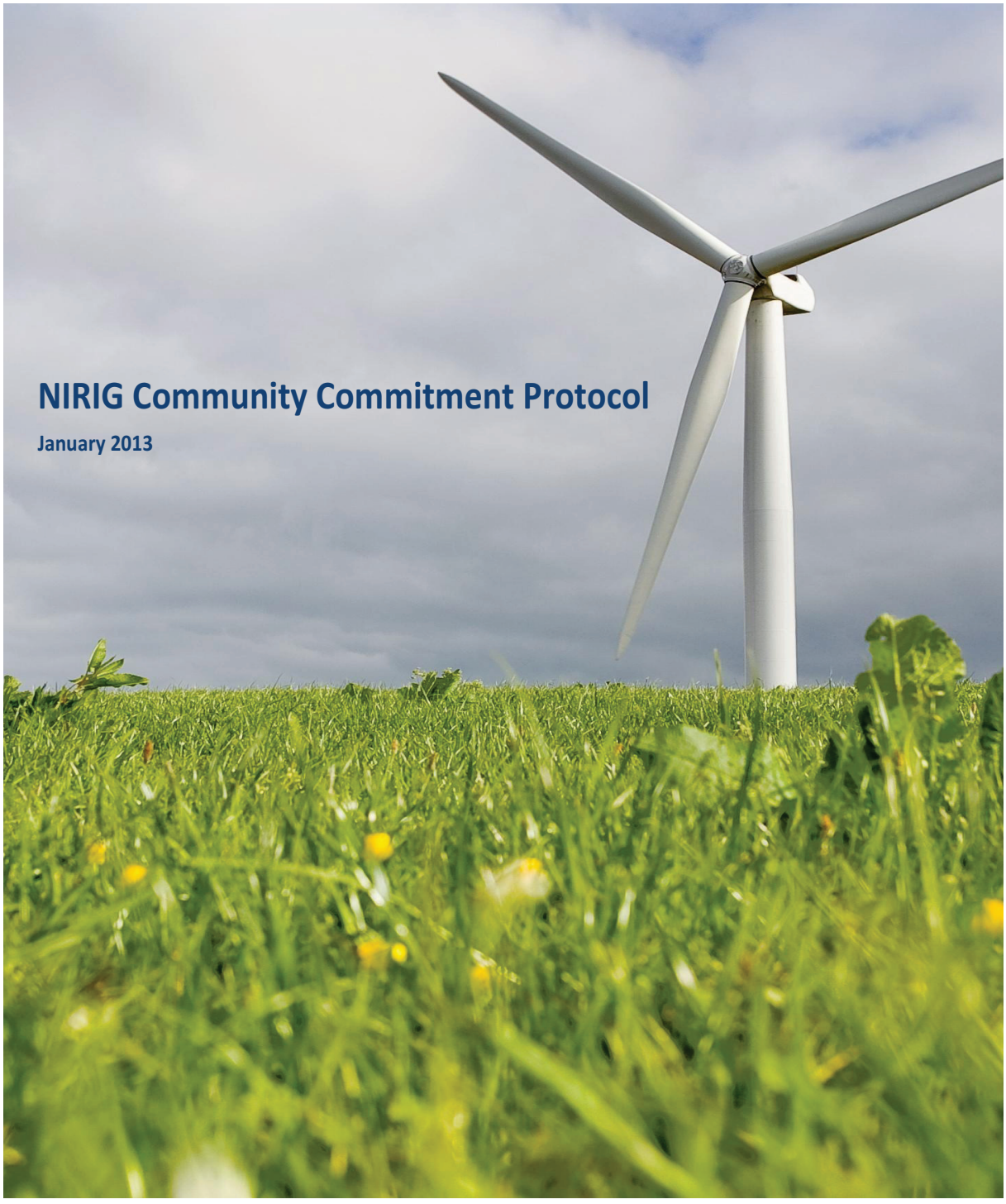
BGE hope that our comments above are helpful and we look forward with interest to the participation in this inquiry process and would like to thank the NI Assembly for the opportunity to participate in this review.

*Sent be email - bears no signature

Angela Larkin

Planning & Environment
For and on Behalf of Bord Gáis Energy

Appendix 1 NIRIG Community Commitment Protocol January 2013



NIRIG
NORTHERN IRELAND
RENEWABLES INDUSTRY GROUP
The voice of IWEA & RenewableUK in Northern Ireland

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The Northern Ireland Renewables Industry Group (NIRIG) is a joint collaboration between the Irish Wind Energy Association and RenewableUK. NIRIG represents the views of the renewable energy industry in Northern Ireland, providing a conduit for knowledge exchange, policy development support and consensus on best practice between all stakeholders in renewable energy. NIRIG represents the wind, wave and tidal sector in Northern Ireland. Currently, NIRIG has more than 30 member companies comprising onshore large- and small-scale wind developers; offshore and marine developers; manufacturers; environmental, legal and planning consultants; training providers; and construction companies.

The Irish Wind Energy Association is the national association for the wind industry in Ireland. Formed in 1993 IWEA is committed to the promotion and education of wind energy issues and plays a leading role in the areas of policy formation and representation, training and conference organisation on the island of Ireland.

RenewableUK is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with more than 700 corporate members, RenewableUK is the leading renewable energy trade association in the UK

Contents

1. Foreword

Alex Attwood, MLA
Minister of the Environment

Renewables is arguably Ireland's greatest economic opportunity. Research and development, manufacturing, electricity self sufficiency and export are its hallmarks. That is why I encourage NIRIG in the work it does to develop best practice and best returns for communities as renewable opportunities emerge. I acknowledge the NIRIG protocol is a contribution to doing so.

I believe that community benefits – on renewables and other areas- need to be properly built into the planning system in a more comprehensive way. That is where I plan to go, so that community benefits are embedded in a proper way across planning.

2. Chairman's Address

Gary Connolly
Chairman
NIRIG

Northern Ireland has some of the most abundant wind resources in Europe and there is an increasing understanding of the benefits that come from harnessing this natural resource. On a global scale, it contributes to climate change mitigation and reductions in greenhouse gas emissions. At a regional scale, it contributes to stabilising energy prices to the customer and reducing fossil fuel dependence, while ensuring a more secure energy supply for a country that currently depends on imported fossil fuels for 99% of its energy needs.

However, it is now becoming clear that wind not only has the capability to provide a substantial proportion of Northern Ireland's green electricity, but it can be a significant driver of economic and employment growth. In a difficult economic climate, it is extremely positive to note that NIRIG members have invested approximately £100m in the local economy in the last 12 months and currently employ well over 550 people in Northern Ireland.

The experience of many local economies over the last few years demonstrates that the economic impact of onshore wind deployment can be very significant. For example, at a recently constructed wind farm in Northern Ireland, an estimated 120,000 working hours went into construction, equivalent to the creation of 42.6 full-time local construction jobs. At its construction peak, more than 150 people were employed on site, drawn from over 20 locally based suppliers in the engineering, construction and services sectors. Looking further, NIRIG estimates that 2000 construction jobs and approximately 600 permanent on-going jobs would be created by 2020 if the DETI Strategic Energy Framework target of 40% electricity from renewable sources were to be reached[1].

In addition to these benefits, the wind industry also provides significant community benefits in Northern Ireland and NIRIG is committed to ensuring that communities continue to benefit from onshore wind farm developments through job provision, investment, and community benefits initiatives. I am therefore pleased to launch this Community Commitment Protocol, which sets out a protocol for NIRIG members, based on current industry positions across the UK and Ireland.

[1] *The economic effects of increasing wind deployment in Northern Ireland*, Redpoint, March 2012

3. IWEA Foreword

The island of Ireland benefits greatly from complementary energy policies. For example, the Single Electricity Market (SEM) has provided a stable, transparent and systematic platform for participants since its inception in 2007. This has created a single market for electricity and natural gas on the island of Ireland and allows the trading of wholesale electricity in Ireland and Northern Ireland on an All-Island basis. Not only this, but the grid infrastructure on the island is mutually dependent and can only benefit from further interconnection: not only North-South, but also East-West.

Increasing community acceptance of wind energy is central to the efficient deployment and expansion of wind energy in Ireland. A well-considered and executed community engagement plan will improve the likelihood of community acceptance of projects and IWEA believes that working with communities and improving the understanding of the benefits of onshore wind are key elements of this. IWEA has a dedicated chapter on community engagement in its recently published Best Practice Guidelines. Furthermore IWEA is extending this guidance and will be issuing shortly further guidance on community commitment and engagement for the industry in the Republic of Ireland. These initiatives are a recognition of the contribution that local communities make to renewable energy. We are successfully leading the industry in developing best practice and IWEA are therefore delighted to endorse the NIRIG Community Committee Protocol.

Kenneth Matthews
Chief Executive, IWEA

4. RenewableUK Foreword

In February 2011 RenewableUK launched 'A Community Commitment: The Benefits of Onshore Wind', which was the culmination of a thorough-going consultation amongst our members on finding a way to formalise community contributions in England. I am now delighted to support the NIRIG Community Benefits protocol, which aims to formalise the industry's commitment to Northern Ireland communities. The Board of RenewableUK has clearly endorsed this Protocol: clearly, community benefit schemes have so far proven to be hugely successful with local communities, and are now deemed to be essential by our members.

As an industry we have always felt that while the carbon reduction benefits from onshore wind farms are national and even international, feeding, for instance, into our European Union carbon reduction targets, the local and regional benefits of onshore wind farms need to be more emphatically stated. Last year we published a long-ranging study into the economic benefits of onshore wind in the UK. This revealed that every MW of onshore wind power had £100,000 worth of value to the local authority area, and £700,000 to the UK as a whole.

The industry has worked hard to ensure that a broader community benefit serves those living close to an onshore wind farm. Examples of existing community benefit funds are numerous and we have showcased some in the second part of this document. NIRIG's Community Commitment Protocol was inspired by the success of community benefit funds thus far and I am delighted to support its publication.

5. Renewable Energy in Northern Ireland

Renewable energy, or clean or even green energy as it is sometimes called is naturally replenished energy generated from natural resources—such as sunlight, wind, rain, tides and geothermal heat — which are renewable. Renewable energy can play a leading role in powering Northern Ireland's homes and businesses, and is already making a significant contribution to our energy needs.

Renewable Energy Targets and the Role of Wind Energy

Through DETI's Strategic Energy Framework (SEF), the Northern Ireland Executive has committed to delivering 40% of electricity consumption from renewable sources by 2020. NIRIG is committed to contributing to reaching these targets and believes that are considerable benefits to doing so, including decarbonised electricity generation, increased security of supply, a diverse energy mix and less dependency on imported fossil fuels. Wind generation is expected to supply the majority of the renewable electricity to meet the DETI SEF target.

Stability and Security in the Low-Carbon Economy

Wind power in Northern Ireland generates electricity at some of the lowest prices in Europe, bringing with it many benefits, both environmental and economic. Onshore wind is one of the most developed renewable energy technologies; reliable, safe and cost-effective. Every unit of electricity produced by a wind turbine displaces one that would otherwise be generated from fossil fuels, preventing the emission of a number of harmful greenhouse gases. Wind is already generating a considerable proportion of Northern Ireland's energy needs, supplying 12% of electricity demand in Northern Ireland in 2011[2] and will continue to significantly contribute to the 15% renewable energy and 40% renewable electricity targets in 2020.

Energy bills are already rising due to rising fuel costs. There are also many uncertainties in the supply of fossil fuels. The Fukushima nuclear disaster, for example, dramatically increased gas demand on the world markets, highlighting our dependence and vulnerability to global fossil fuel supply fluctuations. Energy bills for consumers have increased in recent years, mainly due to increases in the international price of gas and investment in electricity/gas networks (e.g. contributing 62% and 16% respectively of the increase in household energy bills since 2004).

Investing in renewable energy, which is indigenous and uses free fuel, will help us keep energy prices stable. For example, Germany and Denmark have already found that wind generated power has brought down the cost of wholesale electricity. Closer to home, EirGrid and SEAI confirmed that onshore wind lowered total wholesale costs in the Single Electricity Market, and therefore prices paid by all electricity customers in a 2011 study [3].

A Growth Industry

A key component of Government's strategy in the move to a low carbon economy, wind power is the cornerstone of a new renewables industry in Northern Ireland, bringing significant economic

[2] http://www.soni.ltd.uk/upload/Annual%20Renewable%20Report%202012.pdf

[3] http://www.seai.ie/Publications/Energy_Modelling_Group/Impact_of_Wind_Generation_on_Wholesale_Elec_Costs/

benefits beyond its environmental contribution. Currently Northern Ireland spends approximately £2.3billion annually on energy. 99% of that is spent on imported fossil fuels such as coal, oil and natural gas. Energy prices are therefore subject to significant price volatility for a variety of reasons varying from supply disruptions to political instability. A more diverse energy mix is a more secure energy mix, less vulnerable to fluctuations in the availability of any one fuel. Lower price volatility will also mean it will be much easier for families, businesses and the wider economy to plan for the future.

Between 25 and 30% of the capital investment in wind generation projects is retained in the local economy[4]. This typically flows to companies in construction, legal, finance and other professional services. Further investment takes many forms, including land lease payments, local road upgrades and community funding and business rates. The capital spent on the constructed and commissioned turbines will be there for 25 years, generating abundant low carbon electricity and displacing imports of foreign fossil fuels. Between 1st April and 7th October 2011 alone Northern Ireland announced £46m investment[5] and the creation of 450 jobs in the renewable sector.

Climate Change and Greenhouse Gas Emissions Reduction

All government departments bear a collective responsibility in achieving the NI Executive's Programme for Government target to reduce greenhouse gas emissions in 2025 by 35% from 1990 levels.

In order to contribute adequately as a nation to addressing climate change and reducing greenhouse gas emissions, we need to plan and accept major social, cultural and economic change. It is difficult to predict the exact effects of climate change on a particular location or landscape. However, what can and must be done now, is working towards generating as much of our energy as possible from renewable sources, thus reducing carbon emissions and avoiding potential future damage to our landscapes.

The Stern Review[6], using results from formal economic models, estimates that if we do not act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. Northern Ireland must play its part in reducing emissions as the costs of mitigation are substantially lower, and pose less of a threat to economic growth and human welfare, than the damage costs of uncontrolled climate change.

[4] http://www.iwea.com/index.cfm/page/industryreports?twfId=446&download=true
[5] http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/renewable-energy/3301-uk-renewables-investment-and-jobs-map.pdf
[6] Stern Review: The Economics of Climate Change, 2006

6. Community Benefit Schemes

Beyond the local direct investment, community benefit schemes are a well-established part of onshore wind energy developments. These are voluntary schemes set up by developers in recognition of local communities' commitment to accommodating onshore wind farms. They are in turn a commitment by developers to ensure that a proportion of the benefits delivered by these projects are realised within the communities that live near them.

7. Community Benefits and Community Engagement Case Studies

Slieve Kirk (SSE Renewables)

Slieve Kirk is a newly commissioned 27.6MW wind farm located in Co. Londonderry/Derry which officially opened in 2012. SSE runs a Community Fund annually and awards grant funding to projects in the local area which promote energy efficiency and sustainability. Over £80,000 per year in grant funding should flow to the local community for the 25 year lifetime of the wind farm.

SSE's dedicated Community Investment team launched the fund during an open day held during Global Wind Week. Despite weather better suited to electricity generation, over 1000 people came to visit the site, providing an opportunity for locals to meet SSE's Community Liaison Officer and find out about the application process and criteria.

Slieve Kirk's first community fund award took place in October 2012 at the Belfray Country Inn, with a variety of local community groups applying for grant funding – sports clubs, community halls, schools and local charities. Projects awarded grants in 2012 included:

- Creevedonnell Cricket Club near Curryfree received funding to fit loft and wall insulation.
- The Kildoag Culture Group in Lackagh installed insulation and dry lining at their Community Hall.
- New windows fitted at the Diamond Centre in Claudy

- A contribution toward the installation of new energy efficient pitch side lighting for Clann na nGael GAA Club in Dunamanagh

Brian Doherty, Creevedonnell Cricket Club, said:

'Airtricity's support towards the insulation at Creevedonnell Cricket Club will make a huge difference in the winter, not only by ensuring the club hall is more comfortable and warm for visitors, but also in helping to reduce the hall's overall running costs.'

Sandra Allen, Kildoag Culture Group said:

'The local community are delighted with the insulation of the Kildoag Hall. The upgrades will have a real positive impact on the building and we hope that heat loss will be reduced by as much as 50 percent, helping us to significantly reduce the hall's energy bills.'

Altahullion (RES)

Pupils from St Colmcille's visiting Altahullion wind farm

Background

Altahullion Wind Farm, near Dungiven, was commissioned in 2003, and an extension in 2007 took the total number of turbines to 29, with a total power capacity of 37.7 MWs. RES has a programme of linking with schools to facilitate educational visits and Altahullion has received 1088 school visitors to date (2004 – 2012).

School visits

Since 1995, RES has hosted over 29,000 visitors to its wind farms throughout Northern Ireland. In 2012, over 400 pupils from both primary and secondary schools have benefited from these visits. Pupils have enjoyed science-based tours, hands-on activities and discussions which have focused on the wind farms' key operational features, the long term benefits of wind energy along with Northern Ireland's abundant supply of wind.

"I really enjoyed the experience of being inside a real working turbine and learning how to measure things with a metre stick" Megan, Rasharkin Primary School

"A trip like this really brings home the lessons we spend many classroom hours trying to get across" Mrs R Howe, Principal, Rasharkin Primary School

Tourist turbine

In addition at Altahullion Wind Farm members of the public can view the 29 wind turbines as they enjoy a short walk. The walk provides panoramic views over the Roe Valley and south to the Sperrins. The first turbine can be accessed by the public and there is an information board

explaining the wind farm and the surrounding landscape. There is also a visitor car park and the wind farm is part of an 18 mile cycle route from Park Village in the Sperrin foothills to Limavady town.

Community and wider benefits

The total fund from Altahullion Phase I&II is £29,000 per year which is split between three community groups: Foreglen Community Association, Burnfoot Community Development Association and Gortnaghey Community Association. The money has been spent on the creation of a new community riverside pathway and footbridge, entertainment activities for family fun days, summer schemes for local children and the maintenance and running of community buildings.

Callagheen (Scottish Power Renewables)

Background

Callagheen is located in County Fermanagh, in the vicinity of the villages of Belleek and Garrison and has a capacity of 16.9MW. The Callagheen Community Wind Farm Fund Awards are organised by The Fermanagh Trust, who administer the funds, which are worth £1000/turbine.

Community and wider benefits

Proposals for the community fund are accepted from all aspects of community life – economic, social, and educational, with an emphasis on proposals that have an environmental theme and/or are linked to sustainable local activities and have a positive impact on the local community.

Local community groups

A number of primary schools in the area including Belleek Primary School, St Davog's Parents Association and St. Martins Primary School received funding towards environmental and gardening projects. Young people from across the region also benefited as a result of an award to the Erne Music Club to hold master classes and workshops on three separate weekends in Belleek. The master classes focus on singing and a range of instruments including the flute/whistle, banjo, mandolin and the bodhran.

In the Garrison area the local women's group received an award to run a health and fitness programme for local women from across the area. Devenish GAA club has also been offered support towards an energy efficiency project aimed at reducing the Club's carbon footprint and their yearly running costs.

Curryfree (ESB)

Operational in 2011, Curryfree is a wind farm of 15MW capacity on the hills outside Derry. ESB is committed to working with local communities and believes that this requires good communication at all stages of a project. The economic benefits of wind farm development can also be seen from a wind farm such as Curryfree: all of the money spent in the development of the project was spent in the UK and almost half of the construction costs were spent in Northern Ireland.

Community engagement

Throughout the development of Curryfree, there has been significant engagement with local communities. Pre-application, meetings were held with local representatives and an information leaflet on the wind farm was produced. House calls to all houses within 1km of the site were made and a local information event held, as well as adverts in the press to inform the wider community of the proposed development. These were important ways of ensuring that communities were aware of the development and had an opportunity to comment. A local liaison officer was also proactive during the pre-construction and construction phases, to meet with residents and others likely to be impacted by the project. Now that the wind farm is operational a stakeholder manager has been appointed to deal with all local interactions.

Community benefits

The Curryfree community benefit fund is open to local non-profit making organisations or charities within a radius of 6 km from the Curryfree Wind Farm. The fund prioritises capital projects and projects of community, education, health, environmental or sporting benefit. Curryfree has a community benefit figure of £1000/MW per year. In the period since becoming operational at least 11 local community, sporting, or women's groups have benefited from the community fund, including Creevedonnell Cricket Club, St Mary's GAA club, Newbuildings United Football Club and Newbuildings Women's Group and Youth Club.

8. Protocol

The Voluntary Nature of the Protocol

The benefits of wind energy are well known. At a national level, increased reliance on wind energy enhances the security of our energy supply, reduces reliance on imported energy and has the potential to reduce energy price increases in the future. In addition to these benefits, onshore wind farm developments also provide direct financial benefits to local communities via legally binding agreements between the wind farm operator, landowners and a local council or community group. Typically, these agreements provide a guaranteed level of finance for local community projects over the entire lifespan of the wind farm development.

Whilst such agreements are legally binding, the decision to offer such benefits is an entirely voluntary act on the part of the wind farm operator. Such contributions are not a requirement of planning policy or a requirement for the grant of a planning permission. NIRIG and its members support the provision of financial contributions by onshore wind farm operators to local communities and has sought to formulate a voluntary protocol for the provision of community benefits. The protocol sets out, for the first time, principles which NIRIG members seek to adhere to with a view to delivering tangible benefits for local communities for onshore wind farm developments of 5MW or above.

Protocol Criteria

To be agreed by all participating NIRIG members and apply to all onshore wind projects of 5MW and above in Northern Ireland reaching commercial operation 6 months after adoption of the protocol.

Community Benefits

We acknowledge that each individual project and local area is different. In recognition of this NIRIG members propose that the method or manner of community funding will be project specific and determined by the relevant developer through consultation with, and input from, the project specific community and local councils.

- A community benefit scheme will receive support equivalent to a value of at least £1,000/MW of installed capacity per annum and will be index-linked for the lifetime of the project.

- Payments and/or benefits in kind under a community benefit scheme will commence not later than twelve months from the date of completion of commissioning of the wind farm (unless otherwise agreed by the developer/operator and any proposed recipient to be paid at a later date).

- Payments and/or benefits in kind shall be provided for the duration of the commercial operation of the wind farm. Annual payments may be wholly or partially aggregated over

the permitted operational life, as agreed through consultation between the developer/operator and the community.

Community Engagement

The dialogue undertaken by stakeholders during and following the development of onshore wind energy projects should be inclusive, transparent, accessible and accountable.

- NIRIG members will continue to commit to full, open and transparent dialogue with local communities around proposed wind farm projects, including promoting at an early stage the company policy on local benefits and opportunities for public participation, so that local residents and the wider community are informed regarding the development of the proposals and have an opportunity to comment on their development.

- The community/communities with an interest in the wind farm will be identified through a process of engagement involving the applicant and relevant stakeholders.

- In conjunction with relevant community stakeholders and/or local political representatives NIRIG members will continue to work on ways to maximise local benefits to community groups following commercial operation.

In order for these responsibilities to be fully met within individual project developments, key stakeholders will be expected to:

- Enter into constructive dialogue with a view to working towards agreed positions on issues up for negotiation
- Assist, where possible, in identifying other key stakeholders within the community
- Assist, where appropriate, in identifying the full range of local opinion about the development of local benefits

This protocol is based on the current industry position across the UK and Ireland. NIRIG is aware that the recent consultation from the Department for Energy and Climate Change[7] may include further evidence that could inform recommendations on these issues. Similarly, we understand DETI intends to carry out a study on community benefits in Northern Ireland shortly and once this collective evidence is available NIRIG are committed to reviewing the context of any recommendations made.

[7] *Call for Evidence – Part A Community Benefits and Engagement*, UK Department of Energy and Climate Change, September 2012

NIRIG
NORTHERN IRELAND
RENEWABLES INDUSTRY GROUP
The voice of IWEA & RenewableUK in Northern Ireland

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Braid Valley Preservation Group

26 February 2014

Sheila Mawhinney
Clerk of the Committee for the Environment
Northern Ireland Assembly

Dear Ms Mawhinney,

I want to take this opportunity to offer my views to the NIA Inquiry on Wind Energy. As residents living on a farm in the hills just to the north of the village of Broughshane, Co. Antrim, my family and I, along with many of our neighbours have, over the past eight years, been fighting proposals for two large scale wind farms on our doorstep. If approved, these wind farms would envelop our property and dominate this beautiful and peaceful rural landscape for miles around. During that time the Applicants/Developers have evolved a gradual courtship with the Planning Service and have been permitted to withdraw their original applications and submit new ones along with a continuous string of amendments, all of which have been deeply flawed and highly inaccurate. The Planning Service has not only tolerated this, but has encouraged it through its handling of the applications, while it has been down to the beleaguered residents to highlight the many shortcoming of the proposals via literally hundreds of objection letters.

It is clear to us, as we have weathered this war of attrition for so long, that the current planning process is heavily and unfairly weighted in favour of the Applicant and that the true costs of these proposals are not measured equally against the so called benefits of wind energy development within the current system.

This is regrettable because, as a family, we consider ourselves to be strong champions of the environment, both in belief and in practice and we would like to be able to support renewable energy. Yet the current policies and guidelines do so little to protect residents against the negative impacts of having huge turbines erected in close proximity to our homes and threatening our quality of life, that we are left with nothing but resentment for the wind industry as a whole and distrust in the planning process which should offer us better protection.

Current Planning Policy and Guidelines

PPS 18 is currently appears to be much too open to interpretation with regard to issues such as visual amenity and landscape character and the appropriate siting of wind turbines. ‘Unacceptable impact’ is a term which requires much more precise clarification and prescriptive definition. The Supplementary Planning Guidance which accompanies PPS 18 does provide a fairly comprehensive assessment of the capacity of the separate Landscape Character Areas of NI to accept wind energy development, yet the SPGs are often almost completely ignored when planning approvals are granted on inappropriate sites against their advice.

Another bone of contention concerns the siting of power lines leading from turbines to the grid. Prospective power line routes should form an essential part of the planning application process, so that the true potential impact of each proposal on the landscape and community is clear for all to see.

The present planning system, which involves commercial wind farm applications being dealt with in Planning Headquarters while private turbine applications are determined at local planning level, is nonsensical. We have seen in this area that it is a case of ‘the right hand not knowing what the left is doing.’ The result of this is improperly regulated assessment of applications, causing potentially higher levels of cumulative impact. As a example, the local planning office in Ballymena seems to be at odds with Planning HQ over whether PPS 18

applies to single/low number turbine applications or not - this discrepancy emerged after permission was granted for two giant turbines at the Michelin Tyre Plant, well within PPS 18 set-back guidelines from a number of residential properties.

It is difficult to comprehend why wind is often regarded as 'the only show in town,' when other emerging renewable technologies, such as solar and wave power, offer less invasive substitutes from more constant and (particularly in the case of tidal energy) predictable sources. More direct government funding should be appropriated for developing the potential of these sources.

Noise and Separation Distances

It is unfortunate for the likes of us residents that we have to contend with outdated guidelines on issues such as noise (ETSU R-97 is hopelessly out of date) and appropriate set-back distances that were not designed for use with the scale represented by modern turbine applications. We can only hope that the result of the current inquiry will prompt a significant rethink by the NI Assembly and result in the establishment of more fit for purpose guidelines which redress the unfair advantages currently being so shamelessly exploited by wind energy Developers. **If the NIA wishes to encourage more universal support for its renewable energy policies then it must address the issue of separation distance between turbines and nearest dwellings as a matter of the utmost priority**. Ten times rotor diameter is totally inappropriate in the context of today's wind farms. It is now widely acknowledged amongst leading experts that a **minimum** separation distance of 1.5 - 2 km is essential to minimize human health problems caused by disturbance, sleep deprivation, etc.

The system of appointed Consultees used by the Planning Service is far from fair and impartial, with many of the present list of advisors having strong links to the wind industry. Also, many of those currently consulted on issues such as noise, are simply out of their depth. This has certainly proved to be the case involving the wind farm applications in this area, where the local council's Environmental Health Department and its advisors are insufficiently qualified to properly assess the noise information supplied by the Developers. Only the determined efforts of residents, involving the services of a renowned private consultant at considerable expense, prevented the initial dubious statistics being accepted without question. There needs to be a much greater effort to widen the bank of Consultees to include many more **independent** experts if the formal consultation process is to prove fully transparent, trustworthy and of sufficient rigour.

Engagement between Developers and the Community

From personal experience over the past eight years I can say that the wind energy companies are only interested in engaging with those who have least to lose from their planning proposals. They are happy to offer tiny percentages of their prospective profits as incentives to buy the support or silence of community associations based a few miles away from their proposed wind farm sites, in local villages and towns. They have absolutely no interest, however, in the genuine concerns of residents who would have to live in the immediate vicinity of their proposals and who stand to suffer most from the negative impacts of their developments. One only has to trawl coverage of this issue in the national press to discover that this is a pattern repeated time and time again up and down the country.

Conclusion

It is clear that the current 'gold rush' on wind energy within Northern Ireland has major lasting implications for our countryside, its stakeholders, its residents and its ecology and that the present rate of applications for large scale turbines is unsustainable. Those in authority must now take serious stock of the potential impact within our overall landscape if the current march of the turbines continues. They must be careful not to place too high a value on short term economic gains at the expense of all other considerations. They must not sacrifice the rights and quality of life of rural minority communities in the interests of commercialism and

targets and they must recognize their fundamental responsibility to protect the timeless, yet ever diminishing, natural beauty and integrity of our countryside and its fragile balance. The precious rural landscape of Northern Ireland is not a renewable resource.

Yours faithfully,

John Maybin

Joint Chairperson - Braid Valley Preservation Group

Brendan Maguire

From: brendan maguire

Sent: 28 February 2014 16:33

To: +Comm Environment Public Email

Subject: Inquiry into Wind Energy

Dear Sir/Madam,

I would like to comment on the Committees Inquiry into wind energy. My comment relates to connection to the electricity grid as stated in PPS 18 Best Practice Guide

1.2.24 Responsibility for the routing of electrical cabling onwards from the sub-station to the nearest suitable point of the local electricity distribution network is the responsibility of the District Network Operator, presently NIE (Northern Ireland Electricity). This will be achieved either by a standard 3-wire system mounted on wooden poles or by lines laid underground. It should be noted, however, that laying high voltage cables underground is much more expensive (around 6-20 times greater) than pole-mounted overhead systems and would be likely to be used only for limited lengths and/or in special circumstances. Whilst the routing of such lines by NIE is usually dealt with separate to the planning application for the wind farm, developers will generally be expected to provide indicative details of likely routes and the anticipated method of connection (over ground or underground).

In my experience Planning Service have not requested this information. In light of the fact that many single wind turbine applications which are approved are never actually constructed due to the fact that grid connection cannot be achieved it would make more financial sense for this to be a primary requirement of any single wind turbine application and would ultimately improve efficiency within the Planning Service itself.

Your sincerely

Mts Barni Maguire

Broughderg Area Development Association

Committee of Enquiry into Wind Energy.

Broughderg area development Association

Environmental designations being over-ridden

Habitats directives etc are sacrosanct.

Mitigation cannot be accepted.

Blanket Bog is very important but is being overlooked.

Resources must be invested to restore damaged sites as in Wales.

The guidance used in regulating proposals for Wind Turbines and Wind Farms is totally inadequate and not scientifically based. Guidance must be scientifically based. Guidelines used are those which have been developed by the wind energy industry itself and are up to 20 years old. The wind turbines of today bear no relation to the output and size and scale of the domestic scaled turbines of the 1990s. The Turbines of today are amongst the very highest constructions to be found in any man made structure on the Island of Ireland and in the Sperrins they are being proposed on the highest landforms on the Island. Relating such constructions to guidance which was designed for domestic turbines in the last Century in fact is ludicrous. As a starting point for the erection of industrial scale wind turbines we should at least not accept anything less than the most stringent conditions and good practices which are to be found internationally. All standards must be independently agreed and independently monitored. **As the wind industry cannot independently monitor itself this role must be conducted by a neutral body**.

Given the traditional rural settlement pattern of population in Ireland it behoves us to protect all our residents with optimum living conditions, health conditions and realistic valuations of their properties. There are serious questions and widespread anecdotal evidence in relation to health impacts on humans. These concerns must be scientifically explored; turbines must be proven to be completely safe in relation to life and to health before further permissions are granted. Ireland with its dispersed rural settlement is unique in comparison to Europe and therefore requires appropriate accommodation. 500m or 10 rotor diameters is not sufficient distance between a wind farm and occupied property, yet this is the distance suggested in the guidelines. This is clear evidence that the guidelines are nothing more than guesswork and are not based on any scientific evidence. Health, amenity, property values and visual impact are issues which far outweigh the questionable economic return from wind turbines and wind farms which are totally dependent on the ROCs payments to guarantee returns for the Investors involved. That is worth noting.

We must have a robust Planning System. PPS 18 is certainly not a robust Planning policy. The Wind Industry is empowered through using the Planning Appeals Commission to overturn most of the Applications which have been refused through the normal Planning System approach. Furthermore when the Planning Appeals Commission has upheld a Planning Refusal a Judicial Review has found the Planning Appeal System wanting. PAC ref no 2007/A1313 is one example. Indeed such is the process that major Developers are now beginning to by-pass the normal Planning route and going directly to the PAC even before the initial application has had a decision. This automatically means that Applicants who take this approach move ahead of other applicants who follow the conventional pathway. Surely this is an issue which needs to be rectified. The Wind Energy Industry is quite happy to navigate the current system since eventually practically all Applications are successful in the long run and this is a long game. Surely a Planning System which has this net result, that a sector which has a high rate of refusal at initial Planning Stage but can be eventually overturned, is not fit for purpose. There must be a Moratorium on Wind Farm decisions until the Planning System

is robust and can defend itself. **Incidentally** the Electricity network is unable to connect all the Developments currently approved so there is no immediate rush to put more Applications through the system.

Furthermore this **incapacity in the grid** should not be used as an opportunity by the Network controller to justify requests to the Executive for public funds to upgrade the infrastructure. The consumer is already paying substantially to support renewable energy through their Electricity costs. By its very nature Wind Energy is very inefficient because it is so variable in its delivery with huge peaks and troughs. This leads to the requirement to have a network to meet the maximum supply which is only needed for a very small percentage of time and can even be unusable at those times.

Much of the blatant circumvention of the system we believe originates in the interpretation of The Energy Ministers Statement at a meeting of the Irish Wind Energy Association in September 2009. The Minister said "that nothing illustrated the "promotive" nature of PPS 18 more than the opening up of AONBs (Area of Outstanding Natural Beauty) to wind energy development for the first time". He believed that AONBs could successfully accommodate such development without compromising their special character, provided proper safeguards were in place. He remained firmly of the view that Supplementary Planning Guidance (SPG) on the sensitivity of our landscapes to wind energy and on their capacity to absorb further wind turbine development is both a necessary and appropriate response to the opening up of the AONBs.

(SPG) is patently not protecting and enhancing the AONBs and their designated Landscape Character Areas (LCAs) and other special designations, Area of Special Scientific Interest (ASSI), Area of Special Archaeological Interest (ASAI), Ramsar Sites (wetlands of international importance) and Special Areas of Conservation (SAC). The above paragraph illustrates clearly that while we have a Planning Policy, the interpretation leaves everything open to interpretation and that becomes a technical and legal minefield. We need a simple return to the situation pre that 2009 statement where the European and Local designations of Landscape Character and Habitats have absolute priority. We must adhere to AONB, ASSI, ASAI, LCA, Ramsar Sites, SAC designation and guidance. We must protect and enhance our Blanket Bogs etc. and our protected species such as Bats, Grouse, Lapwing, Curlew etc. Introducing large vertical elements will completely change the rural character, scenic quality and setting of the whole area. What sets the Sperrins and its Archaeological features apart is the entire setting which developed naturally over thousands of years. To introduce these huge Industrial machines anywhere in this setting would change the local and visitor perception and experience utterly and forever. Local residents and visitors alike are not gifted with tunnel vision or the ability to imagine what the setting of the Sperrins devoid of turbines would be if turbines are introduced.

Our upland areas of West Tyrone and the Sperrins are mostly clad with Blanket Bog. The higher region, such as the Sperrins are also historically and continuously known to be subject to localised Summer Storms of lightning and torrential rains. This is probably due to the properties contained within the Blanket Bog. In the Summer of 1690 it is recorded that over 300 people were drowned in Glenelly Valley in a downpour. These storms continue to occur on a regular basis up to the present. Surely the probabilities of Bogburst in these conditions are too immeasurable to contemplate in the event of excavation necessary to erect wind turbines and construct access roads. Objects on the open hills extending above the surface level such as single trees and even human individuals are always at risk of lightening strike in storm conditions as are well known locally. Surely because of the materials involved in their construction and their huge height, Wind Turbines will be a serious risk for lightning strike or acting as conductors for lightning strike to the ground. The Sperrins contain evidence of lightening strike over generations even in their natural state.

Given the scarcity and state of Active Blanket Bog in Northern Ireland it would be more important to instigate measures to retain and restore damaged habitat and therefore the landscape to a position where the endangered species which inhabit it can flourish.

The term Community Benefit is a misnomer. Communities in areas such as the Sperrins have lived and are living in harmony with their surroundings. They and their ancestors have nurtured and protected the landscape for thousands of years and presented a treasure which is appreciated by everyone. Currently thousands of farmers sustain themselves and their families in the Sperrins and West Tyrone and contribute to the economy of the whole area. Simultaneously the Tourism sector is rapidly growing with the Sperrins a key feature in this growth. The tourism contribution of the Sperrins to the economy runs into millions of pounds per annum with unlimited growth potential. A simple but significant example are the Davagh Forest Trails which opened to Mountain Bikers in April 2013 and will in its first year attract 25,000 bikers with unlimited potential and further development planned. The damage caused, by erecting industrial scale wind turbines, to the Tourism product would be immense as indicated in surveys already produced.

As indicated above PPS18 can allow for the industrialisation of total rural settings. It can totally disregard the special designations of our Rural Landscape….AONB etc

Neighbour notification

There are many issues which arise at Application stage for single turbines and indeed wind farms. The policy in relation to the above regarding neighbour notification is not appropriate. There is only an obligation we understand to notify neighbours if the dwelling is within 70 meters of the turbine. Since these turbines are in the open countryside this is hardly ever relevant. However given that there must be recognition of fall-over distance (height of turbine to tip plus 10%) this suggests that the landowners within the fall-over distance should be of right be notified. In the event of an incident landowners within this range are liable to suffer adversely therefore they must be notified as part of the application process. Currently in many cases the only notification is to the landowner who has signed a contract with the developer. The notification process used is that which applies to buildings and dwellings. Neighbour notification is not addressed properly in application process. Because of the current situation Applications for turbines have been approved whilst neighbouring landowners and residents were not even aware of an application being made. Presently onus is on immediate neighbour to discover applications. Fall-over distances from neighbouring farms is not cross-checked.

A further element that confuses residents is the implied farm diversification through the wording of the Public advertisement that the electricity being produced is to supply farm and surplus to grid. This leads residents to believe that the 250KW applications are a farm diversification project to add to the farm business. They are in fact an Industrial enterprise since the farm cannot use the Electricity produced. This information properly conveyed would lead to a completely different reaction by neighbouring residents.

Canavan Associates Ltd

Canavan Associates Ltd.
Creating · Achieving · Leading
Chartered Town Planners | Registered Architects | Environmental & EIAConsultants | Renewable & Wind Energy Specialists

Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

28th February 2014

By email to: committee.environment@niassembly.gov.uk.

Re: Response to Wind Energy Inquiry

Dear Chairperson Lo,

We welcome the opportunity to respond to the NI Assembly Inquiry into Wind. We have read and endorse NIRIG's response to this inquiry and provide further detail below under the subject headlines of the targeted inquiry – PPS 18, noise and separation distances and community engagement.

Canavan Associates have been involved in delivering wind energy planning consents for over 23 years and is one of the foremost renewable energy consultancies in the wind sector based in N. Ireland. We provide consultancy services to the wind energy industry on projects throughout the island of Ireland. We compile and manage full Environmental Impact Assessments and Environmental Statements for commercial wind farm projects in Northern Ireland and the Republic of Ireland. We are members of the Northern Ireland Renewable Industry Group (NIRIG and the Irish Wind Energy Association (IWEA). We have a keen interest in emerging policy and guidance for wind energy development in Northern Ireland and the Republic of Ireland.

Clear planning guidance is crucial to ensure community confidence in the consistent standards being applied, and to provide a stable policy framework to allow the industry, which now employs over 3400 people to make the clear and necessary progress towards our 2020 renewable energy targets.

PPS18: The inquiry is seeking to "assess *the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment*".

PPS18 is the current policy document which controls renewable energy in Northern Ireland. It was produced through extensive consultation and a final version of the document was published after this consultation. In our opinion, PPS18, as a whole, is fit for purpose as it is allowing Northern Ireland to develop renewable energy in accordance with the Strategic Energy Framework targets. PPS18 was published in 2009, and since then electricity generation from renewable energy has increased from 8% to over 17% in 2013. In order to meet the SEF targets of 40% by 2020, a further 1350-1600MW of renewable energy wind is

RTPI mediation of space · making of place
RIAI
IWEA Irish Wind Energy Association
NIRIG NORTHERN IRELAND RENEWABLE INDUSTRY GROUP
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expected to be required. Wind energy is the most cost-effective and advanced scalable technology available and is expected to provide the bulk of the renewable capacity.

Whilst PPS18 is generally permissive towards renewable energy developments, it does set out a number of "criteria" whereby renewable energy proposals must be assessed and thus ensures that renewable energy developments are not allowed where they will result in unacceptable impacts to the environment.

Wind farms specifically (depending on thresholds), are also subject to Environmental Impact Assessment Regulations, which ensure that the environmental impacts of the proposed developments are fully assessed. Therefore, in our opinion, the existing policy, in combination with the EIA Regulations, is adequate to regulate proposals for wind energy development. As this strict policy regime applies across all Council areas, it ensures a strategic and consistent approach to the siting and delivery of renewable energy in Northern Ireland.

Noise and Separation Distances: The inquiry is seeking "*to compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development*"

As discussed above, PPS18 is the current policy document which controls renewable energy in Northern Ireland. The Best Practice Guidance to PPS18 states that, ETSU-R-97 should be used to assess the noise impacts arising from wind farm developments (para. 1.3.46). ETSU is a commonly used method of assessing the impacts of wind energy throughout the UK and recent best practice guidelines have been published to assist in the application of ETSU, particularly in cumulative environments.

ETSU methodology is inherently conservative and predicts the "worst case scenario" for wind energy developments. In our opinion, the application of ETSU and the Institute of Acoustics (IOA) Good Practice Guidance is the best way to monitor noise from wind farms. This also allows for conditions to be placed on planning permissions which can help to control noise, should any problems arise during the operation of the wind farm.

With regards to separation distances, we believe that the current distances recommended in PPS18 are sufficient to protect residential amenity. However, we would highlight that these are guides, and not strict "separation distances". When setting strict setback distances we need to understand the purpose of such a set-back distance. It is not quite clear what this is supposed to deliver. If it is to do with noise, then there is a method of assessing noise impacts, which do not rely strictly on distances from dwellings.

Separation requirements are not written in legislation in the UK or Ireland, rather they are suggested in policy and accompanying guidance. Attempts at Westminster to introduce setback distances have been proposed in recent years and have failed to gather support from Government. Current setback distances in England (as set out in PPS 22) are similar to that in PPS18 (NI). Whilst Scottish guidance recommends a distance of up to 2km to edge of settlements, a review in 2013 on behalf of the Scottish government could not trace the origin of this recommended distance and found nothing to support this distance. 500m is the recommended setback in Wales under TAN8 but there is flexibility allowed for based on noise and visual impact. 500m is also the current distance recommended in the Republic of Ireland with regards to impacts from shadow flicker.

Due to the number of permitted of single dwellings in the countryside in Northern Ireland it would be difficult to find any sites for wind energy should higher setback distances be recommended. This was the experience in Australia. In the state of Victoria the policy (at state level) is that no wind farm is allowed within 2 km of a habitable house unless the people living in that house give it consent. As is very difficult to find sites that are 2 km away effectively it cut off the wind industry. Such a setback would not be conducive to meeting renewable energy targets in Northern Ireland in line with the Strategic Energy Framework. We would reiterate that PPS18 is adequate, in its current form, to protect residential amenity.

Community Engagement: The inquiry is seeking "*to review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted*"

As planning consultants, we would always recommend pre-application consultation with local communities. We have been carrying out these community consultations, on behalf of our clients (wind energy developers) for approximately ten years. Historically, these events have been very useful for both the community and the developer, and can be a chance for additional information to be incorporated into the final Environmental Impact Assessment. However, in recent years (2012/2013), these events are becoming a lot more hostile, with protestors turning up and abusing members of staff at these events. Whilst we can understand their concerns, they provide no opportunity for their questions to be answered and can often mean local residents do not get a chance to ask questions they may have about the proposal. Given recent experiences in Northern Ireland, some developers are choosing not to go ahead with these pre-application consultations (especially open days). We appreciate the need for these events and the pre-application consultation, but feel that recent events have made them off putting for developers, and less useful for the local communities.

Strategic planning guidance from the Department would be welcome as it would be an appropriate method of outlining the requirements for engagement with. Additionally, given our comments above, we believe that in order for community engagement to be fully effective, it requires all key stakeholders to enter into constructive dialogue and assist, where appropriate, in identifying the full range of local opinion about the development.

Conclusion

We support the positions taken by NIRIG and reiterate the following points:

- The benefits of developing our wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development

- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland

- The forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond

- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments

- Buffer zones or separation distances are not required by statute in the UK or Ireland and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions

- We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector may be considered a leader in good practice on community engagement in Northern Ireland

We would also like to highlight the need for positive leadership from across the political spectrum for the development of renewable energy resources. Our sustainable energy aims as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital.

We are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind.

In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our renewable energy and low-carbon commitments.

Yours sincerely

**sent by email, requires no signature*

Seamus Canavan
Canavan Associates Ltd.

Carrigatuke against Turbines Residents Group

Re: NI Wind Energy Enquiry Submission To The Environment Committee

I am a member of Carrigatuke against Turbines Residents Group, based near Newtownhamilton, Co Armagh. This area is currently contending with a heavy volume of industrial wind turbine applications (in both wind farm and single industrial scale wind turbine format) within the area of a few small kilometres.

As a resident of this area, my rural home is located at the epicentre of some of the proposed industrial wind development in Newtownhamilton area. I therefore can speak from actual experience on the ground.

I have very serious concerns regarding the application of the PPS18 policy in practice, on the following grounds:

- the scant residential amenity protections in place in terms of the inadequate 500m , 10x rotor diameter setback distance, (notwithstanding the lack of substantive medical research to prove that wind energy is entirely safe to physical and mental human health, to permit such proximate residential setback distances). This slim setback distance makes PPS18 something of a wind developer's charter, and provides carte blanche for wind development across NI, irrespective of the appropriateness or otherwise of the development, and even AONB's.
- The routine and repeated failure of Planning Service to apply even these slim residential amenity setback protections, as specified within PPS18 +SPG, in multiple planning application assessments and approval cases across NI.
- There appears to be a total bias in favour of wind development. This can be evidenced by Planning Service's very close cooperation with wind developers (indeed wind developers appear to have the limitless ear of Planning Service), in contrast to the restrictive contacts provided by Planning Service, with the resident public affected by such proposals (for example, public file viewing appointments in Planning Service are strictly supervised and can last no longer than 1 hour, with maximum 3 files permitted to be viewed at any one time).
- Unfair neighbour notification distance catchment area of 90m means that most homes affected will not be formally notified of wind turbine planning applications and are unaware of them. Procedural unfairness against the resident public is thereby factored in.
- The lack of awareness of Environmental Health Depts with regard to specifics of wind, amplitude modulation, infrasound issues – there is apparently a complete lack of equipment to measure these types noise or indeed any noise, and apparently a willingness by EH Depts to abdicate responsibility on to the wind developer to assess the noise, in the event of a complaint, when Environmental Health Depts have the public protection duty of care. Obviously wind developers have a vested financial interest in securing the smooth and continued running of their wind turbine income stream, and so invariably developer funded noise reports are sent in to EH Depts with findings that the developer's machinery sound outputs are be fully compliant with regulations. If EH Departments have no machinery to independently measure turbine noise in all its formats, then that is akin to the concept of the police fixing speed limit and not having a hairdryer speed detection machine to check what speed an alleged offender has been travelling at. If the police have no such equipment, in the event of a complaint, to ask a potential offender to verify what speed they were doing is a nonsense. In this way, active wind development is not regulated.
- The lack of any substantive medical research into wind energy development close to residential property, to prove that wind energy is entirely safe to physical and mental

human health. The failure of the Public Health Agency to adopt a precautionary approach in further failing to conduct substantive research into the issue of noise and the human physical and mental health impacts of wind energy.

- The foreseeable, longer term adverse impacts on the ground on the resident rural community's future sustainability, in deterring future building in the affected largely rural areas, and in having to contend with the imposition of a proliferation of industrial wind turbine development in a rural area, which has apparently not even been contemplated, never mind taken into account, by policymakers.

PPS 18 and SPG appears to be inadequate with regard to protecting local residents in particular in relation to separation distance. However, what is more alarming is the fact that such protective measures that are in place under PPS18 are routinely ignored and overridden and wind turbines are sited at less than the policy prescribed setback distances. There appears to be a very clear bias on the part of DOE Planning Service in assessing wind applications, in favour of wind development, to the detriment of local residents. This compromises DOE Planning Service in its role as impartial, public servants.

There appears to be scant to no regard for any other existing technologies which are less impactful than wind. There are other less impactful technologies available to the Government as a means of achieving the renewable energy target, however, wind energy, which perversely appears to be the most impactful technology on the resident community (in terms of noise issues, sleep deprivation, scale of development -400 feet constantly rotating industrial turbine machines imposed on smaller scale rural areas) causing visual intrusion, visual distraction, and generalised loss of amenity to the area.

I find it quite simply astonishing that these on the ground, resident community adverse impact issues, which ought to have been reasonably foreseeable to any prudent and duly diligent policy maker do not appear to have been communicated to of foreseen by the policy makers in the first instance. It appears that no feedback has either been sought from or provided to the relevant community based groups from the resident community, and this has therefore translated into a very damaging, ill conceived policy which affords scant protection for the resident community and which has been formulated with the interests of promoting the wind industry primarily, to the absolute detriment of the resident community's rights. The application of the current policy is very heavily weighted in favour of promotion of wind energy.

The adverse impacts of wind development in rural areas does not accord with the principles and spirit of the Rural White Paper, which is an Executive approved document. Perversely this wind promotive PPS18 policy is causing disadvantageous living conditions for rural dwellers. The policy does not appear to have been properly "rural proofed".

Similarly the recent, well intentioned proposals by the Agriculture Minister to improve rural broadband communications which are currently slow to non existent in some areas, is also being negated by the impact of wind farms/wind turbines on rural areas, which damage telecommunications systems.

Counteracting policy provisions(where one policy counteracts and negates the effect of another policy) must not be allowed to exist, as that will amount to ineffective Government.

The wind promotive policy is effecting a form of "Environmental Injustice" on largely the rural resident community (as such areas are in every case, the subject of such industrial wind farm proposal) – this principle is taking a disadvantaged area or disadvantaged community, and inflicting a further disadvantage on that already disadvantaged area or community. It is often the case that rural residents may suffer from limited financial resources/clout, or the wherewithal to effectively counter such inappropriate industrial development proposals, and to enable them to counter the infliction of such a disadvantage on their area. Such communities are therefore soft targets. This is a social and moral wrong which urgently needs to be corrected.

From the experience which we have encountered to date, it is the case that PPS 18 and related SPG is inadequate in regulating or policing proposals for wind turbine development. In practice, it is frequently applied on an inconsistent basis. Case officers appear to approve wind turbines with indecent haste in some cases, without first having rigorously checked that each and every one of the requisite criteria in PPS18 and SPG has been satisfied, to allow an approval to be justified and to proceed. Where there are deficient applications, I have encountered Planning Service Case Officer responses which astonishingly appear to do the work for the applicants and to provide substantive supporting statements for applications, without applicants having to lodge outstanding materials. The onus is on applicants to demonstrate how their application complies with policy, not on Planning Service to demonstrate this for applicants. This type of conduct undermines public confidence in the entire procedure.

There appears to be scant to no regard for emerging technologies or technologies alternative to wind. Wind is apparently the only vehicle employed in NI to achieve the target.

There is also no regard for independent environmental impact assessment. This simply does not happen in NI. This appears to be in breach of EU law.

The claims made by wind developers therefore cannot be verified, and often go untested and unchallenged. There is no independent EIA carried out.

The interests of wind developers (ultimately, to financially profit from a wind development scheme, and for that reason a risk of underplay of adverse environmental/landscape/visual /community impacts), is opposed to what Planning Service is charged with protecting – appropriate development. If an independent EIA is not carried out, then no impartial yardstick against which claims can be tested, is carried out. The effect of this is something of a free for all.

PPS 18 and SPG is also inadequate in regulating proposals for wind turbine development as there is no detailed Policy provision for Safe Siting of Turbines and Roads (as is the case in similar jurisdiction, GB). Cursory treatment has been given to this subject in PPS18 and SPG.

It was devised in GB as a result of litigation case law – claims brought against local authorities for accidents caused as a result of poorly sited turbines in relation to roads.

I have noted this anomaly and this gap in policy provision, and I have already raised this issue with DRD Roads Service however, it appears that for the policymakers, a line of least resistance is preferable, and hang the potential risk consequences.

This approach does not demonstrate due diligence on the part of policy makers. If there is even the slightest risk of adverse consequences which have not been legislated against by the policy makers – effectively, if no form of public liability insurance against risk is in place by policymakers, then the local authorities are not insured, not covered and open to litigation. This loophole needs to be addressed in order that the precautionary principle is seen to be applied, and any potential consequences averted.

It is the case that other devolved Governments have taken site specific steps to address the specific and peculiar needs of their devolved Government areas.

Wales – zoning
Scotland – 2km setback from settlements

If the WHO states issues with wind turbine setback distances, that should be taken as the yardstick. In the absence of substantive research into noise impacts having been conducted this precautionary principle ought to have been adopted.

In our experience with wind farm applications and single wind turbine applications, Wind developers have very minimal local community engagement. Any Public Exhibitions are something of a token gesture, and a cynical, box ticking exercise.

Developers frequently engage in underplay of adverse impacts, withholding of relevant information, lack of transparency. It is most typically an adversarial procedure. It creates division in communities, suspicion, stress and anxiety amongst the resident community, in light of the excessive proximity to homes, the lack of substantive health research having been conducted, the numerous reported cases of noise nuisance, sleep deprivation, and a feeling of powerlessness, that these industrial proposals are to be imposed on the rural areas in question.

Wind Developers are dismissive of valid and genuine local resident community concerns claiming it they are (i) radical NIMBY's (ii) overly sensitive, without cause (iii) ignorant and requiring to be educated on the perceived benefits of wind. This speaks volumes as to the attitude of wind developers to the local resident community.

It is not a case of wind developers need to engage in further local consultation to allay local concerns or to educate the locals. This is an insult to our intelligence. It is transparently the case that the wind development proposals compromise the rights and interests of the community which is targeted to be the "host".

A moratorium on wind energy development should be activated as soon as possible while a costs benefits analysis is carried out on wind, and while substantive health research is conducted by the Public Health Agency. Substantive research work is within the PHA's remit. They need to do this work to act in the best interests of NI citizens and Planning Service also needs to revise this PPS18 policy to act in the best interests of the NI resident community and landscape, which are assets which they are charged with protecting, and which they are currently seriously neglecting.

I trust that the material gathered as a result of this Enquiry will be very carefully digested and the principles regarding the actual adverse impacts extracted and applied to any new revised policy, in order to protect the wider resident community and the NI landscape asset, from voracious wind developer appetite for even more development. The interests of both the wider resident community and the NI landscape asset are currently being entirely eroded by what can only be described as a policy which has the impact of an out of control juggernaut- a blunt instrument blow to resident communities, to the NI dispersed rural settlement and to the unique NI landscape.

Piers Carty

Sent: 28 February 2014 16:06

To: +Comm Environment Public Email

Subject: Environment Committee's Wind Energy Call for Evidence.

Dear Anna L,

I welcome the opportunity to respond to the Environment Committee's Wind Energy Call for Evidence. I believe that it is imperative that we support the development of Northern Ireland's renewable energy resources. There are many benefits of doing so. These include lower carbon emissions, a more diverse energy supply, stabilising the volatile fossil fuel prices upon which so much of Northern Ireland relies and demonstrating our genuine commitment to addressing climate change.

A range of policies are already in place to mitigate any of the potential impacts of wind energy development. For example, PPS18, which sets out the planning framework for renewables, is an appropriate policy for the assessment of wind farm developments in Northern Ireland. The ETSU-R-97 limits are considered to be acceptable in assessing noise levels and these are the limits proposed across the UK by experts in their field.

Separation distances between wind farm developments and houses are not required by statute anywhere in the UK or Ireland and I do not believe that Northern Ireland should impose such limits. However, 500m is a common set-back distance and added to this is the ability of planners to set noise level limits at the houses likely to be significantly affected, and require these to be met by planning conditions.

I would also like to highlight that I support renewable energy and believe that Northern Ireland has among the best wind energy resources in the world. I think that it is important to support the development of these resources in a responsible manner. Policy-making in the complex arena of energy requires strong and robust evidence and a clear, ambitious vision for a low-carbon future.

Yours sincerely,

Piers

Castlereagh Borough Council

Committee for the Environment

Review of Wind Energy Issues

Introduction

The Committee for the Environment initially agreed on 10 October 2013 to carry out a short Review of wind energy issues after hearing from a range of stakeholders over previous months. On 7 November 2013 the Committee agreed that it would not complete this Review but that it would instead carry out a full inquiry into this topic. The aim of the Inquiry is to identify the key issues arising from the generation of renewable energy by onshore wind turbines and to assess the adequacy of existing planning guidance to address these issues.

Castlereagh Borough Council has been identified by the Committee as having a particular interest in the issue and has therefore been asked to submit a written response.

Terms of Reference

The Committee has set the following Terms of Reference for the Inquiry into Wind Energy:

- To assess the adequacy of PPS18 Renewable Energy and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;
- To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development; and
- To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

The Issues in Castlereagh Borough Council Area

Wind Turbines

Castlereagh Borough Council has no wind farms, but has several single wind turbines ranging from small domestic turbines (10 kW) to large commercial turbines (150 kW). In the last five years there have been 28 planning applications for wind turbines in Castlereagh Borough Council area. Of these, 11 were approved, three were invalid and four are pending decisions. One application was refused and nine were withdrawn by the agents. A closer examination of these applications illustrates the range of issues which influence their acceptability. In the majority of cases concerns raised by NIEA regarding wildlife such as bats were cited as a reason to recommend refusal either because the applicant did not provide enough information against which to assess the details of the application or because it was considered that the impact on the wildlife was insurmountable. In four cases the impact on the RADAR at Belfast City Airport was shown to be a reason to recommend refusal. In another application NIW raised a concern over the potential interference on its telecommunications. In two cases NIEA Monuments had cited concerns over the impact on raths as a reason to recommend refusal.

This examination of applications in Castlereagh shows that the need to protect wildlife and the need to prevent interference of RADAR/telecommunications influence the success of wind turbine applications. However, in a recent Planning Appeals Commission decision two wind turbines in Newtownabbey were approved with conditions (2014/A0049 and 2014/A0051). It was accepted by all parties at the appeal that a negative condition would be appropriate requiring that no development should take place until a RADAR mitigation scheme (RMS) for

the turbines' aviation impacts had been approved. The Commissioner accepted that RMSs could be available and operational within the five year lifespan of the approval. Castlereagh Council would therefore call for guidelines on which circumstances will result in a clear refusal for turbines near to airports.

The Members of Castlereagh Borough Council have suggested that wind turbines could provide farmers with additional income which would help them look after the land and wildlife on their farms and that aesthetics should be balanced against the need for green energy.

Anaerobic Digesters

PPS18 focuses on wind energy. There are many alternative types of renewable energy, often influenced by the availability of grants or by location. In rural areas there is a growing demand for anaerobic digesters; Castlereagh Borough Council has one associated with a farm. On a small scale these may be acceptable, but where operators allow deliveries of waste from other suppliers, the impact on traffic, road safety, noise, smell, nuisance and visual impact may become disproportionate and unacceptable.

Solar Photovoltaic Panels

Alternative forms of renewable energy which have become more popular recently are solar photovoltaic panels. These could have significant impacts on vulnerable environments which need equal protection through the planning system. Large scale developments may be more acceptable in an urban setting, such as the recent permission granted to Bombardier Aerospace to install photovoltaic panels on the roof of their Belfast plant at Airport Road West, an area of five hectares. BNRG Northern Power has also recently been granted permission for an 11 hectare solar photovoltaic farm near to Downpatrick. BNRG states that as the maximum height of the panels will be no more than 2.5m, the visual impact will be kept to a minimum. However, more research is needed to determine the full impact of hectares of panels in the rural environment.

Castlereagh Council would welcome clear guidelines on how to balance the need for renewable energy against the need to protect valuable agricultural land.

Smaller scale domestic projects could be acceptable in either rural or urban settings. Indeed there is an argument towards more benefit in rural areas when grid power is lost there would be some power available to homes fitted with solar panels.

Northern Ireland Landscape Character Assessment 2000

Castlereagh Borough benefits from a number of high quality environments which have been identified in the Northern Ireland Landscape Character Assessment 2000 and are recognised as worthy of protection. This protection needs to be balanced against the need for more renewable energy sources. It is important too that this document is updated to take account of recent developments in the rural area and changing requirements on its resources.

Conclusion

Castlereagh Borough Council takes the issue of renewable energy seriously and supports enterprise and investment in renewable energy projects. It recognises that the Borough comprises valued environments and vulnerable landscapes which are under growing pressure from development including renewable energy proposals. The Council would therefore encourage a balanced and programmed approach to renewable energy projects which results in more fair and consistent decisions.

February 2014

Causeway Coast Glens Heritage Trust

Environment Committee Wind Energy Inquiry

Comments by
Causeway Coast and Glens Heritage Trust

28th February 2014

The Causeway Coast and Glens Heritage Trust (CC&GHT) was established in May 2002 as a partnership body with the responsibility of promoting and enhancing the unique qualities of the Causeway Coast and Glens area. The Heritage Trust is funded and supported by the Northern Ireland Environment Agency, the Northern Ireland Tourist Board and the six district councils in whose jurisdiction the Causeway and Coast and Glens area falls, namely: Limavady, Coleraine, Moyle, Ballymoney, Ballymena and Larne. It has also received substantial project funding from a variety bodies including the Heritage Lottery Fund.

The Heritage Trust has been charged by Government in Northern Ireland with the task of promoting and co-ordinating the management of three statutorily designated Areas of Outstanding Natural Beauty:

- Antrim Coast and Glens
- Causeway Coast
- Binevenagh

The Heritage Trust supports the development of renewable energy in Northern Ireland, including windfarms. Wind energy is expected to play a large part in the achievement of government targets in renewable energy while other solutions are being researched and developed. We welcome the opportunity to contribute to the Inquiry into Wind Energy announced by the Assembly's Environment Committee. CC&GHT is a member of Northern Ireland Environment Link and supports the comments made by that body to the Inquiry. The Heritage Trust wishes to provide an additional response in its own right in relation to bullet point one in the Committee's Terms of Reference:

- To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;

Prior to the publication of PPS18, the relevant planning policy regarding windfarms in AONBs was contained within the Planning Strategy for Rural Northern Ireland. That policy was for a presumption against the development of windfarms in AONBs. Given the challenging targets for electricity generation from renewable sources that the Assembly has signed up to, it is understandable why it was considered that this policy was no longer sustainable.

PPS18 acknowledges that the landscape and visual effects of windfarms may be significant depending on the scale of the proposed development, its location and its landscape setting. Some of these effects may be minimised through appropriate siting and design. Its publication by the Department of the Environment was accompanied by the document 'Wind Energy Development in Northern Ireland's Landscapes' published by the Northern Ireland Environment Agency. This document was intended to provide supplementary guidance on the landscape and visual assessment process but was not prescriptive on the scale or type of development that may be acceptable in sensitive areas such as AONBs.

The supplementary planning guidance provides broad strategic guidance in relation to the landscape and visual impacts of wind energy development. It does this in relation to Landscape Character Areas, 130 of which have been identified for Northern Ireland. It

acknowledges that AONBs represent our most highly prized landscapes but neither PPS18 nor the supplementary guidance offers any policy to guide the development of windfarms, or individual wind turbines, in these areas. It is evident that the renewable energy sector, in seeking new sites for wind energy, is increasingly turning its attention to hitherto largely undeveloped uplands in AONBs. The NIEL submission to the Committee has highlighted two contentious developments which have received planning approval in Binevenagh AONB. We also understand that there are proposals for one or more windfarms on the Antrim Hills in the vicinity of Mullaghsandal standing stone in the Antrim Coast and Glens. Such developments have the potential to dramatically change wild landscapes which have been recognised for their outstanding beauty and are a source of enjoyment to Northern Ireland residents and visitors alike.

The Heritage Trust is not opposed to all wind energy developments in AONBs but considers that a more robust policy framework is required to protect the landscape quality and character of these areas. We believe that the first step towards this should be the development of strategic locational guidance along the lines produced by Scottish Natural Heritage in Scotland. Among other things, this guidance identifies some areas which are of greatest sensitivity to wind farms and where proposals are unlikely be deemed acceptable. CC&GHT contend that there are parts of the three AONBs in its area that are deserving of protection equal to this. Should the Committee wish to discuss these comments the Heritage Trust would be happy to meet with it.

Causeway Coast and Glens Heritage Trust

27 Main street,
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BT53 8SL

Chartered Institute of Environmental Health

Northern Ireland Assembly Committee for the Environment

Inquiry into Wind Energy

28th February 2014

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The Chartered Institute of Environmental Health

As a professional body, we set standards and accredit courses and qualifications for the education of our professional members and other environmental health practitioners.

As a knowledge centre, we provide information, evidence and policy advice to local and national government, environmental and public health practitioners, industry and other stakeholders. We publish books and magazines; run educational events and commission research.

As an awarding body, we provide qualifications, events, and trainer and candidate support materials on topics relevant to health, wellbeing and safety to develop workplace skills and best practice in volunteers, employees, business managers and business owners.

As a campaigning organisation, we work to push environmental health further up the public agenda and to promote improvements in environmental and public health policy.

We are a registered charity with over 10,500 members across England, Wales and Northern Ireland.

1 General Comments

1.1 CIEH welcomes the Committees inquiry into wind energy. We recognise that this form of renewable energy has proved somewhat controversial and there are specific aspects of current policy that do require examination and potential amendment.

1.2 However, we also recognise the absolute imperative to reduce our reliance on and generation of fossil fuel generated energy and indeed the potential environmental, social and economic benefits and opportunities to Northern Ireland in appropriately harnessing our potential for renewable energy. Wind generated energy, although not the only possibility, is an important part of our future potential in this area.

2 Wind derived energy as a form of Renewable energy

2.1 Onshore or offshore Wind turbines, like all other renewable energy comes from energy sources that are continuously replenished by nature. Greater use of such energy will not only

reduce dependence on imported fossil fuels but will also bring diversity and security of supply to our energy infrastructure.

2.2 Wind energy has an essential role in combating climate change and the UK will need a mix of both new and existing renewable energy technologies and energy efficiency measures, and as quickly as possible. Significant amounts of investment have been allocated for wave and tidal energy development, and these technologies, along with solar and biomass energy, will have an important role in the UK's future energy mix. However, wind energy is the most cost effective renewable energy source available to generate clean electricity, help combat climate change and meet our energy security objectives right now. It is a proven, efficient technology that can be deployed quickly and has been contributing to the UK's electricity supply for years. Furthermore, developing a strong wind industry will facilitate other renewable technologies which have not reached commercialisation yet, accumulating valuable experience in dealing with issues such as grid connection, supply chain and finance.

2.3 The Sustainable Development Strategy for Northern Ireland' (SDS), 'First Steps towards Sustainability', recognises the enormous potential to develop renewable energy sources in Northern Ireland as alternatives to burning coal, oil or gas. The SDS' priority is not only to foster opportunities but also to build on the existing successes and capabilities of companies in developing innovative ideas and new technologies in renewable energy. In order to meet its regional targets, the SDS sets challenging targets for Northern Ireland above those set at national and international levels for the reduction of greenhouse gas emissions. Such targets include ensuring that where technologically and economically feasible, by 2025, 40% of all electricity consumed in Northern Ireland is obtained from indigenous renewable energy sources with at least 25% of this being generated by non-wind technologies.

3 Health concerns of Wind Energy

3.1 There are, understandably, concerns regarding potential health related impacts that may be associated with wind turbines. These concerns include noise, "flicker" effect, and visual disturbance/annoyance.

3.2 The key to avoiding such potential impacts is appropriate planning policy, associated guidelines, and other relevant professional and technical guidance. We are aware that the Chief Environmental Health Officers Group has made a detailed submission dealing with these technical aspects and we would concur with and support their analysis of the current position and recommendations in this regard as summarised in the following 2 points. It should be noted by the committee that the individuals who have prepared this submission have considerable professional expertise in this particular area.

3.3 A review of the noise limits as derived under ETSU-R-97 is long overdue and should be prioritised along with the other United Kingdom jurisdictions at a national level.

3.4 Within NI specifically, the current policy within the Planning Service in not attaching a 'complaint investigation' condition with respect to single wind turbine applications (unlike wind farm developments) is highly likely to place considerable resource burdens on to ratepayers whilst considerable resistance remains from local residents to such developments. This position should be reviewed as a matter of urgency.

3.5 There is growing evidence suggesting that where wind turbines are appropriately sited and adequate planning conditions are applied adverse impacts are negated. We would refer the committee to our own research, completed in partnership with the University of Ulster a copy of which has been provided along with this submission for reference.

3.6 Although difficult to quantify, it should also be borne in mind that existing forms of power generation based on fossil fuels, in themselves have associated health impacts associated with the air emissions that such energy generation produces. Wind energy has zero air emissions.

4 Other Impacts of Wind Energy

4.1 Onshore wind turbines take a large area of land to generate a reasonable amount or energy. Land, a finite resource, faces a number of competing uses and other pressures. Although we recognise the additional costs associated with offshore wind, this too needs to be further explored, along with other renewable energy sources, particularly wave and tidal sources.

4.2 There is a distributional aspect to wind developments in that those that bear the local environmental cost (local communities) may be different from the beneficiaries (electricity consumers and producers). In addition to concern about costs and benefits, there are therefore questions of adequate benefit sharing with (or financial compensation for) local communities.

4.3 Experience drawn from Germany and Denmark, with respective wind capacities of 27,000 MW and 3,700 MW, shows that the involvement of local communities is crucial in the development of new plants. Unlike the UK, where the majority of onshore wind projects are developed and owned by commercial companies, majority of projects in Germany and Denmark are community owned. Local communities' pool resources to finance the purchasing, installation and maintenance of projects, and individuals are therefore entitled to a share of the annual revenue which is proportional to their investment.

4.4 The footprint of wind power is light. Its operation does not emit any harmful emissions or hazardous waste. It does not deplete natural resources, nor does it cause environmental damage through resource extraction, transport and waste management. When the wind turbines are up and running, existing activities such as agriculture and walking can continue around them. Farm animals such as cows and sheep are not disturbed. Any impacts on the local environment must be set against the much more serious effects of producing conventional electricity.

4.5 The development of wind turbines requires an Environmental Impact Assessment that takes into consideration conservation and wildlife groups to ensure that new developments do not adversely affects their habitats. Extensive efforts must be made to avoid excessively adverse impacts on existing biodiversity.

4.6 According to the European Wind Energy Association – EWEA, the cost of wind energy has fallen over the years as the technology has matured. Historically, the costs per kWh produced by new turbines have fallen by between 9 % and 17 % for each doubling of installed capacity. If the "external" costs of damage to health and other environmental effects of different fuels are added in, the European Commission has concluded that the cost of coal-fired generation would double and the cost of gas-fired generation would increase by 30 %.

Chartered Institute of Environmental Health

Living with Wind Turbines

An investigation into public perceptions and experiences of affected communities

June 2012

University of ULSTER

Acknowledgments

Thanks to the NIEA Challenge Fund which provided the financing to carry out the survey fieldwork which informed this report. Thanks also to the fieldworkers who carried out the door to door survey at the 2 sites. Most of all, thanks are due to those residents within the communities who participated in the research, without which this publication would not be possible.

This report was researched, compiled and written by Shauna McAuley and Sean MacIntyre at the University of Ulster with assistance from Gary McFarlane and Hannah Rollings at CIEH.

Contents

1. Executive Summary

In this coming decade the Northern Ireland Executive aims to maximise the amount of electricity generated from renewable sources in order to enhance the diversity and security of energy supply, reduce carbon emissions and contribute to the province's 40% renewable energy electricity target by 2020.

In view of this target, it is essential to consider the impacts of renewable methods of electricity generation in Northern Ireland (NI) and the level of acceptance of this infrastructure by communities where the technology is located. Northern Ireland is positioned in one of the best locations in Europe, and indeed the planet, to exploit wind energy, however at the neighbourhood level wind farms have anecdotally often been viewed less than favourably by the communities in which they are situated.

In relation to assessing community views on wind energy generation, the research carried out in this study focuses on the perceptions of environmental quality by the residents of two neighbourhoods, one situated within 3km of an operational wind farm site and the other situated within 3 km of a proposed wind farm site.

The research findings indicate that the presence of wind turbines had little impact on the resident's perception of their neighbourhood as both sites rated their area as 'good' or 'very good'.

At the operational site respondents within 3km of the wind farm reported, in an average of 85.6% of cases, that they were not affected at all by the wind farm, in relation to the issues of main concern, visual impact, damage to the environment and negative impact on property prices.

This study found that respondents were generally strongly in favour of energy generation by renewable technologies, including wind power with support being stronger at the site that is operational rather than the proposed wind farm site. The majority of respondents from both areas also considered wind turbines to be an effective method of generating electricity.

Respondents from the operational site were more likely to find wind turbines pleasant to look at compared to those at the proposed site. The findings suggest that the experience of living in close proximity to operational wind farms has largely reduced or mitigated previous perceptions and/or concerns.

The issue of securing tangible benefits for the local community needs to

1. Executive Summary

be addressed. Very few respondents from the operational site feel there has been much benefit at all to the community as a whole. In relation to this the creation of community turbines should be investigated, as has been done in Wales, where the host community benefits from wind energy installations and local people can exercise a degree of control over the projects.

1.1 Project Aim

To compare the public perception, concerns about and experiences of wind farms and other methods of electricity generation among populations who reside close to a proposed wind farm site (Site 1) and those who reside close to an operational wind farm site (Site 2).

1.2 Objectives

1.2.1
To determine how individuals rate their local area as a place to live and investigate any relationship between these views and their opinions on electricity generation and wind turbines.

1.2.2
To establish the public perception of local wind farms and methods of electricity generation in general, at both sites, pre and post development.

1.2.3
To ascertain if the population at the proposed site (Site 1) have a generally positive or negative perception of the planned wind farm and establish what, if any, their main concerns are in relation to the planned wind farm.

1.2.4
Determine if the local population at the operational site (Site 2) perceive the wind farm to have had either positive or negative impacts on the community and surrounding environs and investigate any change in opinion between pre construction and post construction phases of the wind farm development.

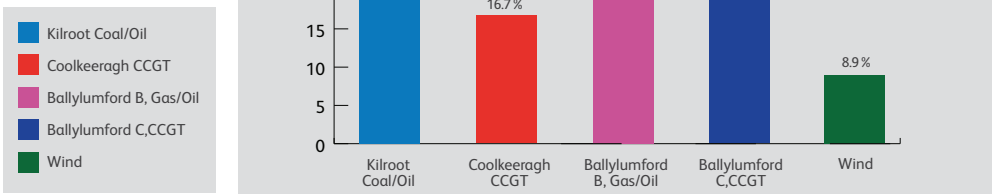
To determine if the local population in both areas consider themselves to be well enough informed about existing or planned wind farms.

2. Introduction and Policy Background

Changing the methods of electricity generation and moving away from a reliance on imported fossil fuels gives NI the opportunity to become more energy independent, as well as contributing to the Northern Ireland economy and reducing carbon emissions. Increasing energy security within the province is a compelling goal for a number of reasons. The ability to meet our electricity needs from locally generated resources reduces the risk of energy supplies being interrupted because of political or social unrest in other countries. In addition, improved energy security also potentially provides a degree of price stability that can impact positively on levels of fuel poverty.

In the Digest of UK Energy Statistics (DUKE) 2011, it is reported that the UK was a net importer of energy in 2010 and that 80% of energy production in the UK was accounted for by oil and gas. The situation in N. Ireland in 2010 was even more extreme with over 90% of electricity generation being derived from imported fossil fuels.

Graph 1



N. Ireland electricity generation percentage by Fuel Source, May 2010

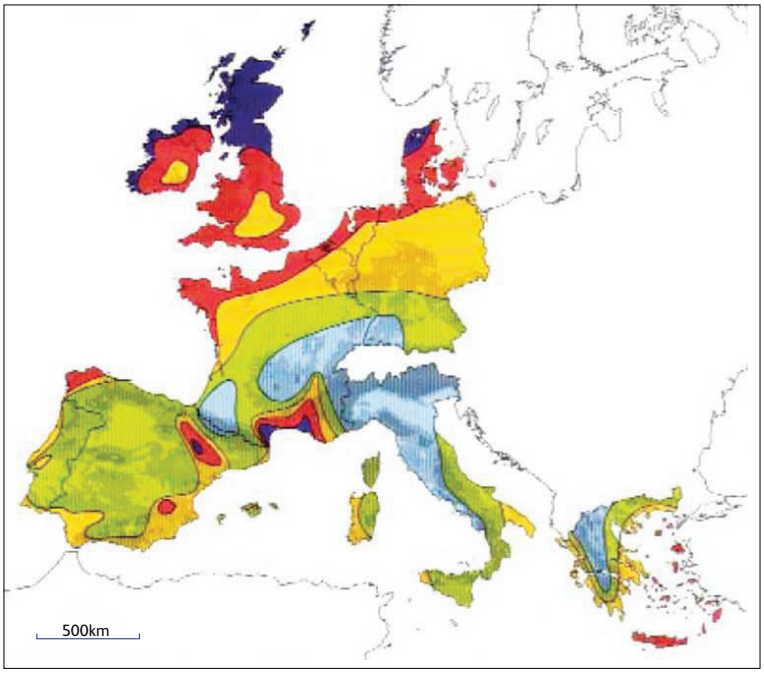
Data source: Department of Energy and Climate Change

Northern Irelands' westerly location within the British Isles immediately adjacent to the north Atlantic, places it at an advantage in relation to the amount of wind resource available. As is illustrated in the map opposite it is ideally located to exploit some of the best wind resources within the European Union.

A shift to renewable energy for electricity generation will also contribute significantly towards reducing NI's greenhouse gas emissions. While renewable technology is to be supported, care must also be taken that the lives of those who reside close to such installations are not negatively impacted upon and that the surrounding environment is also protected.

2. Introduction and Policy Background

2.1 Strategy and Policy Background – NI and UK



European Wind Atlas, Onshore, 1989

	Wind resources[1] at 50 metres above ground level for five different topographic conditions									
	Sheltered terrain[1] ms $^{-1}$	Wm $^{-2}$	Open plain[3] ms $^{-1}$	Wm $^{-2}$	At a sea coast[4] ms $^{-1}$	Wm $^{-2}$	Open sea[5] ms $^{-1}$	Wm $^{-2}$	Hills and ridges[6] ms $^{-1}$	Wm $^{-2}$
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0 – 6.0	150 – 250	6.5 – 7.5	300 – 500	7.0 – 8.5	400 – 700	8.0 – 9.0	600 – 800	10.0 – 11.5	1200 – 1800
	4.5 – 5.0	100 – 150	5.5 – 6.5	200 – 300	6.0 – 7.0	250 – 400	7.0 – 8.0	400 – 600	8.5 – 10.0	700 – 1200
	3.5 – 4.5	50 – 100	4.5 – 5.5	100 – 200	5.0 – 6.0	150 – 250	5.5 – 7.0	200 – 400	7.0 – 8.5	400 – 700
	> 3.5	> 50	> 4.5	> 100	> 5.0	> 150	> 5.5	> 200	> 7.0	> 400

Northern Ireland has a variety of both legal and policy obligations to help reduce carbon emissions through the use of renewable energy:

Promotion of renewable energy in NI is embedded in both national and international policy - Northern Ireland's Regional Development Strategy 2025, Sustainable Development Strategy 2010 and numerous energy policies, such as the UK Renewable Energy Strategy 2009 and the Northern Ireland Strategic Energy Framework 2010.

The European Renewable Energy Directive 2009/28/EC legally requires a National Renewable Energy Action Plan for the UK, which has resulted in the UK wide target of 15% of electricity generated from renewable sources by 2020.

2. Introduction and Policy Background

Current targets set by the Minister for the Department of Enterprise, Trade and Investment (DETI) in the Strategic Energy Framework NI 2010 aim to produce 40% of electricity via renewable methods by 2020.

In the Strategic Energy Framework 2010 for NI it is stated that 40% of electricity generated from renewable sources by 2020 is thought to be an attainable target.

The Draft Programme for Government (2011-2015) published by the Northern Ireland Executive in late 2011 states that it intends to encourage the production of energy from renewable resources to reach 20% by 2015.

The Northern Ireland Renewables Obligation was introduced in 2005 and requires that electricity suppliers can account for proportions of their electricity generation having come from renewable resources.

The proposed targets and strategies gave rise to Planning Policy Statement 18 2009 (PPS18; DOE, 2009) which sets out planning policy within the Department of Environment for renewable energy installations.

PPS18 deals with planning policy surrounding Renewable Energy technologies and their installations. PPS18's objectives are to ensure that 'environmental, landscape, visual and amenity impacts' are considered and addressed, and where there is an unacceptable impact, then the planning application for the installation would be denied. The document recognises that large scale wind operations are likely to have some impacts, and are often sited in areas which are aesthetically pleasing or environmentally sensitive and also sets out the minimum distance of 500m OR 10 times the rotor diameter which a wind turbine is permitted to be to an occupied property.

NI has set a 652% growth rate in renewable energy generation between 2003 and 2010 with the vast majority being from wind power (Energy Trends, DECC, Sept 2011).

2. Introduction and Policy Background

2.2 Potential Health Impacts of Wind Turbines

In 'Health Effects and Wind Turbines: A Review of the Literature', 2011, Knopper et al concluded that there are no peer reviewed studies that show a direct causal link between wind turbines and the negative experiences of those living close to them. It was found in the study that, where negative health effects had been reported, they were as a result of the stressed condition induced in some of those living near wind farms.

This conclusion is supported in a report by the Chief Medical Officer of Health for Ontario, Canada, on the health effects of wind turbines, published in 2010. That report also notes that sound levels from wind turbines are insufficient to affect hearing. Annex1 of PPS18, suggests that the indicative noise level of a wind farm at 350m distance from a typical dwellling is 35-45 dB(A). Guidelines of night time noise levels released by the World Health Organisation indicate that levels should not exceed 40dB outside a dwelling in order to prevent sleep disturbance and preserve health.

Research into the health effects of shadow flicker – which happens when an observer is in a position where they can see the blades of a turbine pass in front of the sun, resulting in an intermittent shadow, was undertaken for a report prepared for the Massachusetts Department of Environmental Protection and Department of Public Health in 2012. The reported, compiled by an independent expert panel said that there was no scientific evidence that shadow flicker was enough to cause seizures. The panel did, however, recognise that shadow flicker 'can be a significant annoyance or nuisance to some individuals'. The degree of flicker which a nearby resident would be exposed to varies depending on the time of year, the time of day and the resident's location.

2.3 Environmental Effects of Wind Turbines

The visual impact of wind turbines on the landscape is especially relevant where the surrounding environment is rural, scenic or sensitive in nature. Abbasi et al, 2000, indicate that, although wind power has relatively few effects compared to other electricity generation sources, aesthetic degradation, noise pollution, stressed ecosystems and an increase in soil moisture may be evident in sensitive areas. Abbasi et al, 2000, also points out that the tower structure and the rotor blades of wind turbines can cause electromagnetic interference and can potentially 'chop TV signals to an irritating degree'.

Environmental effects also includes disturbance to flora and fauna. There has been concern for the potential of birds to fly into the rotating blades of a turbine; however bird fatalities equal 1-2 birds per turbine per year, on average (Taylor D, 2004). It is noted that there may be some effects on nesting grounds and migratory patterns of some birds (Shepherd et al, 2011), but these impacts are deemed to be negligible.

2.4. Public Perception of Wind Farms

In the publication 'Public Attitudes to Wind farms; A Survey of Local Residents in Scotland' published in 2003, Braunholtz et al surveyed 1,810 people by telephone interviewing those who lived within 20km of a wind farm. It was found that, on average, 20% of people reported the wind farms having a positive impact on the area, 73% had no opinion and 7% felt there was a negative impact. A higher proportion of those living closer to the wind farms considered them to have a positive impact on the area (44%) as opposed to those living farther away (16%).

2. Introduction and Policy Background

The most common issue that residents reported feeling concerned about before the wind farms were erected was the visual impact on the surrounding landscape. Traffic and noise during construction were also reported as concerns although actual disturbance was found to be low. Braunholtz also found that overall people liked their area and only five people spontaneously mentioned wind farms as something they disliked about their area. Those who saw wind farms on a daily basis regarded them more favourably. It was also found that the majority of respondents were in favour of reducing the use of nuclear power, coal and oil, while increasing the use of wave and wind power. Regarding the actual pre construction consultation and planning process, Braunholtz found that most people did not remember being consulted about the wind farm, and that the local newspaper was the largest source of information at the time (40%) with 11% being dissatisfied at the consultation.

In another study 'Green on Green: Public Perceptions of Wind Power in Scotland and Ireland' published in 2005, Warren et al surveyed 355 residents in Scotland and Ireland via face to face interviews. They also found evidence that those living closest to the wind farms had an increased positive opinion of them as well as finding that effects on the visual impact of the landscape was a major influence on a person's support of wind power projects. In terms of sites in Ireland, there was a 42% increase in positive opinion amongst those living close to sites, as opposed to 26% farther away.

Warren et al also noted that residents' concerns expressed prior to the construction of the wind farm were not realised. With regards to noise, 11% of people residing close to the wind farms reported that they could hear them, but 75% of that number did not object to hearing the noise. In Warren et al's paper, opinions from both an operational and a proposed wind farm site are compared and the issue of NIMBY-ism ('Not In My Back Yard') is investigated. It was found that NIMBY attitudes existed in a more pronounced way at proposed sites as opposed to at operational sites. Indeed, Warren et al stated that there was a 'reverse NIMBY' attitude at operational wind farm sites. They found that those who were the most accepting and supporting of the wind turbines were those who were living close to sites and as a general trend, support for local wind farms is either lower or neutral at the proposed site compared to the operational site.

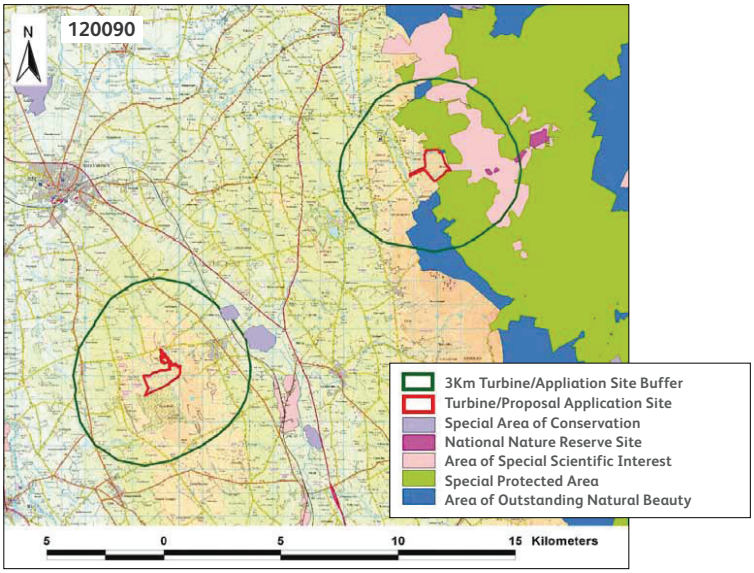
In this investigation two populations were chosen to assess the views of those living close to both operational and proposed wind farm sites. A wind farm site currently seeking planning permission with a relatively near-by recently commissioned operational wind farm was chosen to ensure that both populations would be from very similar settings for example, the rural environment, education, distances to urban areas, size of settlement etc.

3.0 Methodology

3.1 The Study Areas

The operational and proposed sites chosen were both rural in nature and situated at the foot of upland areas. They comprised a small settlement with a dispersed housing pattern surrounding it. In relation to planning and conservation policy designations, the proposed wind farm site bounds an area of outstanding natural beauty (AoNB), Area of Special Scientific Interest (ASSI) and Special Protected Areas. Many of these designations overlap and the site could be viewed on this basis as being particularly sensitive to visual impact. The operational site had lesser planning designations surrounding it but at a distance of just over 3km there are Special Areas of Conservation and an ASSI.

Photo 1 shows a wind farm of a similar size and location to the one being proposed.



Map 1 shows 3km boundaries and Areas of Interest

3.0 Methodology

3.2 Research Design

This research drew inspiration from a study that was carried out in Scotland in 2003 which investigated the perception of wind farms, as well as a study from 2005 discussing perceptions of wind farms in pre and post construction phases in Scotland and Ireland.

A semi structured interview using a predesigned questionnaire (completed by the interviewers) was selected as the most effective method of ascertaining public opinion. This methodology was only made possible through the funding provided through the Challenge Fund which enabled the recruitment and deployment of a team of around 10 fieldworkers. The surveys were carried out over 3 consecutive Saturdays, beginning 18th February, 2012. A weekend was chosen in order to maximise the number of people who may be at home from 9am-5pm. Each team of two people kept a record of which houses they had visited so as to facilitate revisiting those that hadn't responded at the time of the first visit and to prevent houses already covered from being revisited. Identification and a letter of authorisation and explanation was shown to all residents during the fieldwork. Appropriate risk assessments were conducted and the PSNI were informed about the nature, time and duration of the practical work.

3.3 The Questionnaire

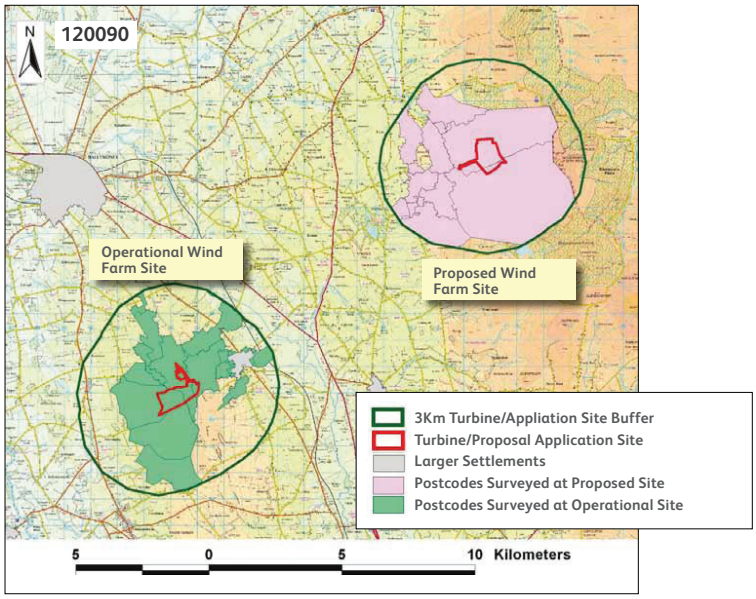
The questionnaire itself was split into two parts, with the first part being generic to both sites. An effort was made when designing the questionnaire, to avoid mentioning wind farms until as late as possible in order to prevent bias from emerging when asking people in general what they liked or disliked about their area. The second parts of the questionnaires were specific to either site and were colour coded accordingly for ease of data input. For the operational site, residents were asked about actual effects the wind farm was having on them. At the proposed site residents were asked about their potential concerns.

The initial question was factual, asking the respondents postcode, followed by attitudinal questions regarding their perception of their local area. The questions which followed were put together so that they flowed from attitudes of surroundings, to support for certain power generation techniques and on to perceptions of wind farms and wind turbines.

4.0 Results and Discussion

In total, 241 questionnaires were completed over the course of the 3 days – 131 from Site 2 (operational) and 110 from Site 1 (proposed). The approximate response rate from Site 2 was 19.9% and from Site 1, 43.8%, taking into consideration the number of properties within 3km of the wind farm or proposed site. The information from these questionnaires was inputted into 'IBM SPSS Statistics 19' to complete data analysis.

Map 2 shows the distribution of surveyed properties at postcode level



4.1 Respondents' perception of the area in which they live

With regard to the perceptions of their neighbourhoods, 98% of people from site 1 (proposed site) and 99.2% of people from site 2 (operational site) thought their area was either 'good' or 'very good' (see Table 1).

Neighbourhood perception		
Neighbourhood perception	**Site 2: Operational**	**Site 1: Proposed**
Very good	53.8%	6.2%
Good	45.4%	35.5%
Poor	0%	0.9%
No opinion	0.8%	0.9%
Total	**100%**	**100%**

Table 1

Both populations were asked to name things they liked and disliked about their area. No respondents from either area mentioned wind farms or wind turbines as something they liked. 57% of respondents in Site 2 (Operational) mentioned 'quietness' as something they liked about their area and 17% mentioned 'scenery'. 50.4% of residents in Site 1 (Proposed) mentioned 'quietness' and 18.3% mentioned scenery. No respondents from Site 1 mentioned

4.0 Results and Discussion

the proposed wind farm as something they disliked and one respondent out of 131 respondents in the Site 2 area mentioned the Site 2 Wind Farm as something they disliked. This suggests that although the Site 2 wind farm is fully installed and functional, it is not something that the general population feels excessively negative towards. This is comparable to the findings of Braunholtz 2003, who, in a larger sample, found that respondents generally liked their area, with only five spontaneously mentioning wind farms as something they disliked.

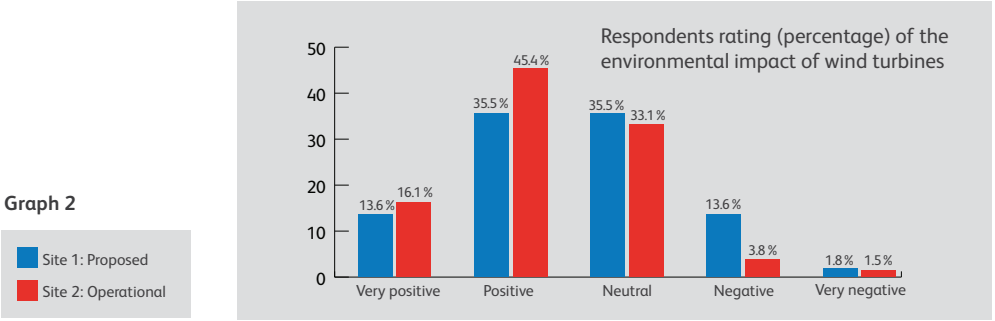
4.2 Overall Perception of Wind Farms

Residents at both planned and operational sites had a broadly positive view of wind turbines. At Site 2 (operational) the majority of respondents felt that wind farms were 'effective' or 'somewhat effective' at generating electricity, although one respondent from Site 2 commented that they often noticed the turbines turned off.

Table 2

Do you think wind farms are effective at generating electricity		
Opinion	**Operational Site 2%**	**Proposed Site 1%**
Yes	66.2 %	66.4 %
Somewhat	13.8 %	11.8 %
No	3.8 %	11.8 %
Unsure	16.2 %	10.0 %
Total	**100%**	**100%**

Graph 2



At Site 1 (proposed site) 84.6% of respondents and 94.6% of respondents at Site 2 (operational site) felt that the environmental impacts of the wind turbines were either 'very positive', 'positive' or 'neutral'. There is little difference between the opinions of either area about the environmental impacts of wind turbines. The respondents from site 2 (operational) tended to be slightly more positively inclined than those at site 1 (proposed). Similarly, more negative views were expressed at the proposed site as opposed to the operational site.

4.0 Results and Discussion

4.3 Perception of Wind Turbine Aesthetics

Graph 3

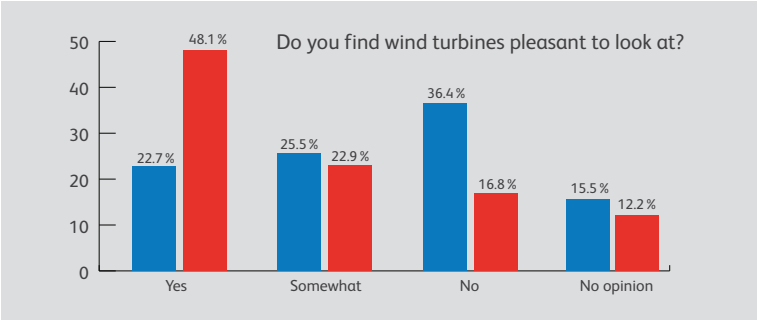


Table 3

Do you find wind turbines pleasant to look at?		
Responses	**Operational Site 2%**	**Proposed Site 1%**
Yes	48.1%	22.7%
Somewhat	22.9%	25.5%
No opinion	12.2%	15.5%
No	16.8%	36.4%
Total	**100%**	**100%**

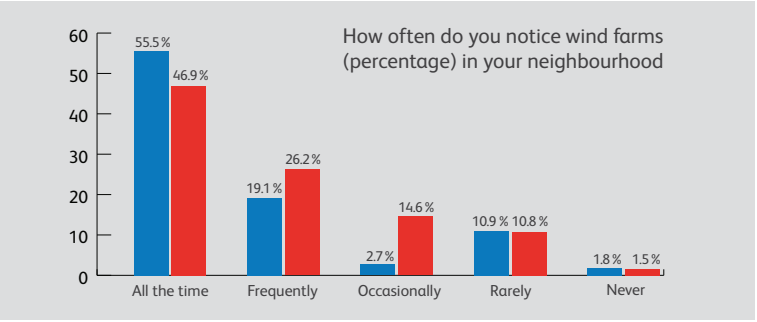
As indicated in the graph and Table 3 above, both areas had similar 'somewhat' and 'no opinion' responses when asked if they found wind turbines pleasant to look at. The differences lie in the more extreme answers where 48.1% of respondents at Site 2 (operational) did find wind turbines pleasant, compared to 22.7% in Site 1 (proposed) and 16.8% at Site 2 disliked wind turbines compared to 36.4% in Site 1. This suggests there is more of an aversion to the sight of wind turbines in the area of the proposed wind farm as opposed to the area where they are operational. Both Warren et al (2005) and Braunholtz et al (2003) found that visual impact of turbines were the cause of most concern and a major influence in the level of support of wind turbines.

In the 'other comments' section of the questionnaire, responses gained from Site 1 (proposed site) area included "They shouldn't be in residential areas", "I'm not against them, but they should be kept away from residential areas" "There's too much emphasis on wind" and "Wind power is already saturated in Ireland". Comments made in Site 2 included 'Quite a lot of people don't like it and are very angered by their increasing number'. Conversely, another respondent from this area commented that wind is 'the way forward for energy'.

4.0 Results and Discussion

4.4 How often do you Notice Wind Farms in the Neighbourhood

Graph 4



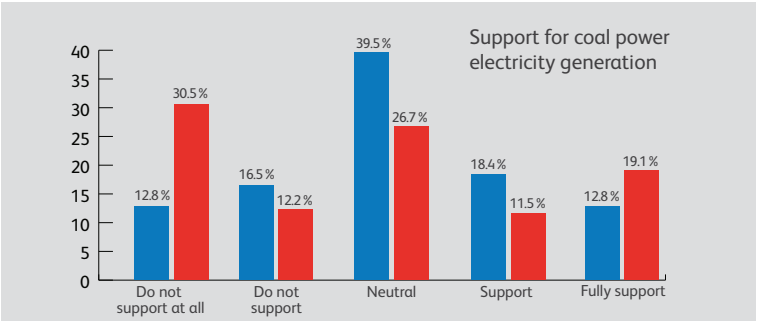
Respondents in Site 1 (proposed) generally noticed wind farms to a similar extent to those from Site 2 (operational). Having said this, 8.6% more respondents noticed wind farms 'all the time' at site 1 (proposed) as opposed to site 2 (operational). The closest operational wind farms to Site 1 (proposed area) were over 6km away from surveyed houses. This may suggest that respondents at the proposed site have become sensitised to the issue of wind farms due to the planning application.

4.5 Knowledge of Energy Security

A higher percentage of residents in Site 2 (11.5%) were aware of the term 'energy security' than Site 1 (8.2%), however, only 20% of those in Site 2 who knew of the term could provide an adequate definition as opposed to 55.6% of those who knew the term in Site 1. Hence, there was more awareness of the term 'energy security' at the operational site, but there were a higher proportion of respondents who understood the term at the proposed site. This could be due to the active perusal of the subject of energy generation in the proposed area due to an impending wind farm.

4.6 Support for methods of generating electricity

Graph 5



30.5% of respondents within Site 2 said they did not support the generation of electricity from coal at all, as compared to 12.8% within Site 1. It is also noted, however, that Site 2 also had a marginally higher percentage of respondents fully supporting this method (19.1% as opposed to 12.8%). The responses from Site 1 follow a bell curve, with the majority of respondents being neutral (39.4%).

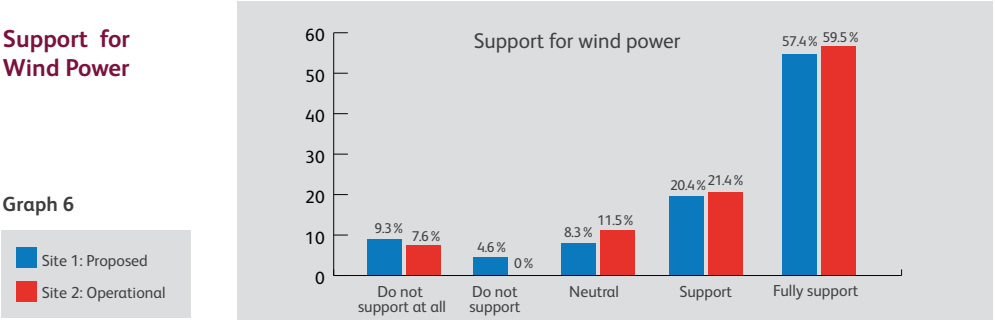
4.0 Results and Discussion

To what extent do you support coal as a method of generating electricity?		
Support for coal	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	30.5 %	12.8 %
Do not support	12.2 %	16.5 %
Neutral	26.7 %	39.5 %
Support	11.5 %	18.4 %
Fully support	19.1 %	12.8 %
Total	**100%**	**100%**

Table 4

4.7 Support for Wind Power

Graph 6



A majority, in both areas, fully supported wind power (Site 1 - 57.4%, Site 2 - 59.5%), with similar proportions of respondents from each site not supporting wind power at all (Site 1 - 9.3%, Site 2 - 7.6%). No significance was found between the area the respondent came from and their support of wind power, hence there was little difference in the responses between Site 2 and Site 1.

To what extent do you support wind power as a method of generating electricity?		
Support for Wind Power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	7.6 %	9.3 %
Do not support	0 %	4.6 %
Neutral	11.5 %	8.3 %
Support	21.4 %	20.4 %
Fully support	59.5 %	57.4 %
Total	**100%**	**100%**

Table 5

This is in keeping with the findings of Braunholtz (2003) who found that respondents were in favour of increasing the amount of power generated from wind power.

4.0 Results and Discussion

4.8 Support for other Energy Sources

In general, there was strong support for power generation by wave/tidal power, burning wood, solar power and wind power in both areas (see Tables 5, 7, 8 and 9), and less support for gas, coal and nuclear power (see Tables 4, 6 and 10). The findings were in line with Braunholtz's study (2003), which found that the majority of respondents thought the use of coal should be scaled back or stay the same. From Table 10, both populations have a vast majority who do not support the generation of power by nuclear means at all.

Table 6

To what extent do you support gass as a method of generating electricity?		
Support for gas	**Operational Site 2**	**Proposed Site 1**
Do not support at all	39.7 %	20.2 %
Do not support	17.6 %	23.9 %
Neutral	25.2 %	33.9 %
Support	7.6 %	11.9 %
Fully support	9.9 %	10.1 %
Total	**100%**	**100%**

Table 7

To what extent do you support wood (biomass) as a method of generating electricity?		
Support for biomass	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	11.5 %	12.8 %
Do not support	9.2 %	8.3 %
Neutral	20.6 %	22 %
Support	22.1 %	30.3 %
Fully support	36.6 %	26.6 %
Total	**100%**	**100%**

Table 8

To what extent do you support wave tidal power as a method of generating electricity?		
Support for wave power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	10.7 %	8.2 %
Do not support	9.9 %	2.7 %
Neutral	13.7 %	17.3 %
Support	22.1 %	20.9 %
Fully support	43.5 %	50.9 %
Total	**100%**	**100%**

Table 9

To what extent do you support solar power as a method of generating electricity?		
Support for solar power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	10.7 %	8.2 %
Do not support	3.8 %	1.8 %
Neutral	9.9 %	9.1 %
Support	30.5 %	20.9 %
Fully support	45 %	60 %
Total	**100%**	**100%**

4.0 Results and Discussion

To what extent do you support nuclear power as a method of generating electricity?		
Support for nuclear power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	69.5 %	70 %
Do not support	11.5 %	12.7 %
Neutral	9.9 %	12.7 %
Support	5.3 %	2.7 %
Fully support	3.8 %	1.8 %
Total	**100%**	**100%**

Table 10

4.9 Concerns and Opinions at the Proposed Wind Farm site (site 1)

The respondents from Site 1 (Proposed) were asked how they would rate their area after the wind farm was constructed. It can be seen that the number of residents rating the area 'very good' fell from 62.7% to 43.6%. 'Good', 'Poor' and 'Very poor' ratings increased, with 'Very poor' ratings rising from 'none' to 4.5%.

Although the respondents from Site 1 were generally positive towards wind farms and wind power generation, a substantial proportion of people thought that their area would be less satisfactory to live in due to the proposed wind farm, which is suggestive of a NIMBY attitude. This is consistent with the work of Warren et al (2005), who found that NIMBY-ism was more pronounced in proposed wind farm areas as opposed to operational wind farm areas.

Expected area rating after wind farm construction at Site 1 (proposed)		
Perception	**Current area rating**	**Expected area rating after windfarm construction**
Very good	62.7 %	43.6 %
Good	35.5 %	42.7 %
Poor	0.9 %	6.4 %
Very poor		4.5 %
No opinion	0.9 %	
Total	**100%**	**100%**

Table 11

4.10 Residents Concerns at the Proposed Wind Farm Site

The respondents in Site 1 (proposed site) were asked to rate their concern about a number of issues related to wind farms on a scale of 1 to 5. 70.9% of respondents were not concerned at all about noise during construction. 60.9% were not concerned at all about Radio or TV signal interference. 67.3% were not concerned at all about shadow flicker effect.

The main areas of concern of the respondents at the proposed site in Site 1 were:
- Damage to the Environment (13.% very concerned)
- House or Land Prices (16.4% very concerned)
- Visual Impact (20.9% very concerned).

4.0 Results and Discussion

Graph 7

Over 50% of respondents in these cases were 'not concerned at all', although 20.9% were 'very concerned' about visual impact, 16.4% about house or land prices and 13.8% about damage to the environment. 'Not concerned at all' and 'very concerned' were the top two chosen answers with both house/land prices and visual impact. This suggests a presence of strong opinion in the community about these issues, where the opinion is polarised. This is, again, consistent with findings from both Braunholtz et al 2003 and Warren et al 2005, who found that the visual impacts of wind turbines are major factors for concern and levels of support.

Very few respondents believed the area would benefit from tourism as a result of the wind farm. 31.8% thought there may be extra employment, with some respondents citing work for the local quarry as a possibility. Many added in the comments that while they thought the local community should benefit from employment, they didn't think it actually would.

Although almost 25% of respondents thought that the community would benefit from a community fund, this topic resulted in many comments being made. Some respondents thought that "the community fund is a sop" and that it was not enough, or may not be divided equally enough. It was suggested by some that a community fund should be there for the life of the wind farm, with another suggesting that there should be yearly compensation for those houses most in sight of the wind farm.

Comments were often directed towards the wind company and land owners, suggesting that these were the only people to see any real benefit. 45.5% of respondents, when asked if there were any ways they thought their community should benefit, thought that the local area should receive cheaper electricity. Those who expanded on this comment often gave the reason that they should get cheaper electricity as they were the ones who would be impacted by the effects of the wind farm.

One respondent mentioned that local schools should benefit from cheaper electricity, with another expressing the view that the wind farm should be used to teach school children about renewable energy. Other comments made included 'if they wanted the community to benefit then there should have been more involvement' and the suggestion of a community turbine within the wind farm owned by and supplying the community.

4.0 Results and Discussion

42.7% of respondents from Site 1 were aware of media articles about the wind farm, compared to 34.5% who were aware of the consultation, which just under half of whom attended. 9.1% spontaneously mentioned they had gained information from a local opposition group. It seems that most respondents were aware of media articles, as opposed to gaining information from the wind farm company or public consultation, which is comparable to the findings of Braunholtz et al 2003, that the local newspaper was where residents gained most information.

43.8% of those who attended the consultation felt they had not been given enough information, reasons for which included 'they avoided answering questions' and 'the picture mock ups didn't look representative'. Other comments made included 'the public isn't informed, there's no information' 'the wind company needs to be more open and honest' and 'there should be more discussion'.

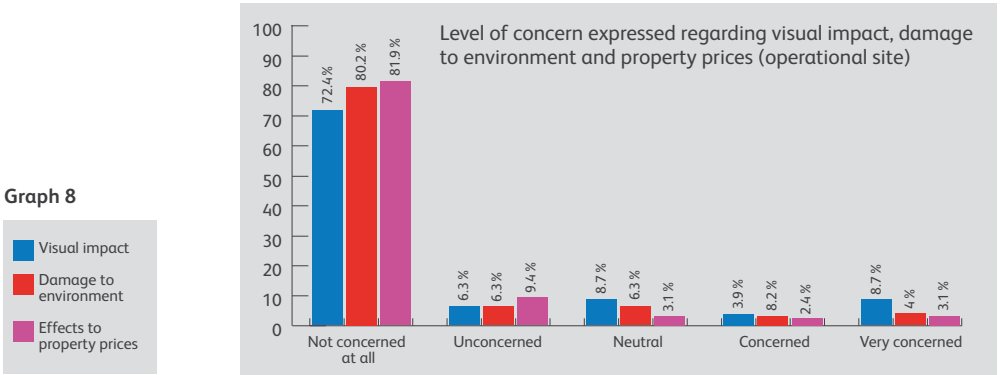
4.11 Resident's Concerns, Effects and Opinions at the Operational Wind Farm Site

Table 12, below, shows the answers given when the respondents in Site 2 were asked to rate what they thought their area was like before the Site 2 wind farm was installed, compared to their rating of the area now. There was little change in the data, with 53.8% rating the area as 'very good' as it is, with the wind farm, and 53.5% as 'very good' before the wind farm was installed. 45.4% rated the area as 'good' as it is, with the wind farm, and 42.5% as 'good' before the wind farm was installed. The installation of the wind farm has had little difference in what they remember their area to be like prior to installation.

Table 12

Area rating before wind farm was installed at Site 2 (operational)		
Perception	**Current area rating**	**Area rating before wind farm construction**
Very good	53.8 %	53.5 %
Good	45.4 %	42.5 %
No opinion	0.8 %	4.0 %
Total	**100%**	**100%**

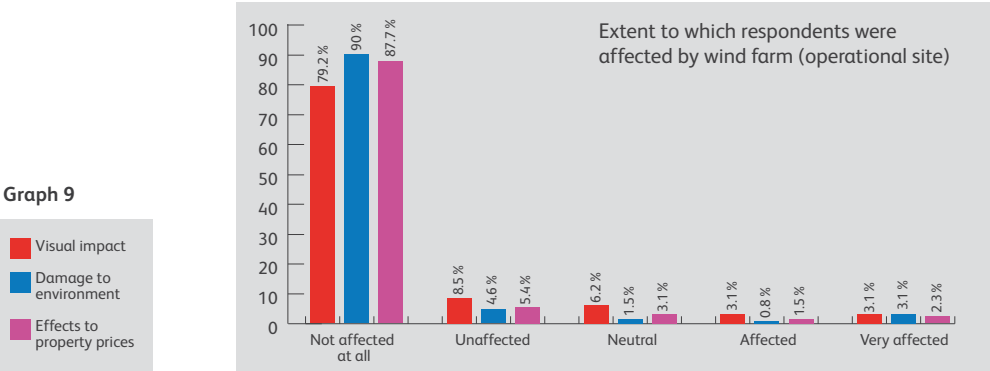
Graph 8



4.0 Results and Discussion

Findings indicate that 78.2% (averaged across these three issues of concern) of respondents reported not being concerned at all about visual impact, environmental damage or effects on property prices prior to the development of the operational wind farm.

Graph 9



When asked how the development of the wind farm had actually affected them, 85.6% of respondents reported that the operational wind farm had not affected them at all (averaged across the three main issues of concern). This indicates that the levels of concern dropped post development of the wind farm site.

10.3% of respondents could remember being concerned about noise from the turbines prior to construction with only 2.3% being affected. Less than 2% were affected by noise during construction. A total of 6.2% say they have been affected or very affected by the visual impact of the turbines, less than 2% stated that they have been affected by flicker effect, 3.8% have been affected by effects on property prices and 6.9% say they have been affected by signal interference. 3.9% felt there had been damage to the environment Two of the respondents at site 2 who reported environmental damage said they had no access to the moss/bog and hence were not allowed to cut peat on the mountain anymore.

The most common issues to be 'affected' or 'very affected' by were signal interference and visual impact, although these levels were still low. This supports Braunholtz, 2003, in that his study found that the highest proportion of people who said there had been problems, listed 'the look of the landscape being spoiled' most often. The findings are also supported by both Braunholtz et al 2003 and Warren et al 2005, in that residents' concerns have not been realised.

Very few respondents in Site 2 (operational) can remember receiving any information prior to the wind farm's construction. 16.4% of respondents reported that they received information by word of mouth. 9.4% remembered being aware of media articles, 6.3% were aware of the public consultation with only 1 respondent having attended. 0.8% of respondents remember receiving information from the wind company. Via the comments, some people said they only found out about the wind farm when construction began. In comparison, those in Site 1 (proposed site), are much more aware of the media articles and

4.0 Results and Discussion

public consultation with regards to the Site 1 wind farm. Braunholtz et al, 2003, also found that the majority of respondents couldn't recall being consulted.

Employment was the biggest perceived benefit at site 2 (Operational), with 13% of people answering 'yes' when asked if they thought there had been any benefit to the local community. There had been no community fund provided for this wind farm, however 1.5% of respondents from this site thought there had been a benefit from a fund. Had a fund been provided to the community, this percentage may have been higher. Perhaps funding from another source had been made available to the community and had been assumed to have been associated with the wind farm. 6.9% agreed there had been benefits from tourism but believed this could be increased by opening up walking routes and encouraging the tourist aspect of the wind farm. Only 3.1% of respondents thought the community had benefitted from better roads. 35.9% of respondents spontaneously mentioned that cheaper electricity for their local area should be a benefit as a result of having a near-by wind farm. As with the proposed wind farm site, many comments were of the opinion that only the land owners and wind company actually benefitted.

5.0 Conclusion

The role of renewable power generation in providing energy security, resilience and diversity, together with its potential benefits to the economy have been recognised and prioritised by the Northern Ireland Executive. Investigating and assessing the opinion and perception of those who reside close to wind turbines is therefore vital so that so that their impact on local communities and neighbourhoods is understood.

Overall it was found that the presence of wind turbines had relatively little impact on resident's perception of their neighbourhood. Residents at both sites were broadly satisfied with the area in which they lived in, with a vast majority either rating their area as 'good' or 'very good'. (99.2% for the operational site and 98.2% for the proposed site).

5.1 Impact of Wind Farms on Neighbourhood

At the operational site (site 2), respondents within 3km of the wind farm reported in an average of 85.6% of cases across the three criteria (visual impact, damage to the environment and negative impact on property prices) that they were not affected at all by the wind farm. On the basis of these figures it can therefore be concluded that again, in a large majority of cases, residents can broadly expect to be unaffected by the presence of neighbouring wind farms.

Statistical significance was found in that those who were most concerned about visual impact, were also likely to think wind farms were ineffective and have negative environmental impacts.

5.2 Respondents view of Wind Power Generation

This study found that respondents from both operational and proposed sites were generally strongly in favour of energy generation by renewable techniques, including wind power. At the operational site 81%, either support or strongly support wind power while at the proposed site this figure was 78%.

The majority of respondents from both areas also considered wind turbines to be an effective method of generating electricity as well as having positive or neutral environmental impacts.

5.0 Conclusion

5.3 Aesthetics of Wind Farms

Respondents from the operational site in Site 2 were more likely to find wind turbines pleasant to look at compared to those at the proposed site in Site 1. This suggests there was more acceptance, possibly through the experience of living adjacent to them, of the visual impact of the turbines at the operational site than at the proposed site, even though there were similar levels of perceived exposure to wind farms.

5.4 Methods of receiving information

The largest proportion of information gained at site 1 (proposed) appears to come from media articles. Similar proportions of people reported receiving information from the opposition group campaigning against the wind farm as had received information from the wind farm company. 43.8% of those who had attended the consultation did not feel they had been given enough information. The comments made concerning the way in which they received information, coupled with the number disappointed by the public consultation, suggest that some of the community are dissatisfied with the stakeholder engagement process that was undertaken.

Few residents at Site 2 (operational) can remember any media articles or consultation about the wind farm at all.

5.5 Perceived Benefits from Wind Farms

The biggest benefits the community at the proposed site in Site 1 (proposed) expected to see were from employment and the community fund. Employment was the biggest perceived benefit at site 2 (operational), with some respondents calling for more access and walking routes around the wind farm. A substantial number of respondents at both sites mentioned that cheaper electricity for the local community should be a benefit. In relation to this the development of community wind turbines similar to schemes run in Wales would directly benefit the host communities. The schemes are based on community members taking shares in an Industrial and Provident Society. Members then benefit from dividends from the sale of the electricity with net income returned to the community via dividend payments over the operational lifetime of the turbine.

In summary, there is positive public perception of renewable energies, including wind power. Those at the proposed site in Site 1 are concerned about the visual impact of the proposed wind farm and are less likely to find wind turbines pleasant to look at than those at the operational site in Site 2.

A substantial proportion of both populations think there should be some tangible benefits in terms of cheaper electricity and local employment opportunities. The community at the operational site in Site 2 also suggested more consideration may be needed regarding the tourism potential of the wind farm

6.0 Recommendations

1. Communication with the host community is viewed as an important component in the development of wind farm projects. The community at the proposed site would have preferred more information and more open dialogue with the wind company. Wind farm developers should be encouraged to build a rapport and develop relationships with local host communities (see recommendation 4).

2. Building up a collection of 'before and after' studies of populations where a proposed wind farm has been installed, and making these publicly available, may help to allay concerns amongst communities and demonstrate that, often, their concerns are not realised. In this particular case study at the time of drafting of this report the proposed wind farm has just been recommended for planning approval. It is suggested that follow up research should be undertaken at an appropriate juncture post construction and commissioning to assess if attitudes to the development have changed.

3. The issue of securing tangible benefits for the local community needs to be addressed. Very few respondents from the operational site (Site 2) feel there has been much benefit at all to the community as a whole. In relation to this, the creation of "community turbines" should be investigated, where the host community benefits from wind energy installations and local people can exercise a degree of control over the projects.

4. In order to ease concerns about wind farm projects it is recommended that neighbouring communities, should receive, be informed of and witness positive contributions above and beyond payments to individual land-owners. There should also be more comprehensive stakeholder engagement between the energy companies and local communities.
The implementation of these recommendations may go some way towards assisting with the attainment of the ambitious 40% renewable energy target set out by the Strategic Energy Framework for Northern Ireland, whilst at the same time, alleviating negative views and perceptions of communities about the potential impacts on their neighbourhoods.



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Chief Environmental Health Officers Group N.I.

Stormont Environment Committee – Inquiry into Wind Energy – 2014

1.0 Environmental Health Service remit

1.1 The Environmental Health Service recognise's the benefits of wind energy in the production of renewable power, improved security of supply and local employment. However there are also a number of potential local environmental impacts including, noise, shadow flicker and visual/ landscape effects.

1.2 The Environmental Health Service within local government is well placed to rigorously review and provide substantive comments to Planning (NI) with respect to noise impact assessments submitted on behalf of applicants for proposed wind energy developments, as Environmental Health Officers have specialist training in the field of noise assessment and control. The Environmental Health Service provide comment solely with respect to noise impacts, in view of Councils statutory duty in relation to noise nuisance i.e. the Environmental Health Service does not provide comment on shadow flicker, visual or other impacts as they lie outside of the statutory remit of the Environmental Health Service and are instead considered by Planning (NI) and its other consultees.

2.0 ontext in which the Environmental Health Service provides comment to Planning (NI)

2.1 The Environmental Health Service, in providing comments to Planning (NI), do so within the confines of published guidance, "Northern Ireland Planning Portal – The Role of the Planning Authority and Consultees in the Online Planning Application Consultation System Version 2.0."(Planning (NI) April2013)

2.2 Matters of relevance,

"Consultees will provide the planning authority with advice on development proposals. They are required to:

- *Provide a substantive response on planning matters in line with published planning policy and Departmental obligations within agreed timescales which is clear, concise, consistent and unambiguous…*
- *Comment only on matters related to material planning considerations, specific to the consultee's area of expertise, and detail any concerns they may have regarding the proposal…*

The advice and information provided by a consultee MUST be set in the context of Departmental policies and obligations.

IT IS NOT THE ROLE OF THE CONSULTEE to recommend or advise that permission should be granted or refused…, it is ultimately for the planning authority to make the decision and decide if an application should be approved (with or without conditions)…"

2.3 With respect to wind energy developments, the above limits the Environmental Health Service to only providing comment on whether or not noise from the proposed development complies with the requirements of Planning Policy Statement 18: Renewable Energy – August 2009.

2.4 PPS18 'Policy RE1 – Renewable Energy Development' in relation to wind energy states,

"Applications for wind energy development will also be required to demonstrate…(vi) that the development will not cause significant harm to the safety or amenity of any sensitive receptors (including future occupants or committed developments) arising from noise; shadow flicker, ice throw; and reflected light…"

2.5 A 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy – August 2009' was published to supplement PPS18. Paragraph 1.3.46 states,

"The report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97) … should be used in the assessment and rating noise from wind energy developments."

2.6 The Environmental Health Service in providing comment to Planning (NI) therefore reviews the applicant's noise impact assessment against the requirements of ETSU-R-97.

3.0 ETSU-R-97 'The assessment and Rating of Noise from Wind Farms'

3.1 ETSU-R-97 contains the noise limits which wind energy developments must not exceed in order to control the impact of noise upon those living in the vicinity. It was drafted in 1996, some 18 years ago, when there were relatively few wind farms and when proposed wind turbines of the day typically had hub heights of 30 – 40m and with power outputs of 0.25 to 0.5MW.

3.2 In recent times, turbines proposed for wind farms, generally have hub heights of 60 – 90m with power outputs of 1.5 to 3 MW. As a consequence of taller and more powerful wind turbines, producing noise of a different character, the protection to amenity originally assumed by the ETSU-R-97 noise limits may no longer be appropriate.

3.3 Page 111 of ETSU-R-97 states, *"This report was drafted in the light of the best information available at the time and in the circumstances prevailing at the time. However it is acknowledged that as more experience and information become available and as circumstances develop it may become necessary to revise and improve the contents of this report.*

The Noise Working Group therefore suggests this report and its recommendations are reviewed in 2 years time. We anticipate that the wind industry will itself take the initiative for such a review and that this review will be undertaken by a cross-section of users of the report."

3.4 To date, no such review has been undertaken.

3.5 **Institute of Acoustics – A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise**

3.6 In May 2013 following a request from Department of Energy and Climate Change (DECC), the Institute of Acoustics (IOA) produced a Good Practice Guide to the application of ETSU-R-97, most notably including a commonly applied wind turbine noise prediction methodology. However, it should be highlighted that the terms of reference provided to the Institute of Acoustics explicitly excluded the examination of the increasingly controversial ETSU-R-97 noise limits.

3.7 **ETSU-R-97 noise limits**

3.8 ETSU-R-97 noise limits are set relative to the prevailing background noise for a given locality. As background noise and wind turbine noise increase with wind speed, so too do the ETSU-R-97 noise limits. ETSU-R-97 considers that noise limits solely set relative to background noise would be unduly restrictive on wind energy developments in otherwise low noise environments remote from other noise sources and hence requires that lower fixed noise limits for daytime (35 – 40 dB LA90) and night-time (43 dB LA90) be applied in such environments .

3.9 Recently, some wind farm developments have been specifically designed to avail of the fixed noise limit at night-time, but have to operate in a curtailed mode during the day to achieve the daytime fixed noise limit which is relatively lower (i.e. the wind farm creates more noise at night than during the day). As people are more sensitive to noise at night-time, this has placed greater focus onto the suitability of the night-time noise limits.

3.10 The ETSU-R-97 noise limits were based on a number of stated assumptions regarding the character of the noise emissions. Recent research from the renewables industry body (RenewablesUK – Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects 16th December 2013) recognises that modern wind energy developments may exhibit noise character not as originally envisaged under ETSU-R-97. This leads the Environmental Health Service to the view that the ETSU-R-97 noise limits, including the night-time fixed limit of 43 dB LA90, require a review to ensure that they remain suitably protective of amenity.

3.11 **Noise limits within other jurisdictions**

3.12 Renewable energy planning policy within Northern Ireland is in line with other United Kingdom jurisdictions in recommending that noise impacts from wind energy developments be assessed against ETSU-R-97.

3.13 The Department of the Environment, Community and Local Government (Republic of Ireland) is currently undertaking a consultation on proposed amendments to wind energy noise limits. Current Irish noise limits are similar to ETSU-R-97 but it is proposed to simplify these to a single fixed noise limit of 40 dB LA90, day and night, with *'a minimum separation distance of 500m between any commercial scale wind turbine and the nearest point of the curtilage of any property in order to provide for other amenity considerations e.g. visual obtrusion.'*

3.14 Research undertaken to inform the current Irish consultation (Examination of the significance of noise in relation to onshore wind farms – 29th November 2013) includes within Section 4.0 a list of noise limits as applied across other international jurisdictions. Given the different acoustic descriptors applied across other international jurisdictions, it is difficult to make meaningful comparisons with ETSU-R-97.

4.0 Planning Conditions for single wind turbines

4.1 The IOA GPG has been endorsed in its entirety by the English, Welsh and Scottish governments. In NI the GPG has recently been endorsed (19 Dec. 2013) but concern was raised over some of the suggested 'Example Planning Conditions'. One such condition requires the operator to provide satisfactory evidence to the planning authority demonstrating compliance with the noise limits, in the event of a complaint being made.

4.2 DoE correspondence has stated that they are not minded to attach this condition to individual wind turbine proposals. However, it should be noted that DoE routinely attaches similar conditions to wind farm applications.

4.3 Noise limits as applied to wind farm developments are identical to those applied to individual wind turbine proposals. The noise impact on local residents is identical irrespective of whether the noise is being created by one nearby turbine or numerous more distant ones. Consequently, the Environmental Health Service do not agree with DoE differentiating between the control needed to protect local residents from the noise impact of the two types of wind energy development.

4.4 Furthermore, the current DoE position sits outside rest of UK. Complaint investigation conditions for wind farm and single wind turbine developments are routinely applied by;

- Local Planning Authorities in England, Wales and Scotland

- The Planning Inspectorate for England – Ref: APP/M0933/A/13/2192651 – decision 2nd December 2013
- The Planning Inspectorate and Wales – Ref: APP/T6905/A/13/2198078 – decision 18th December 2013
- The Directorate for Planning and Environmental Appeals for Scotland – Ref: PAA-170-2072 – decision 23rd December 2013
- The Secretary of State for Communities and Local Government – Ref: APP/Y0435/A/10/2140401, APP/K0235/A/11/2149434, APP/H2835/A/11/2149437

In addition, complaint investigation conditions are also recommended by the Institute of Acoustics and RenewablesUK (Template Planning Condition on Amplitude Modulation: Noise Guidance Notes – 16th December 2013) within their example conditions.

4.5 A recent judicial review decision 'Lancashire, R (on the application of) V Northumberland County Council & Anor [2013] EWHC 3850 (Admin) 12 December 2013' in discussing the complaint investigation condition as attached to an 11kW wind turbine planning application, supports the Environmental Health Service position, "…it was sensible to require the interested party to commission a report from a reputable consultant approved by the defendant…this was a lawful condition capable of effective enforcement…".

4.6 **Merits of the complaint investigation condition**

4.7 The measurement of wind turbine noise is time consuming and hence resource intensive. In the absence of a complaint investigation condition, the costs to verify compliance with the noise limits attached to a planning permission would fall solely upon the local ratepayer within the district where the turbine is located. The use of post verification conditions is not uncommon in development control (e.g. contaminated land verification reports) and it is the view of the Environmental Health Service that they remain wholly appropriate in these circumstances where conditions cannot be readily enforced by conventional investigation techniques.

4.8 It is often assumed that the Environmental Health Service nuisance provisions provide the same level of protection as desired through the planning regime. It should be noted that nuisance provisions can only deal with 'excessive emissions', and do not provide the control of noise as required by PPS 18 and ETSU-R-97.

5.0 Conclusion

5.1 The Environmental Health Service welcome the Environment Committee's interest in the important yet often controversial topic of wind energy impacts. The Environmental Health Service consider that a review of the noise limits as derived under ETSU-R-97 is long overdue and should be prioritised along with the other United Kingdom jurisdictions at a national level.

5.2 On a local level, Planning (NI)'s approach in not attaching a 'complaint investigation' condition with respect to single wind turbine applications is likely to place considerable resource burdens on to ratepayers whilst considerable resistance remains from local residents to such developments. The Environmental Health Service respectively request a review of this position.

Community Places

Response to Inquiry into Wind Energy

Community Places
February 2014

Introduction

Community Places is the only regional voluntary organisation which provides planning advice to individuals and communities. We also facilitate community participation in planning and support community planning and development by assisting groups to develop the skills, knowledge and infrastructure needed to regenerate disadvantaged areas.

We welcome the opportunity to submit evidence to the Environment Committee to inform the inquiry into wind energy. Our comments are informed by our experience of assisting and enabling individuals and communities to engage and participate in the planning process and make representations on renewable energy proposals. This experience has provided us with an insight into the key issues arising from the generation of renewable energy by onshore wind turbines and the effectiveness of current planning policy and guidance.

Foreword

The EU has set a target for 20% of all energy consumption in the EU to be provided by renewable sources by 2020. For the UK, the target is 15% of total energy consumption. As part of Northern Ireland's (NI) contribution to the UK target, the NI Executive has set targets for 40% of total electricity consumption and 10% heat consumption to be provided by renewable sources by 2020.

NI has exceeded the 12% of renewable electricity generation by 2012 target. At the end of May 2013 NI produced approximately 14.8% of its electricity, and 2% of its heat from renewables. The Programme for Government has set an interim target of 20% renewable electricity consumption by 2015 and NI is on track to meet this target that will likely be aided by the 686 single turbine applications and 54 wind farm applications currently pending in the planning system[1].

The application of renewable energy in Northern Ireland is governed by Planning Policy Statement 18 'Renewable Energy' (PPS 18) published in 2009. It is supported by a practice guide 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy" and by supplementary planning guidance published by the Northern Ireland Environment Agency of DoE entitled 'Wind Energy Development in Northern Ireland'.

The adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment

PPS18, and supplementary guidance, is based on a presumption in favour of permitting development that generates energy from renewable resources. This policy bias has been consistently applied resulting in over 400MW of onshore wind in Northern Ireland. The policy however is not informed by any overarching region-wide spatial guidance. The supplementary guidance 'Wind Energy Development in Northern Ireland' was intended to provide broad, strategic guidance in relation to the landscape and visual impacts of wind energy development. In practice, the spatial application of this guidance has been limited

1 Northern Ireland Planning Renewable Energy Monthly Statistics (Figures for 2013/14: PROVISIONAL)

to informing decisions on the appropriate siting, location and cumulative impact of wind proposals on a local scale against the respective Landscape Character Areas. The current renewable energy policy and strategic guidance provide no regional spatial guidance for wind energy proposals. The result has been the rapid proliferation and scattering of single wind turbines and wind farms region-wide in areas of the highest wind resource.

This gap in policy should be addressed with a regional spatial framework that could inform local-level decision making for the large volume of existing and future renewable energy applications (686 single turbines and 54 wind farm applications currently pending in the system). It would also provide greater certainty for developers and communities. Such a document could also inform future decision-making regarding infrastructure works and improvements for such as roads/grid connection to allow NI to meet its renewable energy targets.

Recommendations

- NIEA to update supplementary guidance; update characteristics and the capacity (if any) of each LCA to facilitate future wind turbine proposals.
- DoE to use 2013/14 data on existing and approved turbines and combine it with updated LCA study (above) and DETI Wind Map to identify areas for further and future development of wind energy proposals in a regional spatial framework document.
- DoE to consult on a strategic spatial framework for future wind development proposals in the region prior to the transfer of powers to local councils in April 2015.

Comparison of the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development

There is currently a 500 m minimum separation distance set out in Policy RE1 'Renewable Energy Development' of PPS 18 that relates to wind farms. There is no prescribed minimum separation distance for single turbines. Policy should continue to be informed by evidence-based research on the effects of wind turbines as well as the technological advances of turbines and other renewable energies. Policy should be reviewed regularly to keep abreast of this rapidly evolving and expanding industry to continually inform and update it to ensure that it protects health, safety and residential amenity.

Recommendations

- Retain the 500m minimum separation distance for wind farms.
- Retain flexibility for separation distances between residential properties and single turbines with the onus of proof of acceptability in terms of health and safety and noise on the prospective applicant.
- Review the policy every five years at least to ensure it is up to date with new technologies and informed by evidenced-based research on such effects as noise, safety and health.

Review of the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

There is currently no legal requirement for wind energy providers to engage with local communities prior to the submission of an application. The Planning Act 2011 (Art. 27(1)) will make it mandatory for prospective applicants to carry out pre-application community consultation for major development. We welcome this new legislation for pre-application consultation. To maximise its effectiveness and benefit to communities we will be making representations for a low threshold for what constitutes 'major development' in the context of wind energy proposals to ensure that communities are engaged in the process[2].

2 DoE public consultation on regulations due out Spring 2014

Notwithstanding, planning policy should encourage and look favourably on pre-application engagement for all wind proposals.

Effective engagement between wind energy providers and local communities needs to be underpinned by a clear understanding of the purpose and potential outcomes[3]. The Northern Ireland Renewables Industry Group NIRIG[4] acknowledged the need for effective engagement with local communities through the publication of their Community Commitment Protocol in January 2013. The Community Benefit Summit hosted by then Environment Minister Alex Attwood on 5 June 2013 and attended by approximately 40 community groups agreed the need for effective engagement which led to the exploration of the role of community benefit schemes in Northern Ireland.

Community benefit schemes have been acknowledged by NIRIG as a well-established part of on-shore wind energy developments. In Northern Ireland they are voluntary schemes set up by developers in recognition of local communities' commitment to accommodating onshore wind farms; they are a commitment by developers to ensure that a proportion of the benefits delivered by these projects are realised within the communities that live near them.

The introduction into planning policy of a requirement (ie not voluntary) for wind energy providers to agree a community benefit scheme (or package) for all regionally significant and major developments would promote and encourage meaningful engagement. It would also ensure that the inclusion of a community benefit scheme was not a material consideration for any such applications in the planning process if it is a standard requirement for all regionally significant and major applications. This would safeguard the integrity and impartiality of the planning process whilst delivering meaningful engagement and community benefits between energy providers and local communities. The requirement can be written into DoE strategic (regional) policy with details of the community benefit scheme agreed and undertaken separately between energy providers and local communities and potentially local councils.

In Scotland, requirements for financial contributions to such as a Renewable Energy Funds are often set out in local plans expressed as a figure per MW of installed capacity per annum[5]. There is now a draft guidance protocol on community benefits from wind farms issued by Strabane and Omagh Councils which requires an initial payment based on installed capacity coupled with contributions payable annually and set at a standard rate of £5000 per megawatt of installed capacity (index linked)[6]. The transfer of planning powers to Councils in April 2015 could see such protocols written as policy requirements in local plans. This would directly feed into and be compatible with a strategic policy requirement for wind energy providers to agree a community benefit scheme for all regionally significant and major applications.

The type of community benefits could be informed by a community benefit register that would help communities to make comparisons with similar development to inform negotiations. This would further contribute to the promotion of meaningful and effective engagement between wind energy providers and local communities.

The type and extent of community benefits would dictate the mechanism of delivery through the planning process. If not delivered through local plans it would be necessary to make better use of planning agreements in Northern Ireland. Research carried out in Scotland in 2008 established that the numbers of planning agreements entered into annually was low but increasing. The annual total rose from 168 in 2004/05 to 337 in 2006/07 with the annual value of reported contributions rising from £14.4 m in 2004/05 to just under £52.7

3 Communities and Renewable Energy: a report commissioned by DETI, DoE and DARD

4 NIRIG: Northern Ireland Renewable Industry Group. NIRIG represents the views of the renewable energy industry in Northern Ireland. NIRIG is a joint collaboration between the Irish Wind Energy Association and RenewableUK.

5 Eg. East Ayrshire Local Plan 2010 (Policy requires financial contribution of £2500.00 per MW of installed capacity per annum. Review of plan recommending £5000.00 per MW)

6 Draft guidance protocol on community benefits derived from wind farms in West Tyrone

m in 2006/07[7]. Similar research should be carried out to establish the potential for planning agreements as well as developer contributions (as referred to in the SPPS) and community infrastructure levies (CIL) in Northern Ireland. This would inform and facilitate greater use of a broader range of planning tools that would promote and facilitate engagement and allow the planning process to effectively process wind energy proposals.

Recommendations

- Planning policy should encourage and look favourably on pre-application engagement for all wind energy proposals.
- Agreed community benefit schemes (packages) should be a policy requirement for all major development and regionally significant wind energy applications.
- A community benefits register should be set up to inform community benefit schemes.
- Research should be carried out into the existing and potential use of planning agreements, developer contributions and community infrastructure levies in Northern Ireland.

Community Places

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7 An Assessment of the Value of Planning Agreements in Scotland (2008) Scottish Government Social Research

Consumer Council

The Consumer Council

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Aodhan O'Donnell

Ms Sheila Mawhinney
Clerk
Committee for the Environment
Northern Ireland Assembly
247 Parliament Buildings
Stormont Belfast
BT4 3XX

16 January 2014

Dear Ms Mawhinney

Committee for the Environment – Inquiry into Wind Energy Thank you for your correspondence dated the 9 January 2014 inviting the Consumer Council NI (CCNI) to submit a response to the above Inquiry.

Renewable energy, including wind energy, is a key area of interest for CCNI. We have recently commissioned a significant research project to establish a clear policy position on renewable energy to assess any additional costs to consumers. We believe this research is necessary in the context that renewable energy is set to become an integral part of the energy landscape within NI. Therefore, our research is essential to ensure that consumer opinions, and levels of awareness on this important issue are assessed and used to formulate CCNI advocacy in this area.

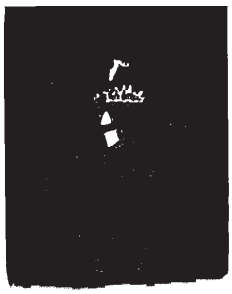
As the research referred to above is not yet completed, CCNI is unfortunately not in a position to provide the Inquiry with a substantive written response at this stage. However we will be in a stronger position, and would be willing to provide the Inquiry with either a written or verbal update on the outcome of our research, at a later stage as outlined in your correspondence.

Yours sincerely

Kathy Graham

Interim Director of Policy

Cookstown District Council



Cookstown
DISTRICT COUNCIL

COMHAIRLE CHEANTAR NA COIRRE CRÍOCHAÍ
DISTRICK COONCIL O COOKESTOUN

A. McCreesh, MSc, Dip IoD, MCIM
Chief Executive (Acting)
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M G Kelso PC/gj

27 February 2014

Ms Sheila Mawhinney
Committee Clerk
Northern Ireland Assembly
Environment Committee
Room 373, Parliament Buildings
Ballymiscaw
Stormont
BELFAST BT4 3XX

Dear Ms Mawhinney

RE: RESPONSE BY COOKSTOWN DISTRICT COUNCIL TO ENVIRONMENT COMMITTEE – ENQUIRY INTO WIND ENERGY

Please find attached Cookstown Council's response to the Environment Committee Inquiry into Wind Energy for consideration and comment.

If you require clarification on any of the matters raised, please do not hesitate to contact me.

Yours sincerely

M G KELSO
Director Environmental Health & Building Control

Enc

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Cookstown
DISTRICT COUNCIL
COMHAIRLE CHEANTAR NA COIRRE CRÍOCHAÍ
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RESPONSE TO ENVIRONMENT COMMITTEE

ENQUIRY INTO WIND ENERGY

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February 2014

TERMS OF REFERENCE

Terms of Reference for the Committee's Inquiry into Wind Energy:

(1) To assess the adequacy of PPS 18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment.

(2) To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development; and

(3) To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

RESPONSE BY COOKSTOWN DISTRICT COUNCIL

TO ENVIRONMENT COMMITTEE – ENQUIRY INTO WIND ENERGY

The Council has given consideration to the issues raised by the Environment Committee into the Enquiry into Wind Energy and has prepared the following comments to the issues identified.

AIM

The aim of the Inquiry is to identify the key issues arising from the generation of renewable energy by onshore wind turbines and to assess the adequacy of existing planning guidance to address these issues.

COUNCIL RESPONSE TO 'ADEQUACY OF 'PPS 18 AND RELATED GUIDANCE'

(1) To assess the adequacy of PPS 18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment.

'Planning Policy Statement 18 : Renewable Energy' sets out the Department's Planning Policy for developments that generate energy from renewable sources and that which requires the submission of planning application.

The document 'Wind Energy Development in Northern Ireland's Landscapes' (SPG), published by the Northern Ireland Environment Agency identifies landscape characteristics that may be sensitive to wind turbine development. This document provides supplementary planning guidance on the landscape and visual analysis process, and the indicative type of development that may be appropriate.

The Planning Policy Guidance makes reference to the following specific Policy and Strategic documents.

(a) Regional Development Strategy

An objective of the Regional Development Strategy for Northern Ireland 2025 (RDS) is to emphasise the importance of cutting environmental costs generally, by reducing the consumption of natural resources and energy from non-renewable sources.

A number of specific measures contained within supporting actions to the Strategic Planning Guidelines in the RDS include:

- promotion of the development of renewable energy resources (RNI 1.1);
- place a special emphasis on the conservation of the natural heritage of peatlands (ENV 1.1);
- promote more prudent and efficient use of energy and resources, and effective waste management (ENV 5);

- promote the use of cleaner and more efficient fossil fuels and the exploitation of renewable sources of energy and alternative energy technology for power generation (ENV 5.3); and

- promote energy saving and energy efficiency measures in households, businesses, construction/industry and the public sector (ENV 5.3)

(b) Strategic Energy Framework

The Department of Enterprise, Trade and Investment (DETI), which has responsibility for energy in Northern Ireland, has published a revised Strategic Energy Framework (SEF) which sets out the scale of Northern Ireland's ambition in the form of new and challenging renewable energy targets. The SEF makes it clear that it is likely that on-shore wind will continue to provide the largest proportion of renewable electricity generation in the period to 2020, not least because it is one of the cheaper forms of renewable electricity generation. The SEF also makes clear the ways in which the Department is developing other forms of renewable energy generation.

The renewable energy targets form the backdrop of this PPS and the complementary 'Wind Energy Development in Northern Ireland's Landscapes' Supplementary Planning Guidance (SPG). DETI and DOE are committed to working together to ensure that these new targets, in line with what is required under the new Renewable Energy Directive, are achieved in a way that respects local and environmental considerations.

(c) Sustainable Development

'First Steps Towards Sustainability – A Sustainable Development Strategy for Northern Ireland' (SDS) recognises that Northern Ireland has enormous potential to develop renewable energy sources as alternatives to burning coal, oil or gas. A priority of the SDS is to foster opportunities and build on the existing successes and abilities of companies in Northern Ireland to develop innovative ideas and new technologies in this field.

The SDS contains challenging targets for Northern Ireland above those set at national and international levels for the reduction of greenhouse gas emissions and indicates important steps towards achieving these targets. These include ensuring that where technologically and economically feasible, beyond 2025, 40% of all electricity consumed in Northern Ireland is obtained from indigenous renewable energy sources with at least 25% of this being generated by non-wind technologies.

(d) COUNCIL COMMENTS

The Strategic Context in which PPS 18 has been established is as outlined above. The Policy objectives of PPS 18 are as outlined below.

"The aim of this Statement is to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment in order to achieve Northern Ireland's renewable energy targets and to realise the benefits of renewable energy.

The objectives of the Statement are:

- to ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed;

- to ensure adequate protection of the Region's built and natural, and cultural heritage features; and

- to facilitate the integration of renewable energy technology into the design, siting and layout of new development and promote greater application of the principles of Passive Solar Design".

In Policy RE1 as contained within PPS 18, it states, "The wider Environmental, Economic and Social Benefits of all proposals for Renewable Energy projects are 'Material Considerations' that will be given significant weight in determining whether planning permission should be granted".

In practice however, it would be argued that this section of the Policy needs significant review, as currently the 'weight and consideration' given to this statement and the present interpretation is not that originally intended. The determination process would appear to be weighted in favour of the applicant in the vast majority of cases, unless there are 'significant' mitigating circumstances.

The Environment Minister highlighted the 'promotive' nature of PPS 18 in his speech to the 'Irish Wind Association' in September 2009, when he commented that, "PPS 18 opened up Areas of Outstanding Natural Beauty (AONBs) to wind turbine development, for the first time. He believed that 'AONBs' could successfully accommodate such development without detriment to the region's Cultural and Natural Heritage".

This statement and direction of travel is often quoted and accepted as a 'material consideration' by the Planning Appeals Commission, in their subsequent determinations, to the detriment of the unquantified Social, Cultural and Natural Heritage considerations, which pertain in these localities.

In this regard Council would have particular concerns regarding the scale and intensification of both committed and proposed wind turbine development in the West of the Province and particularly in the lower Sperrins Region.

Council have also expressed concerns that the current application of Planning Policy contained within PPS 18 : 'Renewable Energy' and associated Guidance, may seriously mitigate against the future 'Strategic Place Shaping' powers which new Councils will be tasked with delivering, following transfer of Planning powers in 2015.

It is also unclear what Monitoring and Control Mechanisms have been put in place to prevent 'Significant Cumulative Impact' from this form of development, particularly in the West of the Province, given its unique geographical and topographical features.

In any review of PPS 18, it is essential that the continued protection and preservation of unique landscapes and architectures across Northern Ireland and in the Sperrins Region in particular, is seen as a 'Material Consideration' which should be protected. This to ensure their continued contribution to the development, promotion and protection of Tourism and Cultural Heritage across the Sperrins and wider region.

The current Planning Policy Guidance Note was issued in August 2009. The related 'Strategic Environmental Assessment of the Onshore Renewable Electricity Action Plan for Northern Ireland', was completed by the Department of Enterprise, Trade and Investment (DETI) in November 2013.

This report recognised that the lack of a 'Spatial Assessment' element within the Strategic Environmental Assessment (SEA), in effect means that the 'Cumulative Impacts' of Onshore Renewable Wind Development has not been addressed within the wider Strategic Assessment. This may be seen as a gap within the Strategic Policy and Management Framework for the ongoing successful and Sustainable promotion of Renewable Wind Energy Development in Northern Ireland.

In light of the issues highlighted, the Council would therefore request a substantial and thorough review of PPS 18 and associated guidance, as the Policy Framework for Renewable Energy Development is currently not 'fit for purpose'.

COUNCIL RESPONSE TO PERCEIVED IMPACT OF WIND TURBINE NOISE

(2) To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development.

The following comments are offered with particular reference to noise from wind turbine development.

(a) ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms'

ETSU-R-97 was drafted in 1996, some 18 years ago, when typically proposed wind turbines had maximum hub heights of 30 – 40m and power outputs of 0.25 to 0.5MW.

Today, typical Wind Farm turbines have hub heights of 60 – 90m with power outputs of 1.5 to 3MW. As a consequence of taller and larger wind turbines, source noise levels have increased and the frequency content of wind turbine noise has shifted to lower noise frequencies. The combined impact of which results in larger separation distances from habitable dwellings being required, than those originally envisaged in ETSU-R-97.

Repeated pressure from local Action Groups to the controls contained within ETSU-R-97, resulted in the Department of Energy and Climate Change (DECC) funding the Institute of Acoustics to provide further technical guidance on application of the guidance The Terms of Reference however, provided to the Institute of Acoustics, specifically excluded a review of the controversial ETSU-R-97 Noise Limits. The original noise limits still apply.

(b) ETSU-R-97 Noise Limits

ETSU-R-97 in presenting the noise limits, "gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or local authorities".

ETSU-R-97 sets lower fixed limits for Daytime (35 – 40 dB La 90) than Night-time (43 dB La 90). The fixed day-time limits therefore permits what is deemed to be an 'acceptable level of

noise', where there was previously no discernible noise from a 'man-made' source. Given the increased levels of technology applied to both wind turbine design and operation, it is recommended that the noise limits set by ETSU –R-97 are now reviewed to ensure they provide a suitable protection for local amenity.

(c) Noise Control - Planning Conditions

The application of appropriate Planning Conditions to control noise emissions from both single turbines and Wind Farms has now been well recognised. In the UK mainland a suite of Noise Conditions are used to ensure that:-

(i) The wind turbine(s) specified are designed and operated to meet the target Noise Levels at the nearest habitable property.

(ii) In the event of a justified complaint the wind turbine operator is required to employ a competent person to undertake an appropriate noise assessment of the wind turbine and its operation to assess compliance with its target Noise Levels as specified in Planning Condition (i).

Although both Conditions are applied in other jurisdictions in the UK, unfortunately Planning Condition (ii) is currently not being applied here in NI. This has a significant resource implication for local Councils, in that in the event of a noise complaint, the Council's Environmental Health Department are obliged to undertake a detailed and protracted investigation, at considerable expense to the local ratepayer, which should in effect be undertaken by the turbine operator under the" Polluter pays Principle".

It should also be noted that the Council investigation is based upon Statutory Nuisance considerations of 'excessive emissions' and is not designed to effect the control limits as may be contained within a Planning Approval. It is therefore requested that the Committee give consideration to the review of current Noise Limits as contained within ETSU-R-97 and the application of appropriate Conditions on Planning Approval to place the onus on the turbine(s) operator to undertake a detailed noise investigation in the event of a justified complaint.

Council would therefore request a thorough review of the Noise Controls which are currently applied to wind turbine development.

COUNCIL RESPONSE TO ENGAGEMENT OF LOCAL COMMUNITIES

(3) To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

To date the level of engagement by Wind Energy Providers within local communities has been somewhat fragmented and disjointed. The local experience is that Applications for Enquiry are lodged with Planning Service before any kind of pre-community consultation has taken place, to assess the nature and extent of potential Community Impact from the project. In fact, it is well recognised that the Renewables Industry do not go beyond the minimum requirements for Community Consultation, as currently set down by the Strategic Planning Division of the Department of Environment.

A typical Consultation Programme is as outlined below.

- Applicant notifies the Strategic Planning Division of proposed consultation, when this is to take place, with whom and what form it will take. A period of at least twelve weeks will be taken to allow community consultation before submission of the planning application.

- The Pre-Application Consultation will involve at least one public event.

- The applicant will place an advert in the local press at least seven days prior to the event.

- The event venue will be local and accessible and the form of the event will be structured so as to allow for 'meaningful participation'.

- The date and time of the event will be chosen to facilitate the attendance of as many community stakeholders as possible.

COUNCIL COMMENTS

It would appear that the format and process for Community Consultation has been refined by the Industry on the back of a number of development proposals. Regardless of the consultation process, the general perception of the local community is that these Community Consultation processes are seen as a 'tick box' exercise to enable the applicant to satisfy the planning process.

It would appear that no defined Spatial Planning Guidance or direction has been applied to developments of this nature, both large and small scale, apart from the Landscape Policy Guidance, as set out in the Supplementary Guidance for PPS 18 – 'Wind Energy Developments in Northern Ireland Landscapes'. The Strategic considerations in regards to acceptable location, siting and associated engagement with the community, as part of a full and proper Development Planning process, have not been implemented. As a result, local communities feel dis-enfranchised from the planning process and see little worth in participating in current engagement processes, as they believe the outcome is a 'foregone conclusion'.
In any Community Planning process, the needs and aspirations of the local community must be well recognised and protected and each application should be subjected to full and comprehensive Social, Cultural and Economic Assessment, to determine the potential impact on the community as a result of the development proceeding. These Social, Cultural and Economic Appraisals need to be conducted and assessed at an early stage, in conjunction with the community and the relevant stakeholders, so as to ensure that the needs and aspirations of the Community, both present and future, have been fully factored and taken account of as part of the decision making process.

In recognition of these issues the regulating Departments – Department of Environment and Department of Enterprise Trade and Investment should establish detailed 'Community Impact Assessment Models' which allow the concerns and issues impacting on communities to be comprehensively documented and assessed as part of the Decision Making Matrix.

A number of Models have been proposed by which Benefits to the community are factored into those areas where wind turbine developments are subsequently developed.

A 'Community Levy Model' developed within the Western Region of Councils has indicated that a Community Levy be applied on all Wind Farm developments. Cookstown Council consider that the levy should be set at a level of £10,000 per MW / energy generated per annum - pro rata, scaled back accordingly for any turbine of 50 Kw capacity or greater. This fee to be levied on the wind turbine / Wind Farm operator, to enable local communities to regenerate and sustain themselves over the life-time of the project.

In large scale Wind Farm developments it has been also been proposed that seventy percent of the funding be made available to the local communities within five miles of the development and the remaining thirty percent within eight miles.

It is imperative however, that the Community Impact Assessment Model be developed as a matter of some urgency, so as to ensure the appropriate siting and location of all future proposed developments of this nature. Consideration should also be given to applying the proposed Community Levy when implemented, to all current and proposed wind turbine developments in the region.

The Committee is respectfully requested to give consideration to these comments in their Review of the existing Planning Guidance and associated issues.

It is abundantly clear that Renewable Energy Development must form a part of the longer term Sustainable Development of this Region. The Council however would respectfully request that the Committee give consideration to the issues raised in this response.

For further information please contact:

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February 2014

Craigavon Borough Council

Response by Craigavon Borough Council to the NI Assembly Inquiry into Wind Energy

Introduction

Craigavon Borough Council welcomes the opportunity to respond to the Inquiry into Wind Energy and notes the terms of reference for the Committee.

The report summarises the key concerns which the Council wishes to raise in relation to this issue.

To assess the adequacy of PPS18 and related supplementary guidance

Having regard to the adequacy of the related supplementary guidance in regulating proposals, we wish to point out that PPS2 is now outdated, having been published in 1997. PPS18 makes several references to PPS2, however it is considered that the document would not now be adequate to ensure protection of biodiversity. In addition, it is important to ensure that any mitigation measures that are specified under Planning conditions are adequately monitored to ensure compliance and that mitigation should be completed within a specified timeframe following construction works.

We believe that the relatively high wind resource available to Northern Ireland means that both on-shore and off-shore wind has the potential to make a significant contribution to the reduction in carbon emissions and climate change effects, the security of local energy supplies and delivery of some local jobs together with improved infrastructure.

We believe that the delivery of on-shore wind developments should be led by a strategic Government plan which seeks to determine how much on-shore wind energy is required and how much can be hosted by specific geographical locations without detriment to local communities, the tourist industry, habitats and the local environment in general. A strategic approach of this type would remove the inefficiencies within the present ad hoc system which results in a vast number of individual applications spread across a wide range of land types and uses. Often the land used is not the best in terms of potential wind energy resource nor in terms of minimal environmental impact, but is instead chosen because it can be readily obtained. It is often disheartening for prospective wind turbine operators to find that the local electricity grid is not ready to receive the power generated or that connection necessitates prohibitive expense. Furthermore, the current trend of erecting turbines capable of producing 500kW but operating them in a restricted power-generation mode to gain additional financial incentives, seems illogical.

A strategic approach would allow for the electrical grid network to be developed to receive energy from the most efficient areas which result in the least environmental impacts and would allow for a new means of publically incentivizing schemes so that the maximum energy must be gained from the turbines erected.

To compare the perceived impact of wind turbine noise and separation distances The potential for disturbance due to noise is a significant factor in residents' concerns regarding wind turbine developments. PPS18 requires that the noise limits are set using guidance prepared for DETI in 1996 (hereafter referred to as ETSU-R-97). The noise limits that apply, and therefore the noise to which nearby residents are exposed, are the same irrespective if the noise is due to a single wind turbine located in close proximity or a large wind farm of multiple turbines located farther away.

The ETSU-R-97 noise limits were based on a number of stated assumptions regarding the character of the noise emissions. Recent research from the renewables industry body

(Renewables UK – Wind Turbine Amplitude Modulation: Research to Improve Understanding as to its Cause and Effects 16th December 2013) recognises that modern wind energy developments may exhibit noise character not as originally envisaged under ETSU-R-97. This leads Craigavon Borough Council to the view that the ETSU-R-97 noise limits, including the night-time fixed limit of 43 dB LA90, require a review to ensure that they remain suitably protective of amenity.

A further point relates to the means of ensuring compliance with the noise limits imposed on any developer. A 'Good Practice Guide' recently commissioned by the Government has been endorsed in its entirety by the English, Welsh and Scottish Governments. However, in NI the Good Practice Guide has recently been endorsed but DoE raised concern over some of the suggested 'Example Planning Conditions'.

One such condition requires the operator to provide satisfactory evidence to the planning authority demonstrating compliance with the noise limits, in the event of a complaint being made. DoE correspondence has stated that they are not minded to attach this condition to individual wind turbine proposals. However, it should be noted that DoE routinely attaches similar conditions to wind farm applications.

As the noise limits as applied to wind farm developments are identical to those applied to individual wind turbine proposals, the noise impact on local residents is also identical. Consequently, Craigavon Borough Council does not agree with DoE differentiating between the control needed to protect local residents from the noise impact of the two types of wind energy development.

This view is supported by the fact that the current DoE position appears to sit outside rest of UK. Complaint investigation conditions for wind farm and single wind turbine developments are routinely applied by Local Planning Authorities in England, Wales and Scotland; the Planning Inspectorate for England; the Planning Inspectorate for Wales; the Directorate for Planning and Environmental Appeals for Scotland; and the Secretary of State for Communities and Local Government. In addition, complaint investigation conditions are also recommended by the Institute of Acoustics and the Renewables UK industry body within their example conditions.

It is often assumed that the Environmental Health Service nuisance provisions provide the same level of protection as desired through the planning regime. It should be noted that nuisance provisions can only deal with 'excessive emissions', and do not provide the control of noise as required by PPS 18 and ETSU-R-97.

The measurement of wind turbine noise is time consuming and hence resource intensive. In the absence of a complaint investigation condition, the costs to verify compliance with the noise limits attached to a planning permission would fall solely upon the local ratepayer within the district where the turbine is located. Craigavon Borough Council believes this situation to be an inappropriate means of controlling the potential noise impact.

To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted

The importance of community engagement at appropriate stages prior to and throughout the planning process is recognised. We would therefore support the development of guidance regarding early and meaningful engagement and consultation that enables communities to make a genuine contribution to a process designed to promote development by agreement.

Guidance should outline the methods, timing and transparency of community engagement processes. It is recognised that there may be opportunities through the statutory planning functions which Council will assume responsibility for through Local Government Reform. The community planning process in particular may represent an opportunity to take a proactive approach to the issue, enabling active, engaged and informed communities who are equipped

to respond to proposals and projects as they arise. In this context, capacity building for communities will also require consideration.

A report by Fermanagh Trust ('Maximising Community Benefits from Onshore Wind in NI') presented in January 2014 found that host communities in Northern Ireland are receiving a lower level of community benefits than in mainland UK. We would support the development of clear guidance/policy to inform the calculation, negotiation and agreement of community benefit to ensure a fair and consistent approach across NI. While ancillary benefits are more difficult to measure and therefore more difficult to guide, it is felt that clarity can be provided regarding the monetary benefits that should be expected by host communities.

In summary, the issues of community engagement and benefit in the context of wind energy are not adequately addressed within current policy provisions, and require considered review as part of a broader strategy that enables appropriate forms of development.

February 2014

D McNeilly

From: D McNeilly

Sent: 28 February 2014 10:37

To: +Comm Environment Public Email

Subject: Submission to Wind Energy Consultation

I wish to make the following submission for consideration in the Wind Energy Consultation.

Present planning policy offers very little or no protection to rural dwellers from wind farm developments but rather is skewed to assist the wind developers at every level. PPS18 was devised with the assistance of the wind industry with absolutely minimal input from rural dwellers.

It is therefore imbalanced as a result and allows the wind industry to act with impunity. and it is quite simply a charter for them to act with impunity. Areas of the policy are only listed as being guidelines rather than as a definitive statement of fact which must be adhered to. The reports presented by wind developers e.g. noise shadow flicker effects wildlife etc. are accepted by planning service with no verification of their authenticity. These extremely lax regulations require to be greatly strengthened to protect families in their homes.

Northern Ireland consists of a scattered housing landscape therefore by its very nature making it virtually impossible for wind developers not to cause disturbance to rural dwellers. Health and noise issues are well documented worldwide and having one's home devalued or even rendered unsaleable by the presence of turbines is very distressing and disturbing and surely that alone must cause anguish and anxiety leading to undoubted health problems and stress - so to state that there are no health problems is very debatable.

Adequate setback distances which offer protection to residents are not achievable because of the dispersed nature of housing in NI. Developers include in their Environmental Statements details of houses they expect to affect with noise shadow flicker etc. with no consideration whatsoever that this will affect residents in their homes for 25 years. Planning Service acquiesce in this. Money is offered to residents within range of developments which are inside the setback guidelines laid down by planning service to ensure they offer no opposition to the planning proposal. This is in essence buying planning permission where regulations state it should not be permitted again with acquiescence of planning service.

Wind developers have already covered large areas of beautiful landscape even in AONB areas and seem intent in continuing indefinitely with their constructions. A map showing wind farm locations throughout Northern Ireland indicates that they are proliferating right across the province.

Despite this their impact is minimal in reducing the target set for renewable energy production. Speaking to the Environment Committee on behalf of NIRIG Mr Gary Connolly confirmed that only 12% of the 2020 target of 40% has so far been met even with this proliferation. That presumably means that over twice as many more wind farms need to be constructed on the landscape to meet this target and that is a frightening prospect. Consideration of lowering the 40% target would appear to be an option to curbing this rural vandalism as developers are quite happy with the status quo and will continue unabated even asking for the 40% target to be increased to 42%. The CEO of a company claiming to be a market leader throughout Ireland stated that it was a "cop out" for planners to put environmental concerns above economic benefits. This clearly demonstrates the lack of concern for rural dwellers and landscape in the pursuit of greed.

Wildly exaggerated claims of financial benefit running into tens of millions of pounds investment in communities is usually modified in the small print to actually downgrade these

claims to 10% -20% being spent locally with the proviso that it is the best available deal for the developers so there are few financial gains for local communities. As these developments require specialist expertise the Northern Ireland economy does not benefit to any great extent and most of the revenue leaves NI. “Concrete and Sandwiches” are usually the sum total of any local economic investment.

A Costs Benefit Analysis requires to be carried out to ascertain just how much is being spent locally and what the benefits are.

I summarise my Consultation Response as follow:

A Moritorium is needed while more information on health issues and protection for rural communities is put in place

40% target is unrealistic in the NI location and should be reduced to a more acceptable figure AONB and scenic areas should be protected from these developments A Costs Benefits Analysis should be carried out to ascertain just how much the local economy is in fact actually benefiting Equal weight should be given by planning service to the views of affected communities as wind developers receive - which is not presently not the case The policy requires ambiguities to be removed and a more clear policy document produced with tighter regulations so that a “coach and horses” cannot be driven through loosely drafted regulations leaving them open to individual interpretation.

D McNeilly

David Boggs

Wind Energy Inquiry response from David Boggs.

The aim of the Inquiry is to identify the key issues arising from the generation of renewable energy by onshore wind turbines and to assess the adequacy of existing planning guidance to address these issues.

Inquiry intoWind Energy - Terms of Reference

Terms of reference for the Committee's Inquiry into Wind Energy:

- To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;
- To compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development; and
- To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

The following concerns are based on my experience regarding the erection of individual wind turbines on private farmland.

Wind energy providers are not attempting to engage with local communities, if anything they are pointedly doing their utmost to avoid any engagement with locals. The nature of the Northern Ireland countryside is that farms are interspersed with private homes, because of the size of farms in NI there is little or no room for wind turbines to be 'shoe horned' into pockets of land that fit the current legislated requirements. This has resulted in wind-turbines being located as far away from the applicant's property and thus closer to neighbouring land as well as property. The planning authorities seem to be blinkered in their approach to the processing of wind turbine applications. The planning authorities have sided with the wind turbine providers as they seem to think that wind turbines MUST be erected. Unless put into check, the emerald isle will soon be blighted by an uncontrolled proliferation of wind turbines, costing the tax payer a fortune and, on a calm day with no wind or a stormy day with gale force winds absolutely no electricity.

Planning Application Process

Further to your advertisement in the papers I am writing to raise my concerns regarding the conduct of the planning authorities as well as the NIEA with regards the planning applications that have mushroomed as a direct result of the ridiculously high Renewable Obligation Certificate (ROC) incentive payments to erect onshore wind turbines. The application process, including the planning application forms, are woefully inadequate as they are aimed at somebody who is applying to build a house or extension. The planning application forms do not go into enough detail regarding the wind turbine allowing the applicant to stick to the bare minimum of information in the hope that nobody will raise an objection. The current planning application forms for the purposes of building onshore wind turbines are not fit for purpose. A completely separate application form needs to be produced that reflects the specific needs for the building of wind turbines. The form should include a requirement to contact all affected neighbouring homes and businesses within a 1km radius. The Wind Energy Inquiry response from David Boggs. form should also include a section on due diligence to confirm, or otherwise, what other windturbine applications are being carried out within a 10km radius. This is clearly not being carried out as I have evidence that highlights that many neighbouring properties are completely oblivious to the fact that they will have a wind turbine next door to them. In many cases the wind turbine is placed closer to the neighbours property than to the applicants own property. Due diligence should also be carried out by the planning services

to ensure that the application is 100% accurate and does not mislead the public or the authorities.

Environment

The environmental assessments that are carried out are simply a 'cut and paste' of the department of the environment's overarching report for the whole of Northern Ireland, little or no impact assessments are specifically carried out relating to the immediate area around the applicants site. The assessment seems to focus on nature rather than people who live and work in the immediate vicinity of the proposed wind turbines. Health considerations, either physical or psychological, seem to be totally ignored. The health implications need to be investigated thoroughly, they cannot be ignored simply because reducing carbon emissions is more important than the environment or the health of people who live or work in the countryside.

Farm Economy

The companies involved in sourcing land for the erection of the wind turbines are simply driven by money there is absolutely no 'true' carbon emissions incentive involved. This is because the companies who own the wind turbines are being paid more per kilowatt hour than I actually have to pay for my domestic electricity supply. These financial incentives are so great that the companies will use dubious tactics to encourage the landowner as well as neighbouring property owners who may object to the application. I have experienced first-hand of 2 specific cases where neighbouring properties have been offered financial incentives to smooth the application process. Remove the financial incentives (ROCs). Do not be misled by the fact that many of the companies highlight that they are creating employment to manage and maintain the turbines.Whilst this is true, it is effectively negating any reduction in carbon emissions for each Kilowatt Hour (KwH) of electricity produced by a wind turbine.

76% of Northern Irish farms are classed as very small (based on Standard Labour Units sourced from DARD 2013 Agriculture Census), this fact along with the average age of the farming population in the high fifties it is natural to understand that these farmers when approached by the wind turbine companies will see the guaranteed rental income as a way of providing an income in their old age. This issue needs to be investigated to determine how the income from wind turbines may impact on how this farmland will be managed in the future. This needs to be thoroughly investigated to ensure that NI farmland is not neglected but is properly invested in to improve our 'food security'.

Wind Turbine efficiency and availability

Stating the obvious, wind turbines only produce electricity when the wind is blowing. Perversely, if the wind is too strong then the wind turbines need to be turned out of the wind to avoid damage. There is no way of storing the electricity produced by wind turbines which means that the electricity produced by wind turbines needs to be fed into the grid regardless of whether the electricity is needed. Overnight when the wind is blowing and everybody is asleep and there is little electricity Wind Energy Inquiry response from David Boggs, . required the wind turbines are of little or no use. The sad fact is that the electricity produced still has to be paid for based on the contractual ROC obligations even if it is not used – how ridiculous is this!

The efficiency of wind turbines is only 30%, anybody who claims otherwise should be challenged. Just think, out of the 365 days in the year the turbine will only produce its theoretical maximum power output for 120 days of the year. The only reason the wind turbines are financially viable is because of the ridiculously high ROC payments, if the turbine companies were paid the same wholesale price as the traditional power generating companies they would simply go out of business leaving white elephants all over the countryside. Of course the wind turbine companies will claim that they are creating employment. Effectively the ROC payments (provided by the Government) are a very expensive

employment scheme. The wind turbine companies may claim that they are reducing our carbon emissions, however they are not carrying out an accurate comparison as they are not providing details of the amount of carbon emitted per KwH per man hour. Normal power stations use far less manpower to produce each KwH. This needs to be challenged and investigated as the wind energy providers will try and portray their environmental credentials. If you 'google' windfarms you will find careers and opportunities NOT the reduction of carbon emissions as the most popular search result. The ROC payments are skewing the electricity market, it is driven by greed and is corrupting our minds with false claims of sound environmental credentials.

NI Tourism

The sad fact is that wind turbines and wind farms are popping up on many of our hills and mountainsides, the impact of these wind turbines on tourism has got to be investigated before it is too late. Having travelled widely in Canada, USA and Australia covering thousands of miles it is clear that they treat their tourism very seriously as I struggled to find wind turbines anywhere. Ironically one of the largest wind farms I did come across looked dilapidated and neglected and as I found out from family in USA was a legacy of a previous subsidised initiate in USA. I did not see a single wind turbine whilst touring British Columbia and Alberta in Canada (having travelled between 2000 and 3000 miles) whilst in Northern Ireland you cannot turn around a corner without seeing a wind turbine. How will this unchecked proliferation of wind turbines be perceived by tourists, surely this needs thorough investigation. Picture this, excited tourists sailing into Belfast only to see the hills surrounding Belfast Lough strewn with wind turbines. Oh look there is the Knockagh Monument commemorating World War 1 (with a backdrop of at least half a dozen wind turbines – what a perfect picture!!).

David O'Neill

Ref: Wind farm concerns

First of all the some bullet points, and I would like to send you documents expanding on the first six if I may?

1. Separation Distances & Long Term destruction of Amenity.
2. Noise Levels.
3. Low Frequency Noise.
4. SAFETY IMPACTS
5. Shadow Flicker and Reflected Light
6. Breach of European Union law and other international agreements and standards.
7. Imposed devaluation of property.
8. Wind turbines are not really green.

Several years ago, I received some mail advising me of a number of industrial wind turbines to be erected in the area. Like many others at that time, I was conditioned to believe all those good things I read and heard about industrial wind farms and their turbines, with absolutely no negative attributes. That is other than that unnatural look I couldn't help but notice against the landscapes at other wind farms. Pigeon Top is well recognised locally as a scenic area.

I began to get curious of some issues with these wind farms and indeed shocked at the behaviour of the companies behind them.

In recent months and after having met others with similar concerns; I have become aware of numerous issues relating to industrial wind farms.

Getting back to my circumstances, my wife phoned the company concerned. The person who answered said the Pigeon Top Wind Farm Project (http://pigeontopwindfarm.com/) is going to be on hold for a long time. A local community group had objected.

I've since heard this group withdrew its objection after receiving so called "Community benefits". I later came across numerous other examples of this form of motivation crowding, probably with the aim of keeping objections to a minimum.

We phoned again some months later and were told of another objection, by the PSNI in relation to possible interference with signals from a radio mast at Pigeon Top.

I now know that the company has created another foundation for the radio mast.

A few months ago I looked it up on the internet again, and found there had been a resubmission, and after local objections planning permission was granted by the Planning Appeals Commission.

As I looked at the details of the re-submission, I saw that the height of these proposed industrial turbines had increased to 126.5 metres with a blade diameter of 90 Metres. I copied the following from the web site;

http://pigeontopwindfarm.com/images/TCIR/downloads/resubmission_supplementary_information.pdf.

> *"This requested amendment is necessary to bring the development in line with the recent planning approval for wind turbines of this height in the immediate locality (e.g. Pollnalaght Wind Farm Ref/K2006/1368, where wind turbines of 125m height have already been*

consented and so established as a visual feature in this locality and Landscape Character Area). The increase in overall height and rotor diameter will integrate the turbines of Pigeon Top and Pollnalaght at a uniform 125/126m overall height within their shared landscape."

Up until this I had heard of a wind farm at Pollnalaght but believed it to be the same one. Pollnalaght is arguably another name for the same hill. On 09 September 2013, I sent an email to Omagh Council's building control to confirm and got a reply as follows:

refer to your query and advise as follows

Two wind farm applications (K/2006/1368/F) Pollnalaght - 12 turbines and (K/2009/0081/F) Pigeon Top - 9 turbines have been approved

Both these application were subject to a decision by the Planning Appeals Commission - (Ref No 2009/A0265 and 2009/A0268) which you may wish to consider on the PAC website.

In relation to your query about the size of the turbines - There was a planning application K/2011/0592/F to increase the size of the turbine to 126m for the Pigeon Top development. My understanding is that the Pollnalaght Turbines are 125m in height (base to tip height)

If you require any further information - please contact me.

Regards

Brian Furey
Senior Environmental Health Officer

So; I now have 21 very large turbines, most of them conspicuously visible from the front of my house, to look forward to. The ridge line of this hill is the main feature in my front south facing view. I am concerned about the potential ill effects of these as they will stretch from south-west to south-east of my house. These are the prevailing angles of both the wind and sun, especially in the winter months.

As I looked at the computer generated imagery on the resubmission web site, I saw they were mostly from distances and locations likely to portray a minimalist impact. I am fairly certain these images did not portray the increase in turbine size. The one image from any where near where I live appears to be positioned to make maximum use of an initial ridge, nearby trees, along with some clever white and grey camouflaging. I copied it into this document as follows.

I tried putting in some arrows, but please look at the company's own web site and decide for your self.

I now support the group “West Tyrone against Wind Turbines”. They were able to demonstrate that these “Toe in the door by stealth” tactics are common. In fact some of them are living with the fear of expansion in their respective areas (planning application already in progress). Others are concerned about new wind farms in planning. All are concerned of their health, quality of life of their families, and the devaluation of their property. Ironically; they have also discovered a further issue about computer images with shall we say; “Diminishing properties”?

The biggest visual impact would be from roughly 0.5 to 1.5 Kilometres to the west or right of this shot (obviously there are no images for this)?

In recent weeks, I spoke with some neighbours. Of those I had spoken to, some knew they were coming but did not know how many turbines or wind farms, many didn’t know anything about it, and some were related to site owners and were concerned about extended family conflicts. I suspect that community engagement is somewhat selective, and carried out with a view to mere advertising and bribery.

In recent months I have found that after some poor publicity, wind farm representatives sought to meet with councils privately. It is my fear that improper and exaggerated incentives have or will be offered. I also fear that any funding given will be exacted directly or indirectly from tax payers, or electricity bill payers in the form of raised tariffs. In fact it would appear that working tax payers are being exploited by large business companies in the form of subsidies (as far as I can tell less 1% of subsidies make up the community incentives).

I believe that the over-bearing view of these turbines will substantially devalue my property. Noise levels and types could only be guessed without proper impartial assessment, not an impact assessment produced from those directly commissioned from the developers. I would also like to mention the zero carbon claims by some of those in the wind industry, in fact there was a glossy magazine circulated at the recent G8 summit in Fermanagh; it claimed the carbon debt of manufacture would be repaid in two years of operation.

In March 2010 American analyst Cindy Hurst commissioned by the U.S. Army’s Foreign Military Studies Office, Fort Leavenworth, KS, carried out what I believe to be an accurate and comprehensive study on the extraction and production of rare earths (95% of them are from the Inner Mongolian region of China - http://www.iags.org/rareearth0310hurst.pdf).

Given her figures are indeed accurate, this means a single 3mw wind turbine results in the following:

- 2 tons of radioactive waste residues, containing water
- 4000 tons of tailings (spoil) usually laced with thorium (also radioactive)
- 17 Kilograms of Fluorine
- 26 Kilograms of Toxic Dust

- Up to 24000 cubic metres of waste gas containing dust concentrate, hydrofluoric acid, sulphur dioxide, and sulphuric acid.
- 150 cubic meters of acidic wastewater

The most common disease in Baotou is pneumoconiosis, better known as black lung. There are 5,387 residents in Baotou who suffer from black lung, which makes up more than 50 percent of the cases in the autonomous region.

The amount of Carbon dioxide (Co2) produced during these processes, and the more potent Methane gas produced in the radioactively polluted, decaying aftermath is not known.

The amount of Co2 produced during the production of the other materials in a wind turbine is not known (335 tons of steel-4.7 tons of copper- up to 2000 tons of concrete-3 tons of aluminiumundisclosed amounts of polymers and resins).

The amount of Methane gas released from blanket bog destruction or disturbance is not known.

The total destruction of flora, fauna and wildlife for both our countries is not known.

Would you like to multiply the known figures by the number of turbines around our country?

I wouldn't either, nor do I believe they are green, in fact I suspect that in years to come; there will be numerous claims for compensation against various companies and official bodies.

Yours sincerely,

David O'Neill

1. Separation Distances & Long Term destruction of Amenity

Question: Are separation distances in PPS 18 adequate to protect residential and visual amenity?

Answer: No.

Reason: Minimum separation distances are totally inadequate, frequently ignored, often falsified and not policed.

Comment: For a single or group of turbines, The general rule in PPS 18 is that the minimum separation distance is the greater of 500 metres or 10 times the rotor diameter. This is being blatantly ignored by planners, Environmental Health Officers and developers, some turbines being placed just over 100 metres from a home. This compares badly with the situation in Scotland, where '**in all instances, proposals should not be permitted if they would have a significant long term detrimental impact on the amenity of people living nearby**', and a general rule of 2000 metres applies.

Accuracy in the measurement of separation distances is fundamental to noise estimation, shadow casting and shadow flicker analysis and visual impact assessment. Yet many developers obscure the definition of the separation distance they are applying and there is no guidance in PPS 18.

The present planning system includes no proper vetting of applications for deliberate falsifications or accidental inaccuracies. In short, an applicant with a vested interest, is trusted, and is only required to state a 'candidate' turbine, not the turbine type and model that will finally be erected. Note also that some single turbine applications are for turbines bigger than in some wind farms.

Due to all the uncertainties involved, it is critical to introduce a mandatory 2 kilometre minimum separation distance from any wind turbine, and a greater distance for turbines over 2 MW, until robust and independently-assessed evidence is produced that a smaller distance will not have impacts on amenity and health.

PPS 18 fails in its stated intent to protect the amenity of those living in and using the countryside. For example, the noise standard used by PPS 18 itself clearly states that it is set above the level necessary to protect amenity, a statement corroborated by the Chief Environmental Health Officers Group. Similarly, no competent authorities are involved in the measurement of the impacts from shadow flicker, reflected light and safety hazards. Both Environmental Health and the Health & Safety Executive deny their responsibilities in such matters and the planners admit to having no expertise in all such areas, including noise.

The cavalier and uncaring attitude within PPS 18 to the amenity of neighbours of wind farms can be encapsulated in just two quotations. These demonstrate a fundamental disregard in Northern Ireland to the effects of visual impact.

Firstly, from PPS 18, section 4.14 (underline added):

'Of all renewable technologies, wind turbines are likely to have the greatest visual and landscape effects. However, in assessing planning applications, the Department recognises that… **some of these impacts may be temporary if conditions are attached to planning permissions which require the future decommissioning of turbines**.'

Thus the term 'temporary' to the department means the expected life of the wind farm from approval to decommissioning.

Contrast this to the recognition of the human cost of such impact in Scotland where the Directorate for the Built Environment wrote in April 2009 under the direction of Jim Mather, Minister for Enterprise, Energy and Tourism (underline added):

"The 2km separation distance is intended to recognise that, in relation to local communities, visual impacts are likely to be a prominent feature and this should be taken into account when identifying the most suitable search areas. However, impacts will clearly vary considerably depending on the scale of projects and the proposed location. **That is why SPP6 confirms that, in all instances, proposals should not be permitted if they would have a significant long term detrimental impact on the amenity of people living nearby**.

In Scotland, with many more turbines, the life of a wind farm from birth to death is described as 'long term'. In Northern Ireland, it is described as 'temporary'. In landscape terms such structures are 'temporary', as are all man made structures. In human terms, they are most definitely not.

drk 9 Sept 2013

2. Noise Levels

Question: Is the noise standard in PPS 18 adequate to protect residents from wind turbine noise?

Answer: No.

Reason: Noise from wind turbines is permitted to be far greater than for any other renewable source and the noise guidance on which it is based is seriously flawed, thus exposing the public to even greater noise levels.

Comment: The guidelines applied to wind energy applications are problematic and controversial and the noise assessment methodology is not based on generally accepted acoustical measurement and prediction procedures, but is based instead on a 1996 document known as 'ETSU-R-97'. Independent acoustical consultants across the world have found it to be seriously flawed and its use in place of the generally accepted procedures codified in ANSI and ISO standards, explains why projects that appear to be compatible with a community during the planning process later produce complaints of noise annoyance, sleep disturbance and other adverse health effects once operation commences.

Other renewable sources such as biomass plants may have to meet levels of 25dBA at night in quiet countryside whilst wind turbines can operate at over 40dBA when background noise may be well below 30dBA. Usually this would be an accepted cause for complaint, but wind noise receives special treatment. . The most bizarre result is that night time noise can be up to 8dBA more than the day time noise. No other standard anywhere in the world has a night time limit higher than a day time limit.

There are a number of difficulties with the ETSU-R-97 guidance.

It is out of date and it stated in 1996 that a revised report would be required in two years time. No such review has ever taken place, yet turbines are at least five times larger than those on which ETSU-R-97 was based;

The guidelines state that there should be separate noise limits for day and night time, and that the permitted noise level from turbines can be higher at night than during the day; yet many noise complaints made about wind turbines relate to sleep disturbance. ETSU-R-97 is the only noise guidance in the world that recommends higher levels of noise during the night than during the day;

The main difficulty with ETSU-R-97 is that it is quite unsuitable for quiet rural areas because, particularly at night, it sets noise limits not by what is acceptable or reasonable to protect

amenity but by what is the upper limit that can be tolerated. For example it often permits turbine noise levels four times as loud as the background noise level at night and just into the region where the World Health Organisation says that it may cause sleep disturbance. Since it was written, the WHO has revised its guidance 5dB lower. So the ETSU night standard is now higher than WHO says is required to get back to sleep;

Consultants working for the Business department (now the DECC) in 2006 indicated that the sound level permitted from turbines had been set so high — 43 decibels — that local people could be disturbed in particular wind conditions and likely to disrupt sleep. The report said the best way to protect locals was to cut the maximum permitted noise to 38 decibels, or 33 decibels if the machines created discernible “beating” noises as they spun. However, it later emerged that officials removed the warnings from the draft report by the consultants. The final version made no mention of them.

Any measurements at night are underestimated due to incorrect assumptions about the masking effects of wind near ground level, and turbines will therefore be producing more noise precisely when background noise levels are low. Atmospheric conditions at night mean higher pulse levels (producing ‘thumping’ noises), but investigations generally take place during the day. Likewise, the guidelines state that measurements should be taken outside properties, whereas complainants are usually more troubled by noise penetrating inside their homes;

Absolute noise level is less important than the character of the noise produced. Similarly, research suggests that wind turbine noise has special characteristics which are easily perceived, even as low sound pressure levels. This is also something that noise measurements do not take into account. Rather than noise being simply related to volume, perception of a noise as unpleasant, neutral or pleasing is much more complicated;

The Best Practice Guide to PPS 18 compares the likely noise levels from a wind turbine to those from a car or an office environment, missing the critical points that the quality of the sound, the appropriateness of the noise, and the source from which it arises are just as important as the level;

The current noise assessment practices and standards in the province, based on the discredited and obsolete document known as ETSU-R-97, are incompetent and unacceptable, and must be urgently reviewed. Future procedures must include full spectrum acoustic monitoring inside homes and workplaces with separation distances being applied that are appropriate to increasing turbine scale and acoustic emissions. Both the allocation of modest funding for independent research and an adherence to the precautionary principle, are an urgent necessity.

drk 9 Sept 2013

3. Low Frequency Noise

Question: Does PPS 18 protect residents from the effects of low frequency noise?

Answer: No.

Reason: PPS 18 ignores this type of noise.

Comment: As turbine sizes increase, pushing the blades into increasingly turbulent winds, the associated low frequency sounds increase and shift downward in the frequency spectrum. Because of this downward shift some larger wind turbines have lower dBA ratings than their smaller siblings. This has led to the incorrect conclusion that larger turbines are quieter.

One of the criticisms of the noise standard used by PPS 18 is that the ‘A’-weighted scale it uses to measure noise mostly excludes low frequency noise. . But much of the noise

produced by wind turbines is low frequency and it seems strange to use a scale that does not take into account fully, noise from an offending source.

Large wind turbines generate very low frequency sounds and infrasound (below 20 Hz) when the wind driving them is turbulent. The amount of infrasound depends on many factors, including the turbine manufacturer, wind speed, power output, local topography, and the presence of nearby turbines (increasing when the wake from one turbine enters the blades of another). The infrasound cannot be heard and is unrelated to the loudness of the sound that can be heard. Infrasound can only be measured with a sound level meter capable of detecting it (and not using the A-weighted scale). Infrasound at the level generated by wind turbines cannot be heard, but the human ear is indeed detecting and responding to it, as research clearly demonstrates.

The situation has been exacerbated by bad siting, poor measurement, and the fact that the ear is most sensitive to infrasound when other audible sounds are at low levels or absent. It has been known for many years that maximum stimulation of the ear with infrasound will occur inside the home, because the audible sound of the turbine is blocked by the walls of the house, but infrasound readily passes through. The infrasound will be strongly stimulating the ear even though this is unheard. But it can be felt as a resonance, typically in the chest or through the feet etc.

This problem has been recognised by the World Health Organisation, which has said that special attention should be given to noises in an environment with low background sound levels, where there are combinations of noise and vibrations; and where there are noises with low frequency components.

The factors listed above can lead to differing views about the existence of noise problems. If analysts are measuring for one type of noise, on a particular scale, but what is being heard is not recognised by this scale, this will underestimate any problems. What has been revealed by recent research is that wind turbines do produce significant levels of infra and low-frequency sound at great distances, even when the sound pressure levels do not rise to the thresholds of audibility, and that the greatest effect is indoors.

4. Shadow-flicker and reflected light

Question: Does 10 times rotor diameter prevent shadow flicker at a home?

Answer: No.

Reason: The original research on which this is based does not state this.

Comment: The claim that 'flicker effects have been proven to occur only within ten rotor diameters of a turbine' is one of a number of unsubstantiated statements made in the Best Practice Guide to PPS 18.

In correspondence with DECC, the source from which this statement was derived was confirmed as being from a paper by A.D. Clarke 1991 for Open University. However, this paper does not prove the ten rotor diameter claim. In fact its recommendation is 'that turbines should be sited at least ten diameters distance from habitations, and more if sited to the East/Southeast or West/Southwest, and the shadow path identified' (emphasis added). The research also contains a fundamental and demonstrable error that restricts its application.

This 10 rotor diameter assumption has also been decisively challenged by research from Delft University of Technology in the Netherlands, who, concluded that "there is no rule-of-thumb regarding the distance from a turbine where shadow flicker may be an issue", and by other comprehensive study. This is also confirmed locally, using the restrictive PPS 18 definition, identifying shadow flicker effects at distances of beyond 22 times the rotor diameter, the worst affected property being at 15 times the rotor diameter.

Other claims, such as the policy being based on a survey by PREDAC, an EU sponsored organisation, when examined, reveal a selective approach to the German model recommended by Predac itself. For example, not only does shadow-flicker occur inside a dwelling, German guidance clearly shows its existence outside the dwelling too. The 30 hours per year limit set by PPS 18 for shadow flicker through one window only, applies in the German standard to cumulative indoor and outdoor flicker.

The evidence indicates that the statement that only dwellings within 10 rotor diameters need to be considered likely to suffer shadow flicker is not correct and must be amended.

Finally, local environmental health departments are claiming that they have no remit or expertise to calculate the impact of shadow flicker on neighbours of turbines. No competent authority therefore exists to scrutinize the often minimalist claims made by developers, in clear breach of EU legislation.

5. Safety Impacts.

Question: PPS 18 states that 'There has been no example of injury to a member of the public.' Is this true? (BPG 1.3.50)

Answer: No. It was not true when it was written and is even more untrue now.

Reason: By 30th June 2008, a minimum of 48 people had been killed and 22 seriously injured as a result of wind farm operations. By 30 June 2013, this had risen to 136 deaths and 121 serious injuries. In the five years to 2011, 1,500 accidents occurred in the UK alone.

Comment: One impact of wind energy that has been generally ignored as almost irrelevant is that of the threat of injury due to a failure in the structure or components of a turbine. This is much more common than is generally known, and bears directly on the issue of separation distances.

Many accidents are not reported and examples of industry cover-ups abound since it is standard policy to obscure the frequency of turbine accidents. The lengths to which the industry will go to divert attention from the dangers of living too close to turbines were well illustrated on 10 February 2009 by Dale Vince of Ecotricity. As the Daily Telegraph noted at the time, he has been assiduous in spreading the story that the turbines which suffered catastrophic blade failure at his Conisholme power station might have been struck by a UFO or some other mysterious external agent:

Blade failure is particularly dangerous for neighbours of wind turbines because detached blades can 'plane' for long distances and fragments are cast using the velocity of the spinning blades to travel significantly further. As an example of the potential damage, a one centimetre slice through a 40 metre long turbine blade weighs 2¼ kg. Or 5 lbs. But how likely is this to occur?

According to the PPS 18 Best Practice Guide, 'Blade failure is therefore most unlikely. Even for blades with separate control surfaces on or comprising the tips of the blade, separation is most unlikely.' (BPG 1.3.51)

However, in one year in Germany, 36% of turbines suffered component failure.

A recent piece of EC - funded research by Loughborough University had the aim of identifying the problems of component failure and offering support to address it. This piece of UK based research estimated that from 8 to 10% of wind turbine blades will fail in some manner, the brakes controlling the speed of the blades will fail in another 7% of turbines, and the structure of 3% of turbines (which obviously support the blades) will fail.

A total of 265 separate incidents of blade failure were found to 30th June 2013, and pieces of blade are documented as travelling up to one mile. In Germany, blade pieces have gone through the roofs and walls of nearby buildings. This is why we believe that there should be a minimum distance of at least 2km between turbines and occupied housing or work places - in order to adequately address public safety and other issues including noise and shadow flicker.

The government's own Health & Safety Laboratory report entitled 'Numerical Modelling of Wind Turbine Blade Throw', demonstrated that blade fragments were being thrown distances of up to1,462 meters. The turbines in use in Northern Ireland are no different from those used in Germany or Denmark or England. Due to the unpredictability of such accidents, their significant scale and the high number of dwellings surrounding many wind turbine site, it is clear that safe separation distances are not being achieved.

Finally, neither the Health & Safety Executive, Environmental Health or any other local agency is prepared to take any responsibility for ensuring that accidents are recorded and that policy is informed by the results of experience.

6. Breach of European Union law and other international agreements and standards

Question: Is PPS 18 fully compliant with all relevant European and international legislation?

Answer: No.

Reason: PPS 18 does not fulfill the requirements of, and is in conflict with, a number of European and international laws and agreements.

Comment:

1. EIA Directive 2003 / 35 / EC

PPS 18 does not appear to recognize that it is a legal requirement that an impact assessment formin g part of an Environmental Statement must suppl y "the data required to identify and assess the main effects which the project is likely to have on the environment", and that the "direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project must be described". A noise assessment, for example, is re q uired to describe the 'levels and effects of noise from the development'. There is also an obli g ation that the 'democratic right of a member of the public to make representations must be meaningful and therefore the information which is made available must be sufficient to enable a member of the public:

(a) To respond to the significant effects on the environment to which it is suggested the project may give rise;

(b) To examine the project to see whether it is likely to give rise to significant effects which have not been identified.

The noise standard used by PPS 18 does not fulfill the requirement of a description of the likely significant effects in the EU Directive. Consequently it does not provide residents with a description of the significant effects of the development and so they do not know whether the impact is small or great – merely that it meets a target noise level set. Similarly, assessments of shadow flicker are frequently simply a zone of occurrence, usually wildly inaccurate and not quantifying the impacts as required in the EIA directive. Further, these are not verified since local environmental health departments are claiming that they have no remit or expertise to calculate the impact of shadow flicker on neighbours of turbines.

See, for example:

- EIA Directive 2003/35/EC, Article 5 paragraph 3
- EIA Directive 2003/35/EC, Annex IV, paragraph 4
- Environmental impact assessment: guide to procedures
- Newman J. in R (Burket) v London Borough of Hammersmith and
- Fulham, [2003] EWHC1031 para 8 (vii)

2. World Health Organisation

Noise is also about residential amenity. Many noise complaints made about wind turbines relate to sleep disturbance. Yet the noise standard used by PPS 18 is the only noise guidance in the entire world that recommends higher levels of noise during the night than during the day;

This guidance is quite unsuitable for quiet rural areas because, particularly at night, it sets noise limits not by what is acceptable or reasonable to protect amenity but by what is the upper limit that can be tolerated. For example it often permits turbine noise levels four times as loud as the background noise level at night and just into the region where the World Health Organisation says that it may cause sleep disturbance. Since it was written, the WHO has revised its guidance 5dB lower. So the PPS 18 night standard is now higher than WHO says is required to get back to sleep;

This updating of the night time level to 38dB as a result of the later WHO guidance was recently confirmed by the reporter in the Spittal Hill decision in Caithness in his recommendation to Scottish Ministers who accepted his recommendation to refuse the application.

The British Institute of Acoustics (IOA) will soon be the only organization left trying to defend a night time level of 43dB, and this is included in their recent Best Practice Guide, which they are trying to have accepted in Northern Ireland. There is no credibility in this position.

3. The United Nations Aarhus Convention

The international legal basis for wind energy disappeared in December 2012 when the Kyoto Protocol ceased being legally binding and now the Aarhus committee have ruled the UK is acting illegally.

The Aarhus Convention Compliance Committee has ruled unequivocally that the UK is non-compliant with Article 7 of the Convention. That ruling will have a profound effect on planning applications for wind farms right across the UK. This will call into question the legal validity of any further consents.

As noted by environmental lawyer, David Hart, QC,,:

‘This ruling means that consents and permissions for further wind-farm developments in Scotland and the UK are liable to challenge on the grounds that the necessary policy preliminaries have not been complied with and that, in effect, the public has been denied the chance to consider and contribute to the NREAP [National Renewable Energy Action Plan]’:

Until such time as the NREAP is fully compliant with the requirements defined under National and Community law and International Treaty Arrangements with regard to environmental democracy and public participation, there should now be a moratorium on such consents.

The opportunity to comment on a planning application is not “public participation” since neither Planning Authorities nor appeals mechanisms will countenance any discussion, never mind criticism, of “Government Policy”.

A halt to further consents until recommendations are implemented should now be automatic.

Deise Against Pylons Ireland

From: Deise Against Pylons
Sent: 28 February 2014 23:09
To: +Comm Environment Public Email
Subject: submission

To Whom It May Concern on the Panel of the Inquiry into Wind Energy in Northern Ireland

Energy costs

- Wind energy due to the enormous subsidies paid is very expensive energy and not sustainable. The EU have already stated that subsidies to the mature energy industry must cease. If Northern Ireland continues to pursue the overly ambitious renewable target for electricity this will create a non-competitive climate for industry in the future and thus lead to future job losses as is now happening in Germany. A competitive and unreliable supply of electricity , is what actually protects manufacturing and supports jobs. An over reliance on expensive wind energy will become a barrier to inward investment resulting in Northern Ireland failing to attract new jobs in the future.

Jobs

- Europe is now realizing that we can never be competitive with our high price of electricity which is primarily as a result of the subsidy / rates system and these subsidies only benefit private wind-farm developers. There are very little jobs in Wind energy in Northern Ireland as Northern Ireland has no history or prospect of wind turbine manufacture. The potential for jobs in Wind energy in Northern Ireland isn't "huge". Northern Ireland has no background in mechanical engineering and is unlikely to acquire the expertise to build turbines in the near future. In Scotland for the few jobs created in larger than Northern Ireland wind energy sector, it is estimated to **cost £154,000 per job in subsidies**

Tourist Jobs Loss

- Jobs will be lost in the Tourist industry if the Northern Ireland Government and private wind farm operators get their way and turn the very valuable Northern Ireland landscape into an industrial landscape. Europe and the Northern Ireland Government are effectively destroying its beautiful and priceless nature by providing huge subsidies to private wind-farm developers and promised large guaranteed returns to the investors.

Unstable Grid

- The number of wind farms envisaged to meet the target for Northern Ireland will make the Northern Ireland Grid unstable and dangerous, therefore it will lead to more episodes of 'lights out' and therefore a problem for economic recovery.

No Cost benefit analysis completed for NREAP

- The Government and its agencies thus far appear unable to provide any data to justify NREAP and Grid upgrade. A seriously flawed NREAP that has a very high risk of becoming a huge white elephant and therefore puts Northern Ireland at risk of going into another recession as a result of the wasted billions , resulting in very expensive and non-competitive energy cost . Northern Ireland needs to push alternatives - such as retrofitting insulation which would generate much needed jobs for Northern Ireland's unemployed workforce. Marie van der Hoeven of the International Energy Agency has said, 'Energy efficiency is our first fuel'.

Substantial installed wind capacity already

- Northern Ireland already has substantial installed wind capacity the technical and financial limit of wind in the energy mix is a maximum of 20%. There would be little need for continuing grid investment except for the expanding wind industry which threatens to destabilise the grid. The full costs of the Grid are spread across all consumers, rather than being charged to the wind farm developers. If the Northern Ireland government pursues higher renewable target for electricity, then this will mean large increases in electricity bills for the hard pressed consumer. Why not provide subsidies for retrofitting of the housing stock and thus it would give more disposable income by way of cheaper energy bills and thus relief for the hard pressed consumer. Retrofitting will result in more direct jobs and indirect jobs created as a result of more disposable income in the consumer's pocket. It will also lead to substantial reduction in CO2 emissions.

There appears to be a lack of environmental information, total lack of any cost benefit analysis and/or any other economic analyses and assumptions.

- The citizens of Northern Ireland have the right to be properly informed, to participate in the decision making and to have access to justice in relation to projects that have an environmental impact. (UN Aarhus Convention) Secretary of Deise Against Pylons Ireland

Regina O Brien

Department for Enterprise, Trade and Investment

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Sheila Mawhinney
Clerk to the Committee for the Environment
Environment Committee Office
Room 247
Parliament Buildings
Ballymiscaw
Belfast BT4 3XX.

3 March 2014

Dear Sheila

Invitation to Submit Written Evidence on the Environment Committee's Inquiry into Wind Energy

Thank you for your letter of 9 January 2014 and for the opportunity to submit evidence to the Environment Committee in relation to its inquiry into wind energy. This response addresses the third point within the Terms of Reference for this inquiry i.e. to review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

"Communities and Renewable Energy; A Study"

This study was commissioned by DETI, DOE and DARD as part of the work progressed through the Sustainable Energy Inter-departmental Working Group's subgroup on Planning and Renewable Energy and was published in October 2013. The study can be viewed online at:

- www.detini.gov.uk/communities_and_renewable_energy.pdf

The main aim of the assignment was to consider the relationship between communities and the development of renewable energy; and how communities can engage with developers and participate and/or benefit from renewable energy developments.

The three Departments have not accepted the recommendations included in the report but, as recommended by the study, have been awaiting the publication by the Department of Energy and Climate Change (DECC) of its Community Energy Strategy before formulating and consulting on a draft action plan to implement the recommendations of the NI report.

The DECC Strategy was published in January 2014 and can be viewed at:

- www.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

The three Departments are now considering the relevant aspects of the DECC Strategy for Northern Ireland and how best to include within our consideration of the recommendations from the Northern Ireland study.

I hope this is helpful. I am copying this response to the ETI Committee for information.

David McCune
DETI Assembly Liaison Officer

Drumsurn Concerned Community Group

From:

To:

CC:

Subject: FW: ehp.122-A20-ADifferentBreedofNoise.pdf

Date: Fri, 14 Feb 2014 14:43:46 +0000

Dear Ms Holmes,

Please read the important document on noise effects from wind turbines. This is alarming and something that seems to be being ignored here. We are not objecting to the siting of industrial sized wind farms and turbines close to our homes, just to be awkward. We have genuine concerns about our well-being, our health, our outlook on our beautiful scenery and the depreciation of the value of our homes and no one is listening to our concerns. This is why we are so opposed to the wind farm being built at Smulgedon Hill; it is too close to our community. We face years of detrimental impacts on all aspects of our lives. This should not be imposed on people against their will. Our authorities, our politicians, our planning and our health and environmental agencies are supposed to be protecting us, not destroying our lives and communities in the countryside.

When is our voice going to be heard and acted upon?

We hope that the forthcoming enquiry into wind farms at Stormont will finally bring out the reality and the truth about how detrimental wind farms are to people, when they are placed too close to peoples' homes and also how their unreliability and unsustainability does not justify depending on them, supposedly for the greater good of the whole country, at the cost of destroying many rural communities and lives.

We need to look at other forms of more reliable energy production. The announcement of the first Solar Farm in Co. Down makes so much more economic sense and doesn't have the massive impact that wind farms have. We need to look at wave power, hydro power—why not harness the power of the Bann? Even off shore wind farms would be more reliable than on shore and they wouldn't impact on people and communities. Wind power on land is not a solution to our energy needs, it is purely a means to satisfy EEC demands for renewable energy production, 20% by 2020. SO WHY ARE WE TRYING TO ACHIEVE 40% WHEN WE DON'T HAVE TO??? The greed and profit driven demands of the Wind Industry are succeeding in convincing Government that wind power is the answer. It is not, so when are those in power going to realise this, before it is too late?

We hope and pray that this forthcoming enquiry into wind power and its implication for rural communities will finally enlighten everyone as to the reality of wind power and the truths that the Wind Industry has succeeded in suppressing for too long because they have had the financial ability to do so. For too long Governments have been blindly convinced into believing that wind power is the answer to our energy needs when in fact it does not. It is only 25% efficient and requires constant back up from conventional fossil fuelled power stations. Denmark, with over 15,000 wind turbines was unable to close one fossil fuel powered station. Now such countries including Holland, Germany and USA are realising that wind power is not the answer. The Wind Industry cleverly move around the world seeking out countries that will give it huge subsidies to establish wind farms that are unreliable and unsustainable without those very subsidies. Meanwhile our landscape, our health, our well being, our rural communities, the value of our homes and our lives are being systematically destroyed because our Authorities are allowing these wind developments to be established too close to our homes, simply because the Wind Industry requests this to keep their

expenses down, by not having to buid wind farms in isolated and less accessible areas, away from communities and dwellings.

Lets invest in more reliable forms of renewable energy, such as Solar, hydro, wave, thorium (a safe replacement for plutonium) and even off shore wind power, which is at least more reliable than on shore.

Yours sincerely

Carlo Mc Closkey

Drumsurn Concerned Community

Yours sincerely, Carlo Mc Closkey

Drumsurn Concerned Community

From: Carlo McCloskey

Sent: 25 February 2014 20:51

To: +Comm Environment Public Email

Subject: Inquiry into Wind Energy

Dear MS. Mahinney (Clerk)

I represent the Drumsurn Concerned Community Group, from the Roe Valley (Limavady) area.

We already have a number of wind farms in our area both existing and proposed, namely Altahulion (existing) projected to eventually have 137 turbines; Temain (existing) with 10 turbines; Belraugh Rd (proposed) with 10 turbines; Benbradagh (proposed) with 14; and Smulgedon Hill (recently passed) with 7 proposed but the likelihood of a further 7 later.

In 2008 we tried to oppose Smulgedon as we felt it was too close to our homes and would be on a very small hill, thus impacting detrimentally on the landscape surrounding our properties.

We collected 340 objection letters, amassed evidence from bird and environmental experts advising against the proposal, had the full support of Limavady Council and Derry City Airport and despite all our efforts, Planning Officials gave permission for this development. At this stage we were not aware of the Health Issues now associated with industrial sized wind farms and turbines. This was a clear example of a Community's concerns being ridden over roughshod and being completely ignored. This wind farm was to be IMPOSED ON US whether we wanted or not and without any Consultation.

We have since made ourselves very much aware, through the Windwatch Group, of the real issues relating to wind power, its' unsustainability, unreliability, 25% efficiency, serious health problems because safe distancing is ignored, the depreciation in value of nearby homes, the detrimental effects on the landscape and bird life, the impact on peoples' well being, who choose to live in the countryside for its beauty and not to look out on massive manmade wind turbines that will not solve our energy problems, AS DISCOVERED IN DENMARK WHERE 15,000 TURBINES FAILED TO PERMIT THE CLOSURE OF A SINGLE FOSSIL FUEL POWERED STATION.

We have been trying ever since to have the Smulgedon Hill development rescinded because we believe it is the last straw here. We think that this area has done its share of hosting wind farms. We can tolerate Altahullion, Temain, even Benbradagh because at least our homes are not directly impacted, but Smulgedon is a step too close and we have recently tried to get the Environment Minister, Mr Durkan, to visit the area to see for himself our concerns. So far, no

luck, though I met him at Stormont briefly on 24 Feb, again through Wind Watch NI. and again invited him to come to see our community.

We feel that this Inquiry needs to focus on,

1. Increasing the distancing dramatically in line with the recommendations of many independent health experts to eg. 2 to 3 kms. PPS 18 is completely inadequate and was established at a time when wind turbines were only 30 metres high. Now they are 125 metres. Also, PPS 18 and ETSU were supposed to be reviewed within two years after their induction in 1997. This never happened, much to the satisfaction of the Wind Industry.

2. Ensuring that the concerns of Rural Communities really are taken on board so that such developments are not IMPOSED on communities, causing them to be fragmented and destroyed.

3. All relevant authorities should be working in tandem and consulting with each other in relation to applications, Public Health, Environmental Health, Health and Safety, Planning Office, and they should be following the guidelines issued by EEC. REGULATIONS on HUMAN RIGHTS and the AARHUS CONVENTION, both of which the UK have signed up to but are completely ignoring in regard to wind farm developments.

4. Wind power should not be being developed on the scale that it is here. N.I. is too small and there is not enough room to establish enough such developments to have a realistic impact on the need for renewable energy. It is not reliable enough and is only 25% efficient. It requires huge subsidies, so is unsustainable. Solar Power is much more reliable and does not impact on the environment or peoples' health and well being like wind power does. Also, other sources need to be developed, such as hydro, and wave, even off shore wind where the wind is at least more reliable. Wind power is pure folly and is only a quick way to meet EEC targets, which at 20%, have already been met, so why are we continuing with wind farms? Is it because DETI see it as a way of supplementing farmer' incomes??? Other people live in the countryside besides farmers.

5. At present local Authorities do not have the means or knowledge to properly assess the noise or shadow flicker problems which are caused by large turbines, so these things are being ignored, to the detriment of those forced to live close to them.

6. Other countries such as Holland, Denmark, Germany, USA, Canada have already discovered how peoples' health and well being can be detrimentally impacted and how unreliable wind farms really are, so why are we not learning from their mistakes?

7. There needs to be a full re appraisal of wind energy and it needs to be realised that it is not worth destroying our small, tourist dependent countryside by establishing a renewable energy source that has only one winner, The Wind Industry Corporations, which are swallowing our money and laughing all the way to the bank by persuading everyone that they are saving the planet!!!!

This is our submission for the above inquiry.

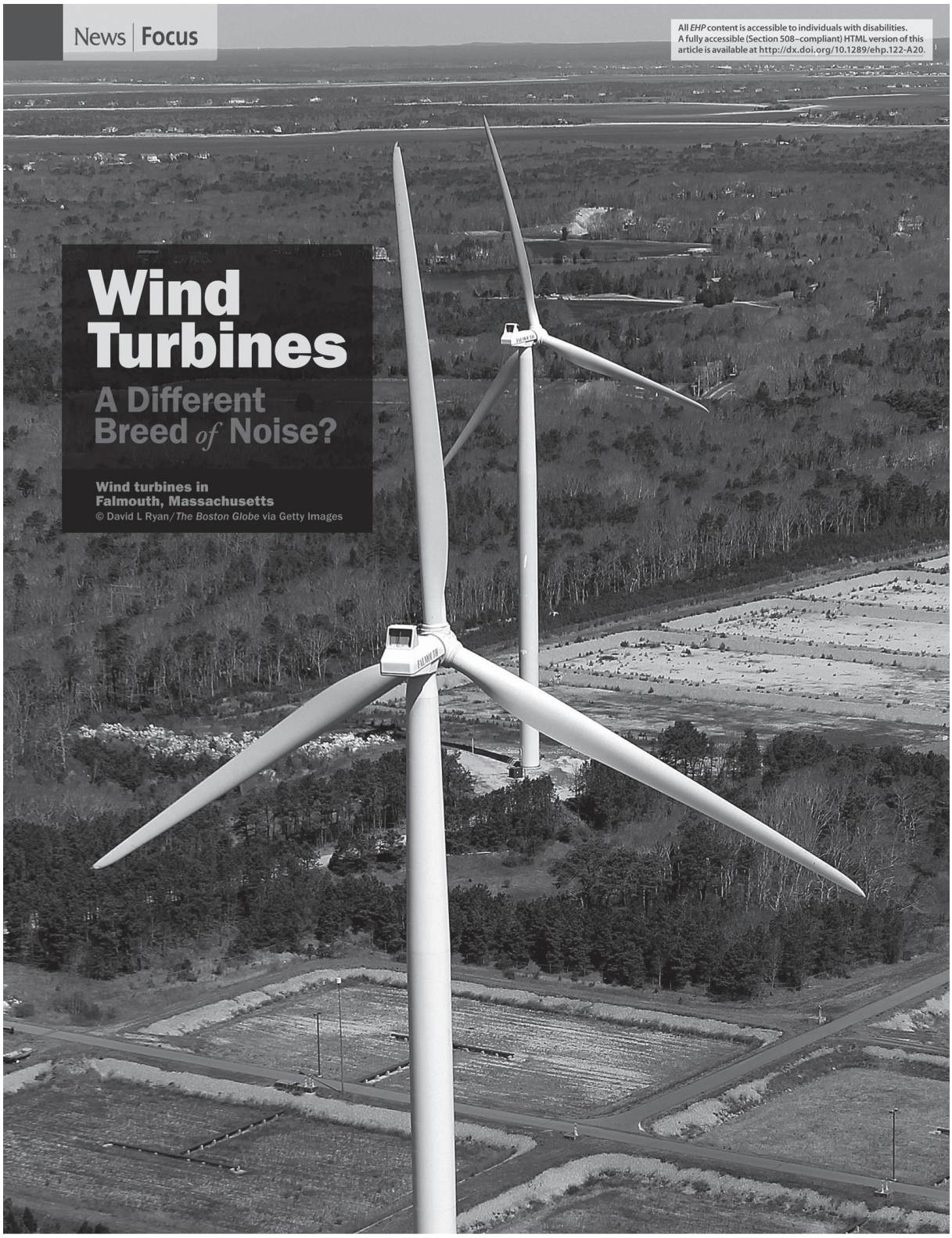
Carlo Mc Closkey

Drumsurn Community

News | Focus

Wind Turbines

A Different Breed *of* Noise?



Wind turbines in Falmouth, Massachusetts
© David L Ryan/*The Boston Globe* via Getty Images

Sue Hobart and her husband built their dream home in 2007 on a quiet, wooded lot outside Falmouth, Massachusetts. Five years later they abandoned it. Less than 1,500 feet from the empty house stands a mammoth wind turbine erected three years ago by Notus Clean Energy. Three blades mounted upon the 262-foot tower sweep an area of the sky equal to 1.3 acres, the size of a football field. They are visible through the forest from the house's meticulously landscaped yard.

But the problem with the property wasn't the degraded view—at least not for the Hobarts. The problem was the noise. Shortly after the turbine switched on in 2010, Sue began experiencing headaches, dizziness, insomnia, and a ringing in her ears. When she noticed the symptoms briefly disappeared during trips out of town, she began attributing them to the arrival of the turbine. Within two years she was ready to leave.

Fellow Falmouth resident Annie Hart Cool can relate. "We live on two and a half acres of land, and we can't use it because of the noise," she says. Cool and her husband live near one of two city-owned turbines installed in 2010 and 2011 that power a nearby wastewater treatment facility, with the excess energy providing a source of revenue for the city. "We were all so excited about it until it turned on, and then we realized we couldn't live with it," Cool says.

In all, 41 Falmouth families have formally complained to city leaders—as have countless other wind-farm neighbors in countries including Australia, Canada, and England. Meanwhile, a small but growing body of evidence has begun to suggest that the health impacts of wind farms can be very real.

Environmental Noise and Health

Researchers have been studying the impacts of environmental noise on human health since at least 1930.[1] Varying degrees of evidence exist for a wide range of nonauditory health effects potentially stemming from noise exposures, including cardiovascular disease,[2,3,4] hypertension,[5,6] stroke,[7,8] diabetes,[9] sleep disturbance,[10] endocrine effects,[11,12] minor psychiatric disorders,[13] and impaired cognitive development.[14]

Yet a March 2013 report by ENNAH, the European Network on Noise and Health, identified 12 areas in which the science of nonauditory health effects of noise still lacks sufficient evidence.[15] These include the extent to which air pollution and other coexposures may contribute to health effects identified in urban noise studies, the comparative health effects of short- and long-term noise exposures, and the relationship between individual health outcomes and noise sensitivity. "Noise sensitivity" has been defined multiple ways but generally refers to an individual's increased likelihood of perceiving noises as annoying—i.e., the person is both more attuned to and more bothered by noise.[16]

Although investigators may not know the exact nature of the relationship between noise and health impacts, or why noise affects some people differently than others, the evidence to date suggests that environmental noise pollution can have serious implications for public health. After air pollution, traffic noise is the second-largest environmental factor affecting human health in the European Union and Norway, according to a 2011 report by the World Health Organization.[17]

The authors of the WHO report estimate that each year, western Europeans lose 1.0–1.6 million disability-adjusted life-years (DALYs) due to traffic noise, a figure thought to be conservative despite accounting for impacts on cardiovascular disease, cognitive impairment in children, sleep disturbance, tinnitus, and annoyance. Sleep disturbance was determined to be responsible for the largest independent share of DALYs lost (903,000), and annoyance (654,000) the next-largest share.[17]

Based on its standing definition of health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity," the WHO concludes that noise-induced annoyance "may be considered an adverse effect on health."[17] High levels of annoyance have also been shown to lead to stress responses and sleep loss, including attendant symptoms such as headache, gastrointestinal upset, anxiety, fatigue, and hypertension.[18,19,20]

Much of what scientists can conclude today about the health effects of noise in general draws upon studies of transportation noise in urban areas conducted over the past four decades. Among the first to suggest a link between noise and learning impairment was a 1975 study by environmental psychologist Arline Bronzaft.[21] In a New York City elementary school adjacent to an elevated train track, Bronzaft compared the reading scores of children in classrooms facing the tracks to those of children in classrooms on the other side of the building. She discovered that children on the noisy side were nearly one year behind their peers in reading. After two years, once noise-abatement measures had been completed—and other classroom variables held constant—Bronzaft returned to the school and found reading scores on both sides of the building to be at the same grade level.[22]

Today, notwithstanding Bronzaft's groundbreaking early study and New York City's ongoing efforts to mitigate noise pollution, much of the field's cutting-edge research originates outside the United States, where there is more funding and interest surrounding the nonauditory health effects of environmental noise.

For instance, from 2002 to 2006 a landmark study dubbed HYENA (Hypertension and Exposure to Noise near Airports) assessed the relationship between noise from aircraft and road traffic near airports and its implications for hypertension. Researchers measured blood pressure and collected a range of health, socioeconomic, and lifestyle metrics via questionnaire from 4,861 individuals between the ages of 45 and 70. These participants had lived near one of six major European airports for at least five years. The study revealed clear relationships between risk of hypertension and both nighttime aircraft activity and average daily road noise, after adjusting for major confounders including age, sex, body mass index, alcohol intake, and physical activity.[23]

After air pollution, traffic noise is the second-largest environmental factor affecting human health in the European Union and Norway, according to a 2011 report by the World Health Organization. The report authors estimate that each year, western Europeans lose 1.0–1.6 million disability-adjusted life-years due to traffic noise.

Wind Turbines

Large-scale wind turbines are a relatively recent innovation, so the body of peer-reviewed research addressing the potential impacts of their unique brand of sound is sparse and particularly unsettled. Anecdotal evidence strongly suggests a connection between turbines and a constellation of symptoms including nausea, vertigo, blurred vision, unsteady movement, and difficulty reading, remembering, and thinking.[24]

The polarizing issue of wind-turbine noise is often framed one of two ways: Turbines are either harmless,[25] or they tend to

have powerful adverse effects, especially for sensitive individuals.[26] According to Jim Cummings, executive director of the nonprofit Acoustic Ecology Institute in Santa Fe, New Mexico, most of the reports to date that have concluded turbines are harmless examined "direct" effects of sound on people and tended to discount "indirect" effects moderated by annoyance, sleep disruption, and associated stress. But research that considered indirect pathways has yielded evidence strongly suggesting the potential for harm.

Multiple recent studies, including one coauthored by Daniel Shepherd, senior lecturer at New Zealand's Auckland University of Technology, have demonstrated that sleep interference gets worse the nearer residents are to turbines.[20,27] "Sleep is absolutely vital for an organism," he says. "When we lose a night's sleep, we become dysfunctional. The brain is an important organ, and if noise is disturbing its functioning, then that is a direct health effect."

In another recent study, Shepherd made a case for approaching the debate from a social or humanistic standpoint, taking perceived effects seriously even if the potential mechanisms through which they occur remain unclear. Many reasons exist for taking this approach with wind-turbine noise, he wrote.[28]

First is that turbine noise (that is, the aerodynamic noise produced by air moving around the spinning blades as opposed to any mechanical noise from the motor itself) is often deemed more annoying than the hum or roar of transportation noise because of its repetitive nature and high variability in both level and quality—from "swoosh" to "thump" to silence, all modulated by wind speed and direction. This pulsing, uneven quality enables the noise to repeatedly capture the attention and become more difficult to ignore.[29,30]

In addition, unlike vehicle traffic, which tends to get quieter after dark, turbines can sound louder overnight. As Cummings explains, "Often at night, wind shear sets in. This creates conditions with moderate winds at hub height and a sharp boundary layer below which winds are much lower, or even near still." The absolute noise level of the wind farm may be no more than during the day, but it can be 10–20 decibels louder than the quieter nighttime ambient sound levels. This detail has important implications for sleep disruption.

Third, wind turbines generate lower frequencies of sound than traffic. These lower frequencies tend to be judged as more annoying than higher frequencies and are more likely to travel through walls and windows.[31] Infrasound, or sound frequency lower than 20 Hz—inaudible to the human ear—has been associated in some studies with symptoms including fatigue, sleeplessness, and irritability,[32] as well as with changes to the physiology of the inner ear that have poorly understood implications.[33]

Many previous infrasound studies have looked at exposures in populations such as jet pilots and factory workers. Today, Cummings says, "There are some studies looking at whether wind turbine infrasound may have specific qualities that make it more apt to trigger health effects, especially nausea, than 'normal' infrasound from wind or waves or traffic, but these are still very preliminary."

Shepherd points out that residents of the rural and semirural areas—like Falmouth—where turbines are becoming more common may be a self-selected group who are naturally more sensitive to noise than the population at large. As such, they may have greater expectations of quiet and be more aware of noise disturbances, amplifying the potential for health effects related to environmental noise.[34]

"People live in these areas and create their own little patches of paradise, and part of that is the soundscape," Shepherd says. "When an industrial noise source comes in, they get very stressed, because they're losing something that is very dear to them." The negative feelings engendered by this loss of "amenity" (something that once brought joy) can further contribute to a feedback loop of stress, sleep loss, negative emotions, and related health impacts.[10,35]

But are quiet-seeking rural dwellers more prone to report health impacts from new turbines simply because they anticipate a negative outcome? That's the question surrounding the role of the "nocebo" effect—the flip side of placebo, where negative thoughts engender negative outcomes—which is yet another point of contention in the turbine-noise debate. The turbine nocebo effect gained currency worldwide following the March 2013 release of two Australian reports claiming to offer evidence that people who expect adverse effects of turbines—in part as a result of activism by groups such as Australia's Waubra Foundation—are more likely to report having them.

In Cummings' estimation, the two new studies are not as definitive as they purport to be.[36] One, a paper published at the University of Sydney,[37] considered no explanation of health effects other than nocebo. The other, a peer-reviewed study published in *Health Psychology*,[38] reported expectations to have, at most, a very small effect on either the number or severity of reported symptoms.[36] Still, the nocebo effect, whose role has been established in other areas of epidemiology and medicine,[39] may

Turbine noise is often deemed more annoying than transportation noise because of its high variability in both level and quality. Unlike vehicle traffic, which tends to get quieter at night, turbines can sound louder at night. And they generate lower frequencies of sound, which tend to be judged as more annoying than higher frequencies and are more likely to travel through walls and windows.

be impossible to rule out as at least a partial factor in some neighbor responses.

Looking Long Term

The gold standard for proving causality of an exposure is the randomized clinical trial. But when it comes to testing the health effects of noise exposure on humans, such a study design is likely to be not only impractical and difficult to implement, but also unethical.

The next-best evidence would come from longitudinal field research, many researchers agree, such as long-term studies that assess the health of a community before a turbine project is ever proposed and then continue to follow up during operation. Lercher notes that some effects of chronic noise exposure such as elevated blood pressure could take one or two decades to manifest at significant levels.

> High levels of annoyance have been shown to contribute to stress, sleep loss, and attendant health effects such as headaches, anxiety, fatigue, and hypertension.

Most of the studies performed to date around both transportation and wind-farm sources have been cross-sectional, which makes it impossible to assess causality. That's because investigators cannot establish whether the potential cause precedes the potential effect. Lercher stresses that cross-sectional studies purporting to demonstrate a relationship between noise exposures and health effects may be averaging out potential effects that are only visible in some subgroups—e.g., those with certain medical risk factors, or those exposed to the noise for longer than others.

Today, wind turbine noise is attracting ever more interest as a public health issue. That's evident in the offerings at NoiseCon, an annual conference dedicated to noise research, says Purdue University professor Patricia Davies. She chaired the 2013 conference, which was organized in conjunction with the International Wind Turbine Noise Conference in Denver, Colorado. Davis says Noise-Con is beginning to see nearly as many sessions organized around wind turbine noise as in all categories of transportation noise combined. "A few years ago, there were just occasional papers," she says. "Certainly there's more interest right now, because of course there have been a lot more wind turbines built."

Despite increased attention to the issue throughout Falmouth, some residents claim they're hardly better off today than they were when the first turbine switched on in March 2010. Once complaints about the turbines reached a fever pitch, the city voted to limit operation of its two turbines to 12 hours a day, shutting them down between 7 P.M. and 7 A.M. (the Notus Clean Energy unit was not affected).[40] The two city-owned turbines still follow that schedule[41] after surviving a recent petition to decommission them, and in spite of not generating enough income to cover operating costs. Their future remains uncertain.

Nate Seltenrich covers science and the environment from Petaluma, CA. His work has appeared in *High Country News*, *Sierra*, *Earth Island Journal*, the *San Francisco Chronicle*, and other local and national publications.

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Emma Kiely

From: Emma Kiely
Sent: 01 March 2014 05:16
To: +Comm Environment Public Email
Subject: Wind Energy Call for Evidence

Dear Anna Lo,

I welcome the opportunity to respond to the Environment Committee's Wind Energy Call for Evidence. I believe that it is imperative that we support the development of Northern Ireland's renewable energy resources. There are many benefits of doing so. These include lower carbon emissions, a more diverse energy supply, stabilising the volatile fossil fuel prices upon which so much of Northern Ireland relies and demonstrating our genuine commitment to addressing climate change.

A range of policies are already in place to mitigate any of the potential impacts of wind energy development. For example, PPS18, which sets out the planning framework for renewables, is an appropriate policy for the assessment of wind farm developments in Northern Ireland. The ETSU-R-97 limits are considered to be acceptable in assessing noise levels and these are the limits proposed across the UK by experts in their field.

Separation distances between wind farm developments and houses are not required by statute anywhere in the UK or Ireland and I do not believe that Northern Ireland should impose such limits. However, 500m is a common set-back distance and added to this is the ability of planners to set noise level limits at the houses likely to be significantly affected, and require these to be met by planning conditions.

I would also like to highlight that I support renewable energy and believe that Northern Ireland has among the best wind energy resources in the world. I think that it is important to support the development of these resources in a responsible manner. Policy-making in the complex arena of energy requires strong and robust evidence and a clear, ambitious vision for a low-carbon future.

Yours sincerely,

Emma Kiely

Emma McCarthy

From: Emma McCarthy
Sent: 27 February 2014 18:23
To: +Comm Environment Public Email
Subject: Renewable energy: call for evidence

Dear Anna Lo,

I welcome the opportunity to respond to the Environment Committee's Wind Energy Call for Evidence. I believe that it is imperative that we support the development of Northern Ireland's renewable energy resources. There are many benefits of doing so. These include lower carbon emissions, a more diverse energy supply, stabilising the volatile fossil fuel prices upon which so much of Northern Ireland relies and demonstrating our genuine commitment to addressing climate change.The devastating impact of climate change has been starkly evident this year, particularly in the South of England. It is important that politicians act in the long-term interest of society, despite the inevitable fact that some decisions may be unpopular amongst some in the short-term.

A range of policies are already in place to mitigate any of the potential impacts of wind energy development. For example, PPS18, which sets out the planning framework for renewables, is an appropriate policy for the assessment of wind farm developments in Northern Ireland. The ETSU-R-97 limits are considered to be acceptable in assessing noise levels and these are the limits proposed across the UK by experts in their field.

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I would also like to highlight that I support renewable energy and believe that Northern Ireland has among the best wind energy resources in the world. I think that it is important to support the development of these resources in a responsible manner. Policy-making in the complex arena of energy requires strong and robust evidence and a clear, ambitious vision for a low-carbon future.

Yours sincerely,

Emma McCarthy

Employment and Learning Committee

Northern Ireland Assembly

Committee for Employment and Learning
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Tel: +44 (0)28 9052 1448
cathie.white@niassembly.gov.uk

To: **Sheila Mawhinney**
Clerk to the Committee for the Environment

From: **Cathie White**
Clerk to the Employment and Learning Committee

Date: **17 January 2014**

Subject: **Inquiry into Wind Energy**

Sheila,

At its meeting on 15 January 2014, the Committee for Employment and Learning considered your correspondence, dated 18 December 2013, regarding the Committee for the Environment's inquiry into Wind Energy.

The Committee agreed to provide you with all correspondence received from the Universities and Colleges regarding Public Sector Renewable Generation Uptake for your consideration. The Committee also requested that it be kept updated on the progress of the inquiry.

Regards,

Cathie White
Committee Clerk

ENC

Department for
Employment
and Learning
www.delni.gov.uk

Mrs Cathie White,
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Our Ref: COR/215/13
23 May 2013

Dear Cathie

Thank you for your letter of 9 May in which you sought comments from the Department in relation to the NIARIS briefing paper on Public Sector and Renewable Generation Uptake.

Most of DEL's estate forms part of the NICS Estate which is owned and managed by DFP. The rest of our estate is leasehold arrangements with Private Landlords.

We understand that DFP, Properties Division, has no immediate plans to install renewable technologies within the existing estate or in new acquisitions as this is not viable from an economic or operational perspective. DFP will however reassess the application of renewables in the NICS office estate as the technologies further develop and the capital cost reduces.

The refurbishment of Adelaide House however, which is scheduled to start in October 2013, will be in line with Properties Division Policy to achieve a 'Very Good' Building Research Establishment Environmental Assessment Method (BREEAM) rating (within financial constraints).

DEL will continue to drive energy efficiency across its estate by reducing the carbon footprint through green and sustainable development measures and by promoting the behavioural change of staff.

DEL will also continue to fund, where possible, energy efficiency initiatives across its network of NDPBs and ALBs for example, Stranmillis University College were funded to install a Biomass boiler as part of the overall project on its new Orchard Building.

The University of Ulster was also funded for the erection of a wind turbine on its Coleraine campus.

Yours sincerely

FIONA STANLEY
Departmental Assembly Liaison Officer

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31 May 2013

Mr Robin Swann MLA
Chairperson
Committee for Employment and Learning
Room 373, Parliament Buildings
Ballymiscaw
Stormont, Belfast BT4 3XX

Dear Robin

Thank you for your invitation to respond to the report on Public Sector Renewable Generation Uptake. The report offers an interesting analysis of the incorporation of renewable energy generation across the public sector estate, together with some conclusions on the technology trials carried out at a number of sites across the estate.

Renewable energy, or indeed the broader heading of sustainable energy, is an area which all six regional colleges have strongly embraced, whether to support future economic growth through providing the facilities to support education and skills development or within the college estate itself. Current examples of development within the sector include the E3 Campus within Belfast Metropolitan College, the Centre for Renewable and Sustainable Technologies within South West College and also the planned Integrated, Sustainable Building Technology Centre within Southern Regional College.

Responses from the sector to the report tend to fall under two headings. Firstly, there is a view within the sector that renewable technologies should be incorporated primarily within new builds and fully integrated within the design if the benefits of the technologies are to be realised. The achievement of excellent classification within BREEAM, for example, would be typical of the goal of such new builds. There is a general concern that those installations assessed within the aforementioned report were retro installations which may not have allowed full demonstration of the benefits of the technologies. However, there is general agreement with the comments on solar thermal water heating.

The Association of Northern Ireland Colleges trading as Colleges Northern Ireland. Co. Registration NI. 033199. Registered Charity No. XR35461.

Secondly, the assessment appears to have been carried out on the basis of 'payback' against initial capital costs. This was primarily in respect of photovoltaic and solar heating, with biomass being inconclusive although there was a concern on the limited operating hours within office buildings. In respect of the latter, South West College has provided you with the findings of its assessment of biomass which currently provides in excess of 75% of the Omagh Campus' requirements. With regard to the report's comments on limited operating hours, colleges typically operate on a 14 hour day which further improves the viability of biomass systems. Importantly, the report makes reference to payback in the context of 'displaced grid energy cost', indicating that the assessments have focussed on current energy costs. It is important that such assessments of renewable sources also consider the sensitivities of future fuel prices and any impact of Middle East conflict which may have a major impact on the viability of renewable systems.

I trust that these comments will be of value.

Yours sincerely

Gerard Campbell
Chief Executive CNI

COOKSTOWN ■ DUNGANNON ■ ENNISKILLEN ■ OMAGH ■

Director Email

22 May 2013

Robin Swann MLA
Committee for Employment & Learning
Room 373 Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

Dear Robin

I thank you for your correspondence of 9 May 2013.

The three key findings are on page 4 and I comment on each of the following:

- The College agrees with your comments on solar thermal hot water. Installation and operational difficulties, in general, outweigh the benefits especially in a retro-fit situation within a public building.
- I would be more analytical prior to making this recommendation and would look at each situation separately, especially in view of decreasing costs and potential grant aid. A four to five year payback is good, if the fact that PVs do not present long term maintenance difficulties is taken into consideration.
- The College is using Biomass to provide in excess of 75% of the Omagh Campus requirements and is carrying out a Business Case analysis in Dungannon, in partnership with the District Council. The College, Council Offices and Swimming Pool are on adjacent sites and provide an opportunity for a District Heating System. It should be noted that colleges generally operate on a 14 hour day and this improves the viability of biomass heating. Also, modern biomass heating systems can operate using high moisture content biomass and this improves the fuel supply options. Another SWC Campus at Killyhevlin in Enniskillen uses wood pellets to fuel a biomass boiler; this is very successful.

Attached, for your perusal, is a presentation delivered by our Sustainability Officer this year.

Yours sincerely

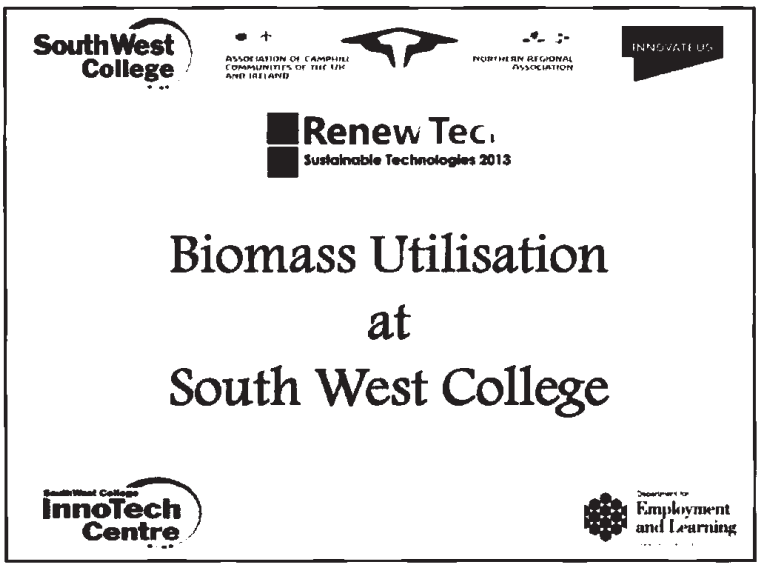
Malachy McAleer
Director

www.swc.ac.uk

Correspond to **Address** Tel Fax Textphone
Omagh

Campuses at **Address** Tel Fax Textphone

22/05/2013



Overview of SWC

- **Four College Campuses & Skills Centre**
  - Cookstown, Dungannon, Omagh & Enniskillen covering both Fermanagh and Tyrone
- Approx. **18,500 students enrolments**
  - skilled workforce **of approx. 1,000 people** (inc. both full and part-time staff)
- Curriculum courses ranging from subjects such as ICT, Business Studies, Engineering etc.

Renew Tec
Sustainable Technologies 2013

1

22/05/2013

Omagh Campus

- 150kW KWB biomass boiler commissioned in 2005
- Additional 250kW Catfire biomass boiler installed in 2008 (containerised boiler house & fuel store)
- Current installed capacity 400kW
- Biomass chip locally sourced (Winters Renewables Ltd.) approx. 9 miles from college.

Some additional modifications made to allow chip to be blown into fuel store

Renew Tech
Sustainable Technologies 2013

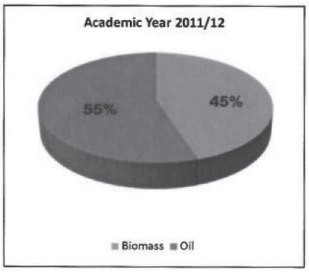
2

22/05/2013

Omagh Campus - Analysis

(figures based on 2011/12 academic year)

- Biomass served
  Approx. **45%** of campus heating
- Displaced –
  Approx. **63,983 litres of Oil Equivalent**
- Avoided –
  Approx. **171 tonnes of CO_2 Equivalent**
- Financial saving –
  £19,000 in comparison to using oil



Renew Tech
Sustainable Technologies 2013

Technology & Skills Centre

- **360kW** Gillies pellet boiler installed in 2009
- Pellets locally sourced from Brites –
  approx. **5 miles from Centre**
- In 2012 biomass served
  approx. **61%** of the Centre's heating demand
- Displaced –
  approx. **21,220 Litres of oil equivalent**
- Avoided –
  approx. **55 tonnes of CO_2 equivalent**

Renew Tech
Sustainable Technologies 2013

3

22/05/2013

Dungannon Sustainable Energy Consortium (DSEC)

- Collaboration between the South West College and Dungannon & South Tyrone Borough Council (DSTBC)
- Proposed installation of a biomass-fuelled district-heating system with the ability to serve:
    1. SWC Dungannon Campus
    2. DSTBC Office accommodation
    3. DSTBC leisure Centre

Renew Tech
Sustainable Technologies 2013

4

22/05/2013

DSEC – Project overview

- **Twin boiler solution**
  - accommodate the heat-load variability of all users
  - ensure increased operating efficiencies
- **Equipped with underground storage**
  - Approx. 140m^3
  - 1 delivery of chip per week during winter
    - i.e. lorry holding 110m^3 equating to 20t @ 30% MC
- **Utilising existing oil boilers**
  - Biomass will provide approx. 90% of annual heat requirement
  - Oil will serve as an additional/back-up heat source

Renew Tech
Sustainable Technologies 2013

DSEC – Project Drivers

- **Environmental Benefits**
  - Reduced CO_2 emissions
  - Conservation of dwindling fossil fuel supplies
- **Excellent curriculum resource tool**
  - Students at SWC
  - Local community within the Dungannon area
- **Financial Saving**
  - Saving in comparison to using oil
  - Renewable Heat Incentive (RHI)

Renew Tech
Sustainable Technologies 2013

5

22/05/2013

Thank You

Renew Tech
Sustainable Technologies 2013

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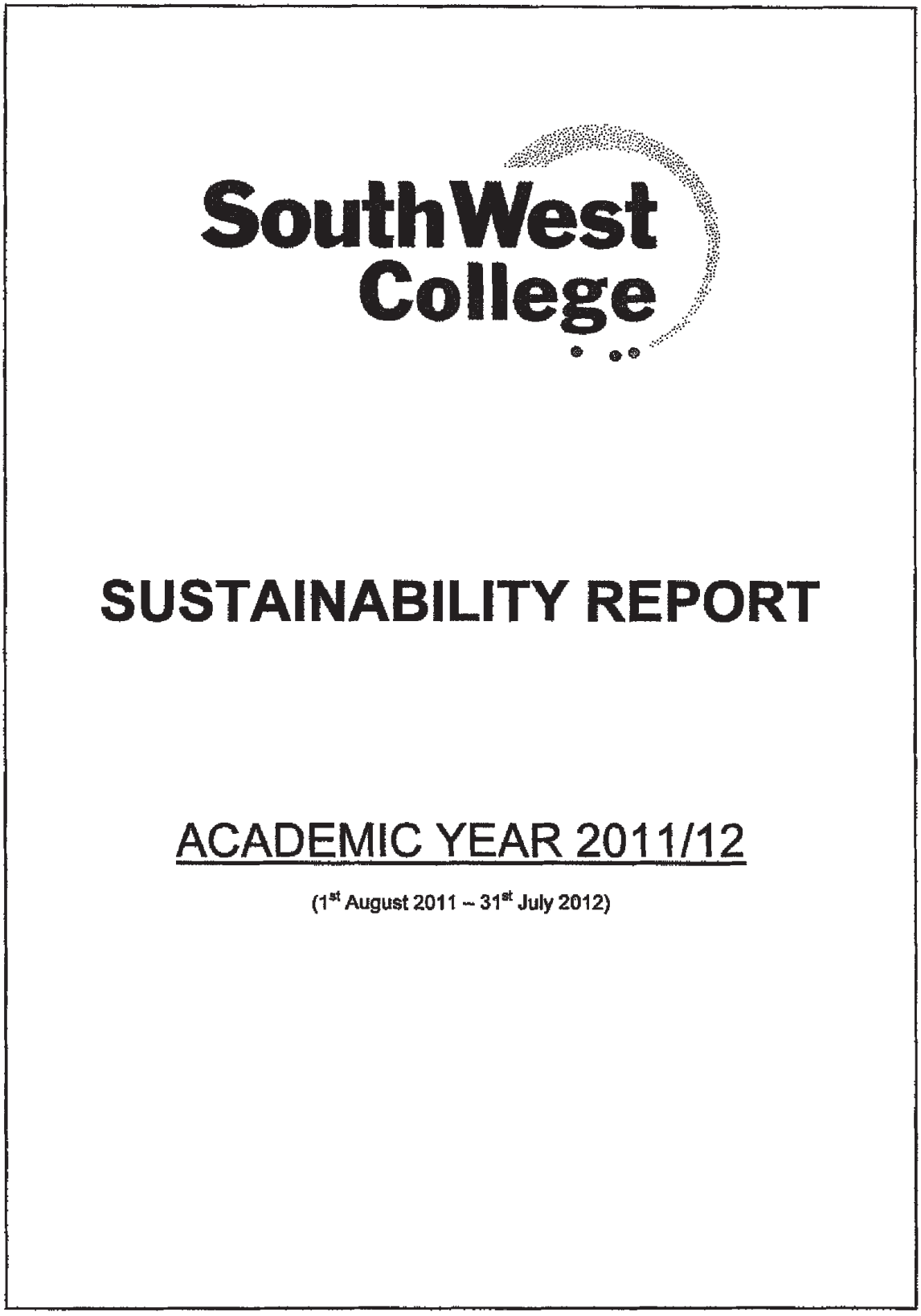
SouthWest
College
SUSTAINABILITY REPORT
ACADEMIC YEAR 2011/12
(1st August 2011 – 31st July 2012)

Table of Contents

1.0 College Sustainability Committee

The College Sustainability Committee met a total of three times during the recent academic year 2011/12. During this time the South West College has implemented numerous measures to improve energy efficiency - in order to become more sustainable. Whilst the College recognises that further improvements can be made; significant progress has been achieved.

Details of meetings:

2011/12 Academic Year		
Meeting 1	19th Jan 2012	Omagh campus, 3.30pm – 5pm
Meeting 2	17th April 2012	Enniskillen campus, 3.30pm – 5pm
Meeting 3	19th June 2012	Dungannon campus, 3.30- 5pm

The above Sustainability Committee meetings held throughout the year enabled the college to devise a structured energy management strategy consisting of the following;

- Devising and implementing energy efficiency action plans
- Setting realistic targets in relation to reducing energy consumption and costs
- Raise awareness among the College community i.e. staff and students.

2.0 Voltage Optimisation

Following consultation with our utility supplier (Electric Ireland) regarding excess electricity costs at both Omagh & Dungannon Campuses, it was recommended to explore the possibility of installing Voltage Optimisation units in an effort to reduce electicity consumption.

Voltage optimisation operates by reducing and regulating the incoming voltage to more efficient levels, thereby reducing carbon emissions and extending the life of existing appliances. Supply voltage can theoretically be anywhere between 207V and 250V depending on local conditions, however a typical building only requires 220V to function effectively.

After a detailed period of assessment by both Interserve FM and Harvey Group Ltd the feasibility study has determined that installing a VO unit at Omagh campus will generate an annual saving of approximately £9,654 per annum (approx.. 116,118 kWh) equating to an investment payback of approx. 4 years. Elsewhere, at Dungannon Campus the study has shown that installing a VO unit will generate a saving of approximately £8,117 per annum (96,623kWh) equating an investment payback for of 4 years. Findings generated from this study have proven that Voltage Optimisation would be a very effective method of reducing electricity consumption within the college.

3.0 Solar Energy

Recognising the potential of installing Photovoltaic panels at Cookstown Campus, a number of specialised solar energy companies have been contacted about undertaking a detailed feasibility study. It is expected that an initial examination of the campus will take place within the next number of weeks by Ambergreen Energy Ltd in which all site suitability factors will be assessed (i.e. solar radiation etc.). Not only will PV have the ability to reduce the carbon footprint of the college, but financial incentives such as the Renewable Obligation Certificates (ROC) will prove lucrative.

4.0 ISO 50001 (Energy Management Systems)

Costs have been obtained for the college to gain ISO 50001 (Energy Management System) accreditation. This accreditation will offer numerous benefits to the college, including; energy cost savings, reduced GHG emissions & carbon footprint and increased energy awareness amongst staff/students. However, this accreditation will also improve corporate image and credibility of the college, and if the process proves successful South West College will be the first FE College in Northern Ireland to obtain this prestige standard.

5.0 Sustainable Transportation

In line with the college sustainable transport policy/procedures the management of the South West College have decided to purchase a hybrid mini-bus. A tender has compiled

and advertised in both the Belfast Telegraph and College website. It is proposed that this vehicle will be an effective combination of both diesel and electric power – with the ability to reduce both fuel consumption and CO^2 emissions. One prospective supplier known as Ashwoods, retail a hybrid mini-bus which has the ability to utilise kinetic energy normally wasted during deceleration and use this energy to the assist the vehicle during periods of acceleration; therefore no plug-in charging is required. An approximate cost for this vehicle is in the region of £25,000; however the college has the opportunity to avail of the Government's Low Carbon Vehicle Procurement Programme which will reduce this price by approx. £3000.

6.0 Energy Improvements via Refurbishment activity

Throughout the summer period refurbishment work has been on-going at the Enniskillen campus. All 16 toilet rooms have been fitted with energy efficient hand driers (900w – previously 2400w), urinal sensor-flush controls, automatic extraction fans and also water-efficient taps. All walls have been repainted, whilst floors have been re-surfaced with non-slip PVC lino. Not only has such refurbishment improved the aesthetic appearance of the college, but will also improve overall energy efficiency.

7.0 Dungannon Sustainable Energy Consortium (D-SEC)

In May 2012, by the process of public procurement, Clearpower Ltd were contracted to undertake a detailed feasibility to assess the potential of installing a Biomass heating system with the ability to facilitate the heat demand of the college and council buildings (Inc. office and leisure centre). It was determined from this study that the project was economically and technically feasible under all scenarios examined. Capital costs for the project vary between £736,663 and £1,086,376 depending on the number of connected users, and the design option chosen. It was discovered that the most economical location for the proposed bioenergy centre would be beside the offices (Location D) with the plant having the ability to utilise municipal wood waste in conjunction with connecting only the 3 large heat users. In order to avail of the Renewable Heat Incentive (RHI) equating to approx. £30,000 per annum (20 year guarantee) – it would not make sound financial sense to connect the SELB Primary school & Nursery, suggesting that it

would be more appropriate for SELB Primary school & Nursery to install their own independent Biomass Boiler of 100kW and under in size, whilst availing of the higher RHI tariff of 5.9p/kWh. Currently, the process of obtaining outline planning for this project has begun, with the plant expected to be installed and commissioned by autumn 2013.

8.0 Upgrade of BEMS at Cookstown campus

The Building Energy Management System (BEMS) at Cookstown campus is in major need of upgrade in order to improve overall energy efficiency. ATC-ni has quoted a cost of approximately £3,282 (exc. VAT) to install specialised Trend 963S Server Supervisor Software which will enable a campus representative to monitor and record energy consumption within the building. The cost quoted includes creation & installation of Plant & Floor plan graphics, installation & commissioning onto Clients PC's, and Client demo & training. It is also important to note that approximately £1247.16 (38%) of this investment cost could be obtained from Libraries NI.

9.0 Sustainable Waste Management

The College has recently undergone changes to the way in which waste is managed. The new waste contractor (Skips Services Ltd) has the ability to collect the entire college waste ensuring that the highest possible recycling rates can be achieved in line the EU Waste Management Hierarchy. Monthly waste reports will be produced clearly outlining the type and quantity of waste collected at each campus, and the percentage of waste recycled/recovered etc. Along with routine bin/skip collection, Skip Services also have to ability to recycle industrial waste generated from the training workshops – whilst reimbursing the college for such high value goods (see prices quoted below). In total, switching from our previous waste contractors to Skips Services will generate a saving of approx. £6000 per annum on bin/skip collection alone.

Material	Price per Unit
Copper	£4250 per tonne
Ferrous metal	£150 per tonne
Compacted Cardboard	£75 per tonne
WEEE	£100 per tonne
Timber	£15 per tonne

With aid from Skip Services Ltd the college can now enter into a 100% recycling policy. It has been advised that internal segregation of waste (i.e. bin collection) within the college is not necessary as all waste will be segregated again by a combination of Mechanical technology and manual labour at the contractor's recovery facility. Therefore, internal segregated recycling bins are considered to be an unnecessary spend for the college.

10.0 Display Energy Certificates (DEC's)

DEC's for all campus buildings were successfully renewed by an accredited energy assessor and placed on the NI Landmark register. All five campus buildings have been reissued with an updated DEC. It has been duly noted that all five campus buildings are above the recommended standard in relation to building energy performance and energy improvements have occurred.

11.0 Carbon Trust Standard

The Carbon Trust Standard is a voluntary certification which provides independent verification and recognition for organising wishing to communicate that they are measuring, managing and reducing their carbon footprint. Organisations use this standard for communicating their environmental achievements and for demonstrating their proactive approach in this area. Costs for obtaining use certification are approximately £3500 (for a two year period). Such certification will allow use of the Carbon Trust Logo- which is an excellent marketing tool.

12.0 Energy Awareness Campaign

South West College has shown in the past year that it is fully committed to raising awareness among staff and students on energy efficiency and related issues. A range of measures that implemented throughout the year to promote and encourage both staff and students to save energy within the College:

Plasma screens have been used to great affect displaying energy saving advice and tips to promote good practice among students and staff. This information has been on display at all campuses. The college's most recent monthly energy consumption figures have also been displayed highlighting to staff and students the amount of energy we use and the need for conservation.

13.0 On-going Energy Efficiency Initiatives

Dungannon & Omagh Campuses

- Temperature room settings 17 – 19 °C
- Heating adjusted to reflect timetable schedule i.e. rooms that are not occupied are not being heated.
- External lighting (car parking/street and signage) adjusted in accordance with seasonal changes.

Enniskillen Campus & Skills Centre

- Heating time schedule in place with Caretaking staff allowing for manual interruption if necessary.
- External lighting (car parking/street and signage) adjusted in accordance with seasonal changes.

Cookstown

- Temperature room settings 17 – 19 °C
- External lighting (car parking/street and signage) adjusted in accordance with seasonal changes.

ENERGY ANALYSIS

1st August 2011 – 31st July 2012

Omagh Campus

Energy Consumption

			Annual Saving (%)		Annual saving (%)
	1095160	1109870	**+1.3%**	1117660	**+0.70%**
	123713	89975	**-27.27%**	80595	**-10.43%**
	9943	9861	**-1%**	7603	**-22.90%**

	565,225	591,245	+ 4.60%	678220	+ 14.71%

Note: All figures sourced above have been obtained from BMS at each campus.

Utility Saving

Omagh Campus Utility Saving (2011/12)	
Electricity	- Increase *7790kWh* - 7790 x £0.14 per kWh = £1090.60 - **£1090.60** (Increase in Electricity)
Oil	- Saving *9380 Litres* - 9380 Litres x £0.63 per Litre = £5909.40 - **£5909.40** (Saving in Oil)
Water	- Saving *2258* m^3 - 2258 m^3 x £2.52 per m^3 = £5765.76 - **£5690.16** (Saving in Oil)
TOTAL SAVING	£10,508.96

Biomass Analysis

Omagh Campus Biomass Saving (2011/12)	
678220 kWh x £0.031 = **£21,025** 678220 kWh @ 10.6 kWh = **63983 Litres** (Oil equivalent) 63983 x £0.63 per Litre (avg. price) = **£40,310**	
Estimated saving from using Biomass instead of oil	£19,285

CO^2 Analysis

	599.05	607.10	611.36
	331.55	241.133	238.56
	154.64	161.76	189.39

Note: Electricity based on a 10% renewable mix from supplier

Dungannon Campus

Energy Consumption

			Annual Saving (%)		Annual saving (%)
	987870	986591	**-0.13%**	971694	**-1.5%**
	146862	127217	**-13.38%**	112875	**-11.28%**
		6741	-	5834	**-13.45%**

Note: All figures sourced above have been obtained from BMS at each campus

Utility Saving

Dungannon Campus Utility Saving (2011/12)	
Electricity	- Saving *14,897kWh* - 14,897 x £0.14 per kWh = £2085.58 - **£2085.58** (saving in Electricity)
Oil	- Saving *14,342 Litres* - 14,342 Litres x £0.63 per Litre = £9035.46 - **£9035.46** (Saving in Oil)
Water	- Saving *907* m^3 - 907 m^3 x £2.52 per m^3 = £2.285.64 - **£2285.64** (Saving in Water)
TOTAL SAVING	£13406.68

CO^2 Analysis

	540.36	539.66	531.51
	393.59	340.94	334.11

Note: Electricity based on a 10% renewable mix from supplier

Cookstown Campus

Energy Consumption

			Annual Saving (%)		Annual saving (%)
	143008	134344	**-6.06%**	131308	**-2.26%**
	24,548	24005	**-2.21%**	20472	**-14.72%**

Note: Oil figures sourced from weekly meter readings at Cookstown campus, whilst electricity consumption figures have been obtained from supplier.

Utility Saving

Cookstown Campus Utility Saving (2011/12)	
Electricity	- Saving 3036 *kWh* - 3036 kWh x £0.14 per kWh = £425.04 - **£425.04** (Saving in Electricity)
Oil	- Saving *3533 Litres* - 3,533 Litres x £0.63 per Litre = £2225.79 - **£2225.29** (Saving in Oil)
TOTAL SAVING	**£2650.33**

CO^2 Analysis

	77.98	73.25	71.82
	65.79	64.33	60.60

Note: Electricity based on a 10% renewable mix from supplier

Enniskillen Campus

Energy Consumption

			Annual Saving (%)
	528670	546418	**+3.5%**

Note: Electricity consumption figures sourced from utility supplier

Oil Recordings only exist since January 2012

Utility Saving

Enniskillen Campus Utility Saving (2011/12)	
Electricity	- Increase *17,748 kWh* - 17,748 x £0.14 per kWh = - **£2484.72** (Increase in Electricity)
TOTAL SAVING	+ £2484.72

CO^2 Analysis

	289.18	298.89
	-	-

Note: Electricity based on a 10% renewable mix from supplier

Skills & Technology Centre

Energy Consumption

			Annual Saving (%)
	283901	276396	**-2.64%**

Note: Electricity consumption figures sourced from utility supplier

Oil Recordings only exist since January 2012

Utility Saving

Skills & Technology Centre Utility Saving (2011/12)	
Electricity	- Saving 7505 *kWh* - 7505 x £0.14 per kWh = - **£1050.70** (saving in Electricity)
TOTAL SAVING	£1050.70

CO^2 Analysis

	154.81	151.18
		-

Note: Electricity based on a 10% renewable mix from supplier

Biomass Analysis

Skills & Technology Centre Biomass Saving (2011/12)	
Approx. 50 tonnes consumed in 2011/12 period; 50 tonnes x 4300 kW per tonne = 215,000 kW 50 tonnes @ £146 per tonne = **£7300** 215,000 kW / 10.6 kW per litre = 20,283 Litres 20,283 L x £0.63 (avg. price) = **£12,778**	
Estimated saving from using Biomass instead of oil	£5,478

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31 May 2013

Mr Robin Swann MLA
Chairperson
Committee for Employment and Learning
Northern Ireland Assembly
Room 373
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

Dear Mr Swann

Briefing Paper on Public Sector Renewable Generation Uptake

The report indicates that the uptake of renewable energy across the public sector estate is limited. Furthermore, technical difficulties together with lengthy pay back periods have resulted in solar thermal hot water, solar pv and biomass not being recommended as suitable technologies.

From the University's perspective the findings of the report underpins our Carbon Management Plan (CMP) which aims to reduce the University carbon emissions in line with national targets. To achieve this the CMP identifies a number of strategies aimed at reducing energy consumption in conjunction with implementing conventional natural gas fuelled CHP as an alternative , lower carbon method of satisfying our energy requirements.

However, the University continues to review any developments in relation to renewable energy technology whilst appraising its suitability during the design phase of all new buildings and major refurbishments.

Yours sincerely

Professor Sir Peter Gregson
President and Vice-Chancellor

THE QUEEN'S ANNIVERSARY PRIZES
FOR HIGHER AND FURTHER EDUCATION 2011

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Robin Swann MLA
Chairperson
Committee for Employment and Learning
Room 373
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

20 May 2013

Dear Robin,

Renewable Energy Generation Strategy and Implementation

Further to your letter of 8 May 2013 regarding the above, I enclose details of the University's activities in this area.

Carbon Management Plan and On-site Renewables

The University has been pro-active in managing energy and environmental performance over the last 20 years. Current energy strategy is based around the Carbon Management Plan which seeks a 28% reduction in carbon emissions by 2020/21 from a baseline year of 2005/06. The University is currently on schedule to meet this target. In line with the Carbon Management Plan, the University continually assesses the feasibility of renewable energy sources including wind, biomass and solar power. Investments have been made in wind turbine generation and solar photovoltaic installations and further projects utilising these technologies are planned.

Coleraine Campus – Wind Turbine Generator

Given the advantages of the high average wind availability, a green field campus and an on-site electricity demand, the University identified Coleraine Campus as a potential location for a wind turbine project. In 2008 the University installed the first large scale wind turbine generator on any UK University Campus. The turbine is an 850KVA unit with a tower height of 55 meters and a blade diameter of 48 meters. The project cost £1.22M and was in receipt of a £1.08M grant funded from the NI Central Energy Efficiency Fund. During the most recent academic year 2011/12 the turbine generated 1,785MWH of electricity with net savings to the University of £270,000 and 929Tonnes of Carbon. This equated to renewable generation of around a quarter of the electricity used on Coleraine campus.
The turbine has also become a local landmark and stands as a symbol linking sustainability and the University of Ulster in the minds of students, staff, visitors and the local population.

Solar Photovoltaic Generation

In 2003 the University installed a 32KVA solar photovoltaic wall on its Jordanstown Campus ENERF Building, primarily as a research tool. The photovoltaic wall is connected to the campus electrical network and is capable of generating around 30,000KWH per annum with net savings of around £3000.

Future Plans

Given the evident financial and environmental benefits of the existing Coleraine campus Wind Turbine Generator, the University plans to erect a further two similar wind turbine generators on campus. The project is in receipt of planning permission and subject to identifying essential grant aid has a provisional completion date in 2016. Once the new turbines have been commissioned, over one half of the electricity used on campus will be generated through on-site wind power.

In addition, buildings planned as part of the University's new Belfast city campus will meet the "BREEAM Excellent" environmental standard and will incorporate large scale roof-mounted solar photovoltaic arrays. In conjunction with highly energy efficient building fabric, the use of renewable generation should make a major contribution to the achievement of Carbon Management Plan targets.

As always we are happy to discuss any aspect of our work with you and your committee.

With best wishes

Yours sincerely

Richard Barnett

Energy Generation and Wholesale Markets

Energy for generations

esb.ie

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Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast BT4 3XX

28 February 2014

By email to: committee.environment@niassembly.gov.uk.

Re: Response to Wind Energy Inquiry

Dear Ms Lo,

ESB Generation & Wholesale Markets (ESB) is a leading developer of wind generation projects in Northern Ireland (NI) with 73MW of operational plant and circa 30MW in development. In addition to these projects ESB also has 25MW of generation in the planning process and additional projects under consideration.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our low-carbon energy future.

We support the positions taken by NIRIG and reiterate the following points:

- We believe that the benefits of developing our wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development.
- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland.
- We strongly believe that the forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond.
- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments.
- Buffer zones or separation distances are not required by statute in the UK or Ireland and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions.

- We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector may be considered a leader in good practice on community engagement in Northern Ireland.

We would also like to highlight the need for positive leadership from across the political spectrum for the development of our substantial renewable energy resources. Our sustainable energy aims as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital. We continue to look forward to and are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind.

In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our low-carbon commitments.

Yours Sincerely

Gary Connolly

NI Development Manager

Fergal Campbell

From: Fergal Campbell
Sent: 27 February 2014 13:12
To: +Comm Environment Public Email
Subject: Wind Energy Inquiry

Dear Anna Lo,

I welcome the opportunity to respond to the Environment Committee's Wind Energy Call for Evidence. I believe that it is imperative that we support the development of Northern Ireland's renewable energy resources. There are many benefits of doing so. These include lower carbon emissions, a more diverse energy supply, stabilising the volatile fossil fuel prices upon which so much of Northern Ireland relies and demonstrating our genuine commitment to addressing climate change.

A range of policies are already in place to mitigate any of the potential impacts of wind energy development. For example, PPS18, which sets out the planning framework for renewables, is an appropriate policy for the assessment of wind farm developments in Northern Ireland. The ETSU-R-97 limits are considered to be acceptable in assessing noise levels and these are the limits proposed across the UK by experts in their field.

Separation distances between wind farm developments and houses are not required by statute anywhere in the UK or Ireland and I do not believe that Northern Ireland should impose such limits. However, 500m is a common set-back distance and added to this is the ability of planners to set noise level limits at the houses likely to be significantly affected, and require these to be met by planning conditions.

I would also like to highlight that I support renewable energy and believe that Northern Ireland has among the best wind energy resources in the world. I think that it is important to support the development of these resources in a responsible manner. Policy-making in the complex arena of energy requires strong and robust evidence and a clear, ambitious vision for a low-carbon future.

Yours sincerely,

Fergal Campbell

Sent from my BlackBerry® smartphone on O2

Fermanagh District Council

Dear Ms. Mawhinney,

I refer to your letter of 9th January 2014 inviting Fermanagh District Council to submit a written response to the above Inquiry.

The Environmental Health Committee of the Council considered the matter at its meeting held on 9th January 2014 and formed a Working Group to prepare a submission. Fermanagh District Council has now approved the Working Group's response and I attach herewith the response.

The Council's Planning Committee also recently approved a Guidance Protocol on Community Benefits from Wind Farms and presently this guidance is out for comment in the public domain. I also attach herewith a copy of the Protocol.

Yours sincerely,

Lynda Hutton
Head of Environmental Health

Response to Request for Comments Regarding the Northern Ireland Assembly, Committee for the Environment, Inquiry into Wind Energy

Fermanagh District Council would generally be in support of wind energy development but would highlight the following issues for consideration by the Committee for the Environment during the inquiry into wind energy.

1. Whilst Fermanagh District Council agrees that the conditions in PPS 18 satisfactorily cover visual and landscape impacts for wind turbine applications, the natural unspoilt beauty of Fermanagh is one of its greatest assets and is crucial to the development of the tourist potential in this area. Accordingly, the visual/landscape impacts of all wind energy development must be carefully assessed and the unique landscape protected. Consideration should also be given to using forestry land for wind energy developments.

2. Habitats and vulnerable species must be adequately considered in all wind energy developments. Of particular importance in Fermanagh is the protection of migration routes for birds.

3. Hydrological factors must be taken into account of in the development of wind farms on peat land to avoid contributing to future flooding.

4. Local environmental impacts of wind energy development including noise, shadow flicker, electromagnetic interference and ice throw, can be avoided or mitigated by careful location and siting.

5. Noise is the local amenity impact of most concern in view of the Council's statutory role in relation to noise nuisance. It is considered that the noise criteria used in the assessment of planning applications (ETSU-R-97) may not be appropriate for modern wind energy proposals and the guidance document (including its recommended noise limits) should be reviewed as soon as possible.

6. The Council has concerns that Planning NI's approach in not attaching complaint investigation conditions to single turbine applications could add to the potential burden on the Council, created by the legacy of inadequate or no conditions in the past. The Council would request a review of this situation to ensure consistency on wind

farm and single wind turbine applications and that similar conditions be attached by Planning Service to individual wind turbines as are presently attached to wind farms, i.e. complaint investigation conditions.

7. The Council requests that the 500 metre separation distance from wind farms as recommended in the Best Practice Guidance to PPS 18 become planning policy. Concerns were expressed that when Planners grant permission for a turbine or wind farm and relax distances to financially linked properties, problems can occur in the future if the premises are sold and a new occupier is no longer interested in financial benefit and has to tolerate the closer proximity of the wind turbines. In addition, the Council recommends that a minimum distance should be set for a single wind turbine to be located from an 'unconnected' property correlated to the scale of the turbine.

8. The Guidance should also be updated to consider the potential impact of the likelihood of approvals for applications being granted and the approval then 'blighting' neighbours from being able to develop a site near a wind turbine in the future.

Fermanagh District Council Guidance Protocol on Community Benefits from Wind Farms

1. Background

1.1 On the 06 June 2013, the Department of Energy and Climate Change (DECC) released their report on their 'Call for Evidence on Community Benefits from Onshore Wind'. The Report recommended an increase in the recommended community benefit package in England from £1000 per MW of installed capacity per year, to £5000 MW/Year for the life time of the Wind farm.

1.2 The report also recommended the following actions:

- Compulsory pre-application consultation with local communities.
- Clear and reliable evidence on the impacts on onshore wind, through an evidence toolkit.
- Develop good practice guidance for developers, communities and local government by Summer 2013.
- Development of a community engagement register in early 2014.
- Guidance for communities on how best to engage with developers.
- A register of community benefits in early 2014.
- Development of a community energy strategy by Autumn 2013.
- Production of guidance for potential supply chain business by the end of 2013.
- Band for onshore wind under the Renewable Obligation to stay as is.

1.3 In terms of the Northern Ireland context, the report said:

> *"The devolved administrations are already carrying out work on community engagements and benefits for onshore wind. They are fully engaged in this call for evidence, but reserve the right to use the evidence and adapt the outputs as appropriate for their countries."*

1.4 As Omagh District Council have already adopted this Guidance Protocol, both Councils could clearly advocate and lobby the wind industry for a fair and equitable approach to host communities in Northern Ireland.

1.5 It is recommended that the Committee:

- Approve the draft guidance protocol.
- Note that once the Guidance Protocol is approved, it is recommended it should be issued for a period of 12 weeks consultation. It is also recommended that it should be published on the Council's website and interested stakeholders invited to submit comments in writing to the Council.

Draft Guidance Protocol on community benefits derived from Wind farms in Fermanagh District Council area.

1. Introduction and Rationale

1.1 Fermanagh District Council are committed to maximising community benefit from renewable energy development. The Council assert that community benefit schemes should be an integral part of all wind farm developments in Fermanagh District Councils area. This guidance protocol gives an overview of the Councils' minimum requirements that will be

expected to apply to all future wind farm developments locally. It also is to be used as a framework of good practice which all existing wind farms will be measured against.

2. Definitions and Scope

2.1 This approved guidance protocol is based on developments where the turbines are above 50 metres in base to tip height. Schemes which are below the minimum of 2 or fewer turbines and either below 5 megawatts or below 50 metres in height from base to tip are not considered as part of this framework. Community benefits from smaller schemes, as defined above, are encouraged but are not currently part of this guidance protocol.

2.2 This guidance protocol sets out the principles Fermanagh District Council hold in relation to wind farm development in the district area as a whole. However, this guidance protocol has been developed to provide sufficient flexibility to allow for the negotiation of tailored solutions that address individual community circumstances. A key focus of this document is to encourage negotiated engagement between communities and developers. The council recognise that the potential exists for individual schemes to negotiate different/better terms.

2.3 This guidance protocol refers specifically to monetary benefits that are focused directly upon, and are more tangible to the local community living near a wind farm. They must include, but are not in any way limited to, a community fund which receives an annual lump sum or regular payments from the wind farm. Communities in Fermanagh District Council area can also benefit from local contracting and associated employment benefits, skills training and educational visits.

3. Guidance Protocol Statement

3.1 Fermanagh District Council require commercial wind farm developers located in Fermanagh District Councils area to contribute to a dedicated community benefit fund which will be used to help regenerate and sustain rural communities locally. For the lifetime of the operation of the wind farm all contributions will be directed exclusively to local projects within 8 miles of the exterior boundary of the wind farm, with 70% of the fund being allocated to the community living within 5 miles of the site and the remaining 30% being allocated to the community living within 8 miles of the site[1]. The developer will commit to making an initial payment based on installed capacity coupled with contributions payable annually and set at a standard rate of £5,000 per megawatt of installed capacity per annum, index linked.

4. Guidance Protocol Criteria

4.1 The following criteria present the framework for a formalised approach providing certainty to communities that live near onshore wind farms. These criteria have been agreed by Fermanagh District Council and apply to all schemes which fulfil the criteria outlined in 2.1 above.

4.1.1 A community benefit scheme will received support to a minimum value of at least £5,000 per megawatt of installed capacity per annum and will be index-linked with the retail price index for the lifetime of the project.

4.1.2 The developer will commit to making an initial payment based on installed capacity coupled with annual payments also based on installed capacity.

1 Where it is not possible to allocate 70% of the funding within 5 miles of the outer boundary of the wind farm, any unallocated funding shall be distributed within the wider proximity threshold of 8 miles.

4.1.3 70% of the community benefit fund should be allocated to the community living within 5 miles from the outer boundary of the wind farm. The remainder 30% should be allocated to the community living within 8 miles from outer boundary of the site.

4.1.4 The developer will commit to undertaking early and transparent dialogue with the Council and engaging in detailed community consultation and engagement.

4.1.5 Payments and benefits in kind under a community benefit scheme will commence not later than twelve months from the date of completion or commission of the wind farm (unless agreed by the developer to be paid earlier) and shall be provided on or before each anniversary date of the first payment or equivalent.

4.1.6 Payments and benefits in kind shall be provided for the duration of the commercial operation of the wind farm, irrespective of any change of ownership should it arise. Annual payments may be wholly or partially aggregated over the permitted operational life, as agreed through consultation with the community.

5. Statement of Community Benefit

5.1 At the time of submission of a planning application, or in advance of it if desired, the developer will sign and submit to the Council and relevant community and voluntary organisations a "Statement of Community Benefit" setting out the developer's commitment to provide benefits in accordance with the criteria identified above. This will ensure an open and transparent understanding of the minimum level of benefits that will accompany the project. The overall level of benefits shall be no less than that set out in this guidance protocol.

6. Annual Information Returns

6.1 In order to maintain clear evidence of the developer's commitment to providing community benefits in line with this guidance protocol, the developer shall make a return providing information to the Council and relevant community and voluntary organisations on request. This information will be used to record and verify the developer's continued commitment to engaging with local communities and to providing community benefits in line with the criteria outlined above.

6.2 An example of some of the information requested would be, but is not in any way limited to:

6.2.1 Value of benefits provided by the wind farm.

6.2.2 % revenue allocated to community benefits schemes.

6.3 In the event that a project is subsequently not taken forward into construction, the developer should duly notify the Council. The terms articulated in this guidance protocol should accompany the terms of sale and be upheld in any new ownership arrangement.

7. Review

7.1 This guidance protocol, including the minimum value of community benefit to be provided in connection with each wind farm, will be kept under regular review to ensure that it reflects best practice and market conditions. It will be reviewed at least once per year and revised at least once every five years.

September 2013

Fermanagh Trust

Anna Lo MLA
Chairperson of the Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

Friday 28th February 2014

Dear Chairperson,

Re: Submission by the Fermanagh Trust to the Inquiry into Wind Energy carried out by the Committee for the Environment

The Fermanagh Trust welcomes the opportunity to respond to the Committee for the Environment's Inquiry into Wind Energy.

The Fermanagh Trust aims to promote any charitable purpose and to support initiatives which will lead to social and community development, thereby improving the conditions of life for people in Co. Fermanagh and its immediate hinterland. Since being established in 1995, the Trust has supported hundreds of community based projects in the county. The Trust which is a registered charity, manages a range of funds and programmes dedicated to strengthening and improving local communities and finding solutions to the pressing community needs in Co. Fermanagh.

The Fermanagh Trust has experience of engaging with a number of wind farm developers. The Trust currently administers a community fund on behalf of a wind farm developer in Co. Fermanagh and has also previously acted in a consultancy role to another wind farm developer - providing advice to this developer on applications it received for its community funds at several different wind farm sites in Northern Ireland.

These experiences prompted the Fermanagh Trust to explore further the issues surrounding how communities can engage with wind energy. With the support of The Building Change Trust, the Fermanagh Trust conducted research into this field and published the report 'Maximising Community Outcomes from Wind Energy Developments' in January 2012.

The report explored the opportunities that exist for communities to engage with commercial onshore wind energy developments. The ways in which communities can benefit from wind energy development are highlighted, including the opportunities presented by community ownership. Good practice by local and national governments, the wind industry and the voluntary sector towards engaging and working in partnership with local communities was investigated.

The report also investigated the levels of community benefit being provided by developers into community funds in Northern Ireland. However the report showed that there was a disparity in the level of contribution being made by developers into community funds at approved wind farms in Northern Ireland in comparison with Great Britain, with host communities in Great Britain typically receiving a higher level of community benefit per MW per annum than communities in Northern Ireland.

The report made a series of recommendations for communities, councils, developers and Government. For more details please see the link below:

Mr Lauri McCusker – Director
Fermanagh House, Broadmeadow Place, Enniskillen, Co. Fermanagh BT74 7HR
T: 028 66 320210 F: 028 66 320230 E: info@fermanaghtrust.org www.fermanaghtrust.org

Registered as a Charity – Inland revenue Reference No. XR22580

The Fermanagh Trust (2012) *'Maximising Community Outcomes From Wind Energy Developments'*. Available at:
http://www.fermanaghtrust.org/cms/uploads/1/Wind_REPORT_2.pdf

Further to the report, the Fermanagh Trust has engaged extensively with stakeholders across the community and voluntary sector, the private sector and Government on these issues. The Fermanagh Trust has actively participated in conferences, consultations and discussions in order to help further the debate on how communities can engage with energy. This has included two meetings with Environment Minister Alex Attwood MLA and his officials.

The Trust which is a member of the Community Energy Coalition, recently gave oral evidence to the Committee for Enterprise, Trade and Investment regarding community benefits from wind farms and community energy. As part of this, the Fermanagh Trust submitted a briefing report to the Committee on these issues.

This report titled 'Communities and Energy' is available at:

Fermanagh Trust (2014) *'Communities and Energy'*

http://www.fermanaghtrust.org/images/custom/uploads/127/files/Presentation%20to%20ETI%20Committee.pdf

The Fermanagh Trust recently hosted an event on community energy with the Committee for Enterprise, Trade and Investment at Parliament Buildings, Stormont. The event which took place on 18th February 2014, importantly looked at ways communities can engage with energy including the concept of community ownership. A brochure on community energy was distributed to delegates by the Fermanagh Trust on the day of the event.

This brochure lays out what needs to be done to advance community energy in Northern Ireland. For more details please see the link below:

Fermanagh Trust (2014) *'Community Energy: Unleashing the potential for communities to power change'*. Available at:

http://www.fermanaghtrust.org/images/custom/uploads/127/files/Community%20Energy%281%29.pdf

Please do not hesitate to contact the Fermanagh Trust if you have any queries regarding our submission.

Yours faithfully,

Graeme Dunwoody

Research and Policy Officer

Fermanagh Trust Submission to Committee for the Environment's Inquiry into Wind Energy

The Fermanagh Trust's response is focused on two specific terms of reference of the inquiry. These include:

- To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment; and
- To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

Section 1.0

Term of Reference -

To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment

Currently under the Review of Public Administration (RPA), there will be significant forthcoming changes to the planning system and the role of local councils. We would like to draw your attention to approaches being taken by local authorities in other jurisdictions, such as East Ayrshire and South Lanarkshire Councils in Scotland. In their planning policy documents, these Councils make reference to developer contributions from renewable energy developments and spatial planning for wind energy in the local authority area.

In East Ayrshire for example, the Council is producing a new East Ayrshire Local Development Plan. Part of the development of this plan included producing a Main Issues Report, the purpose of which was to look at key areas of change and put forward preferred and alternative options for their future development. A consultation was made on this report and responses are being used to prepare the Proposed Plan, the next stage in the preparation of the East Ayrshire Local Development Plan.

East Ayrshire Local Development Plan: Main Issues Report (October 2012)
http://www.eastayrshire.gov.uk/BusinessAndTrade/PlanningAndBuildingStandards/LocalAndStatutoryDevelopmentPlans/MainIssuesReport.aspx

The Main Issues Report under 'Section 7: Planning for Renewable Energy' makes reference to a number of issues including: a spatial framework for large scale wind farms; the approach to small-medium sized wind turbine proposals and the Renewable Energy Fund (which refers to financial contributions made by developers).

South Lanarkshire Council for example, has produced its Proposed Local Development Plan. This makes reference to issues including the Wind Energy Supplementary Guidance; the preferred location for wind farms over 20MW and contributions made by operators of wind turbines/farms.

Proposed South Lanarkshire Local Development Plan, May 2013

https://www.southlanarkshire.gov.uk/downloads/file/7600/south_lanarkshire_local_development_plan_proposed_may_2013

Proposed South Lanarkshire Local Development Plan, Wind Energy Supplementary Guidance, May 2013

http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CDcQFjAB&url=http%3A%2F%2Fwww.southlanarkshire.gov.uk%2Fdownload%2Fdownloads%2Fid%2F7619%2Fwind_energy_supplementary_guidance_may_2013&ei=hvKuUpzrHqO00wWn04CACA&usg=AFQjCNH1RGtaNztbWZxHyE175lZpMij0aA

Given that Councils in Northern Ireland will have their own Development Plans in the near future, it is important that practice from other jurisdictions is learnt from when developing these plans.

The Fermanagh Trust is not advocating that PPS 18 and related supplementary guidance in Northern Ireland should adopt the same approaches/policies as those taken by East Ayrshire and South Lanarkshire Councils, but that the approaches/policies taken in other jurisdictions such as these are studied carefully. This may help assist in developing a long term strategy for wind energy development.

Section 2.0

Term of reference -

To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted

2.1 Introduction

The Fermanagh Trust believes that the public engagement and consultation with renewable energy developments need to be strengthened in Northern Ireland, and that the planning system has an important role to play in this.

The planning system in Northern Ireland must place strong requirements on developers to conduct thorough public engagement and consultation when developing a wind energy project. The role of local councils in the future will be important. The Fermanagh Trust welcomes new requirements placed on a range of stakeholders as laid out in the Planning Act (Northern Ireland) 2011. The Fermanagh Trust welcomes the Planning Act's requirements relating to pre-application community consultation and for a statement of community involvement to be produced.

Community engagement with wind energy projects of all scales (small, medium and large), needs to be improved.

2.2 Community engagement with wind energy

Strong engagement with the public, including local communities must take place throughout the process of developing a wind farm project. This should mean thorough engagement should take place during the following stages:

- Before submitting a planning application;
- During the period when the relevant authority/body is assessing the submitted planning application;
- Post planning approval (during the preparation for proceeding to construction and during the actual construction phase itself).
- Post construction (including ongoing maintenance)

Developers should engage the public and local communities as early as possible and enhance engagement throughout these stages. From our experience, often in Northern Ireland the process of informing the public with regards to wind farm developments is inadequate and not early enough. Local people are often unaware that a developer is considering submitting a planning application for a wind farm project and on many occasions local people are simply unaware that a planning application has been submitted at all. Currently as often is the case in Northern Ireland, if communities are given advance notice prior to a developer submitting a planning application for a wind energy project, this is often at very short notice for communities and public representatives to actively and appropriately comment and input into the development. In reality what is happening is developers are providing information but not actively engaging with communities.

The earlier developers can engage with local communities prior to submitting a planning application, the better the likely outcomes will be for all stakeholders. If developers engage and work with communities well in advance of submitting a planning application, this would help to keep local communities better informed and create opportunities for the local community to participate and influence the development process. Early engagement could for example create opportunities for the developer and communities to explore community ownership opportunities, or enhance any community benefit packages that may be offered by the developer.

Some of the benefits of extensive community engagement were seen at Airtricity's proposals to develop the Clyde Wind Farm in South Lanarkshire, Scotland. This example can be found in the Scottish Executive's Planning Advice Note 81. Airtricity's proposals at this site included a programme of consultation with the relevant statutory bodies, members of the public in addition to wider economic, social and environmental interests. The consultation included road show exhibitions, direct mail drops, door to door discussions, a trip to an existing wind farm and ongoing liaising with local media. This consultation process helped to keep the local community well informed and ensure that the local community had opportunities to participate and influence the development. **The consultation process resulted in fifty changes and twelve new layouts being made prior to the planning application being submitted**. Some turbines were resited to mitigate and avoid environmental and visual impact, and the proposed number of turbines was reduced.

Developers should continue to strongly engage communities whilst the planning application has been submitted and assessed for its merits by local authorities / relevant bodies. Developers should use a combination of extensive engagement methods. From the Fermanagh Trust's experience, developers in Northern Ireland need to do more to inform and consult communities throughout the process of developing a wind farm including post construction.

It is important for developers to continue to engage with communities after a wind farm has been developed. This is particularly important taking into account that local communities continue to have to live with the impacts of a wind farm and that there is a strong possibility that a future extension may be made to the wind farm or that it may be repowered. Ongoing maintenance post construction can also create disruption in the area surrounding the wind farm. Continued engagement post construction is also crucial if the developer has voluntarily provided a community benefits package for the local community.

2.3 Community Benefits

Community benefits are viewed as key components of the way in which communities can engage with wind energy development. In the context of wind energy, community benefits tend to be contributions made by a developer to communities which host a development. Developers need to continue to engage with the local community to ensure that contributions are effectively used in the local area and that the host communities are aware of any community funds available. It is the Fermanagh Trust's experience that post construction there is inadequate contact with local communities in the area surrounding wind farms, and often local people are unaware that a community benefits package exists. It is also important that developers continue to engage with communities post construction, as the needs of local communities may change and therefore the criteria of community funds may need to be adapted by the developer to meet the changing needs in the local area.

The leadership by Omagh, Strabane and Fermanagh District Councils on community benefits is to be strongly commended. Omagh and Strabane District Councils have jointly developed a draft guidance protocol on community benefits derived from wind farms in West Tyrone. The document which was recently out for public consultation, sets out the principles both Councils have in relation to wind farm development in the West Tyrone area. The draft guidance protocol states that 'The developer will commit to making an initial payment based on installed capacity coupled with contributions payable annually and set at a standard rate of £5,000 per megawatt of installed capacity per annum, index linked.'

Fermanagh District Council has developed a similar guidance protocol on community benefits derived from wind farms, which is currently out for consultation. For further details see http://www.fermanagh.gov.uk/consultations/consultations.html

The level of community benefit outlined by Omagh, Strabane and Fermanagh District Councils, is in line with the level of community benefit being offered at many wind farms in GB. It is also in line with the level promoted by the Scottish Government and the level agreed by

bodies representing the renewable energy industry, including RenewableUK and Scottish Renewables:

- RenewableUK (2013) Onshore Wind: Our Community Commitment. A commitment by the onshore wind industry to local communities. http://www.renewableuk.com/en/publications/reports.cfm/community-benefits-report

  Signatories to this Protocol have agreed to '…provide community benefit schemes in connection with eligible onshore wind schemes, of no less than £5,000 per MW per year or benefits-in-kind to an equivalent value'.

- Scottish Renewables (2013) Onshore Wind Community Benefit Protocol http://www.scottishrenewables.com/technologies/onshore-wind/ (accessed 28/02/14)

  The protocol states that onshore wind developers in Scotland will 'Deliver community benefit of £5,000/MW or equivalent for all new wind farms…'

However it should be noted that the protocol relating to community benefits developed by the Northern Ireland Renewables Industry Group (NIRIG) states that 'A community benefit scheme will receive support equivalent to a value of at least £1,000/MW of installed capacity per annum and will be index-linked for the lifetime of the project.'

For further details see the NIRIG Community Commitment Protocol, January 2013 http://www.ni-rig.org/wp-content/uploads/2013/01/NIRIG-Community-Commitment-FINAL.pdf

NIRIG is a joint collaboration between the Irish Wind Energy Association and RenewableUK. It is therefore extremely disappointing that the minimum level of community benefit outlined in NIRIG's Community Commitment Protocol is significantly less than the minimum level of community benefit outlined in RenewableUK's protocol, as outlined above.

2.4 Engagement by developers

More extensive engagement for wind farm development proposals could include the following:

- Face to face and group meetings to inform local communities of projects;
- Provide clear information on the development and address any concerns the public may have about the development such as noise and shadow flicker etc;
- Effective use of local media to inform the public;
- Conduct house visits, hold public exhibitions and open days; create liaison groups.
- Provide a direct point of contact which members of the local community can turn to for support;
- Provision of up to date information throughout the process. This could involve distributing newsletters on for example a quarterly basis;
- Creation of a dedicated website for the wind farm proposal which provides detailed information on the proposal, timeframes for the development, contact details, community benefit opportunities etc.

Developers in Northern Ireland need to do more and develop a more extensive community engagement process when developing a wind farm project, from the pre-planning application phase right through to post construction and maintenance phase.

An important issue to consider is the size of developments to which new requirements on preapplication community consultation will relate to under the Planning Act. It is the Fermanagh Trust's understanding that pre-application community consultation will only be needed for certain types of development. The Department will therefore need to clarify the thresholds which will be used to determine which developments require pre-application community consultation. Given the scale of future onshore wind energy development and the

significant impact on 'host' communities and the environment throughout Northern Ireland, it is vital that the Department sets the correct thresholds for determining which developments need pre-application community consultation. The Fermanagh Trust believes that a low threshold in relation to wind energy developments should be adopted when applying preapplication community consultation i.e. requirements for pre-application community consultation should include smaller wind energy developments.

The Fermanagh Trust believes that the pre-application community consultation report needs to demonstrate how comments raised during engagement have been taken into consideration, and that the public and community groups should have the opportunity to provide feedback on the pre-application community consultation report.

Consultation with communities should be comprehensive and take into consideration concerns raised. Consultation with communities should not be viewed as simply a hurdle which applicants have to overcome into order to obtain planning permission.

2.5 Community Ownership

There needs to be more opportunities for communities to avail of ownership in wind developments. Community ownership presents significant economic and social opportunities. Early engagement by developers with communities is key to advancing community ownership in wind energy developments. Community ownership can:

- generate a long-term sustainable income for communities;
- help to empower and give autonomy to local people;
- help to strengthen communities and help to tackle pressing local issues such as fuel poverty;
- save communities money on their energy bills;
- strengthen communities and provide greater community cohesion and resilience;
- help to tackle climate change;
- contribute to the local economy;
- allows energy to be generated locally and enables people to have greater control over their energy supply.

The Fermanagh Trust would recommend that the Committee and the Northern Ireland Executive explores Denmark's approach to onshore wind energy development.

In Denmark, the Promotion of Renewable Energy Act came into force on 1st January 2009. This includes schemes which promote the development of onshore turbines including:

- Loss of value to real property due to the development of wind turbines – the developer of a wind turbine has a duty to pay compensation for loss of value of real property further to the development of the wind turbine. An appraisal authority determines the size of the loss of value.
- Local citizens' option to purchase wind turbine shares - this requires a duty on the developer of a wind turbine to offer at least 20% of the shares in the wind turbine to those with an option to purchase.
- A scheme to enhance local scenic and recreational values – the scheme can provide subsidies for initiatives launched to promote local acceptance of new onshore wind turbines.
- A fund to support financing of preliminary investigations – the fund helps to finance preliminary investigations etc by local groups. This helps to act as a security and improve decision making for those stakeholders who are considering developing a turbine. The

fund could for example be used to explore the financial details of developing a wind turbine and the effect it might have on local people.

For further details of the schemes outlined above see
http://www.ens.dk/en/supply/renewable-energy/wind-power/onshore-wind-power

Promotion of Renewable Energy Act
http://www.ens.dk/sites/ens.dk/files/supply/renewable-energy/wind-power/onshore-windpower/Promotion%20of%20Renewable%20Energy%20Act%20-%20extract.pdf

The Fermanagh Trust supports creating opportunities to advance community ownership of renewable energy projects, including wind energy. The Fermanagh Trust strongly supports the Department of Energy and Climate Change's (DECC) approach to encouraging community ownership, as laid out in the recent DECC Community Energy Strategy (see section 2.6 for more details). The Fermanagh Trust encourages the Committee and the Northern Ireland Executive to endorse DECC's approach to this vital issue.

Finally, it should also be noted that in Denmark, there is a register of wind turbines. This is a national database which contains all power producing wind turbines. This includes information on location, size and output for each wind turbine. For more information see:

Danish Energy Agency http://www.ens.dk/en/info/facts-figures/energy-statistics-indicatorsenergy-efficiency/overview-energy-sector/register

2.6 DECC approach to strengthening how communities engage with energy

The Fermanagh Trust strongly encourages the Committee and the Northern Ireland Executive to learn and adopt best practice by Government, the private sector and the voluntary sector in other jurisdictions. Whilst it is encouraging that action is being taken in Northern Ireland, it is important to recognise that the issue of how communities engage with energy has received far greater attention in GB.

In GB and across Northern Europe, a far more proactive approach has been taken to improving and strengthening community engagement with renewable energy. In GB this can be clearly seen in Government policy; by recent measures announced by the Government to strengthen community engagement; the Community Energy Strategy; and the increasingly proactive approach taken by communities who have been prepared to develop and get involved in community energy projects. There appears to be real merit for Government, the private sector and communities to embrace current best practice and action is being taken in order to advance these issues further. A number of notable developments are/have appened

in GB including:

i) DECC's response to the Onshore Wind Call for Evidence. The Government response includes setting out a series of measures and an action plan aimed at strengthening engagement and empowering local people. This includes addressing the following elements:

   1. Compulsory pre-application consultation with local communities in planning for onshore wind;
   2. Empowering communities in planning;
   3. Engagement guidance – bench marking and monitoring good practice;
   4. Fivefold increase in community benefit package value to £5,000/MW/year;
   5. Transparency and flexibility of benefits – register and guidance;
   6. Community ownership and buy-in;
   7. Enhancing local economic impacts.

DECC (2013) *Onshore Wind Call for Evidence: Government Response to Part A (Community Engagement and Benefits) and Part B (Costs)*. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205423/onshore_wind_call_for_evidence_response.pdf

The Northern Ireland Executive has been fully engaged in the Onshore Wind Call for Evidence.

ii) On 27th January 2014, DECC launched the Community Energy Strategy. The Strategy sets out the Government's vision for community energy, along with a plan to make that vision a reality.

DECC has identified a number key issues facing community energy and has set out actions to address them. The issues include the role of partnerships; community capability and capacity; and evaluation and measuring impact.

Under the role of partnerships, the need to strengthen the relationship between communities and commercial renewable energy developers has been clearly identified. DECC has outlined the need to facilitate industry-community models on shared ownership and has stated that 'We expect that by 2015 it will be the norm for communities to be offered the opportunity of some level of ownership of new, commercially developed onshore renewables projects. We will review progress in 2015 and if this is limited, we will consider requiring all developers to offer the opportunity of a shared ownership element to communities.'

This is extremely important to take into consideration, particularly given the contribution which onshore wind energy makes to Northern Ireland's target of achieving 40% of its electricity consumption by 2020 and the impact which this has on host communities.

The Secretary of State for Energy & Climate Change has asked an industry and community taskforce to develop a plan in relation to the commitment by the renewables industry to facilitate a substantial increase in shared ownership, and to report back to him by summer 2014. DECC has recently produced a discussion document on these issues titled *'Community Right to Buy In to Renewable Electricity Generation Developments: Discussion Document'*. Responses to this discussion document should submitted by Friday 7th March 2014. Please find attached a copy of this discussion document. **The Fermanagh Trust strongly advocates that the enabling powers and scope of the Community Right to Buy In should be extended to Northern Ireland**.

The Community Energy Strategy therefore presents an important chance to maximise opportunities for communities in Northern Ireland, and make communities an integral part of energy policy alongside Government and the private sector.

The Fermanagh Trust welcomes the DECC Community Energy Strategy and is delighted that the **Northern Ireland Executive has been fully engaged in its development**.

In order to improve how communities engage with wind energy in Northern Ireland, the Fermanagh Trust would strongly encourage the Environment Committee and the Northern Ireland Executive to closely study the actions laid out by DECC in its response to the Onshore Wind Call for Evidence and the Community Energy Strategy. **DECC's approach demonstrates how engagement is to be best promoted**.

2.7 Scottish Government Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments

The Scottish Government recently launched its Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments. This document outlines good practice principles and procedures promoted by the Scottish Government. It also refers to the identification of a community; governance issues; public consultation on community benefits;

and the role of developers/operators. The public consultation for the document ended on 17th January 2014.

The document notes 'Hence the key principles of our national guidance are the promotion of a national rate for onshore wind community benefits packages equivalent to at least £5,000 per MW per year, index linked for the operational lifetime of the development, together with the consideration by developers of the scope for community investment.'

It is also states that the Scottish Government will develop guidance to cover community benefits from offshore renewables in 2014.

Scottish Government Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments http://www.scotland.gov.uk/Resource/0043/00438782.pdf

2.8 Other studies relating to how communities can engage with energy

i) 'Communities and Renewable Energy: a Study'

In Northern Ireland, consultants were commissioned by **DETI, along with DOE and DARD**, to conduct a study into communities and energy in Northern Ireland in December 2012/ January 2013. This had a particular focus on the relationship between communities and the development of renewable energy, and how communities can engage with developers and participate and / or benefit from renewable energy developments. This resulted in the report 'Communities and Renewable Energy: a Study' being published in October 2013. The report made a series of recommendations.

Further to this report, DETI in partnership with DoE and DARD have a view to formulate and consult on a draft action plan to support communities and renewable energy. This action plan needs to at least match what has been outlined in DECC's Community Energy Strategy in order to improve community engagement with energy, by putting in place the necessary support and mechanisms in Northern Ireland. The action plan also needs to at least match measures set out in DECC's response to the Onshore Wind Call for Evidence.

ii) ResRepublica (2013) 'The Community Renewables Economy: Starting up, scaling up and spinning out'

Both Greg Barker MP, Minister of State for Climate Change and RenewableUK Chief Executive Maria McCaffrey have written a foreword to this report. Respublica is a UK thinktank.

Greg Barker MP stated that 'I welcome the ideas in this report on helping communities navigate the planning system, and on forming productive partnerships so that they are better able to take an active role in their own local projects. Our aim is to help communities and local businesses seize this exciting opportunity.'

Available at:
http://www.respublica.org.uk/documents/yqq_Community%20Renewables%20Economy.pdf

Through a press release, in addition to her foreword the Chief Executive of RenewableUK also added regarding the report that:

'This report highlights the exciting prospect of communities working more closely with local wind farm developers, local businesses and local authorities in jointly-owned projects. Using this socially and economically-inclusive model, we have an opportunity to redefine the relationship between communities and developers to unlock a significant growth in community energy, particularly in onshore wind. This will enable all of us to reap the economic and environmental benefits of wind energy at a truly local level.'[1]

1 RenewableUK (2013) Enable local communities to own and invest in more local wind farms-new report. http://www.renewableuk.com/en/news/press-releases.cfm/2013-09-1-enable-local-communities-to-own-andinvest-in-more-local-wind-farms-new-report (accessed 28/02/14)

RenewableUK's support for this report is important to note, especially given that the Northern Ireland Renewables Industry Group is a joint collaboration between RenewableUK and the Irish Wind Energy Association.

Below is a summary of the six recommendations made by the report:

1. Incentivise the joint ownership of community energy
2. Extend the planned register of community benefit to include a portal for developercommunity 'match-making'.
3. Establish partnerships with leading 'pathfinder' local authorities to develop models of co-operation
4. Encourage the local authorities to act as financial intermediaries
5. Pilot local energy development plans and a planning fast-track for community renewable projects
6. Pilot Community Commissions

For details of the report see:

ResRepublica (2013) *'The Community Renewables Economy: Starting up, scaling up and spinning out'*

http://www.respublica.org.uk/documents/yqq_Community%20Renewables%20Economy.pdf

The Fermanagh Trust encourages the Committee and Northern Ireland Executive to study the findings of this report and its recommendations.

2.9 Planning and Community Benefits Summit

The **Minister of the Environment Alex Attwood MLA** held a Planning and Community Benefits Summit in June 2013. The Summit provided the opportunity for practitioners in the public, local government, academic, community and voluntary sectors to look at how planning and other processes could allow communities to benefit from major developments in their areas. **The Minister agreed** a series of next step actions which included three streams of work to build in and embed community benefits[2]:

'1. Policy and Practice:

a) develop a guidance circular on planning and community benefit
b) identify and promote good practice to communities;
c) introduce an assessment of Community Benefit opportunity (separate from Pre Application Discussions) early in the process;
d) escalate the range of Community Benefit opportunities - especially through Article 40;
e) re-examine how applications are advertised;
f) introduce a register of community benefits; and
g) establish a fund for communities to both set up community trusts and develop a business case.

2. Planners will identify any projects currently in the planning system where there are community benefit opportunities.

2 Planning and Community Benefits Ministerial Summit Report (2013).

3. Government spending should have conditions attached to how the money should be spent for community benefit (e.g. facilities, labour clauses and placements; supply of services; etc.).'

The Minister also stated his intention to hold another Summit on the area of planning and community benefit later in 2013. This however has not come to fruition and we are still waiting upon the series of next step actions.

2.10 Development of wind energy on Forest Service land in Northern Ireland

The Forest Service Business Plan 2013/2014 notes that forestry land '…has strong potential for development of wind-farms, subject to planning approval, grid connection, agreement on community benefits and securing financial backing; during 2013-2014 we will work closely with the Strategic Investment Board to develop plans to exploit the best opportunities for wind-farm development on forestry land consistent with our forestry obligations[3].' Recently a Wind Farm Development Manager has been seconded from SIB to the Forest Service to advance this work. The Forestry Commission in Wales and Forestry Commission Scotland have demonstrated how local communities can be integral to the design and implementation of developing renewable energy on the forestry estate.

The Fermanagh Trust strongly believes that the Northern Ireland Executive should engage with developers and local communities when developing wind energy projects on public sector land. A strategy and vision to develop wind farms on Forest Service land needs to be created, which makes public engagement an integral part of these plans.

Conclusion

Good practice exists of how communities should be engaged in relation to wind energy development as outlined in this submission. This involves moving away from a purely developer led approach to putting communities and their role at the centre of wind energy development and energy policy.

3 Forest Service Business Plan 2013 /2014. Available at: http://www.dardni.gov.uk/business-plan-2013-2014.pdf

Department of Energy & Climate Change

19th February 2014

Community Right to Buy In to Renewable Electricity Generation Developments: Discussion Document

Background

DECC launched the UK's first Community Energy Strategy[4] on 27th January 2014, setting out the Government's vision for how communities can get more involved in energy and climate change issues. This includes both community-led projects and partnerships between communities and commercial developers.

The Strategy announced a commitment by the renewables industry to facilitate a substantial increase in shared ownership, with the aim that by 2015 it should be the norm for communities to be offered the opportunity of some level of ownership of new, commercially developed onshore renewables projects. The Secretary of State for Energy & Climate Change has asked an industry and community taskforce to develop a plan for implementation of this commitment and report back to him by summer 2014. Progress of this voluntary process will be reviewed in mid-2015.

The Strategy also indicated that DECC would 'consider requiring all developers to offer the opportunity of a shared ownership element to communities' as a backstop in case the voluntary process does not deliver. **Our strong preference is that the voluntary, industry-led approach to increasing shared ownership is successful. However, in order to establish the backstop in case it is ever needed, we are considering introducing legislation**, as soon as Parliamentary processes allow, to set up an enabling framework for a 'Community Right to Buy In to Renewable Electricity Generation Developments'. If it wished to activate and enforce the Community Right to Buy In, Government would need to make subsequent secondary legislation.[5]

The powers could not be exercised before mid-2015 at the earliest because of the length of time needed for parliamentary processes, and would apply only to new projects. Before exercising the powers, we would formally consult, enabling your views at that time to be carefully considered. **Our strong preference is that there is no need to exercise the powers because the voluntary process will have been successful**.

We are considering taking a flexible enabling power that could apply to a broad range of renewable electricity generation technologies. If we were to exercise the power, we would formally consult and then make secondary legislation which defined the exact technologies to which it would apply. We envisage this would most likely be those technologies which currently form part of the voluntary process – such as onshore wind, solar and hydro. **Government would only exercise the legislative powers if the 2015 progress review finds that the voluntary process has failed to deliver** a situation where it is the norm for communities to be offered the opportunity of some level of ownership of new, commercially developed onshore renewables projects.

4 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

5 Through the affirmative resolution procedure, which requires approval by both Houses of Parliament

Whilst discussions to date have focussed on onshore renewables, it is our ambition that there may also be scope in future for offshore renewable projects to offer shared ownership opportunities to communities. However, this would be on a longer timescale. The powers would therefore be broad to give more flexibility for the future.

Intended scope of the Community Right to Buy In

DECC is considering setting out an enabling framework in primary legislation. The legal framework would involve taking a series of powers; the shape of these is still being developed and we are seeking your views on specific questions below. However, most of the detail would be set in secondary legislation if the powers were used. In advance of making such secondary legislation, Government would formally consult on whether to use the power at all, as well as the detailed design, such as the definition of the eligible community and the size of the ownership stake.

The enabling powers would allow a broad range of options on what we can require, but we would restrict the scope to:

- Renewable electricity generation
- Great Britain
- New developments above a minimum size (at least 5MW), and expansions above a minimum size (at least 5MW) of existing developments

The powers would not be intended to replace any existing community benefit schemes, such as the voluntary agreement for onshore wind in England.

We are currently engaging with industry trade associations, developers and community groups on the Community Right to Buy In. We would particularly welcome your views on the following areas: 1) community shared ownership in general; 2) the enabling powers.

In respect of these two aspects, any feedback should be supported with evidence and emailed to **communityenergystrategy@decc.gsi.gov.uk by Friday 7th March 2014 at the latest. Please note that responses will not be published but may be subject to the Freedom of Information Act 2000 and the Environmental Information Regulations 2004**.

We will not be able to reply directly to any questions you send in by email. However, if you would like to discuss or ask anything in addition to your written response either in person at DECC's main London office or over the phone, please let us know.

Please answer as many or as few of the following questions as you wish. In your answer, please also briefly set out on whose behalf you are responding (if it is an organisation), and your experience to date (if any) of community shared ownership.

If you are an organisation that represents the views of a number of members, we would appreciate it if you could submit one consolidated response that reflects, as far as possible, the views of your members.

General questions on the community shared ownership

1. It is our intention to maximise the benefits of shared ownership for both developers and members of the community. ***What do you consider to be the benefits of community shared ownership of renewables developments?***

2. ***What do you consider to be the disadvantages of community shared ownership of renewables developments?***

Questions on the enabling powers

3. We are considering taking a flexible enabling power that could apply to a broad range of renewable electricity generation technologies. If we were to exercise the power, we

would formally consult and then make secondary legislation which defined the exact technologies to which it would apply. We envisage this would most likely be those technologies which currently form part of the voluntary process – such as onshore wind, solar and hydro. ***What are your views on this?***

4. We would intend to retain flexibility on the definition of 'community' if we take enabling powers, such that the eligible buyers may be defined in secondary legislation either as individuals (within a specified area) or as community groups (with restrictions on their legal forms). ***What are your views on this?***

5. We would also intend to take a power to define the geographical extent of the community, either by distance, population or administrative boundaries. The exact definition would be set through secondary legislation following formal consultation. ***What are your views on this?***

6. In order to maximise the benefits of community engagement, we consider that developers would be well advised to engage with the community at an early stage in a project. We also consider that members of the community will be most likely to invest at a later stage, for example after planning permission is granted or after construction has started. We would need to set a framework for this in the enabling powers. ***What are your views on the best timing of community engagement for shared ownership?***

7. We are aware of a number of types of existing community part-ownership arrangements already in existence in the UK and abroad. What are your views on the following types of community stake?

    A. Shares in the equity of a development

    B. A revenue-linked stake, such as a royalty instrument

    C. A debt instrument, such as a bond

    D. An asset-linked stake (for example, ownership of a number of turbines within an onshore wind farm)

    E. Other options.

We are particularly interested in your experience of how different approaches to offering a community stake have worked in practice (where applicable), and the advantages and disadvantages of these types of stake from your perspective.

8. ***Do you have any other comments on the proposed Community Right to Buy In enabling powers?***

First Flight Wind Ltd

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28 February 2014

Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Stormont
Belfast
BT4 3XX

28th February 2014

By email to: committee.environment@niassembly.gov.uk

Re: Response to Wind Energy Inquiry

Dear Chairperson Lo,

I am writing on behalf of First Flight Wind Ltd, a consortium comprising B9 Energy Offshore Developments Ltd, Renewable Energy Systems Ltd and DONG Energy Wind Power A/S.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry and we would be delighted to provide further clarification of any aspect of our submission as required.

Yours sincerely,

Michael Harper
Managing Director, B9 Energy Offshore Developments Ltd
Director, First Flight Wind Ltd

e: m.harper@firstflightwind.com
t: 028 9042 3165
m: 07802 605192

First Flight Wind

Environment Committee Inquiry
FFW Submission

Title	Environment Committee Inquiry		
Subtitle / Status	FFW Submission		
Purpose of Document	Submission by First Flight Wind Ltd to inquiry by Environment Committee into pre-application engagement with local communities, March 2014		
Author	Sacha Workman	Doc. No.: 07-15-0018	28/02/2014

1. Introduction

First Flight Wind Limited (FFWL) was awarded an exclusivity agreement by the Crown Estates to develop an offshore wind farm off the SE coast of Co. Down on 10th October 2012. On 24th October 2012 in Newcastle, FFWL simultaneously launched the project and the community consultation process to the local community. FFWL's Community Liaison and Communications Team of five staff, based in North Down, carries out this work.

FFWL is a consortium comprising B9 Energy Offshore Developments Ltd, Renewable Energy Systems Ltd and DONG Energy.

The following submission is intended to provide information on the nature of the pre-application engagement with local communities being undertaken for the proposed offshore wind project. In the context of this submission, it should be recognised that the project is still only halfway through the design and development stage – project launched in October 2012 with target submission for consent application in Quarter 1, 2016. Formal discussions on the post construction Community Fund and arrangements for its management have not yet begun as it is too early in the development of the project. This document will therefore not cover this aspect of the project but FFWL will be commencing such discussions in due course.

In parallel with engagement with the local communities, engagement is also being undertaken at a statutory level and with other topic-specific stakeholders. The full range of engagement is illustrated in the following figure. This submission relates purely to category 4) Community.

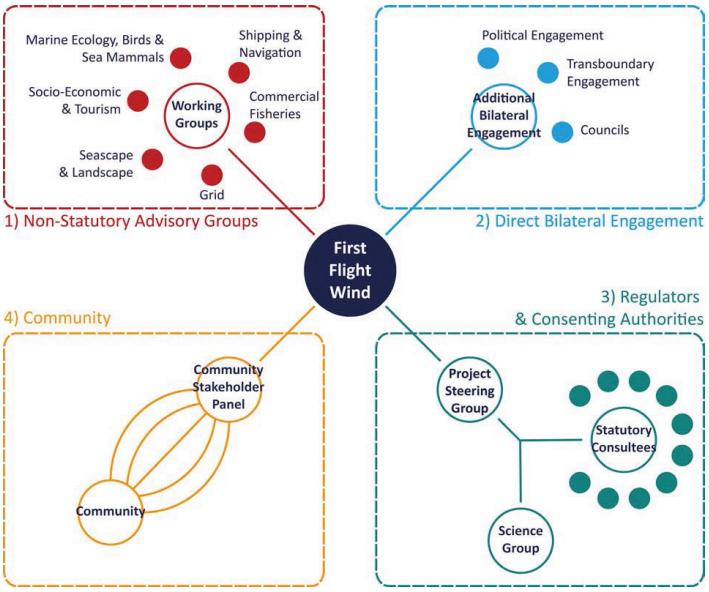


Figure 1: Overview of pre-application engagement

2. Consultation principles

It is recognised that the development of an offshore wind farm will generate considerable local interest and debate. A process that best facilitates early critical engagement with a wide range of perspectives will result in better outcomes. From the outset, therefore, it was FFWL's intent to conduct an open and transparent stakeholder engagement process through (i) the provision of timely and accurate information, (ii) effective project consultation with appropriate channels for receiving stakeholder comment and (iii) collaboration in the design and implementation of the programme of community involvement. To achieve this, a process was necessary that provided engagement with many different individuals and groups with specific interests and concerns from a range of political, religious and cultural backgrounds. As a result it was considered appropriate to consult using many different tools – both traditional communications methods and newer internet-based online social media channels.

In the absence of NI guidelines, and in consideration of best practice guidance on pre-application community consultation, the scale of the proposed project and the potential for a long pre-application development period, FFWL developed and published an extensive consultation programme to last through to consent application. This is framed by a timetable of four rounds of pre-application consultation according to a set of principles that are summarised below and set out comprehensively in leaflet No. 2 'How We Will Consult', October 2012, attached in Appendix 1.

- *Early and pro-active*: It is important to start at the earliest possible point (project launch) to ensure immediate public information and involvement which lasts throughout the pre-application stage of the project.
- *Inclusive accessible and understandable*: It must be an extensive programme engaging with all sectors and using a variety of appropriate methods.
- *Transparent and open*: The timetable should be clear and identify what stakeholders can and cannot influence.
- *Integrity*: All views should be respected when exploring solutions with critical comments welcomed and with the recognition that issues and potential solutions can be fully explored even though views might differ.
- *Accurate and far interpretation*: Feedback should be accurately recorded, reviewed and reported throughout the process and in a final report when applying for consent.

3. Defining community

FFWL defined the area in which to consult as the coastal settlements within a 35km radius from the edge of the wind resource zone. We carried out a community audit and began our mailing list to represent a full spectrum of sectors. This has built from an initial list of 1,000 and now comprises more than 1,700 political representatives, community and environment groups, churches, sports clubs, tourist businesses and other economic interests as well as relevant national umbrella organisations. We have invited these contacts to pass on information about the project as individuals can register on line at anytime from anywhere in the country.

4. Stakeholder Panel

FFWL has established an independent Community Stakeholder Panel to provide advice on the scope of the stakeholder engagement programme and to hold us to account in its effective implementation. Panel members participate on the Panel as individuals and are independent of FFWL. Their remit and the Terms of Reference of the Panel make clear that members can participate in the Panel whatever their views on the project. The Panel comprises local individuals with a mix of experiences and backgrounds – see
Table 1. This ensures that collectively the Panel can comment on how best to engage with the communities in the Mourne Coastal area. The panel is not a technical forum for reviewing the project itself but will act in an advisory capacity with a focus on the delivery of the community stakeholder consultation programme. The panel are paid expenses and the minutes of their meetings are published on the website. It is chaired by Dr Connor Paterson of the Newry and Mourne Enterprise Agency.

Councillor Robert Burgess	Mr Nicholas McCrickard
Mrs Audrey Byrne	Councillor Harold McKee
Mr Edward Carson	Dr Conor Patterson
Councillor Dermot Curran	Councillor Brian Quinn
Mr Michael A Curran	Mr John Smyth
Ms Pamela Houston	Mr Seamus Walsh
Councillor Jimmy McCreesh	

Table 1: Membership of Community Stakeholder Panel

5. Consultation Timetable

The timetable showing when FFWL consults on individual project topics has evolved since first published in October 2012. Figure 2 illustrates key consultation events that either have occurred or will occur prior to the submission of consent applications in 2016. Table 2 sets out what information and issues have been subject to consultation to date alongside the information and issues that will be discussed at future consultation events prior to the submission of consent applications in 2016. As the programme has changed, any amendments have been publicised on the website. For each round of consultation, FFWL makes clear what stakeholders can influence. At all times FFWL also makes clear that the engagement activities being undertaken represent pre-application consultation carried out by the developer and that any subsequent consent application will be subject to normal post submission public consultation processes.

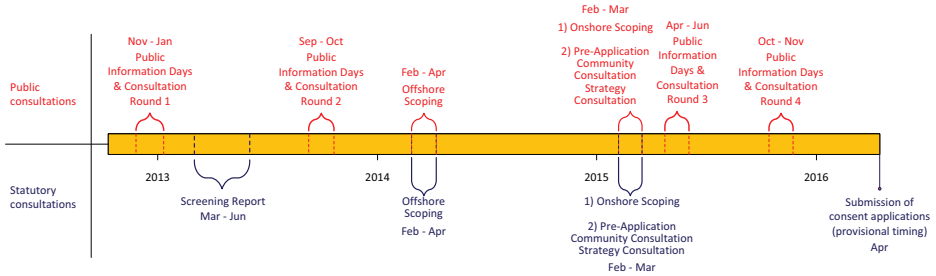


Figure 2: Illustrative stages of pre-application consultation programme for proposed offshore wind project

Event	Information provided /to be provided	Issues for consultation
Consultations that have concluded		
Round 1	• The Project and development process • The Project team • The proposed programme for community consultation and engagement	• The appropriateness of the community engagement and consultation programme
Screening Report	• Information to enable DETI and DOE to determine whether the Project was an EIA development	• Determination whether the Project is an EIA development
Round 2	• The preliminary scope of the EIA • Preferences for hypothetical turbine layout arrangements • Preferences for viewpoints from which	• The preliminary scope of the EIA • Preferences for hypothetical turbine layout arrangements • Preferences for viewpoints from which

Event	Information provided /to be provided	Issues for consultation
	to judge visual impact	to judge visual impact
Consultation in progress		
Offshore Scoping Report	• Offshore Scoping Report	• The scope of the EIA relating to offshore elements of the Project.
Future consultation (prior to consent applications)		
Onshore Scoping Report	• The Onshore Scoping Report	• The scope of the EIA relating to onshore elements of the Project.
Pre-Application Community Consultation Strategy Consultation	• The draft Pre-Application Community Consultation Strategy setting out the process of pre-application community engagement for the Project.	• The draft Pre-Application Community Consultation Strategy.
Round 3	• Project location and layout arrangements • Grid connection arrangements • The "design envelope" • Progress with the EIA	• Project location and layout arrangements • Grid connection arrangements • The "design envelope"
Round 4	• Proposals for mitigation measures • The draft Environmental Statement	• Proposals for mitigation measures • The draft Environmental Statement

Table 2: Pre-application consultation events, information and issues

6. Consultation methods and opportunities

In recognition that people wish to receive their information and to engage in different ways, FFWL developed a range of methods for people to "have their say" and indeed, tested their appropriateness in the first round of consultation (see Consultation Round One Questionnaire Q1 - attached). This allows us to capture people's comments in a variety of ways.

1. **Four rounds of information days** (2012/3, 2013/4, 2015 and 2015/6) are taking place across 8 venues. These are day-long drop-in exhibitions providing face to face contact with FFWL (engineers, environmental scientists and community liaison team) and allowing people to make verbal comments or complete a *phase-specific questionnaire*.
2. **Face to face engagement via presentations and meetings** are held with political representatives, community groups and other stakeholders. Comments and questions are recorded. These public meetings are listed on the website where stakeholders are encouraged to get in touch should they want a presentation to or meeting at their organisation.
3. **Direct emails** to submit a completed questionnaire or to raise a comment or question or can be sent in.
4. **Written correspondence** by letter or in a questionnaire can be posted to the project team. Freepost envelopes were provided with the questionnaires.
5. **Phone calls** provide verbal comment to the project team which is recorded on the Open Debate system.
6. **Social Media** (Facebook/Twitter) pages direct people to the information and to where to have their say.
7. Individuals have the **opportunity to register on line** to be added to the mailing list and kept informed.
8. **Local media**. FFWL engages with the media to keep them informed.
9. **Community Stakeholder Panel**. The independent membership of the panel should allow individuals in the community to raise issues via the panel that they might not be comfortable to raise directly with FFW. Two members have already been to visit Walney Wind Farms, Barrow in Furness and we will be arranging speakers to visit this group from existing offshore wind energy projects.
10. **Information Points** Project literature and free post envelopes are made available at 18 local information points in towns along the coast from Portavogie to Dundalk.

7. Sources of information

We are making available the following documents at face to face meeting opportunities as listed above and as downloads from the website. Apart from the news releases and Fisheries Q&A they are also available at information points. Contact information is displayed on all materials.

- **Leaflets** "Project Introduction" and "How we will Consult".
- Booklet of R2 **exhibition panels** from information days.
- **Project Newsletter** There will be three per annum.
- **Fisheries Bulletin** These started end 2013 and will be quarterly.
- **Consultation Reports** Mini reports recording feedback received from each round of consultation and how each comment has been addressed. There will be a final report at application for consent.
- **Posters** to advertise the information days.
- **News releases** (fortnightly).
- **Fisheries Q&A** A list of answers to critical fisheries questions as answers become available.

In addition we make available online

- Comprehensive **website** containing all publicly available information including that listed above plus consultation and "have your say" sections – www.firstflightwind.com.
- Daily **Facebook** and **Twitter** posts.
- Vimeo site with **video shorts** of different aspects of the project, community views, students of and careers in the offshore wind industry and FFWL employee roles.

8. Education programme

After consulting with teachers and educational advisors, FFWL wrote an education strategy and has engaged with Co. Down schools to rollout a programme to inspire students to study subjects which could allow them to work in the offshore renewables sector. We also provide speakers for Northern Ireland colleges and universities.

9. Recording and responding to views and opinions

After each stage of the pre-application consultation process, we will publish a mini community consultation report with a summary of the views discussed and questions raised. Finally, as part of the consent application to the Department of Environment and the Department of Enterprise, Trade and Investment, FFWL will submit a final "Pre-application Community Consultation Report" detailing all the consultation that has taken place. This will:

- provide an analysis of the consultation responses;
- describe how the consultation comments have been taken into account in shaping the final project application; and,
- explain if and why changes weren't made to the project on any issues raised in the consultation.

Both the mini reports and the final Pre-application Community Consultation Report are reviewed by the Stakeholder Panel in draft form before being finalised and published. Copies of all consultation reports are then made publicly available.

9.1. Consultation Round One

A full and a summary report from the first round of consultation published after review by the Stakeholder Panel are attached. Key suggestions to improve our consultation included: holding further information days at Portavogie, Portaferry and Warrenpoint; ensuring that all information was available in a sufficient format and optimum size for easy readability; providing a booklet of the exhibition panels at the information points and, inviting schools to visit information days. Qualitative comments raised were grouped into six subject areas: commercial fishing; local economic opportunities; visual impacts; grid connection; tourism; and, recreation and environmental impacts.

As a result, as well as bringing forward the education programme, the Community Liaison team increased the information on the economic opportunities and education pages of the project website. The project social media pages provide information and videos on careers, courses, supply chain opportunities and links to InvestNI. FFWL has also engaged further with InvestNI on supply chain issues, taken part in InvestNI trip to the east of England wind farm businesses and FFWL organised a visit for fishermen and councillors to see Walney wind farm and meet a local business leader and a local Councillor.

9.2. Consultation Round Two

Over 725 comments were received in Round Two and the consultation report is currently being prepared. Comments will be collated by allocating them to one of three categories: onshore development; offshore development; and general comments. Appendices will provide further detail on the stakeholder comments received and how FFWL has taken account of all comments received.

10. Conclusion

Learning from past experience with similar projects of this scale, it is considered that a comprehensive process that engages with local people and stakeholders at an early stage can foster informed discussion and thereby create better outcomes. This is felt particularly important for an issue that is still relatively new and complex and for which the project details remain undefined until the design and assessment periods are complete. The approach adopted is designed to help FFWL to identify issues of concern, explore solutions and design a project that will be a positive asset to the local community. In this regard, critical comments have been welcomed during the pre-application stage as they can support project re-evaluations. Whilst FFWL has an aspiration to achieve consensus with all consultees, it is recognised that this may not be possible in every aspect of the development process given the complex nature of the project and the diverse range of deeply held value-based views surrounding wind energy development. FFWL nevertheless believes that issues and potential solutions can be fully explored even though views about the project might differ.

Appendix: Materials provided as part of community pre-application engagement

1. Leaflet 01
2. Leaflet 02
3. Newsletter 01
4. Newsletter 02
5. Newsletter 03
6. Newsletter 04
7. Poster/Advert 01
8. Poster/Advert 02
9. Exhibition 01 - Panels
10. Exhibition 02 – Panel booklet
11. Questionnaire 01
12. Questionnaire 02
13. Mini Consultation Report of Round One
14. Summary Consultation Report Round One
15. Fisheries Bulletin 01
16. Fisheries Q&A Dec 2013

01

October 2012

First Flight Wind

Project Introduction

Welcome to First Flight Wind's introductory project leaflet. The leaflet describes the background and development plan for the proposed offshore wind farm from the start of the project through the assessment and design phase to the applications for consent, to be submitted potentially in 2015. Our proposals for community consultation are set out in a separate leaflet ("How We Will Consult") in which we invite you to record your views on our consultation proposals using the accompanying feedback form.

First Flight Wind

Introduction

The wind farm proposed by the First Flight Wind consortium is a pioneering offshore renewable energy project.

Whilst offshore wind energy is becoming a familiar sight in many parts of the UK, this will be the first such project in Northern Ireland. We have one of Europe's windiest areas and wind turbines can harness the immense power of this unending, local resource to produce electricity, with minimal waste products or environmentally damaging emissions. Reducing our reliance on imported coal, oil and gas for our energy is essential, not only for our environment but also to secure our electricity supplies for years to come. As well as producing considerable amounts of renewable energy, offshore wind can provide an economic stimulus and create opportunities for local companies in the development, construction and operation phases.

Northern Ireland consumed an average of 12% electricity from renewable sources during 2011, with some months as high as 18% [1]. This comes mostly from onshore wind, currently the most readily available and affordable source of renewable energy for power generation. Although onshore wind will continue to be a vital source of renewable electricity generation in Northern Ireland, research for Department of Enterprise Trade and Investment's (DETI) Onshore Renewable Electricity Action Plan indicates that offshore energy will also be needed to reach the Northern Ireland target of 40% of electricity consumption from renewable sources by 2020 [2]. We also believe that offshore wind has a crucial role to play in ensuring progress towards meeting Northern Ireland's and the UK's longer term carbon reduction targets.

Who we are

First Flight Wind Ltd is a consortium comprising B9 Energy, DONG Energy and RES. It has been established specifically to develop and, if successful, install and operate an offshore wind farm off the south east coast of County Down, Northern Ireland.

B9 Energy Offshore Developments Ltd and its sister companies have been successfully involved in renewable energy development and wind farm operations in Northern Ireland, where it is based, since 1992. Currently, its sister company, B9 Energy O&M Ltd is the largest independent wind farm operator and maintenance company in the UK.

DONG Energy is a global leader in offshore wind energy development and construction. Its vision is to provide clean and reliable energy, and developing offshore wind farms is a key part of realising this vision. DONG Energy has significant involvement in other offshore wind projects in the Irish Sea and is investing in Belfast Harbour as an assembly port for offshore turbines.

RES is one of the world's leading renewable energy project developers with substantial experience of providing development, engineering, operational and consultancy services to the offshore wind sector. In the three decades since RES Group was formed it has developed more than over 6.5 Gigawatts of renewable energy projects worldwide and has played a central role in the development of the UK offshore renewables sector. With an office in Larne, RES is well established in Northern Ireland, having worked on onshore wind farm development and construction here since 1994.

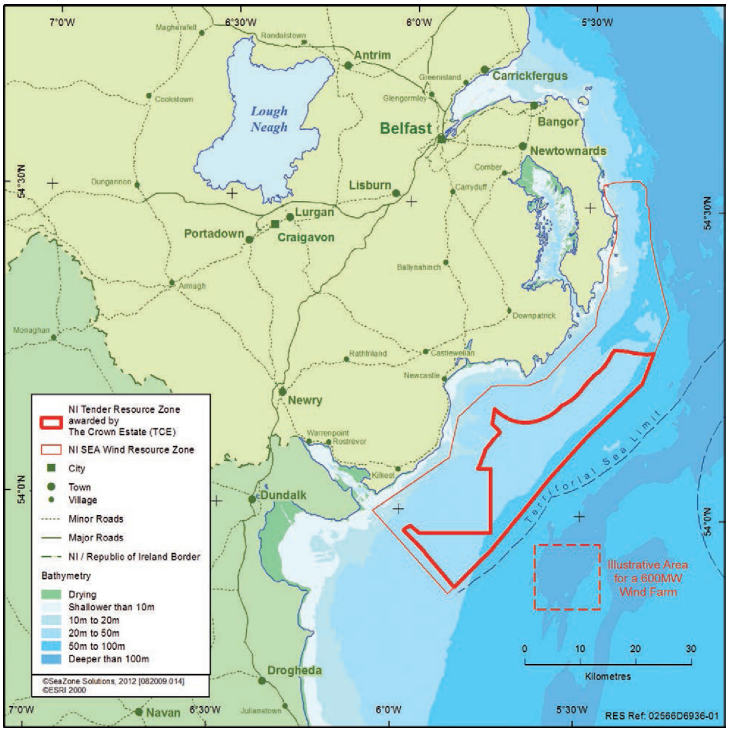
The project:

"What will it look like?"

At this point it is envisaged that the First Flight Wind project will have a capacity of 600 megawatts (MW) - see box. However, the final type, number and location of turbines within the zone of search will only be determined during the project design. Wind turbine technology is a rapidly advancing field. We plan to consider wind turbines of between 5 and 10 MW. Although currently it is believed that turbines in the order of 6 MW may be the most appropriate, we will only be able to select the most suitable turbine for the project as a result of the environmental, engineering and technical studies, supply chain constraints and the outcome of our consultation process.

One megawatt is equal to one million watts and is a unit of power. A 600 MW wind farm could be capable of generating enough electricity in one year to meet up to 20% of Northern Ireland's electrical demand.

The majority of the resource zone has water depths between 30 and 50 metres with moderate wave and tidal conditions, making it suitable for using a range of foundation options. An offshore network of buried cables will collect the electricity from each turbine and feed it to one or two new offshore substations located within the wind farm. Subsea cables will take the power ashore to join Northern Ireland Electricity's (NIE) transmission network. We have further studies to undertake before we can identify the location of the landfall (where the electricity cable comes ashore), the location of the connection point with the NIE transmission network and the connection route and associated infrastructure joining these two. A number of options for the grid connection will be presented for consultation with local communities at the second round of consultation in 2013 – see leaflet **"How We Will Consult"**.



Project history:

"Why is an offshore wind farm being considered for this area?"

The Northern Ireland Executive has endorsed a policy to develop Northern Ireland's offshore wind energy resources. An area off Co. Down has been identified as potentially suitable for development as detailed below.

– **Strategic Environmental Assessment and Northern Ireland Renewable Energy Policy**
Under a European Directive, DETI was required to assess how the implementation of an Offshore Renewable Energy Strategy would affect the marine and coastal environment of Northern Ireland. The Strategic Environmental Assessment (SEA), which was undertaken by the consultancy firms of AECOM and Metoc, was managed by a DETI-led group comprising other relevant Northern Ireland Departments and key organisations. Both the scope of environmental issues considered by the SEA and the resulting Environmental Report itself were issued for public consultation in 2009 (in May and December respectively), the latter to coincide with the publication for consultation of the draft Offshore Renewable Energy Strategy [3]. The Environmental Report identified the area off the south east coast of Co. Down as potentially suitable for at least 600MW of offshore wind energy capacity due to its good average wind speeds, suitable water depths and the lack of significant environmental issues (subject to project-level impact assessment and mitigation measures).

As recommended in the SEA report, DETI subsequently published non-statutory guidance and information on the opportunities and constraints for developing offshore renewables in Northern Ireland waters (the Regional Locational Guidance) [4].

In September 2010, the Northern Ireland Executive endorsed an overarching Strategic Energy Framework [i] that set out a vision for a less unsustainable system where Northern Ireland's energy is used as efficiently as possible; where more energy is obtained from renewable sources; and where generation is as competitively priced as possible. As part of this, the Northern Ireland Executive set a challenging target of 40% of electricity consumption from renewable sources by 2020.

To assess whether the Offshore Renewable Energy Strategy would lead to any adverse effect on the integrity of any European designated sites DETI initiated a Habitats Regulations Appraisal of the draft strategy. The key recommendations from this were then built into the final Offshore Strategy endorsed by the Executive in March 2012.

– **The Crown Estate Leasing Round**
In December 2011, following consultation, The Crown Estate launched a tender to select an experienced developer for a 600MW offshore wind project in a zone off the south east coast of Co. Down that was reduced in size from the area identified through the SEA process.

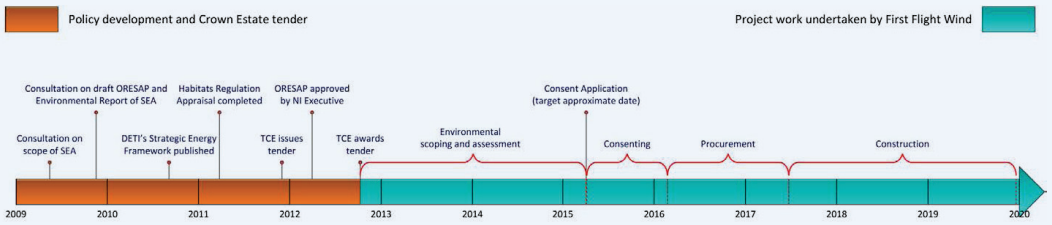
In October 2012, the First Flight Wind consortium was selected to develop the project. The right to develop is subject however to First Flight Wind being successful in gaining the necessary consents from Northern Ireland statutory bodies for the construction, operation and eventual decommissioning of the offshore wind farm - see below.

Project Development:

"What will happen now?"

First Flight Wind will work towards submitting applications in 2015 for a Marine Licence from the Northern Ireland Environment Agency of DoE; consent under the Electricity Order from DETI; and, planning consent from DoE for all onshore works. A timeline for the development process is illustrated overleaf. This shows the different stages of development leading to consent application and beyond and the indicative timescales for each stage.

Project development and indicative consultation timescale



Zone review and Environmental Impact Assessment

It is important to realise that the whole zone will not be used for the project. Over the next two years, First Flight Wind will undertake a series of surveys and studies to identify an area within the zone most suitable for development, based on environmental, engineering, technical and commercial considerations and the outcome of our consultations.

An Environmental Impact Assessment (EIA) is required to accompany the applications listed above. First Flight Wind will follow published guidance including DETI's Regional Locational Guidance for the preparation and submission of EIAs. During the whole pre-application period leading up to submission of applications, consultation will take place with relevant coastal communities and environmental bodies, shipping, navigation, commercial fishery, tourism and other stakeholders.

Prior to undertaking the EIA, First Flight Wind will consult with the relevant authorities in the preparation of a Scoping Report. The Scoping Report will provide an overview of the project and the potential impacts that will require detailed consideration within the subsequent EIA. At First Flight Wind's second round of consultations in 2013, you will be able to review the Scoping Report - see leaflet **"How We Will Consult"**.

Following completion of the Scoping Report, the EIA itself will be undertaken, with input from appropriate specialists, based on site specific data, publicly available information and extensive stakeholder consultation. A suite of monitoring surveys (desk based and site based) will be commissioned to establish the existing environmental baseline and subsequently to assess any potential anticipated impacts. The surveys will be undertaken to cover the biological, physical and human environment and the results of these will inform the EIA conclusions. The issues to be covered are likely to include:

- Visual assessment of seascape and landscape
- Shipping and navigation
- Existing infrastructure
- Commercial fisheries
- Ports and harbours
- Protected sites and species
- Dredging and disposal sites
- Benthic, intertidal and onshore ecology
- Cultural and archaeological heritage (marine, coastal and onshore)
- Marine mammals
- Marine users and land use (for onshore works)
- Ornithology (offshore and onshore)
- Water quality
- Radar interference and EMF
- Coastal processes and sediment movement
- Traffic and population disturbance
- Air quality and dust (for onshore works)
- Fish ecology
- Climate change
- Soil and water (for onshore works)
- Recreation and tourism
- Noise and vibration

Appropriate mitigation and monitoring to avoid or minimise any environmental impacts will be identified during the assessment period. In addition, cumulative impacts that arise from the impacts of more than one project are an important aspect of the EIA process. The full results will be detailed in an Environmental Statement that will accompany the consent applications.

The Community Liaison Team comprising Sacha Workman, Sinead Maguire, Victoria McCabe and Leigh Walsh will be available to discuss the project or the consultation programme. You can contact us in the following ways:

Postal address: First Flight Wind, c/o B9 Energy, 18 High Street, Holywood, Co. Down BT18 9AZ
Email: info@firstflightwind.com
Website: www.firstflightwind.com
Twitter : @firstflightwind
Facebook Page: First Flight Wind
By telephone: 028 9042 3165

Footnotes:

[1] Northern Ireland Strategic Energy Framework, 2011, http://www.detini.gov.uk/strategic_energy_framework__sef_2010_-3.pdf

[2] Onshore Renewable Electricity Action Plan, http://www.nigridenergysea.co.uk/wp-content/uploads/2011/10/ER_FinalReport_Oct2011.pdf

[3] Offshore Renewable Energy Strategic Action Plan 2009-2020, http://www.detini.gov.uk/ni_offshore_renewable_energy_strategic_action_plan_2012-2020__march_2012_.pdf

[4] Regional Locational Guidance for Offshore Renewable Energy Developments in NI Waters, http://www.detini.gov.uk/regional_locational_guidance__rlg__for_offshore_renewable_energy_developments_in_ni_waters.

02

October 2012

First Flight Wind

How We Will Consult

First Flight Wind's Community Consultation Plan

"At First Flight Wind, we recognise that the development of an offshore wind farm off Co. Down could generate considerable local interest and debate. We strongly believe that a process that best ensures early open discussion with all viewpoints will result in better outcomes for everyone. To achieve this, we will need to talk with many different individuals and local groups with specific interests and concerns or with specialist local knowledge. We are committed to undertaking this work in accordance with our consultation principles so that we can identify issues of concern, explore solutions and design a project that will be a positive asset to the local community and Northern Ireland."

— Benj Sykes, Chairman of the First Flight Wind consortium

First Flight Wind 02: How We Will Consult

First Flight Wind 02: How We Will Consult

First Flight Wind

Introduction

Consultation *[noun]*: the dynamic process of dialogue between individuals or groups, based upon a genuine exchange of views, and normally with the objective of influencing decisions, policies or programmes of action.

First Flight Wind, a consortium comprising B9 Energy, DONG Energy and RES. has been selected to develop an offshore wind farm off the south east coast of Co. Down, Northern Ireland.

This leaflet sets out how we plan to engage and involve the community during the design phase before submitting a consents application for the proposed wind farm, potentially in 2015. Over this period we will consult in three distinct stages as illustrated in the box, below:

What are we consulting on and when?

Information Day	We will provide information on	We will consult on
1. Launch Winter 2012	• The project and development process • Meeting project team • Our proposed community consultation programme.	• Appropriateness of our community consultation plans.
2. Feasibility Summer 2013*	• Scope of the Environmental Impact Assessment • Options for project layouts and locations • Options for connecting to the grid	• All of these
3. Assessment Summer 2014*	• Reporting on the environmental impact assessment • Final design "envelope"	• Final design "envelope"
4. Consent Applications Spring 2015*	• Results of Environmental Impact Assessment • Final engineering design assessments • Details of the consent applications	

*Dates indicative and subject to change

During the first round of consultations you will have the chance to give us your opinions on our proposals for how we intend to engage and consult with the community.

When we have considered your comments, those of a specially established Stakeholder Panel (see below) and those of the relevant local councils we will publish our final plans for the pre-application community consultation in a "Statement of Community Consultation". It will appear in local newspapers and be available at our information points and on our website.

We believe that beginning a comprehensive community consultation at an early stage and at the same time as commencing the environmental and design studies is essential. It encourages informed discussion and should achieve better outcomes for everyone involved. We will approach our stakeholder engagement and community consultation using the principles outlined in the Appendix of this leaflet.

To make it easy for you to find out more about the project and to make your views known to us, we will provide information and record views in several ways. Listening and responding to public questions and concerns as they arise will allow us to understand and address these at each stage of the project. We guarantee that all consultation responses will be reviewed and, where possible, used for reappraisals of the project and that a feedback report detailing the conclusions of the consultation process will be published. In our feedback to you, we will be clear how any views expressed have changed our plans for the project and if not, why not.

First Flight Wind 02: How We Will Consult

Stakeholder Panel

To help us achieve our aims, we are establishing a Stakeholder Panel comprising independent people with a local community interest, experience with community relations or other relevant expertise. The Stakeholder Panel is not a technical forum but will provide independent advice on the scope of the stakeholder engagement and consultation programme and will hold us to account in relation to the implementation of that programme. This will ensure our commitment to engage is effectively carried out. Its independent membership will allow individuals in the community to raise issues via the panel that they might not be comfortable to raise directly with First Flight Wind.

Stakeholder Panel membership details will be published separately.

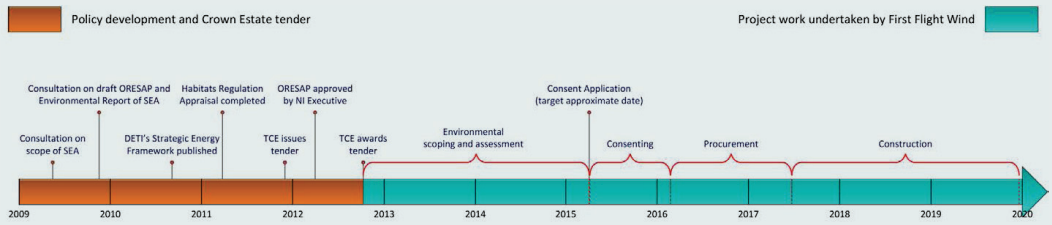
How we will consult

At First Flight Wind we have established a Community Liaison Team to help implement the consultation process. To start the process, we have compiled an initial consultation list of local individuals and groups that are likely to have an interest in the project. This represents a full spectrum of sectors: economic development; political; community; social; environment; tourism; and leisure. This list of stakeholders will remain open to additional contacts throughout the consultation process. We recognise that different people like to be engaged in different ways. To ensure that everyone has an opportunity to give us their views we will use the following range of methods:

- **Direct communications by phone, post and email** The First Flight Wind Community Liaison Team address, email and telephone number will be listed on all documents in order that you will always be able to contact us. You will always have the option to choose not to receive further information and to be removed from our consultation lists.
- **Website** Our website will be used both to broadcast information (such as Information Day timings) and as an online consultation centre. Here anyone who is not already on our consultation list can register to be kept informed. You will also be able to fill in feedback forms online and all key information will be available to download.
- **Engagement with political representatives** We will ensure local political representatives are kept informed about the proposed offshore wind farm through meetings with individual politicians, party groupings and members of Assembly committees as required.
- **Meeting community groups and other local stakeholders** The Community Liaison Team will attend existing events, such as residents' association meetings, by invitation, and will also set up special meetings at the request of interested groups.
- **Information Days** First Flight Wind will host four rounds of Information Days to give communities the opportunity to find out more or to ask us questions on a one-to-one basis. The first three will coincide with the three rounds of consultation to provide the background information necessary for each stage of the process.
- **Education Outreach** We will be engaging with local schools to discuss how we can best provide project information to schools to complement their study programmes. Any materials subsequently produced or any other useful educational links will be posted on the website education pages.
- **Local media** First Flight Wind will regularly keep the community up to speed with what's happening through the local media.
- **Twitter, Facebook, Vimeo** First Flight Wind will make social media sites available to those who wish to discuss the wind farm proposal informally on their usual social channels. We see social media as an important way to engage sections of the community, particularly younger people, who would prefer to communicate through such channels than through more traditional methods. This communication will be distinct and separate from the opportunity to make formal pre-application consultation comments through our feedback mechanisms.
- **Information Points** Copies of our consultee information such as leaflets and newsletters can be found at the Information Points listed at the end of this leaflet. We are happy to designate other locations as Information Points if requested by the Stakeholder Panel or the community.

First Flight Wind 02: How We Will Consult

Project development and indicative consultation timescale



How to contact us

The Community Liaison Team comprising Sacha Workman, Sinead Maguire, Victoria McCabe and Leigh Walsh will be available for discussing any aspect of the project or the consultation programme. You can contact us in the following ways:

Postal address:	First Flight Wind, c/o B9 Energy Offshore Developments Ltd, 18 High Street, Holywood, Co. Down BT18 9AZ
Email:	info@firstflightwind.com;
Website:	www.firstflightwind.com;
Twitter:	@firstflightwind
Facebook:	First Flight Wind
Telephone:	028 9042 3165

Sources of information

We will make available the following documents at the Information Points, at meetings and Information Days and as downloads from the website:

- **Project leaflets** These will provide information on progress with the project, the environmental assessment and the consultation programme.
- **Project newsletters** We will produce up to three per year to contain updated project information, news of meetings and up and coming Information Days and events.
- **News releases** You can sign up to receive notice of the latest news releases to view on the website media centre. News releases or articles will be kept in the archive website.
- **Information Day boards** The information used in each round of Information Days will be available to view on the website after each round is over.
- **Statement of Community Consultation** Once the district councils, the community and the Stakeholder Panel have had their say on our draft proposals for community consultation during the Information Day roadshow, they will be updated and published locally as a "Statement of Community Consultation."
- **Consultation reports** Mini consultation reports on each of the three rounds of consultation and a final full report to accompany the application for consent (see below).
- **Draft environmental information and other project documentation** Relevant project documentation as it becomes publicly available.

How we will respond to your views and opinions

We will be seeking responses related to the specific subject matter of each of the three rounds of consultation. We will use all responses received on our consultation feedback forms and direct responses received (electronically or paper copy) to ensure we can accurately reflect your views in our re-evaluations of the project.

After each stage of the pre-application consultation process, we will publish a mini community consultation report with a summary of the views discussed and questions raised. Finally, as part of the consent application to the Department of Environment and the Department of Enterprise, Trade and Investment, First Flight Wind will submit a final "Pre-application Community Consultation Report" detailing all the consultation that has taken place. This will:

- provide an analysis of the consultation responses;
- describe how the consultation comments have been taken into account in shaping the final project application; and,
- explain if and why changes weren't made to the project on any issues raised in the consultation.

Both the mini reports and the final Pre-application Community Consultation Report will be reviewed by the Stakeholder Panel in draft form before being finalised and published. Copies of all consultation reports will then be made publicly available.
In addition to the feedback received through the consultations, we will welcome communication from you whether as comments or questions at any time during the development process on any aspect of the project.

Appendix

Stakeholder Engagement and Consultation Principles

First Flight Wind will approach stakeholder engagement and community consultation with a commitment to the following principles:

- **Inclusive, accessible and understandable**
  We will engage with all sectors of the community that might have an interest in the project. We will use a variety of methods and present information in an appropriate way to suit the range of different audience needs. Consultation materials will restrict the use of jargon.

- **Early and pro-active**
  The consultation programme will commence straight away at the local First Flight Wind launch of the project and continue throughout the assessment and application phases, allowing for specific consultation events to be time-dependent. We will take special care to involve all sectors of the community in the consultation process.

- **Transparency and openness**
  Stakeholders will be given accurate information (and made aware of any information gaps or uncertainties) and be told what they can or cannot influence by responding to First Flight Wind engagement. Representatives of First Flight Wind will be accessible to provide project information and to provide enquiry responses that are appropriate in terms of content, timing and clarity given the state of project development at that time.

- **Integrity**
  We will ensure the consultation process is effective by conducting all engagement on an open and good-faith basis with respect for all positions adopted by consultees. Critical comments are to be welcomed as they can support project re-evaluations. Whilst First Flight Wind has an aspiration to achieve consensus with all consultees, it is recognised that this may not be possible in every aspect of the development process given the complex nature of the project and the diverse range of deeply held views surrounding wind energy development. First Flight Wind recognises that issues and potential solutions can be fully explored even though views about the project might differ.

- **Accountability and fair interpretation**
  We will accurately record, review and report all feedback received in response to our community consultations by publishing interim mini reports throughout the consultation process and in a final report to accompany the applications for consent.

Information Days 10am - 9pm

Location	Date	Venue
Kilkeel	Mon 5th Nov	Nautilus Centre
Castlewellan	Tues 6th Nov	Community Centre
Carlingford	Wed 7th Nov	Heritage Centre
Downpatrick	Thurs 8th Nov	St Michael's Hall
Newcastle	Mon 12th Nov	Slieve Donard Hotel
Ardglass	Tues 13th Nov	Community Centre

Local information points

Northern Ireland	Republic of Ireland
Annalong Barbican	Carlingford Tourist Office
Ardglass Community Centre	Castlebellingham Post Office
Castlewellan Library	Clogherhead RNLI shop
Downpatrick Library	Dundalk Tourist Office
Dundrum Post Office	
Kilkeel Nautilus Centre	
Kilkeel Library	
Newcastle Library	
Newcastle Tourist Information	
Newry Library	
Portaferry Library	
Warrenpoint Library	
Portavogie Post Office	

First Flight

Newsletter ONE

October 2012

First Flight Wind selected to bring offshore wind to Northern Ireland

Energy Minister Arlene Foster MLA and Rob Hastings from The Crown Estate with First Flight Wind consortium members (l-r) Michael Harper, B9 Energy, Chris Morgan RES and Benj Sykes, DONG Energy.

On the 10th October 2012, the Crown Estate announced the launch of an initiative to develop an offshore wind facility off the south east coast of County Down.

First Flight Wind, the consortium selected to undertake the work, will commence a programme of community consultation in parallel with the environmental impact assessment and design studies. Subject to obtaining all necessary consents from the Department of the Environment and the Department of Enterprise, Trade and Investment, it could be generating 600MW of electricity by 2020.

The Northern Ireland Executive has said it wants to see 40% of electricity to come from renewable sources by 2020, and the winds off Northern Ireland will help make this happen. By harnessing its locally abundant sources of renewable energy, Northern Ireland will be able to increase its energy independence by reducing its reliance on increasingly expensive, imported fossil fuels. This will also help to put Northern Ireland on course to fulfil its commitment of reducing carbon emissions.

Energy Minister Arlene Foster MLA commented:

"The development of offshore renewables is an excellent opportunity for Northern Ireland in many ways - energy security and diversity; climate change mitigation; a contribution to the Executive's 2020 targets and the business supply chain opportunities for local companies over the next few years."

First Flight Wind Information Days (anytime between 10am-9pm)

At our Information Days you can find out more about the First Flight Wind project. We would like to hear your opinions and get your feedback.

However if you can't make it to one of the information days, please visit our website or get in touch with the Community Liaison Team for more information. First Flight Wind's first round of information days will take place at the venues and on the dates that are listed below.

We look forward to meeting you!

Location	Date	Venue
Kilkeel	Mon 5th Nov	Nautilus Centre
Castlewellan	Tues 6th Nov	Community Centre
Carlingford	Wed 7th Nov	Heritage Centre
Downpatrick	Thurs 8th Nov	St Michael's Hall
Newcastle	Mon 12th Nov	Slieve Donard Hotel
Ardglass	Tues 13th Nov	Community Centre

Welcome

Welcome to First Flight Wind's project newsletter. This is the first in a series that will keep you informed about what's happening with the project, let you know when and where Information Days are happening, and ensure you know how to get involved and have your say in how the project develops.

In this first edition, we will introduce you to the First Flight Wind consortium and the project itself.

This newsletter will also outline our stakeholder engagement and consultation plans, and direct you to a range of public information materials about the project. All of the relevant First Flight Wind documents are available online at our new website ***www.firstflightwind.com*** and we encourage you to take the time to visit and get involved!

For First Flight Wind, community consultation is central to the project. In this assessment and design stage, before any consent applications have been prepared we want to hear your point of view. Remember, if the First Flight Wind team can be of any further assistance, our contact details are listed in this newsletter, so please don't hesitate to get in touch.

Who is First Flight Wind?

First Flight Wind is a consortium comprising of B9 Energy, DONG Energy and RES.

B9 Energy ***(B9 Energy Offshore Developments Ltd)*** and its sister companies have been successfully involved in renewable energy development and wind farm operations in Northern Ireland, where it is based, since 1992. Currently, its sister company, B9 Energy O&M Ltd is the largest independent wind farm operator and maintenance company in the UK. For further information, see ***www.b9energy.com***

DONG Energy is one of the leading energy groups in Northern Europe. We are headquartered in Denmark. Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe. We have approximately 6,400 employees and generated DKK 57 billion (EUR 7.6 billion) in revenue in 2011. For further information, ***see www.dongenergy.co.uk***

RES Group is one of the world's leading independent renewable energy developers, with substantial experience of providing development and engineering services to the offshore wind sector. In the three decades since RES Group was formed it has developed more than 6.5 Gigawatts of renewable energy projects worldwide and has played a central role in the development of the UK offshore renewables sector. With an office in Larne, RES is well established in Northern Ireland, having worked on offshore wind farm development and construction here since 1994. For further information, see ***www.res-group.com***

Did You Know?

In the UK during 2011, wind energy reduced emissions of carbon dioxide by at least…

5,500,000 tonnes

IPPR, 'Beyond the Bluster' (August 2012)

DONG Energy's Gunfleet Sands project in Clacton-on-Sea, Essex

Offshore Wind in Action

DONG Energy's Gunfleet Sands project in Clacton-on-Sea, Essex *(pictured above)* reached full production in the Spring of 2010, and supplies electricity to around 125,000 households. Four day trippers from Clacton-on-Sea took a boat trip out to the offshore wind farm to experience it first-hand.

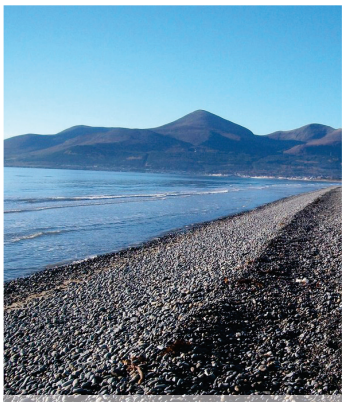
To learn how people who live and work close to an offshore wind farm feel, and find out how the day trippers got on, go to our website ***www.firstflightwind.com***

Tony and Diane Judd and Sheila and Frank Wakeford prepare for their boat trip to Gunfleet Sands offshore wind farm

Where did the name 'First Flight Wind' come from?

When naming the project, it was felt important to pay tribute, not only to the area where the wind farm would be located, but also to Northern Ireland's legacy of inspired engineering.

In 1910, the first official powered flight in Ireland was made over the sands of Newcastle, County Down *(pictured below)*. That first flight stands testament to the forward thinking, innovation and skills of the people of Northern Ireland.



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Renewables Policy

If you would like to find out more about the Offshore Renewables Energy Strategic Action Plan (2012 – 2020), visit *www.detini.gov.uk/ni_offshore_renewable_energy_strategic_action_plan_2012-2020__march_2012_.pdf*

The Plan contains a range of actions to facilitate the successful and sustainable development of offshore renewable energy in Northern Ireland waters.

DONG Energy's Gunfleet Sands project in Clacton-on-Sea, Essex

Where to get further Information?

We recently launched our project website where you can have your say on the offshore wind farm project plans and put your questions to us. The website *www.firstflightwind.com* will also have the latest project documents, news releases, project newsletters, contact information and will address a wide range of questions about the project.

You can follow First Flight Wind on Twitter @firstflightwind and 'like' us on Facebook to find out the latest project news and updates.

We hope to make copies of our published information available for viewing at Information Points in the following areas: Annalong, Ardglass, Castlewellan, Downpatrick, Dundalk, Dundrum, Kilkeel, Newcastle, Newry, Portaferry, Warrenpoint and Carlingford.

However please check the First Flight Wind website ***www.firstflightwind.com*** and the next edition of the newsletter to find out exactly where you can access the latest information at a venue in your area.

Community Liaison Team Diary

Hello and welcome to the Community Liaison Team Diary.
The Community Liaison Team has been established by First Flight Wind to help implement the consultation process. We'll use this Newsletter to update you on our activities. The team will be meeting the local community and stakeholders and we wish to reach as many of you as possible who may feel the proposed offshore wind farm will have an impact on you or your local area. We'll hopefully meet many of you at First Flight Wind Information Days.

Remember you can access information on the project and register to have your say on our website www.firstflightwind.com. Alternatively you can pick up the latest project documents from Information Points in your area.
In the meantime if you'd like to get in touch with the Community Liaison Team, our contact details are below.

Contacts: Sacha Workman, Sinead Maguire, Victoria McCabe and Leigh Walsh.
Postal Address: First Flight Wind, c/o B9 Energy Offshore Developments Ltd, 18 High Street, Holywood, County Down, BT18 2AZ.
Telephone: 028 9042 3165
E-mail: info@firstflightwind.com

First Flight

Newsletter TWO

First Flight Wind

March 2013

Round 1 Consultation Completed - Thank You for Participating!

Sharon Robson from Homestart Newcastle and Paula Nixon of the Co. Down Rural Community Network meet Sacha Workman of First Flight Wind's Community Liaison team at the Newcastle Information Day.

It's been a busy few months for the First Flight Wind project team. We were delighted to take our first exhibition to six Information Days in Kilkeel, Castlewellan, Carlingford, Downpatrick, Newcastle and Ardglass during November 2012 and over 230 people came along.

These Information Days allowed the local community to hear about our plans for the potential offshore wind project and to meet members of the First Flight Wind team. It was also an opportunity for visitors to record their views on the proposed Community Consultation Programme. Thanks to everyone who took the time to visit the exhibitions and to the many other people who have given us their views.

We have compiled a mini report to record the results of the first round of the consultation. The three areas of most interest to you were: the local employment opportunities; potential impacts on the local fishing industry; and, how the project might be connected to the Northern Ireland Electricity (NIE) onshore grid network. We will be working hard through the 2013 assessment work to design the project whilst taking these issues into account.

If you would like to read the full report, see ***www.firstflightwind.com*** or contact us for a copy. Summaries will also be made available at the Information Points which are listed in this newsletter. Round 2 of our consultation will begin late summer 2013 with further Information Days throughout the local area. During Round 2 we will consult you on the scope of the Environmental Impact Assessment, options for the location of the offshore wind farm as well as options for connecting the electricity to the NIE onshore grid network. We will advertise the dates and venues over the summer, and we look forward to seeing you then.

Look to the Sky for Aerial Surveys

In December 2012 First Flight Wind commenced its aerial surveys over the Tender Zone. Surveys will take place once a month so local people may see this plane, equipped with four high definition video cameras, flying over the Zone to record bird and marine mammal activity.

The twin-engined aircraft will fly in a grid pattern over the Zone approximately 610m (2000 feet) above the sea. Flights will take approximately 4 ½ hours to cover the whole Zone and will be limited to daylight hours during reasonable weather conditions. The results of the survey will help to determine which birds and marine mammal species use the Zone and to identify any potential effects on them.

More surveys are due to begin in the spring of 2013 and will include boat-based sea bird and marine mammal surveys, as well as geophysical surveys and wind speed measurements (using two onshore Light Detection and Ranging, or 'LiDAR' units).

▲ *The pattern of flight taken by the HiDef survey plane.*

Aircraft image Copyright © Darren Wilson

Welcome

We are pleased to bring you the second 'First Flight' newsletter.

In this edition you can read about the newly established Community Stakeholder Panel which held its first meeting in February.

We also take a closer look at some of the training and careers opportunities available in offshore renewables, and meet some students who are taking steps to embark on a career within this exciting industry.

Remember, if you would like to get in touch with the First Flight Wind Community Liaison Team our contact details are listed on the back of this newsletter.

The first meeting of the Community Stakeholder Panel was held at the Newry & Mourne Enterprise Agency.

First Flight Wind Community Stakeholder Panel

We are delighted to have established our Community Stakeholder Panel, with Dr Conor Patterson as Chair. The first meeting, held in Newry on 14th February, reviewed the findings of the first round of community consultation.

The panel members are drawn from a wide range of backgrounds with in-depth knowledge of the South Down area. From Down District Council are Councillors Dermot Curran and Robert Burgess; from Newry & Mourne District Council are Councillors Harold McKee, Brian Quinn and Jimmy McCreesh. Other panellists include John Smyth (Ardglass Port), Audrey Byrne (Newcastle Chamber of Commerce), Nicholas McCrickard (Co. Down Rural Community Network), Edward Carson (Farmer), Seamus Walsh (Co. Down GAA), Pamela Houston (Kilkeel Development Association) and Michael Curran (Louth Co. Council).

The panellists will bring insights and experience gained from their respective backgrounds to provide independent advice on our planned Community Consultation Programme. Further working groups are being established to provide technical advice on different aspects of the development of the project including the connection to the grid, marine ecology, commercial fisheries, seascape and landscape, socio-economics and tourism, and, shipping and navigation. These will ensure relevant local expertise and knowledge are captured in the design and review of the project.

Find out more about the Community Stakeholder Panel on our website ***www.firstflightwind.com/community-stakeholder-panel***

Coastal Communities Fund

The 2013 Coastal Community Fund launched in Northern Ireland on 13 March. If your community group is based in a coastal area, then you can apply for the next round of funding.

This new fund operating in England, Scotland, Wales and Northern Ireland, is equal to 50% of the revenues raised by The Crown Estate's marine activities in each region. It aims to promote and support the economic prospects of coastal communities. The fund for Northern Ireland is delivered via a partnership between the Department of the Environment and the BIG Fund. The Fund presents a unique opportunity and we encourage you to find out more by emailing the BIG Fund ***ccf@bigfund.org.uk*** The closing date for applications is 12 noon on 26 April 2013.

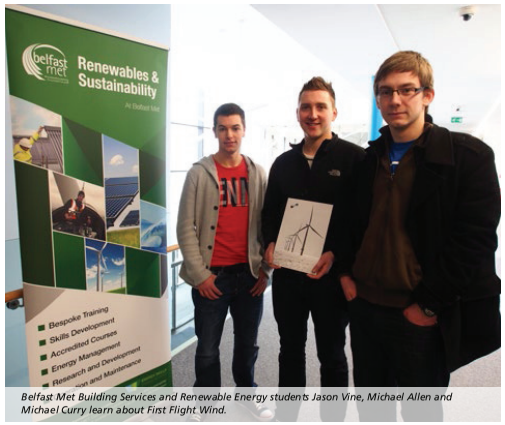
Did You Know?

By 2030, more than **70%** of the projected electricity demand in the Single Electricity Market (SEM) between Northern Ireland and the Republic of Ireland could be provided by renewable energy.

WWF

WWF Positive Energy: how renewable electricity can transform the island of Ireland by 2030 (November 2012)

Students keen to learn about Offshore Renewables



Belfast Met Building Services and Renewable Energy students Jason Vine, Michael Allen and Michael Curry learn about First Flight Wind.

The offshore renewables industry is a vibrant and growing sector which has the potential to bring new career opportunities whilst delivering a cleaner future for Northern Ireland. We presented our project plans to around 30 undergraduates at Queen's University, Belfast who are studying Environmental Impact Assessment on the RICS accredited BSc. course in Land Use and Environmental Management. These students were keen to learn about the key stages of the project, from the Strategic Environmental Assessment (SEA), right up to 2020 when the offshore wind farm could be fully operational.

The First Flight Wind Community Liaison Team also visited Belfast Met in January to meet students who are currently studying the Building Services and Renewable Energies Foundation Degree. Student Michael Allen has already gained work experience with B9 Energy Operation & Maintenance (O&M) at Altahullion Wind Farm in Limavady. Michael said: *"I come from an electrical background and found that from around 2007, when the recession hit, that this was an up and coming industry with a lot more work that I can transfer my skills to."*

You can watch an interview with Michael and read the profiles of other students from Belfast Met at ***www.firstflightwind.com*** If you would like to find out more about the relevant courses on offer at Belfast Met, then contact Chris Corken ***ccorken@belfastmet.ac.uk***

For further details about a career in offshore wind, with information on qualifications required and the types of roles available see The Crown Estate website ***www.thecrownestate.co.uk/energy-infrastructure/offshore-wind-energy***

Want to Find Out More?

For the latest project updates, please visit our website ***www.firstflightwind.com*** where you can also find First Flight Wind project leaflets, project newsletters, exhibition materials, press releases and contact information. Also check our Facebook page and follow us on Twitter for news updates and information.

Copies of our published information are available at 18 different Information Points:

Libraries		Post Offices	Tourist Information Centres
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– Downpatrick	– Portaferry	– Portavogie	– Carlingford
– Kilkeel	– Warrenpoint	– Castlebellingham	– Dundalk
– Newcastle			

You can also find First Flight Wind information at:

– Annalong Barbican
– Ardglass Community centre
– Sea Gems at the Harbour Ardglass
– Kilkeel Nautilus Centre
– Clogherhead RNLI

Did You Know?

The **UK** has the **largest amount** of installed offshore wind capacity in **Europe** (2,947.9 MW) which represents **58.9%** of all installations. Denmark follows with 921MW of installed offshore wind capacity.

(EWEA Jan 2013 'The European offshore wind industry – key trends and statistics 2012)

EWEA

It took 15 months to build Belfast's new offshore wind terminal. Image supplied by DONG Energy.

DONG Energy and ScottishPower Renewables Welcomed to Northern Ireland

Belfast Harbour has handed over its new £50m offshore wind terminal to DONG Energy and ScottishPower Renewables. The terminal is the first purpose-built offshore wind installation and pre-assembly harbour in the UK or Ireland. Up to 300 jobs are expected to be created, ranging from welders to electricians and engineers.

DONG Energy has signed a lease for the terminal which will initially be used to support the development of the West of Duddon Sands offshore wind farm in the Irish Sea, a joint venture between ScottishPower Renewables and DONG Energy.

Built by local construction company Farrans, the 50-acre terminal is the largest single investment in Belfast Harbour's 400 year history.

Community Liaison Team Diary

Since our project launch last October at the Slieve Donard Hotel in Newcastle we have held six Information Days and met with groups including the local fishing organisations, Lecale Conservation Group, NELCO and Strangford Lough & Lecale Partnership. We also presented our project plans to councillors and officers from Newry & Mourne, Down District, and Louth Co. Councils.

We continue to meet with local communities and you can find details on our website. Our contact details are below, so please don't hesitate to get in touch:

Contacts: Sacha Workman, Sinead Maguire, Victoria McCabe.

Postal Address: First Flight Wind, c/o B9 Energy Offshore Developments Ltd, 18 High Street, Holywood, County Down, BT18 9AZ.

Telephone: 028 9042 3165

E-mail: info@firstflightwind.com

At Newry Arts Centre Michael Harper, First Flight Wind and Phil Elliott, DOE Marine Division gave a presentation to Newry & Mourne, Down District and Louth Co. Councils.

Victoria McCabe, First Flight Wind Community Liaison Team presents at the Community Stakeholder Panel meeting.

Councillor Harold McKee, Newry & Mourne District Council with Sinead Maguire, First Flight Wind Community Liaison Team at the project launch, held at Slieve Donard Hotel.

Who is First Flight Wind?

First Flight Wind is a consortium comprising of B9 Energy, DONG Energy and RES.

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04

Working in Offshore Wind

Are you interested in a career in offshore wind and would like to find out more about the types of jobs available? Then go to our website ***www.firstflightwind.com/economic-opportunities*** and meet some people who are working in the industry or are taking the appropriate steps to do so. Also, if you would like to learn more about working within Operations and Maintenance, then take a look at 'A Guide to UK Offshore Wind Operations and Maintenance' which you can download from the publications section of ***www.scottish-enterprise.com***

Thomas Frampton (pictured left) is an Offshore Assistant Developer with RES Offshore, based in Kings Langley. Tom has recently been working on an analysis of fisheries data to assess the value of the commercial fishing activity off the south east coast of Co. Down.

Community Liaison Team Diary

It has been a busy few months for the Community Liaison Team. We continue to meet with local communities and key stakeholders. We met Kilkeel fish processors in June and have already set up meetings with Chambers of Commerce, tourism and environmental organisations for the coming consultation round. If you are keen for your organisation to receive a presentation, our contact details are below.

We continue to update our 19 Information Points throughout Co. Down and Co. Louth with the latest 'First Flight' newsletter and project literature. We have also had project update meetings with political representatives from the project area, including Ards Borough Councillor Robert Adair (DUP), Chris Hazzard MLA (Sinn Fein), John McCallister MLA (NI21), Steven Agnew MLA (Green Party), Jim Wells MLA (DUP) as well as MP for South Down Margaret Ritchie and Strangford MP Jim Shannon.

Contacts: Sacha Workman, Sinead Maguire, Victoria McCabe, Danielle Barrios-O'Neill

Postal Address: First Flight Wind, c/o B9 Energy Offshore Developments Ltd, 18 High Street, Holywood, County Down, BT18 9AZ.

Telephone: 028 9042 3165

E-mail: info@firstflightwind.com

Earlier this year Sacha Workman, First Flight Wind, gave a project presentation to Newcastle Dinner Club.

First Flight Wind held four technical advisory Working Group meetings in June, including one addressing Seascape, Landscape and Visual Impact.

Sinead Maguire, First Flight Wind, updates the Information Point at the Nautilus Centre, Kilkeel.

Want to Find Out More?

For the latest project updates, please visit our website ***www.firstflightwind.com*** where you can also find First Flight Wind project leaflets, project newsletters, exhibition materials, press releases and contact information. Also check our Facebook page and follow us on Twitter for news updates and information. **Copies of our published information are available at 19 different Information Points:**

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– Kilkeel	– Warrenpoint	– Dundalk	– Sea Gems at the Harbour Ardglass	– Warrenpoint Town Hall
– Newcastle			– Mourne Seafood Bar, Dundrum	– Castlebelllingham Post Office
			– Portavogie Post Office	

Who is First Flight Wind?

First Flight Wind is a consortium comprising of B9 Energy, DONG Energy and RES.

B9 ENERGY · DONG energy · res power for good · First Flight Wind

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Welcome

This summer 2013 we bring you the third 'First Flight' newsletter. We hope you find it interesting and informative.

Within this edition you can find out about the Information Days coming up in September. You can also read about the First Flight Wind Technical Working Groups, four of which met for the first time in June. These Working Groups will provide an important forum for the discussion of issues specific to this offshore project.

First Flight Wind continues its survey work. Monthly aerial surveys which have been taking place over the winter and spring across the Wind Resource Zone to collect bird and marine mammal data are being replaced by monthly boat-based surveys.

We hope you can make it to one of the Information Days to learn more about the project and the surveys and studies underway; in the meantime if you would like to get in touch our contact details are listed on the back of this newsletter.

We look forward to hearing from you.

Members of the Working Groups were asked to participate in practical exercises to collate relevant information and to raise key questions for their specific area of interest.

Working Groups Meet

First Flight Wind has established six Technical Working Groups, each focussing on a specific topic. Their purpose is to provide a constructive forum for the discussion of issues and exchange of information as part of the overall environmental impact assessment of the proposed offshore wind project.

Four of the Working Groups met for the first time in June, focussing on: Marine Ecology; Seascape, Landscape and Visual Impact; Socio-Economics and Tourism; and Shipping and Navigation. The groups comprise representatives of statutory bodies, local councils, relevant associations and organisations, and individual specialists; the groups will meet approximately every six months as the project progresses.

The two remaining Working Groups covering commercial fisheries and the arrangements for grid connection have already met this year.

First Flight Wind must undertake a robust and comprehensive assessment of the potential impacts of the project and these Working Groups will help to ensure that all relevant issues are raised for inclusion within the assessment process. The remit, membership and minutes from each of the Working Group meetings are now available from ***www.firstflightwind.com/downloads***

Survey Work Continues

Our survey campaign to collect bird and marine mammal activity within the Wind Resource Zone began in December 2012. Hi-Def Aerial Surveying Ltd were appointed to carry out monthly surveys using a plane equipped with four high definition video cameras, to record bird and marine mammal activity in the area. The surveys will show us exactly what birds and mammals use the Zone so that we can assess any potential effects of the offshore wind farm on them.

Boat-based bird and mammal surveys (where ornithologists and marine mammal observers record the number of species they see within a 500 metre radius of the boat) started in July, taking over from the aerial surveys. Natural Power Consultants (NPC) will be carrying out the survey work, using Anglo North Irish Fish Producers Organisation Ltd vessels. These boat-based surveys will take place over three continuous days each month until late 2014. They can only take place in calm sea conditions, so if at any time NPC are unable to mobilise the monthly boat survey Hi Def will collect the data for First Flight Wind through an aerial survey. This will ensure that we continue to collect data on a monthly basis.

NPC will commence the boat-based bird and mammal survey work using the vessel "Glenravel" which has been fitted out to meet the needs of the survey requirements.

First Flight Wind also recently appointed Pegasus Group Ltd., a Seascape, Landscape and Visual Impact Assessment consultant, and a commercial Fisheries Consultant, Brown and May Marine Ltd. Two fishing industry representatives (FIRs) have also been appointed, one from the Kilkeel area and one from Ardglass. They will act as a point of contact for the fishing industry to liaise with First Flight Wind and its fishing advisors.

Community Liaison Team Diary

We continue to engage with key political representatives and welcomed many along to our Information Days including Ards Borough Councillor Robert Adair (DUP) and Alderman Robert Gibson, Newry & Mourne Councillor Harold McKee (UUP), Steven Agnew MLA (Green Party), Chris Hazzard MLA (Sinn Fein), Jim Wells MLA (DUP), Sean Rogers MLA (SDLP), as well as MP for Strangford Jim Shannon and MP for South Down Margaret Ritchie. This was an excellent opportunity for them to ask us questions and highlight to us key areas of interest for their constituents.

Since we held our Information Days, the Community Liaison Team has been busy giving project presentations to community groups throughout Co. Down including Penninsula Community Network, Strangford Lough and Lecale Partnership and Mourne Heritage Trust. We also travelled to Newry to update local schools on the offshore project.

We presented at a fisheries meeting hosted by Jim Shannon MP, and met with Junior Minister Jonathan Bell, Mike Nesbitt MLA (DUP) and Michelle McIlveen MLA (DUP) to brief them on the project.

We continue to meet with local communities and you can find details on our website.

Our contact information is below, so please don't hesitate to get in touch:

Contacts: Sacha Workman, Sinead Maguire, Victoria McCabe, Danielle Barrios-O'Neill.

Postal Address: First Flight Wind, c/o B9 Energy Offshore Developments Ltd, 18 High Street, Holywood, County Down, BT18 9AZ.

Telephone: 028 9042 3165

E-mail: info@firstflightwind.com

Staff and students from St Joseph's HS, Newry met Victoria McCabe (centre) who introduced them to the offshore wind project.

We visited the Nautilus Centre in Kilkeel to meet the Mourne Coastal Tourism Forum and give them a project presentation.

Sacha Workman, First Flight Wind (centre) gave a project update to members of Cloughey Probus Club.

Want to find out more?

For the latest project updates, please visit our website ***www.firstflightwind.com*** where you can also find First Flight Wind project leaflets, project newsletters, exhibition materials, press releases and contact information. Also check our Facebook page and follow us on Twitter for news updates and information. **Copies of our published information are available at 19 different Information Points:**

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– Newcastle			– Mourne Seafood Bar, Dundrum	– Castlebelllingham Post Office
			– Portavogie Post Office	

First Flight Wind is a consortium comprising of B9 Energy, DONG Energy and RES.

We are investigating the potential location for a 600MW offshore wind project, which could result in between 40 – 120 wind turbines (depending on the size of each turbine), operating off the Co. Down coast and subject to planning consent. This project could supply up to 20% of Northern Ireland's electricity needs.

100% recycled paper

Welcome

This winter 2013 we bring you the fourth 'First Flight' newsletter.

Within this edition we tell you about the 2013 Information Days and share some insights gained from those who attended and completed a questionnaire.

We recently held one of our technical Working Groups with the remaining four convening in early 2014. In this edition you can find out a bit more about the Shipping & Navigation Working Group and group member Peter Conway explains its function. The Community Stakeholder Panel will hold their third meeting in January 2014.

Our survey work in the Wind Resource Zone continues; the metocean survey has started and the second Lidar unit has been installed.

We are working towards the submission of our applications for consent in late 2015 or early 2016, and will keep you updated on the progress of the application through this newsletter, on our website and at future events.

If you would like to get in touch with us, our contact details are listed on the back of this newsletter, and we look forward to hearing from you.

Belfast Met course director Paddy Gorman joins students Philip Elwood and Sorcha Millen, along with Jan Tilma from Offshore Wind Force at the Belfast Harbour offshore wind facility.

Belfast Met students experience offshore wind

Second year Building Services and Renewable Energies foundation degree students Sorcha Millen and Philip Elwood have been experiencing the full force of the offshore wind industry by gaining work placements at DONG Energy's Belfast Harbour offshore wind facility, working with Offshore Wind Force.

Sorcha, who was formerly a senior technician in her family's architects practice and taught BTEC Level 3 in Construction, has now set her sights on a career in offshore wind. Her placement involves working on site, where outfitting the transition pieces for the foundations takes place, as well as office based research and quality control and assurance.

She highlights the range of opportunities involved in offshore wind, from site management to health and safety and offshore opportunities. Sorcha also commented that for her, the offshore wind industry has opened a 'whole new world of job opportunities'. You can watch the full interview with Sorcha at ***www.firstflightwind.com/courses*** and all of our project related films at ***www.vimeo.com/firstflightwind***.

If you would like to find out more about relevant courses at Belfast Met then contact Chris Corken ***ccorken@belfastmet.ac.uk*** and for information on the types of careers available within offshore wind then go to ***www.firstflightwind.com/economic-opportunities***.

Coastal Communities Fund

The Coastal Communities Fund, which operates throughout England, Scotland, Wales and Northern Ireland, aims to encourage the economic development of UK coastal communities by awarding funding to create sustainable economic growth and jobs.

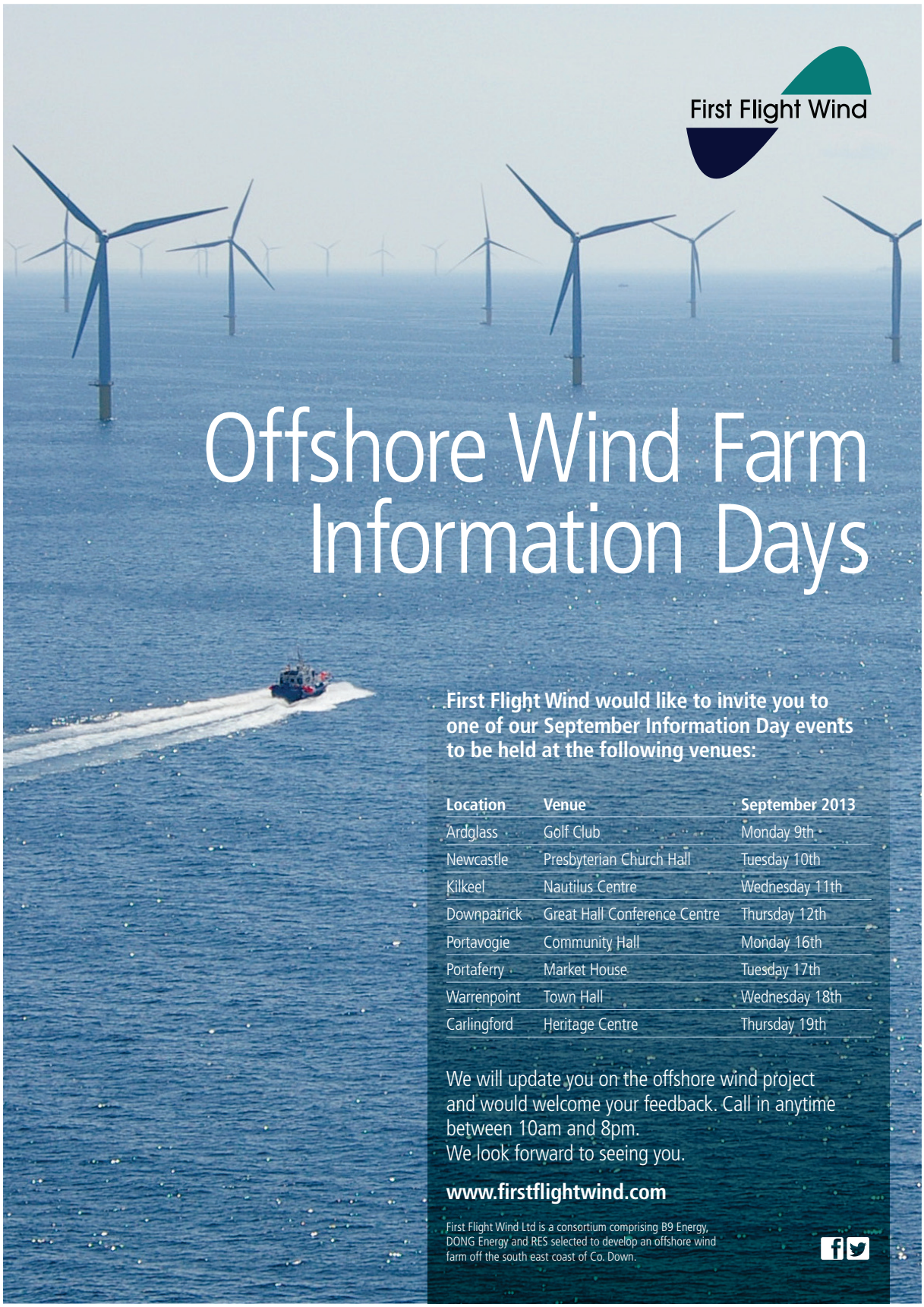
The third and final round of the current Coastal Communities Fund programme will open in January 2014, and grants of £50,000 and over are available.

Since the start of the Coastal Communities Fund in 2012 grants have been awarded to 62 organisations across the UK to the value of £32 million. The fund for Northern Ireland is delivered via a partnership between the Department of the Environment and the BIG Fund.

BIG FUND

For information on how to apply, email The BIG Fund at ***ccf@bigfund.org.uk*** or contact the enquiries line 0845 4 10 20 30.


First Flight Wind
Invitation to Attend Offshore Wind Farm Information Days
First Flight Wind was selected to develop an offshore wind farm off the south east coast of Co. Down. At the start of this process, we are inviting you to come and learn more about these plans and how you can contribute to shaping them as part of the overall environmental assessment of the project.
Location | Venue | November
Kilkeel | Nautilus Centre | Monday 5th
Castlewellan | Community Centre | Tuesday 6th
Carlingford | Heritage Centre | Wednesday 7th
Downpatrick | St Michael's Hall | Thursday 8th
Newcastle | Slieve Donard Hotel | Monday 12th
Ardglass | Community Centre | Tuesday 13th
Drop in anytime between 10 am and 9 pm
You will be able to meet our Community Liaison Team, ask questions and complete a questionnaire on the proposed pre-application community consultation programme that runs from now until 2015. We look forward to seeing you!
Alternatively please contact us at
Web: www.firstflightwind.com
Email: info@firstflightwind.com
Telephone: 028 9042 3165
Twitter: @firstflightwind
First Flight Wind Ltd is a consortium comprising
B9 Energy, DONG Energy and RES


First Flight Wind
Offshore Wind Farm Information Days
First Flight Wind would like to invite you to one of our September Information Day events to be held at the following venues:
Location | Venue | September 2013
Ardglass | Golf Club | Monday 9th
Newcastle | Presbyterian Church Hall | Tuesday 10th
Kilkeel | Nautilus Centre | Wednesday 11th
Downpatrick | Great Hall Conference Centre | Thursday 12th
Portavogie | Community Hall | Monday 16th
Portaferry | Market House | Tuesday 17th
Warrenpoint | Town Hall | Wednesday 18th
Carlingford | Heritage Centre | Thursday 19th
We will update you on the offshore wind project and would welcome your feedback. Call in anytime between 10am and 8pm.
We look forward to seeing you.
www.firstflightwind.com
First Flight Wind Ltd is a consortium comprising B9 Energy, DONG Energy and RES selected to develop an offshore wind farm off the south east coast of Co. Down.

First Flight Wind

Information Day
Round Two Booklet

FOR REFERENCE ONLY THIS IS INFORMATION FOR YOUR COMMUNITY – DO NOT REMOVE

This booklet is a print out of the information panels used for First Flight Wind Ltd.'s second round of information days (9th – 19th September). It is designed to inform you and help you complete the accompanying questionnaire should you wish to.

Questionnaires should be returned by 31st October 2013

Please note: these are A4 reproductions of the original A0 panels. If you need to see a larger copy of any of the maps, please contact us and we can make these available in an alternative format.

If you have any questions please contact the
First Flight Wind Community Liaison Team
Tel: 028 9042 3165 or **Email:** info@firstflightwind.com

First Flight Wind Ltd, is a consortium comprising B9 Energy, DONG Energy and RES
Registered address: Murray House, Murray Street, Belfast BT1 6DN. Registration Number: NI611390

1 Welcome

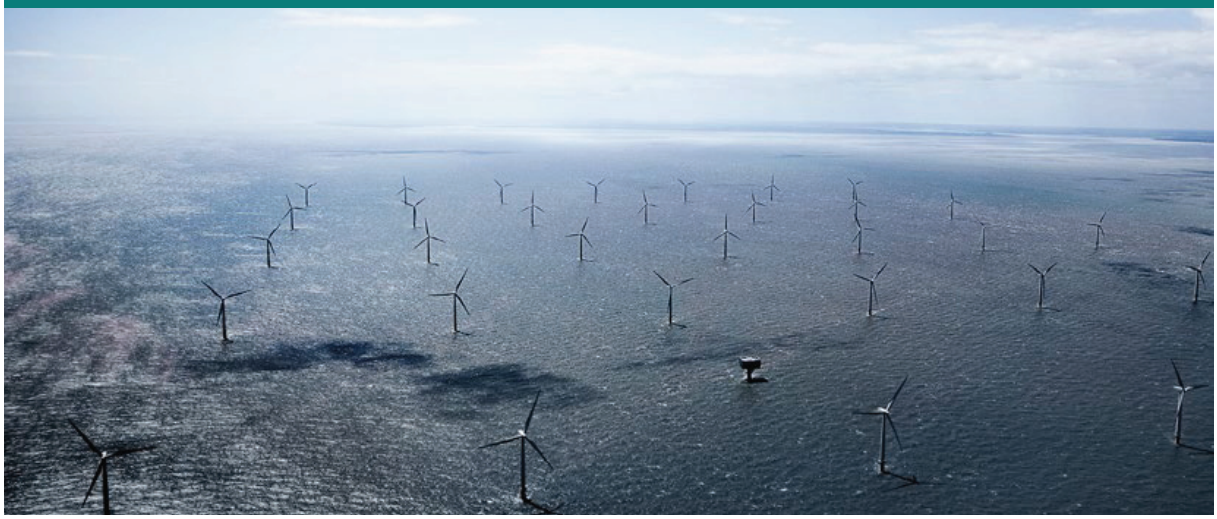
First Flight Wind

Welcome to the second in the series of four rounds of Information Days for the proposed First Flight Wind offshore wind farm. Today you can read about progress to date and what comes next as we move through the development process.

The project is at a relatively early stage with the assessment and design work still on-going. Your views are important to us and today you will have the opportunity to guide us in the next phase before we begin our detailed wind farm design. Please therefore take a questionnaire to complete as you go round the exhibition as we would like your views on a number of issues including:

- What needs to be taken into account when locating the wind farm;
- Different turbine number and size combinations; and,
- Viewpoints from which to assess the potential visual impacts of the project.

If you have not read about the project before or you cannot find the information you are looking for, First Flight Wind staff are here to answer your questions.



2 Policy background

First Flight Wind

The Executive's objective is to ensure competitive, secure and sustainable energy for Northern Ireland. Renewable energy is central to this.

Currently, around 85% of our electricity comes from conventional, non-renewable sources of electricity (for example, coal, and gas)[1]. This is unsustainable, both environmentally and economically. In response to this, the Executive has set a policy target of obtaining 40% of our electricity requirements by 2020 from renewable sources (for example, wind energy). To meet the 40% target, it is estimated that Northern Ireland would need between 1,200-1,800 MW of renewable energy capacity installed[2]. By June 2013, approximately 575MW of renewables capacity had been installed[3].

The Executive's strategy set out in its 'Strategy Energy Framework' contains 4 key energy goals as shown below.

Wind energy and other renewable energy technologies will be needed if we are to meet our 2020 renewable energy targets and the UK's longer term decarbonisation goal to reduce carbon emissions by 80% from 1990 levels by 2050.

Offshore Wind

As part of its preparation of an Offshore Strategic Action Plan, the Executive conducted a three year Strategic Environmental Assessment that identified an area off the Co. Down coastline as potentially suitable for offshore wind energy taking into account a range of considerations. Following a competitive tender conducted by The Crown Estate[4], First Flight Wind Ltd was selected in October 2012 as the company to develop the offshore project.

Building Competitive Markets

Ensuring Security of Supply

(Photograph reproduced with permission of Powerteam)

Enhancing Sustainability

Developing our Energy Infrastructure

(Photograph reproduced with permission of London Array Ltd)

1 From 1 August 2012 to 31 July 2013, renewable sources of energy comprised 14.3% of the Northern Ireland fuel mix (SONI website)
2 (a) National Grid EMR Analytical Report, National Grid and SONI, July 2013 and (b) OREAP Environmental Report, AECOM for DETI, October 2011
3 Renewable integration Status Report, NIE for Renewable Grid Liaison Group, June 2013 (UREGNI website).
4 The Crown Estate owns the seabed out to 12 nautical miles / c. 19km

3 Project summary

First Flight Wind

First Flight Wind Ltd is proposing to develop a 600 megawatt (MW) offshore wind farm off Co. Down. This is Northern Ireland's first offshore wind farm and could provide, subject to planning, up to 20% of our electricity[1].

First Flight Wind Ltd is made up of three companies: **B9 Energy, DONG Energy and RES.**

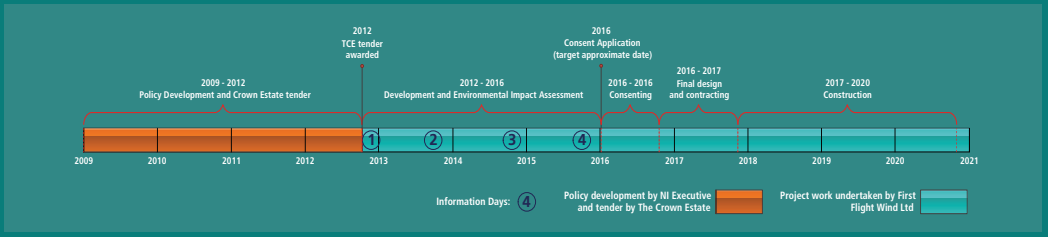
We are currently in the 'development' stage of the project (see timeline), in which we are undertaking the necessary assessments to enable us to understand how best to design the project and to minimise any potential impacts.
Before constructing the project, First Flight Wind Ltd must gain all the necessary consents. After this, it will take three to four years to build the wind farm.

What does an offshore wind farm look like?

Whilst the final design of the project is not yet complete, a 600MW offshore wind farm is likely to include:

- Offshore wind turbines and foundations;
- Up to two offshore collector/convertor stations and their foundations to transform the electricity to a voltage suitable for bringing to shore;
- Cables between the turbines and the offshore collector stations;
- Offshore export cables and onshore circuitry that will link the offshore substations to the landfall points, the onshore substations and the Northern Ireland transmission network;
- Onshore substations that are required to convert power to the voltage for the Northern Ireland transmission network.

Wind Resource Zone. The dotted orange box represents the approximate area necessary for a 600MW wind farm. The dark red line shows the Wind Resource Zone within which a project location will be found. The area of search will therefore not be completely filled with turbines.



1 Based upon total annual system demand for Northern Ireland in 2020 of 10,100GWh (All-Island Generation Capacity Statement 2013-2022, 'median' projection, Eirgrid / SONI, 2012) and load factor of 39%.

4 Why are we doing this project?

First Flight Wind

This offshore wind project will help to:

– provide security of energy supply to Northern Ireland - **Local**
– bring economic benefits to Northern Ireland - **Economic**
– meet Northern Ireland's renewable energy targets - **Renewable**
– deliver carbon emission reductions - **Sustainable**

Project Benefits

Northern Ireland currently imports more than 95%[1] of its energy for heating, transport and electricity in the form of non-renewable fossil fuels (for example coal, oil and gas).

We have little control over the supply of such energy sources, we are exposed to the volatility of world energy prices and burning fossil fuels contributes to climate change.

'The development of offshore renewables is an excellent opportunity for Northern Ireland in so many ways – energy security and diversity; climate change mitigation; a contribution to the Executive's 2020 targets and the business supply chain opportunities for local companies.'
Arlene Foster, October 2012

This project will help us to reduce the threat of climate change, supporting Northern Ireland in meeting its renewable energy targets and its commitments to cut greenhouse gases.

'Renewable energy and technology is one of our single biggest economic opportunities. It has the potential to be a significant driver of our economy.'
Alex Attwood, March 2013

Example: The total number of people who worked on the London Array project (630MW, opened July 2013) at one time or another during the development and construction phases was around 6,700.

The project will create job and economic opportunities during the development, construction and operation phases for Northern Ireland companies wishing to compete in the offshore energy industry.

Example: The Greater Gabbard project (500MW, opened August 2013) involved an investment of £500 million in UK companies. 100 permanent jobs were created in the operations base, with 95% of employees coming from the local area, and ongoing local maintenance and service contracts worth an extra £100 million over the next 20 years.

This project will help to increase Northern Ireland's energy independence and security of supply by reducing its reliance on imported fuels. Unlike such fuels, the costs of wind energy are predictable, this will help to reduce consumers' exposure to volatile world energy prices.

Following a 17.8% price increase to electricity prices in May 2013, the Managing Director of Power NI, said: "The fact is that so much is dependent upon world fuel costs, which are outside our control and which have a volatile effect on the price we pay for wholesale electricity."

1. The main fuels used by final consumers in UK in 2012 were petroleum products (45.4 per cent), natural gas (32.1 per cent) and electricity (18.4 per cent). Section 1.16, Digest of United Kingdom Energy Statistics, 2013

5 How is the assessment work progressing?

First Flight Wind

In October 2012 we commenced a programme of studies, surveys and baseline data collection to better understand the physical, ecological, social and technical characteristics of the area of search for the wind farm (the 'Wind Resource Zone').

These studies and surveys will continue through 2013 and 2014 and they play a crucial role in allowing us to understand the existing environment. The findings will help us to assess the potential impacts of the wind farm and to determine the final proposed size, layout, location and grid connection arrangements.

The survey programme is supported by specialist consultants covering:

- **The impacts on fish stocks and the fishing industry.**
- **Birds and marine mammals:**
  - Coastal Vantage Point surveys for winter/spring bird migration (from October 2012);
  - Aerial bird and marine mammal surveys (Dec 2012 to June 2013); and
  - Boat based bird and marine mammal surveys from July 2013.
- **The assessment of seascape and landscape.**
- **Physical processes**
  (the assessment of potential offshore impacts including changes to suspended sediment concentrations during construction and changes to waves and currents).
- **Shipping and navigation**
  (to see how the project might co-exist with commercial shipping traffic and other marine users).
- **Cultural heritage and marine archaeology**
  (impacts of features of archaeological or historical interest, such as wrecks).

Additional surveys are underway or planned to gather wind resource data (commenced June 2013); metocean data (waves, currents, water levels and suspended sediment concentrations - commencing October 2013); and geophysical data (seabed conditions – commencing spring 2014).

We have established six Technical Working Groups to focus on specific technical aspects of the project (Marine Ecology; Seascape and Landscape; Socio Economics and Tourism; Shipping and Navigation; Commercial Fisheries; and Grid Connection). Their purpose is to provide a constructive forum to discuss issues and exchange information as part of the overall Environmental Impact Assessment. Each group has compiled a number of key questions to be considered through the design process.

6 How are we engaging with local stakeholders?

First Flight Wind

Communication with local people and groups is a key part of our approach to developing the offshore wind farm and interest in the project is growing!

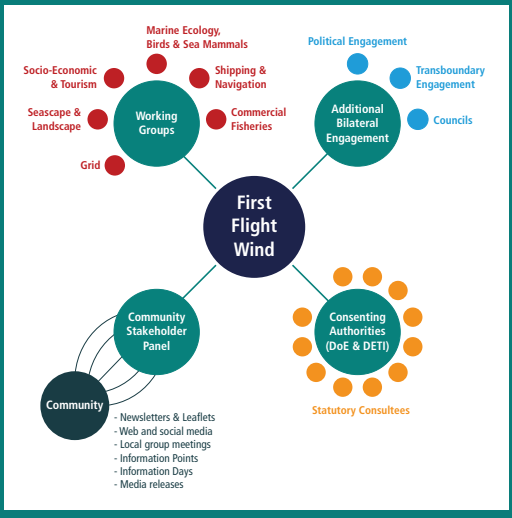
Based in Co. Down, our Community Liaison Team of four is here to engage and listen to local points of view and to channel these views to the rest of the project team.

We have established a Community Stakeholder Panel with meetings in February and June 2013. Panel members are independent of First Flight Wind Ltd and participate whatever their views on the project. The panel's main purpose is to ensure that we are consulting with you in the best possible way. Feedback from the panel has really helped us improve how we communicate with you.

We make project literature available in 19 Information Points throughout Co. Down and Co. Louth. We also produce three "First Flight" newsletters annually and place articles in Co. Down newspapers fortnightly to ensure you are kept abreast of developments. **www.firstflightwind.com** holds all our published information.

We now have over 1,500 contacts on our mailing list, 160 Facebook likes and 800 Twitter followers, whom we can reach daily with pictures and stories as they happen. We regularly meet political representatives as well as community and national interest groups.

In April 2013 we launched our education programme to around 600 pupils in 14 Co. Down schools. We explain how renewable energy can affect young peoples' lives and communities.



Overview of stakeholder engagement

School's programme

7 Environmental scoping - introduction

First Flight Wind

As part of our consent application for the project, First Flight Wind Ltd will complete a full Environmental Impact Assessment for both the onshore and offshore elements of the project. This will help us to design a project that minimises any adverse effects whilst maximising potential benefits.

In June 2013, the Department of Environment and the Department of Enterprise, Trade and Investment issued a 'Screening Opinion' that notified us that a full Environmental Impact Assessment would be required for the project because of its scale, nature and potential environmental effects. The purpose of the Environmental Impact Assessment is to assess predicted impacts arising from the development (both onshore and offshore) during construction, operation and eventual decommissioning.

To make sure we are assessing all the potential significant impacts, we are preparing a 'Scoping Report' that should be submitted to the Department of Environment before the end of 2013 for public consultation.

This important phase of the project seeks to:

- Establish key issues and who or what may be affected by the project ('receptors');
- Reach agreement on the assessment methodology and approach; and,
- Obtain feedback from the general public, statutory and non-statutory stakeholders.

The Department of Environment will consult relevant bodies on our Scoping Report and subsequently publish a Scoping Opinion, taking into account the issues raised during the consultation. The Department of Environment will also inform us if an "Appropriate Assessment" is required under the Habitats Regulations. This process can be seen in the accompanying leaflet.

Panel 8 and the accompanying leaflets set out the key issues that we consider are important to address as part of the Environmental Impact Assessment in respect of the physical, biological and human environments during the construction, operation and decommissioning phases.

Please use the questionnaire form to record any comments you may have on the information presented on Panel 8 or the accompanying leaflets found at the end of this booklet.

SEE Q QUESTIONNAIRE

8 Environmental scoping - topics

First Flight Wind

This panel identifies the key topic areas that we need to consider regarding the physical, biological and human environments. The accompanying leaflets set out in more detail the potential impacts arising for each topic area.

Potential impacts on the offshore environment due to the wind farm turbines and foundations, inter-array cables, offshore substation and export cable(s) include:

Offshore Topics

Physical Environment	Biological Environment	Human Environment
Hydrodynamic regime (waves, currents, tides, water levels, surges)	Benthic Ecology	Commercial fisheries
Sedimentary regime and morphology	Ornithology	Shipping and navigation
Frontal features and stratification	Nature Conservation Designations	Seascape, landscape and visual amenity
Hydrodynamic regime (waves, currents, tides, water levels, surges)	Marine Mammals, basking sharks, turtles	Cultural heritage and marine archaeology
	Fish and shellfish ecology	Aviation
		Tourism and socio-economics

Potential impacts on the onshore environment due to cable landfall site selection, substation site selection, onshore cable route site selection include:

Onshore Topics

Physical Environment	Biological Environment	Human Environment
Geology and ground conditions	Ornithology	Landscape and views
Water resources and flood risk	Ecology and Nature conservation	Archaeology and cultural heritage
		Soils, agriculture and land use
		Noise and vibration
		Air quality and dust

Ideally we will submit a single Scoping Report that will cover both the onshore and offshore parts of the project at the same time. However, this depends on the outcome of the grid connection consultations currently being undertaken by the Utility Regulator (see Panel 19). We may need to submit an Offshore Scoping Report for the offshore elements first (before end 2013) with an Onshore Scoping Report for the onshore elements later (possibly, spring 2014) once the options for potential grid connection points have been reduced to a realistic number.

9 Identifying the location for the wind farm - introduction

First Flight Wind

The process of selecting a wind farm location within a set area is a complex task. There are various diverse needs that can pull the project in different directions and the challenge is to balance the demands of society, what is environmentally necessary and what is technically or commercially possible.

For example, by siting a project much further from shore, we could reduce its visual impact but it might also:

- Have a greater impact on shipping and potentially fishing;
- Be too deep for currently available foundation technologies;
- Mean high electrical losses due to longer cables and therefore more expensive electricity; and
- Make it difficult for engineers to return home after a day's maintenance.

For this site, turbines will not need to cover the whole Wind Resource Zone as the area for a 600MW project will only occupy a proportion of the zone. This smaller area has not yet been identified. We are therefore assessing the whole zone to establish all relevant issues. The table below highlights some technical, environmental and societal considerations that will need to be taken into account in determining the project's final location.

Technical / Physical	Environment / Biological	Society / Community
Water depth	Birds (including migration routes)	Visual impact
Distance to shore and to the grid connection	Sea-mammals	Fishing
Seabed conditions	Fish and Crustaceans (including spawning sites)	Shipping
Wind speeds	Benthos (seabed life)	Recreational boating
Wave Climate	Changes to tides and waves	Aircraft / radar
Tidal currents	Protected habitats	Archaeology
Tidal range		Cables / Pipelines
Ammunitions (unexploded ordnance)		Oil & gas reserves

It is possible that the project turbines could be sited all together in one location or be split across two separate areas within the Wind Resource Zone. The final location and layout arrangement of the wind farm will be determined by considering all the relevant issues and taking account of any views received from stakeholders.

Over Panels 10, 11 and 12 we examine the above considerations in more detail and invite your views on how best to locate the project. Please see questions 2 to 3 on your questionnaire.

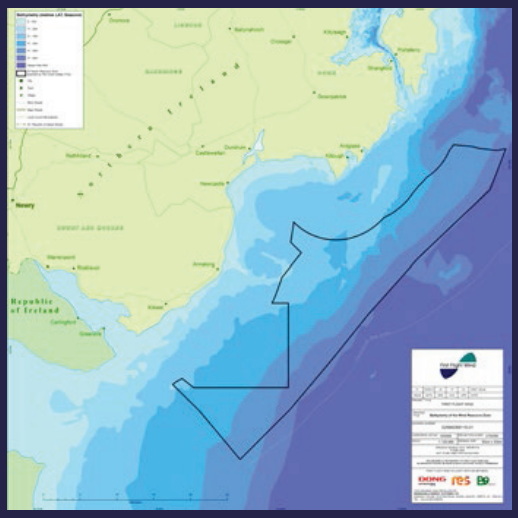
SEE Q QUESTIONNAIRE

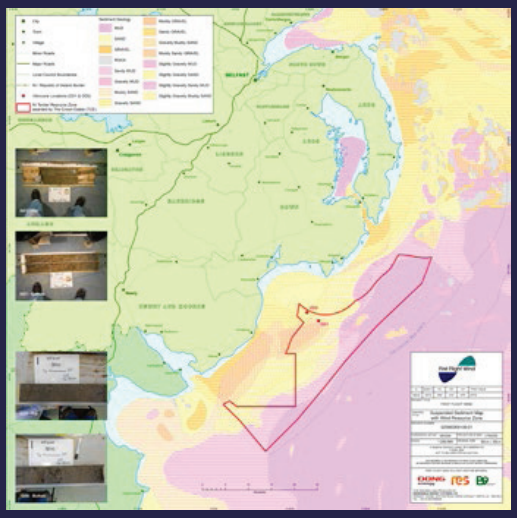
10 Identifying the location for the wind farm - physical considerations

First Flight Wind

An understanding of the physical properties of the Wind Resource Zone is essential in helping to identify an appropriate location for the project. An ideal location would involve:

- **Appropriate water depth.**
  This is necessary in order to use foundation technologies that are safe, proven and cost effective. Off Co. Down, the seabed slopes away fairly rapidly and parts of the zone are deeper than for any offshore wind farm built so far.
- **Stable soils and seabed conditions.**
  The soils (seabed muds, sands, gravel etc.) will need to be firm enough to support structures weighing over a thousand tonnes and even more for the case of the offshore electrical substation. Understanding the soil conditions is one of the biggest challenges for any project as it is necessary to have confidence in the seabed structure beyond the base of any piles (foundations pushed c.40m deep into the seabed). Conversely, the soils must not be overly hard, otherwise pushing foundations into the seabed will be very slow and expensive. Seabed conditions can vary a lot over short distances and to be confident that our designs will work, we will need to drill down and take samples at the necessary depths.
- **Benign wave and tidal conditions.**
  We have gained experience across the Irish Sea from other projects and as a result wave and tide conditions are well understood.
- **Good wind speeds.**
  For this project, although the wind speeds are good, the area lies partly in the shadow of the Mourne Mountains, which will make the wind-flows off the shore more complicated to model and predict.



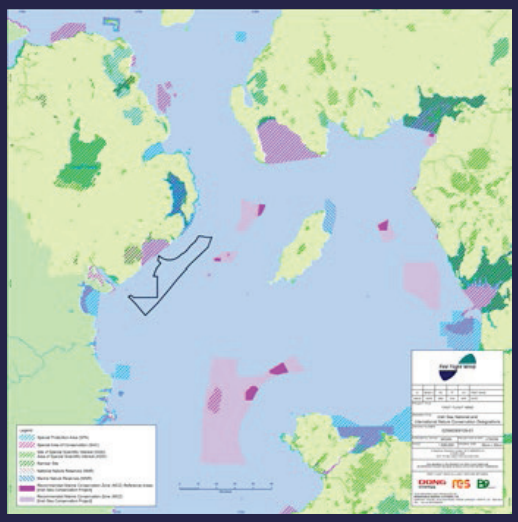


11 Identifying the location for the wind farm - biological considerations

First Flight Wind

The biological characteristics of the Wind Resource Zone and particularly sensitive species, features and habitats need to be taken into account when designing a wind farm and identifying its location. Our aim is to minimise impacts on these biological "receptors" within the site and surrounding area.

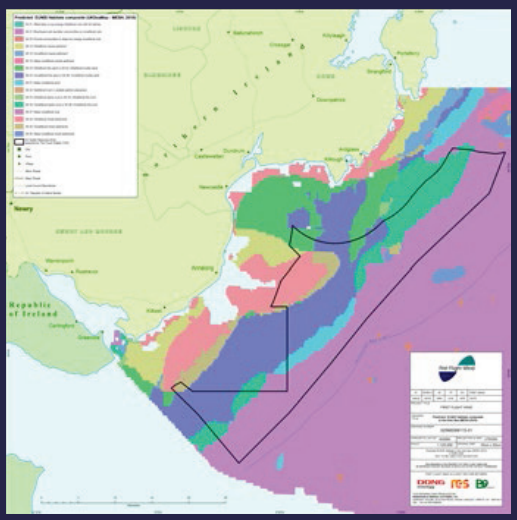
For this project, several sites designated for their conservation value are located within 30km of the Wind Resource Zone. This includes sites protected at national level, such as Areas of Special Scientific Interest, a Marine Nature Reserve, and a Ramsar site (internationally protected wetland).



European sites, such as Special Areas of Conservation (for example, Murlough), and Special Protection Areas (for example, Strangford Lough, Carlingford Lough (North) or Kilough Bay), are of particular importance due to their high level of legal protection. They support mobile species such as birds and marine mammals and give legal protection to habitats such as rocky reefs.

For this site, we are gathering information on biological 'receptors' present across the area including fish, basking sharks, birds, benthic (seabed) ecology and marine mammals. We will also be assessing fish spawning sites, bird migration routes and the extent of the Nephrops (prawn) burrows.

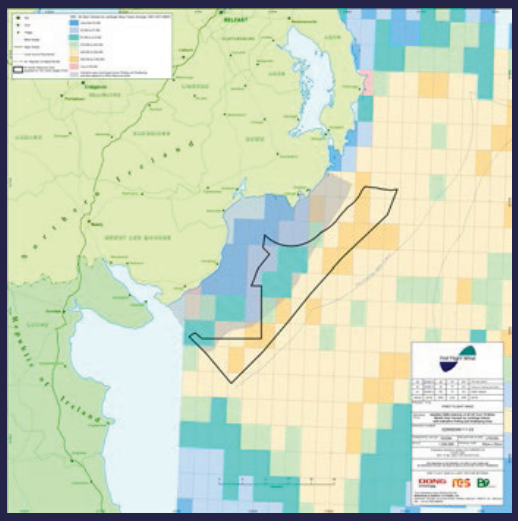
In addition, we are consulting relevant stakeholders, Government departments and statutory nature conservation bodies to ensure that the important biological constraints are fully considered. As different location options may result in different impacts on biological receptors, we will take all of the information produced by the studies into consideration to identify the best design and optimum location.



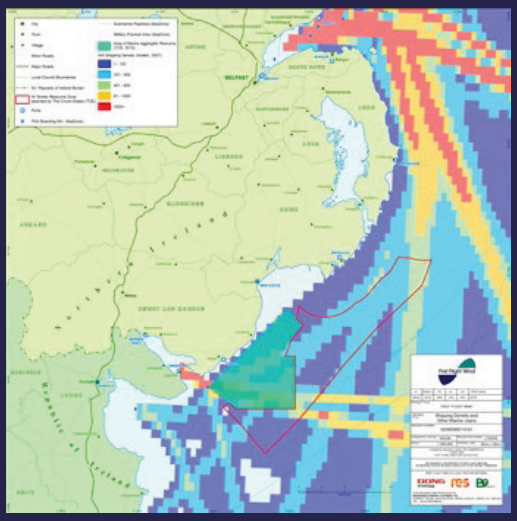
12 Identifying the location for the wind farm - human activities

First Flight Wind

We aim to locate the project to minimise any adverse effect on other human activities whilst also trying to maximise any potential benefits the project can bring to such activities.



Fishing activity



Other marine activities.

We recognise that a wide range of activities takes place across or within the vicinity of the Wind Resource Zone, the adjacent coastline and inland areas. These include: commercial fisheries, commercial shipping and ports, mining industries (for example, aggregates, oil and gas), recreational boating, angling, other maritime uses, military activity, cultural heritage and archaeological activities, seascape and landscape interests, and activities based upon nature conservation, tourism and recreation.

We are currently assessing each activity to assess whether and how best they can accommodate a wind farm development. As part of the Environmental Impact Assessment process, mitigation relevant to the different activities will be proposed if necessary.

13 Turbine numbers and heights

First Flight Wind

The proposed project total capacity is 600MW with individual turbines of 5MW capacity or greater being considered. Different combinations of turbine numbers and sizes can be used to produce a total of 600MW (for example, 120 x 5MW or 60 x 10MW).

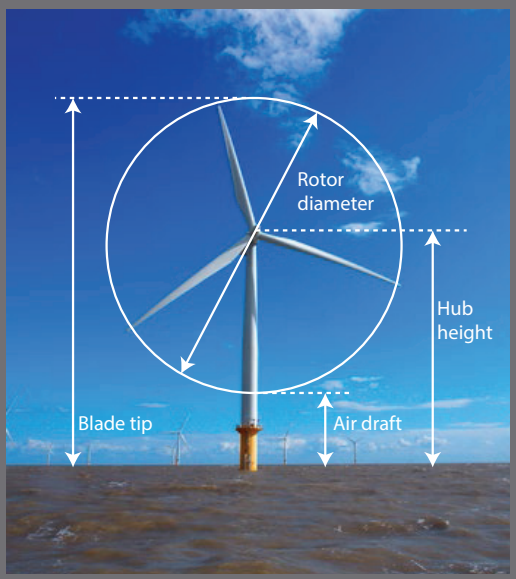
The final project design will be subject to design reviews conducted throughout the Environmental Impact Assessment process and comments received from stakeholders. The table below provides three possible combinations of turbines numbers and sizes to obtain a total of 600MW capacity.

	Maximum rotor tip height (m LAT)	Maximum number of turbines	Maximum rotor diameter (m)	Maximum hub height (m LAT)	Air draft (above MHWS)	Indicative turbine spacing range approx. (m)	Nominal Rating
A	200	120	155	123	22	800 – 1500	5MW
B	265	60	220	155	22	1100 – 2000	10MW
C	310	40	265	178	22	1300 - 2500	15MW

We have prepared indicative images for the above three turbine size and number combinations to illustrate what a theoretical wind farm could look like from the shoreline when viewed at a distance of (a) 8km (Panel 14) and (b) 13km (Panel 15).

While we are still at an early stage of the design process, we are seeking your views on whether there is any preference for a project that has more, smaller turbines that are closer together or fewer, bigger turbines that are spaced further apart.

Please use your questionnaire to record your answers.



SEE Q QUESTIONNAIRE

14 A

IT IS IMPORTANT TO VIEW THE IMAGE AT A DISTANCE OF 30CM

This image has been produced to illustrate a hypothetical layout arrangement comprising 120 turbines of a maximum tip height of 200m when viewed from the shoreline at sea level at a distance of 8km. It has been produced to support the early pre-design public consultation exercise in order to gain feedback on attitudes to layout arrangement considerations. Further consultation will be conducted in 2014 and 2015 as the project design unfolds.

This is an illustrative visualisation and does not represent the actual location or final layout of the proposed development, but is intended to allow comparison of different turbine number and size combinations. For the avoidance of doubt, the image does not represent any proposed development option.

The visualisation portrays a viewing angle of 75 degrees and has been produced in accordance with best practice guidelines. Whilst this visualisation is presented on a flat A3 sheet, in reality, the world through the human eye is seen cylindrically and therefore to replicate this in a photomontage one would need to curve the image around the viewer's head to make it technically accurate, though this is difficult to achieve in practice. In order to view the presented flat images correctly they must be viewed at a distance of 30cm with one eye only.

14 B

IT IS IMPORTANT TO VIEW THE IMAGE AT A DISTANCE OF 30CM

This image has been produced to illustrate a hypothetical layout arrangement comprising 60 turbines of a maximum tip height of 265m when viewed from the shoreline at sea level at a distance of 8km. It has been produced to support the early pre-design public consultation exercise in order to gain feedback on attitudes to layout arrangement considerations. Further consultation will be conducted in 2014 and 2015 as the project design unfolds.

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14C

IT IS IMPORTANT TO VIEW THE IMAGE AT A DISTANCE OF 30CM

This image has been produced to illustrate a hypothetical layout arrangement comprising 40 turbines of a maximum tip height of 310m when viewed from the shoreline at sea level at a distance of 8km. It has been produced to support the early pre-design public consultation exercise in order to gain feedback on attitudes to layout arrangement considerations. Further consultation will be conducted in 2014 and 2015 as the project design unfolds.

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15 A

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This image has been produced to illustrate a hypothetical layout arrangement comprising 120 turbines of a maximum tip height of 200m when viewed from the shoreline at sea level at a distance of 13km. It has been produced to support the early pre-design public consultation exercise in order to gain feedback on attitudes to layout arrangement considerations. Further consultation will be conducted in 2014 and 2015 as the project design unfolds.

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16 Viewpoints and visual analysis

First Flight Wind

As part of the Environmental Impact Assessment, we will complete a full review of the impacts of the project on the seascape and landscape.

For this, we shall use both a Core Study Area of 35km radius from the outer edge of the offshore wind farm and an Extended Study Area of 60km. The Core Study Area is intended to focus attention on where 'likely significant effects' may occur. The Extended Study Area will be used to consider the potential for visual effects from particularly sensitive landscape areas including nationally designated Areas of Outstanding Natural Beauty (AONB), or equivalent designations in Ireland and the Isle of Man. Ultimately, the nature and magnitude of any potential impact on these areas will depend on a variety of factors, including the location and height of the turbines.

Panel 17 shows a preliminary Zone of Theoretical Visibility that has been generated based on turbines notionally located throughout the whole Wind Resource Zone. **For the final project, turbines will not be located throughout the whole Wind Resource Zone** but this approach allows us to identify sensitive land-based areas from where the project can potentially be viewed. Turbines of the largest tip-height dimensions of all those under consideration were used in Panel 17 to identify the maximum extent of potential visibility for the project.

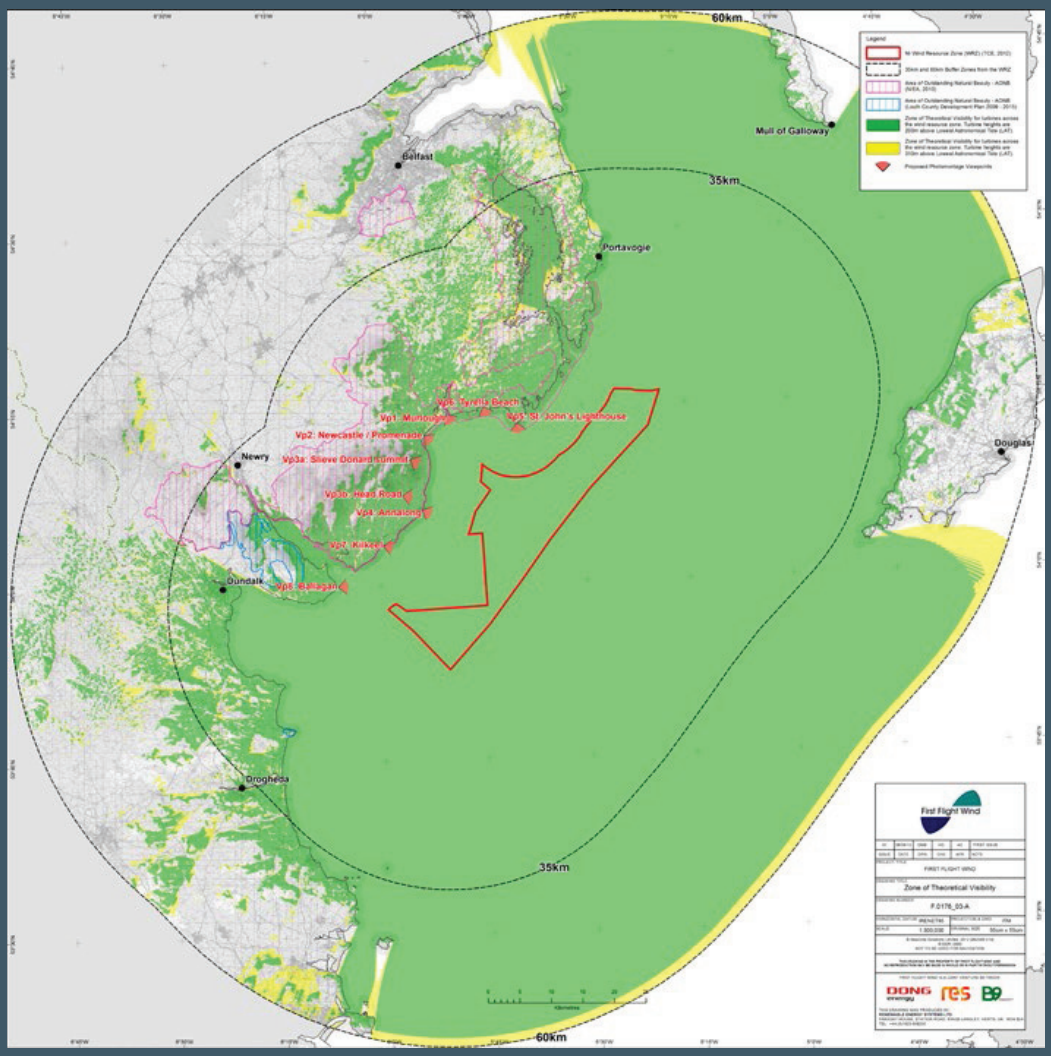
A number of photomontages will be prepared from agreed viewpoint locations to assess the project's visual effects. A photomontage shows computer-generated wind turbines superimposed upon a photograph taken from an actual viewpoint. The eight proposed photomontage locations are illustrated on Panel 17 and have been chosen in discussion with the First Flight Wind Landscape Working Group to represent a variety of distances, elevations and orientations and to reflect different types of viewer. Please note that Viewpoint 3 has two options. A rationale for their selection is provided in the accompanying leaflet found at the end of this booklet.

The final selection of viewpoint locations will be agreed with stakeholders to make best use of local knowledge and to understand stakeholder priorities. Please use the questionnaire to comment on the viewpoint selection.

SEE Q QUESTIONNAIRE

17 Zone of Theoretical Visibility

First Flight Wind



18 Grid connection

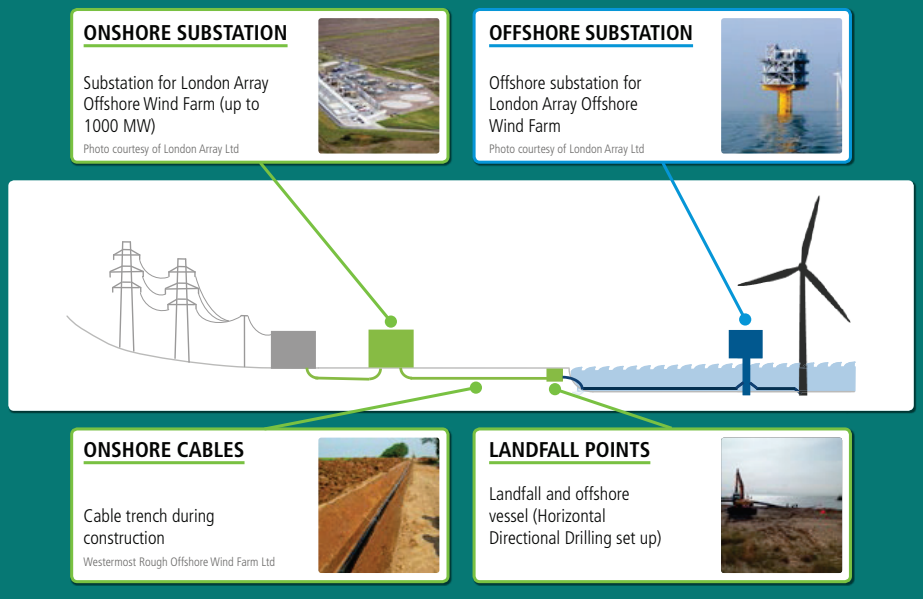
First Flight Wind

The offshore wind farm will supply electricity to Northern Ireland's homes and businesses by connecting to the Northern Ireland electricity transmission network, 'the grid'.

Electricity generated from the offshore wind farm will be brought to the shoreline via subsea export cables. It will then be connected to the grid so it can be used by consumers across Northern Ireland. The diagram below shows the key elements that will make up this connection. These elements include:

- **Offshore substation(s)** may, depending upon the final design, be required to step up the power from the wind turbines for transmission to shore;
- **Landfall points** at the shoreline where electricity will be transferred from offshore export cables to onshore circuits;
- **Onshore substations** that are required to convert power to the onshore transmission voltage, to contain equipment to comply with requirements of the Grid operator and to provide metering and control functions; and
- **Offshore export cables and onshore circuitry** that will link the offshore substations to the landfall points and the landfall points to the onshore substations respectively.

For connecting the landfall to the grid, a detailed assessment of technical and environmental factors will be carried out to determine the most appropriate technology, point of connection and routing.



This schematic shows the key elements that make up the electrical infrastructure that is required to connect an offshore wind farm to the grid network. This schematic is not intended to represent connection arrangements for or locations of the electrical infrastructure for the First Flight Wind project.

19 Grid connection - options

First Flight Wind

First Flight Wind Ltd is currently working to identify the preferred connection point and methods to be used for connecting the project to the existing Northern Ireland grid network.

Whilst we are still awaiting the outcome of the Utility Regulator's consultation on offshore connection arrangements, we have not been able to finalise our options for connecting to the grid. The map (below) shows our current shortlist of possible locations on the network where the wind farm could connect and includes connecting to existing substations at Ballynahinch, Castlereagh, Newry and Tandragee or connecting to the 275kV overhead line that runs between Castlereagh and Tandragee.

We are continuing to engage with Northern Ireland Electricity and System Operator for Northern Ireland to agree the most appropriate locations to connect the project to the existing grid network. The selection of the preferred locations will take into account environmental, technical and commercial factors. It will also be influenced by the conclusions of a consultation that is being conducted by the Utility Regulator into connection arrangements for offshore renewable generation that will determine who has principal responsibility for constructing the connection (First Flight Wind Ltd or Northern Ireland Electricity). It is expected that the conclusions will be available this winter.

Once the connection location has been chosen, we will start to identify suitable locations and routes for landfalls, substations and onshore and offshore circuitry to connect the offshore wind farm to the grid. This investigation will include the scope to utilise underground cables.

Attaching blades to rotor

20 Onshore connection works

First Flight Wind

Once the preferred grid connection point has been identified, First Flight Wind Ltd will identify suitable sites and routes for the onshore infrastructure including landfalls, circuitry and substations.

We will adopt a methodological approach to identifying site and route options to connect the offshore wind farm to the existing grid network. Our principles for identifying and appraising potential sites and routes include:

Identifying possible onshore substation sites:

- Avoid protected landscapes where possible;
- Use existing man-made features in the landscape (e.g. towers, industrial sites) if appropriate;
- Use existing screening opportunities including those afforded by land form;
- Keep visual, noise and other environmental effects to a minimum;
- Avoid, as far as possible, internationally and nationally designated sites of nature conservation;
- Avoid sites of historic importance where possible;
- Avoid areas at risk of flooding; and
- Aim to use sites in proximity to existing roads.

Identifying possible onshore circuit routes:

- Aim to minimise route length to minimise cost and environmental impacts;
- Minimise routing through protected landscapes where possible;
- Aim to avoid designated sites of natural and heritage conservation;
- Minimise routing in close proximity to homes;
- Minimise road, river and railway crossings; and
- Aim to avoid difficult ground conditions.

Identifying possible landfall points:

- Consider the suitability and space availability of sites for cable landing;
- Consider the suitability for submarine cabling up to and land circuitry onward from landfall options;
- Technical and construction considerations; and
- Consider sites of natural and heritage conservation.

NEXT STEPS

Since the UREGNI consultation has not yet concluded, we have not been able to present for consultation today potential options for sites and routes for the onshore infrastructure. We therefore intend to present these options at the next round of Information Days in Autumn 2014.

We will begin the onshore environmental survey work as part of the environmental assessment process. When the UREGNI consultation is complete we will carry out the environmental surveys and studies in line with relevant guidance and best practice.

21 What next?

First Flight Wind

Thank you for coming to our second Information Day. We hope you found it clear and informative. Please do not forget to hand in your completed questionnaire before you go.

You will also find these exhibition panels on **www.firstflightwind.com**. Here you or your friends and family can go to "Have Your Say", register to join our contact list or ask a question. **Questionnaires must be completed by 31st October 2013.**

During September and October, we will continue to meet local community and industry groups as part of this round of consultation. After this, we will publish a 'consultation report' covering the questionnaire results as well as comments made by emails, letter, phone call or face-to-face.

If you join our contact list, you will receive direct invitations to future Information Day events and copies of the "First Flight" newsletter. Information will continue to be made available in printed form at the locations listed below. You will also find regular information in the press as well as daily updates on Facebook and Twitter.

If you would like us to present to your group or have any other questions, here is how to find us.

Email: info@firstflightwind.com
Phone: 028 9042 3165
Web: **www.firstflightwind.com**
Address: 18 High Street, Holywood, BT18 9AZ

INFORMATION POINTS

Northern Ireland

Annalong Barbican; Ardglass Community Centre; Sea Gems at the Harbour, Ardglass; Castlewellan Library; Downpatrick Library; Mourne Seafood Bar Dundrum; Kilkeel Nautilus Centre; Kilkeel Library (beside Nautilus Centre); Newcastle Library; Newcastle Tourist Information Centre; Newry Library; Portaferry Library; Warrenpoint Library; Warrenpoint Town Hall; Portavogie Port Office.

Republic of Ireland

Carlingford Tourist Office; Castlebellingham Post Office; Clogherhead RNLI Shop; Dundalk Tourist Office.

We aim to hold future Information Days in October 2014 to update you on the project, the engineering design, our proposals for mitigation measures and options for connecting to the grid. We plan to hold a further round of Information Days in September 2015 prior to submitting for consent.

First Flight Wind

Information Day
Round Two Booklet

ACCOMPANYING LEAFLETS

Panel 7: Consents Process

Panel 8: Physical Environment
Biological Environment
Human Environment

Panel 17: Viewpoint Rationale

First Flight Wind Ltd, is a consortium comprising B9 Energy, DONG Energy and RES
Registered address: Murray House, Murray Street, Belfast BT1 6DN. Registration Number: NI611390

First Flight Wind

Panel 7

Consents Process

The principal consents First Flight Wind requires are as follows:

Principal consents	Organisation / Department	Notes
Marine Licence	Department of Environment (DOE) Marine Division	A Marine Licence is required under Part 4 of the UK Marine and Coastal Access Act 2009. The Act came into effect in April 2011. DOE will be the licensing and enforcement authority for the Marine Licence in Northern Ireland's inshore waters.
Consent under Article 39 of the Electricity Order	Department of Enterprise & Investment (DETI)	Consent under Article 39 of The Electricity (Northern Ireland) Order 1992 is required from DETI for the construction and operation of any electricity generating station in Northern Ireland (onshore or offshore).
Planning consent	DOE Planning Service	Planning consent under The Planning (Northern Ireland) Order 1991 is required for all onshore works associated with the project.
Licence under Article 10 of the Electricity Order	Utility Regulator for Northern Ireland (UREGNI)	A Licence under Article 10 of the Electricity (Northern Ireland) Order 1992 is required from the utility regulator in order to generate electricity for supply to the Northern Ireland grid.

PTO

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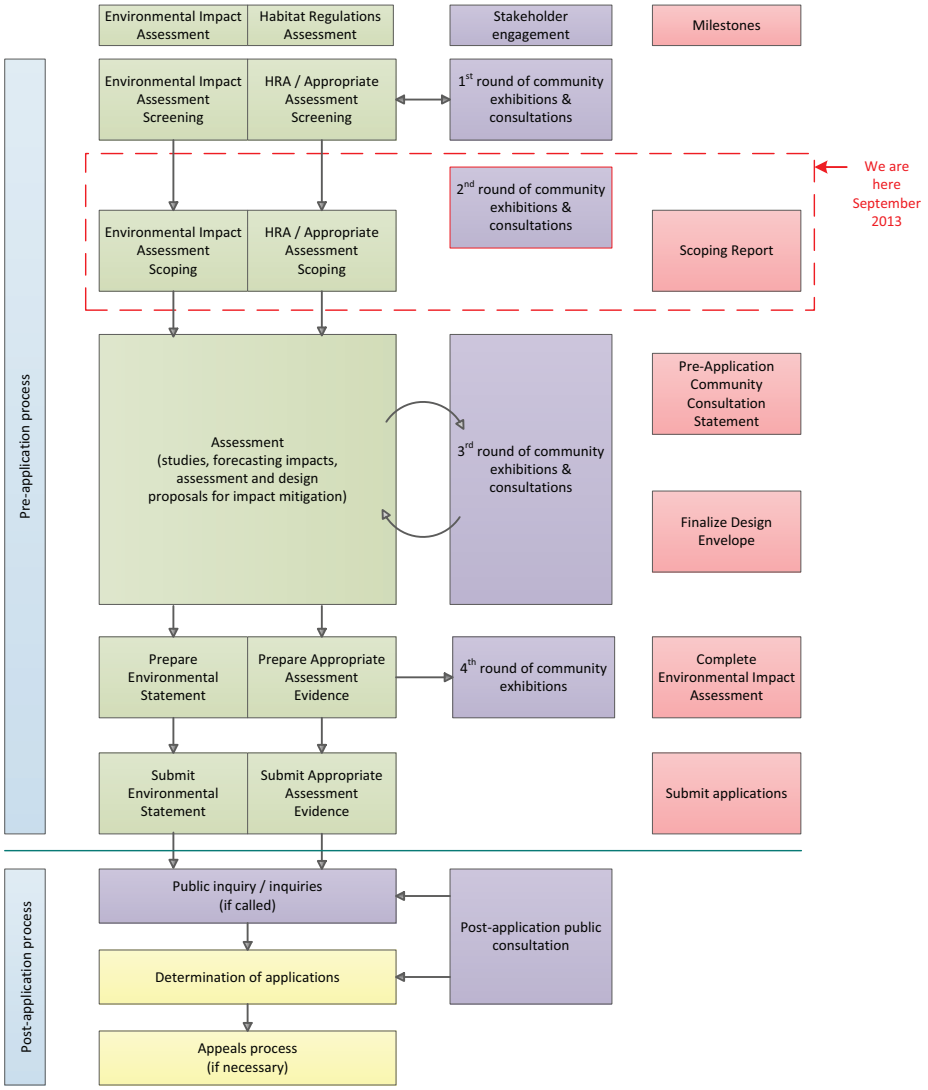
Preparation, submission and determination of applications
for Marine Licence (DoE, Marine Division), Section 39 Consent (DETI) and Planning (DoE, Strategic Planning Division)



First Flight Wind

Panel 8 Leaflet A

Environmental Scoping – Physical Environment

Potential impacts on the onshore and offshore physical environment are provided in the tables below. Further detail will be provided in the Scoping Report to be published later in the year, in which we will set out the full range of issues that should be included for all phases of the project (development, construction, operation and decommissioning), the potential impacts, the approach to assessment and proposed mitigation.

Potential impacts on the offshore physical environment due to the wind farm turbines and foundations, inter-array cables, offshore substation and export cable(s) include:

Physical Environment – offshore wind farm	
Topic	***Potential issue and impacts***
Hydrodynamic regime (waves, currents, tides, water levels, surges)	Changes to wave and currents affecting near field (offshore) and far field (nearshore) regimes; localised scour impacts due to changes in tidal currents; short and long term changes to adjacent coastline (erosion or accretion) due to changes in sediment supply; localised changes to seabed morphology and designated seabed features; increased suspended sediment levels; mobilisation of contaminants and alteration of cold water gyre.
Sedimentary regime and morphology	Changes to bathymetry, seabed features, adjacent coastline form; changes to surficial sediment distribution due to changes to bedload and suspended sediment load; impact on benthic ecology due to changes in habitat or smothering; impact on designated coastal sites; impact on commercial fisheries and spawning, nursery areas; changes in morphology at cable landfall sites; change in seabed level due to rock dumping.
Frontal features and stratification	Changes to form and function of frontal features; impact on cold water gyre and long term near-surface circulation; impact on salinity and temperature fronts; sensitivity to changes in permanent and seasonal stratification; impacts on biological productivity and associated feeding grounds for marine species.
Hydrodynamic regime (waves, currents, tides, water levels, surges)	Changes to wave and currents affecting near field (offshore) and far field (nearshore) regimes; localised scour impacts due to changes in tidal currents; short and long term changes to adjacent coastline (erosion or accretion) due to changes in sediment supply; localised changes to seabed morphology and designated seabed features; increased suspended sediment levels; mobilisation of contaminants and alteration of cold water gyre.

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Potential impacts on the onshore physical environment due to cable landfall site selection, substation site selection, onshore cable route site selection include:

Physical Environment – onshore infrastructure (cables, substations, etc)	
Topic	***Potential issue and impacts***
Geology and ground conditions	Potential impacts on designated geological sites and potential risk of exposure to contaminated soils.
Water resources and flood risk	Potential impacts on surface water (including drainage ditches), ground water and abstraction; and potential impacts on ecological receptors directly or indirectly associated with water features.

PTO

First Flight Wind

Panel 8 Leaflet B

Environmental Scoping – Biological Environment

Potential impacts on the onshore and offshore biological environment are provided in the tables below. Further detail will be provided in the Scoping Report to be published later in the year, in which we will set out the full range of issues that should be included for all phases of the project (development, construction, operation and decommissioning), the potential impacts, the approach to assessment and proposed mitigation.

Potential impacts on the offshore biological environment due to the wind farm turbines and foundations, inter-array cables, offshore substation and export cable(s) include:

Biological Environment – offshore wind farm	
Topic	***Potential issue and impacts***
Fish and shellfish ecology	Direct disturbance or loss of fish and shellfish habitat during installation; impacts on nursery and spawning areas for nephrops, cod, herring; noise disturbance to sensitive species; effects of suspended sediments on spawning grounds; effects on elasmobranch species that may be sensitive to electromagnetic fields (EMF); impact of EMF on crab, lobster, nephrops; changes in diversity or biomass due to presence of structures and rock dumping; operational noise impacts; impacts on migratory routes for brown crab and lobster
Benthic Ecology	Direct and indirect physical disturbance to sedimentary communities; direct loss or alteration to habitats from installation of foundations and inter-array and export cables; smothering from mobilisation of soft sediments; indirect effects due to scour or changes in physical processes; changes to composition of communities; impacts on Annex 1 habitats present; infrastructure provides hard substrate and new habitat for colonisation
Ornithology	Impacts on marine and migratory bird species; mortality due to collision risk; displacement from foraging sites, migratory routes and roosting ground; barrier effect to movement of migrants; presence of vessels may disturb and displace birds using site during construction and operation; construction noise effects on prey species; changes in marine ecology affecting availability of prey species; reduction of seabird productivity due to degradation of prey habitats and barrier effects to foraging routes
Nature Conservation Designations	Impacts of Installation of export cable on sensitive habitats, SACs, ASSSIs, features along cable corridor; noise impacts on SAC species (marine mammals and fish); collision risk , disturbance and displacement of SPA species; noise inhibiting SAC species from entering site; impact on physical processes due to presence of foundations and indirect effects on suspended sediments, changes to tidal regime impacting SACs and ASSSSIs.
Marine Mammals, basking sharks, turtles	Disturbance due to construction/operational underwater noise; potential reduction in prey species; impacts on tidal fronts in respect of basking shark movements; indirect barrier effect due to new structures in environment

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Potential impacts on the onshore biological environment due to cable landfall site selection, substation site selection, onshore cable route site selection include:

Biological Environment – onshore infrastructure (cables, substations, etc)	
Topic	***Potential issue and impacts***
Ornithology	Disturbance to breeding and wintering birds. Loss of habitat at landfall, cable route and grid connection point, reduction in breeding and wintering bird populations due to habitat loss, displacement and disturbance. Direct or indirect impact on sites of ornithological interest. Disturbance due to noise, vibration, lighting
Ecology and Nature conservation	Species and habitat loss and disturbance, Disturbance or degradation of designated nature conservation sites; temporary or permanent loss of habitat and species; habitat fragmentation and species isolation (especially newts, badgers, bats, if present); impacts on hydrological regimes affecting wetlands and bog areas; temporary discharge or runoff of pollutants could affect species and habitats in catchment area;

First Flight Wind

Panel 8 Leaflet C

Environmental Scoping – Human Activities

Potential impacts on the onshore and offshore biological environment are provided in the tables below. Further detail will be provided in the Scoping Report to be published later in the year, in which we will set out the full range of issues that should be included for all phases of the project (development, construction, operation and decommissioning), the potential impacts, the approach to assessment and proposed mitigation.

Potential impacts on the offshore human environment due to the wind farm turbines and foundations, inter-array cables, offshore substation and export cable(s) include:

Human Environment – offshore wind farm	
Topic / activity	***Potential issue and impacts***
Commercial fisheries	Displacement of fishing activity and direct impact on shellfish and fish is a concern for the commercial fisheries industry as fishing effort across the Zone is high for a range of species and gear types. Nephrops trawling is prevalent over the eastern deeper part of the zone with potting and scallop dredging further inshore.
Shipping and navigation	A major shipping lane cuts east-west across the zone with large vessels and ferry traffic into and out of Carlingford Lough transiting across the Irish Sea. Coastal commercial and recreational traffic transiting north to south and fishing vessels in zone. Concerns include increased collision risk due to interaction with the offshore wind farm, displacement of vessels on to new routes and increased concentration of traffic in existing lanes, reduced availability of adverse weather routes and increased vessel interaction with other Irish Sea wind farm projects.
Aviation	Potential additional effects on aviation and radar interests are not anticipated but consultation will include aviation interests.
Seascape, landscape and visual amenity	The change in landscape and seascape character and the impact upon the visual environment and amenity. Turbines will be visible from a number of public viewpoints along a heavily designated coastline including AONB.
Cultural heritage and marine archaeology	Direct damage to protected/unprotected wrecks, artefacts, palaeo-landscapes due to foundations, scour protection or anchoring. Indirect damage due to changes in erosion and accretion patterns.
Tourism and socio-economics	Impact on direct and indirect demand for supply chain leading to changes in spending, income, employment; potential economic impact on commercial fisheries, shipping and navigation, recreation and leisure

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Potential impacts on the onshore human environment due to cable landfall site selection, substation site selection, onshore cable route site selection include:

Human Environment – onshore infrastructure (cables, substations, etc)	
Topic / activity	***Potential issue and impacts***
Landscape and views	The potential effects the development will have on landscape character and features during project lifecycle. Potential impact on private and public visual receptors. Temporary changes due to habitat loss during construction until re-establishment.
Archaeology and cultural heritage	Potential effects of construction and operation phases on buried archaeological resource and heritage assets from above ground works including cable route, substation.
Soils, agriculture and land use	Direct loss of agricultural land (due to land take for substation), temporary disruption to agricultural practices, soil structure, and land use due to underground cabling.
Noise and vibration	Noise and vibration impacts received by sensitive receptors in area surrounding substation and cable route corridor during construction activities. Impacts of increased traffic - routes, type and duration.
Air quality and dust	Impacts on air quality and dust from both onsite and offsite activities during construction. Potential impacts on ecological receptors.

PANEL 17: Potential Photomontage Viewpoints in Northern Ireland						
Viewpoint number	Name	Location	Easting	Northing	Distance from WRZ boundary (km)	Rationale / issues to consider
			Irish Transverser Mercator (ITM) & Irish National Grid (ING)			
1	Murlough	Beech near Murlough House	ITM741374 ING341385	834773 334781	9.7	Coastal location. AONB. Viewpoint is located along Ulster Way and in close proximity to the Murlough National Nature Reserve. Coastal link with Newcastle and Dundrum Inner Bay. Close range views towards the proposed development. Views across the bay towards steeply rising Mourne Mountains which form a feature on the horizon. Geometric morphology of the development seen in conjunction with the expanse of the sea and upland landscape. Scale of the landscape versus the proposed development. Perception of the height of the turbines may vary with height 'decreasing' either side of the view. Turbines potentially seen along the majority of the available horizon with some of the turbines seen much closer.
2	Newcastle / Promenade	End of the promenade next to Slieve Donard hotel and a car park	ITM737923 ING337934	831516 331524	10.3	Coastal location. AONB, Newcastle is a popular tourist destination with easy access into Mourne Mountains and a number of other tourist attractions nearby. Viewpoint representative of golf course users, visitors to Slieve Donard Hotel and from the promenade. Close range views towards the proposed development. Views across the bay towards steeply rising Slieve Donard which dominates views from Newcastle, promenade and the beach. Geometric morphology of the development seen in conjunction with the upland landscape. Scale of the landscape versus the proposed development. Perception of the height of the turbines may vary with height 'decreasing' either side of the view. Turbines potentially seen along the majority of the available horizon with some of the turbines seen much closer.
3a	Slieve Donard summit	East of cairn	ITM735727 ING335744	827678 327682	11.4	Inland location. AONB, one of the most popular destinations in Mourne Mountains due to elevation and relatively easy access. Exposed and elevated views across the bay with views of Newcastle and further inland. Views into Mourne Mountains representing rugged and remote landscape. Part of the Mourne International Walking Festival. Due to elevation, views of the proposed development will be of different quality and scale, bird's eye view. The layout of the development will be more evident and the height of the turbines and changes in height due to perspective less noticeable than the lower level viewpoints. Relation of the layout, its extent to the scale of the bay and the overall view. Elevation: 400m+ Above Ordnance Datum (AOD)
3b	Head Road	Car park	ITM734487 ING334498	821911 321917	11.9	Inland location. AONB. Highly elevated road offering distant views overlooking low lying agricultural landscape. Car park is often used as a starting point by ramblers. Designated viewpoint marked on 1:25000 OS map and bus line (popular amongst tourists) are located along this road. Relationship between the surrounding mountain landscape and the coast. Expansive views of the sea versus geometric morphology of the proposed development and the perceived horizon defined by distinctive headlands. Perception of the height of the turbines may vary with height 'decreasing' either side of the view. Elevation: 200m AOD
4	Annalong	Main Street / the quay	ITM737632 ING337643	819664 319670	8.2	Coastal location. AONB. Potential for tourist receptors. Mourne Mountains define views to the north. Potentially one of the closest viewpoints subject to final layout. No simultaneous views with Mourne Mountains. Perception of the height of the turbines may vary with height 'decreasing' either side of the view.
5	St. John's Lighthouse	On the approach to the lighthouse	ITM752741 ING352754	833573 333581	8.5	Coastal location, AONB, Lighthouse is a listed building. St. John's Point Church, located in close proximity is State Care Historic Monument. Views of Mourne Mountains forming a feature on the horizon. Relation between the development and steeply rising hills. Contrast between exposed and rugged uplands and low lying coastal landscape and the sea. Visual balance between offshore elements and uplands forming a strong feature on the horizon. Visual relationship between the lighthouse and the turbines.
6	Tyrella Beach	Beach	ITM747282 ING347294	836087 336095	9.2	Coastal location, AONB, no specific tourist attractions identified at present. No designated / OS map recognised viewpoints identified at present. Mourne Mountains form a strong feature on the horizon albeit in the peripheral vision when looking directly towards the sea. Relationship between the development and the coastal landscape depends on the location of the turbines. Headlands well defined by St. John's Point and Mourne Mountains with the potential for the development to stretch along the majority of the horizon as perceived from the beach.
7	Kilkeel	Beach or harbour	ITM731464 ING331475	813961 313967	9.5	Coastal location. AONB. Identified as an improvement area in the South East Coast master plan prepared for Department for Social Development (January 2013). Perception of the height of the turbines may vary with height 'decreasing' either side of the view.
Potential Photomontage Viewpoint in the Republic of Ireland						
8	Ballagan	Scenic Route / headland	ITM724330 ING324340	807323 307328	8.7	Coastal location. Area of High Scenic Quality and scenic route identified in Louth County Development Plan 2009-2015. Open and exposed views across Carlingford Lough to the north dominated by Mourne Mountains. Expansive coastal views. Development partially visible from this location subject to layout. Potentially, seen as a strong linear feature with the scale of the turbines diminishing with the distance. Geometric morphology compared with the rising topography of Mourne Mountains.

1 Welcome

First Flight Wind

Welcome to the first of four rounds of 'pre-application' Information Days that the First Flight Wind consortium will host between now and 2015 to inform you about progress with the design and development of the proposed offshore wind farm.

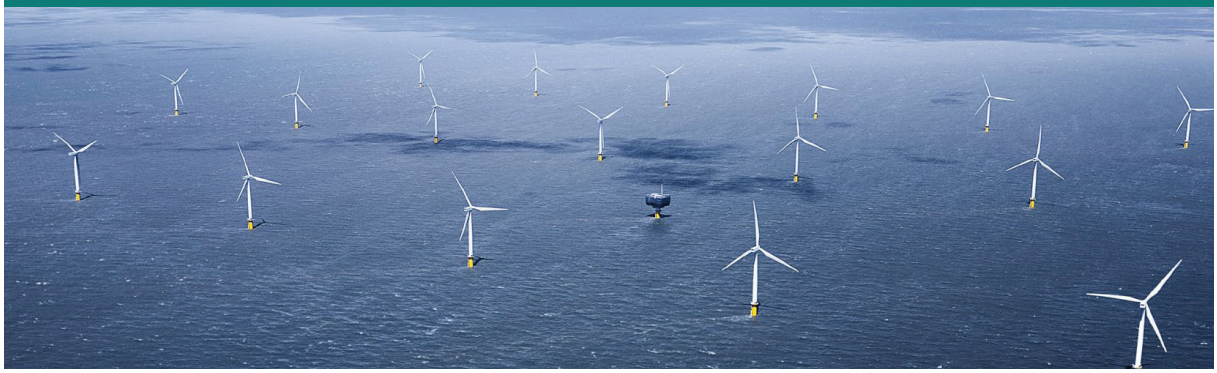
The first three rounds of Information Days (one now, one in 2013 and one in 2014) will also provide the context for the specific consultations that will be held to coincide with the Information Days. The last round of Information Days in 2015 will be feedback events on the results of all the design and consultation work and will be held to coincide with the consent application for the proposed project.

All views, comments and concerns that we gather through the Information Days and consultations will be considered during the detailed environmental and technical review stage (2012-2014). During this period we will seek to define the final scale, nature and exact location of the potential project within the area of search awarded to First Flight Wind by The Crown Estate.

The specific purpose of today's Information Day is:

- to explain the government policy background;
- to describe the project and the development programme; and,
- to introduce the community consultation process and the project team.

The specific topic that we are consulting on today is the appropriateness of our Community Consultation Plan.



2 Who is First Flight Wind Ltd?

First Flight Wind

First Flight Wind Ltd is a consortium comprising B9 Energy, DONG Energy and RES. It has been established to develop and subject to gaining consent, install and operate an offshore wind farm off the south east coast of Co. Down.

B9 Energy Offshore Developments Ltd and its sister companies have been successfully involved in renewable energy development and wind farm operations in Northern Ireland, where it is based, since 1992. Currently, its sister company, B9 Energy O&M Ltd is the largest independent wind farm operator and maintenance company in the UK.

DONG Energy Power (UK) Ltd. DONG Energy is one of the leading energy groups in Northern Europe. We are headquartered in Denmark. Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe. We have approximately 6,400 employees and generated DKK 57 billion (EUR 7.6 billion) in revenue in 2011.

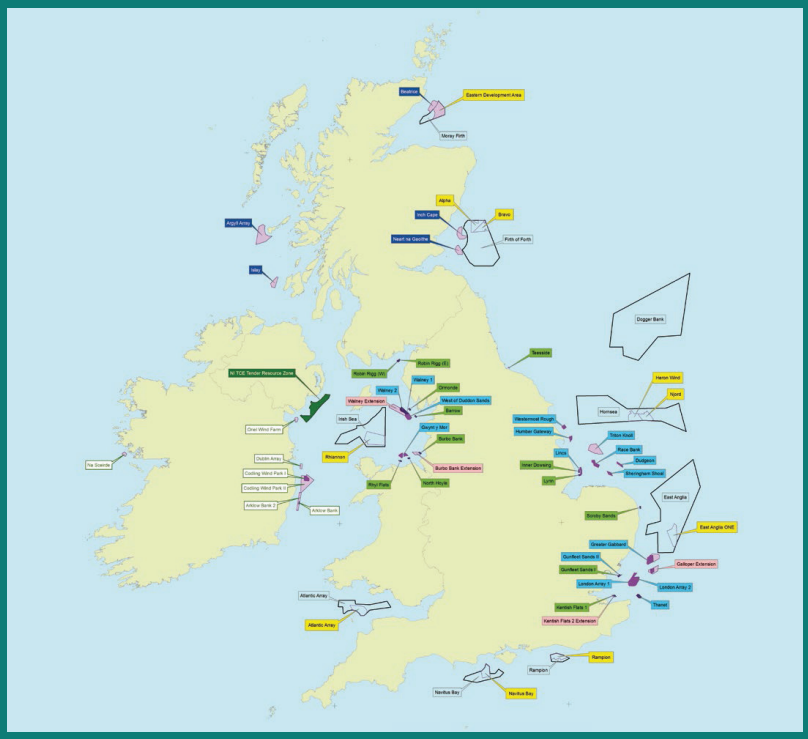
RES is one of the world's leading renewable energy project developers with substantial experience of providing development, engineering, operational and consultancy services to the offshore wind sector. In the three decades since RES Group was formed it has developed more than 6.5 Gigawatts of renewable energy projects worldwide and has played a central role in the development of the UK offshore renewables sector. With an office in Larne, RES is well established in Northern Ireland, having worked on onshore wind farm development and construction here since 1994.

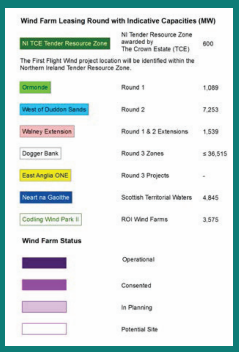
3 Offshore Wind Energy

First Flight Wind

The wind farm proposed by the First Flight Wind consortium is a pioneering offshore renewable energy project. Whilst offshore wind energy is becoming a familiar sight around the rest of the UK, this will be the first such project in Northern Ireland.

We have one of Europe's windiest areas and wind turbines can harness the immense power of this unending, local resource to produce electricity with minimal waste products or environmentally damaging emissions. Reducing Northern Ireland's reliance on imported coal, oil and gas for our energy is essential, not only for our environment but also to secure our electricity supplies for years to come. As well as producing considerable amounts of renewable energy, offshore wind could provide an economic stimulus and create opportunities for local companies in the development stage, construction and operation phases.





4 Why We Need Offshore Wind Energy

First Flight Wind

Northern Ireland consumed an average of 12% electricity from renewable sources during 2011, with some months as high as 18%. This comes mostly from onshore wind, currently the most readily available and affordable renewable energy for power generation.

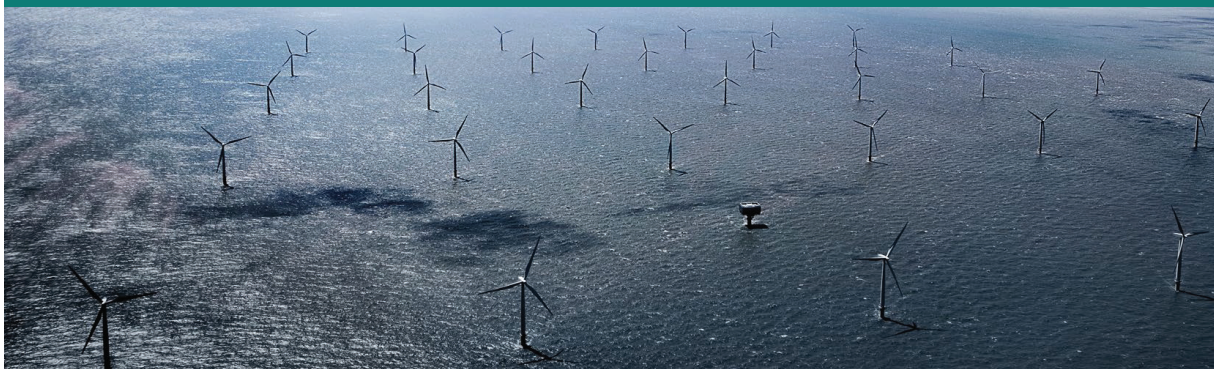
Although onshore wind will continue to be a significant source of renewable electricity generation in Northern Ireland, research for Department of Enterprise Trade and Investment's (DETI) Onshore Renewable Electricity Action Plan indicates that offshore energy will also be needed to reach the 40% target by 2020. We also believe that offshore wind has a crucial role to play for ensuring progress towards meeting the UK's longer term 2050 decarbonisation targets under which the UK is seeking to reduce 80% of its carbon emissions (from 1990 levels) by 2050.

5 Project Introduction

First Flight Wind

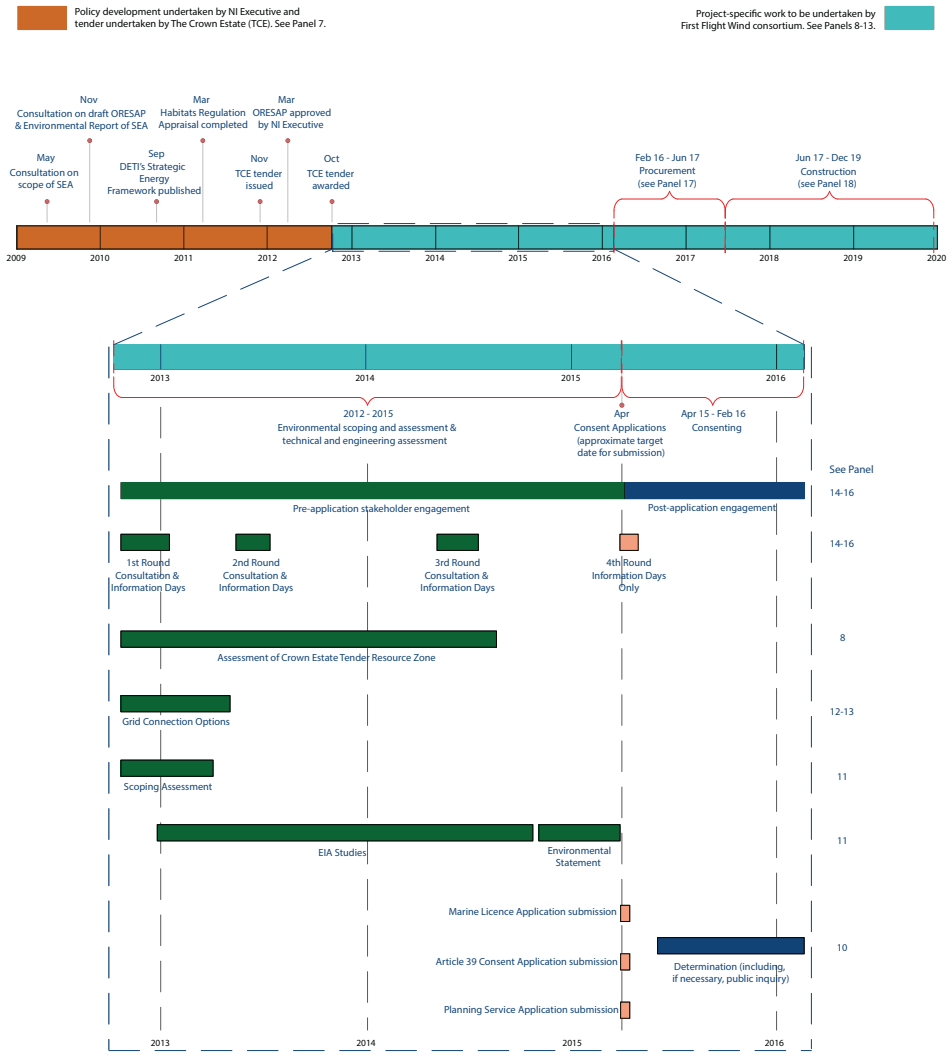
First Flight Wind is proposing to develop a 600MW offshore wind farm in waters off the Co. Down coast. The zone within which a project will be sited (see Panel 8) was identified through a Strategic Environmental Assessment as potentially suitable for offshore wind development. The 600MW project will include:

- Offshore wind turbines and foundations within a wind farm area of approximately 150km^2. The exact number, location and type of turbines will be determined during the development process in response to the identified environmental and technical constraints and the views of stakeholders. The choice of wind turbine will also be influenced by supply chain constraints. Wind turbine technology is a rapidly advancing field. We anticipate that we will consider wind turbines of between 5 and 10 Megawatts and will only be able to select the most appropriate turbine for the project as a result of the design and consultation process.
- Up to two offshore collector / converter stations and their foundations to collect the electricity from the turbines and transform it to a form suitable for transfer to shore.
- Seabed export cables to transfer the electricity to shore. (See Panel 12)
- A landfall site with onshore transition pits to connect the offshore and onshore cables. The location of the landfall will be identified during the development process in response to the identified environmental and technical constraints and the views of stakeholders. (See Panel 12)
- Underground cabling and/or over-ground lines to transfer the electricity from the 'landfall' to an onshore substation and onto the Northern Ireland electricity network. (See Panel 12)



6 Overall Project Indicative Timescale

First Flight Wind



7 Background Policy

First Flight Wind

The Strategic Environmental Assessment

Department of Enterprise Trade and Investment (DETI) initiated a Strategic Environmental Assessment (SEA) in 2009 to ensure environmental factors were properly considered in their strategy for offshore renewables. The SEA process was managed by a DETI-led project steering group comprising other relevant NI Departments and key organisations – for example, the Department of Agriculture and Rural Development, the Agri-Food and Bio-sciences Institute, the Department of the Environment, the Northern Ireland Environment Agency, the Department for Culture Arts and Leisure, the Department for Regional Development, The Crown Estate and the Maritime and Coastguard Agency.

Public consultations were held for the scope of environmental issues to be considered by the SEA in May 2009 and for the draft SEA report in December 2009.This report identified the area off the south east coast of Co. Down as potentially suitable for offshore wind energy due to its good average wind speeds, suitable water depths and the lack of significant environmental issues (subject to project-level mitigation measures).

The Offshore Strategy and the Strategic Energy Framework

In parallel with the publication of the SEA report, DETI published a draft Offshore Renewable Energy Strategic Action Plan 2009-2020 (the "Offshore Strategy") for consultation in December 2009. Following this, after NI Executive endorsement, DETI published in September 2010 an overarching Strategic Energy Framework for Northern Ireland. As part of this, the NI Executive set a challenging target of 40% of electricity consumption from renewable sources by 2020.

To assess whether the Offshore Strategy would lead to any adverse effect on the integrity of any European designated sites DETI then initiated a Habitats Regulations Appraisal of the draft strategy including an Appropriate Assessment as required under the Habitats Directive. The key recommendations from this were then built into the final Offshore Strategy endorsed by the Executive in March 2012. Water depths and the lack of significant environmental issues (subject to project-level mitigation measures).

Regional Locational Guidance

As recommended in the SEA report, DETI commissioned the production of Regional Locational Guidance.

The aim of the Guidance was to provide advice and guidance to developers, regulatory authorities, marine users and other stakeholders on the key environmental, and other factors that need to be taken into account with respect to the planning, development and operation of offshore renewable energy projects in Northern Ireland waters. See graphic opposite.

This document can also act as a stepping stone between the SEA and the preparation of any statutory Marine Spatial Plans for NI waters. After extensive consultation with key marine stakeholders final report was published in September 2011.

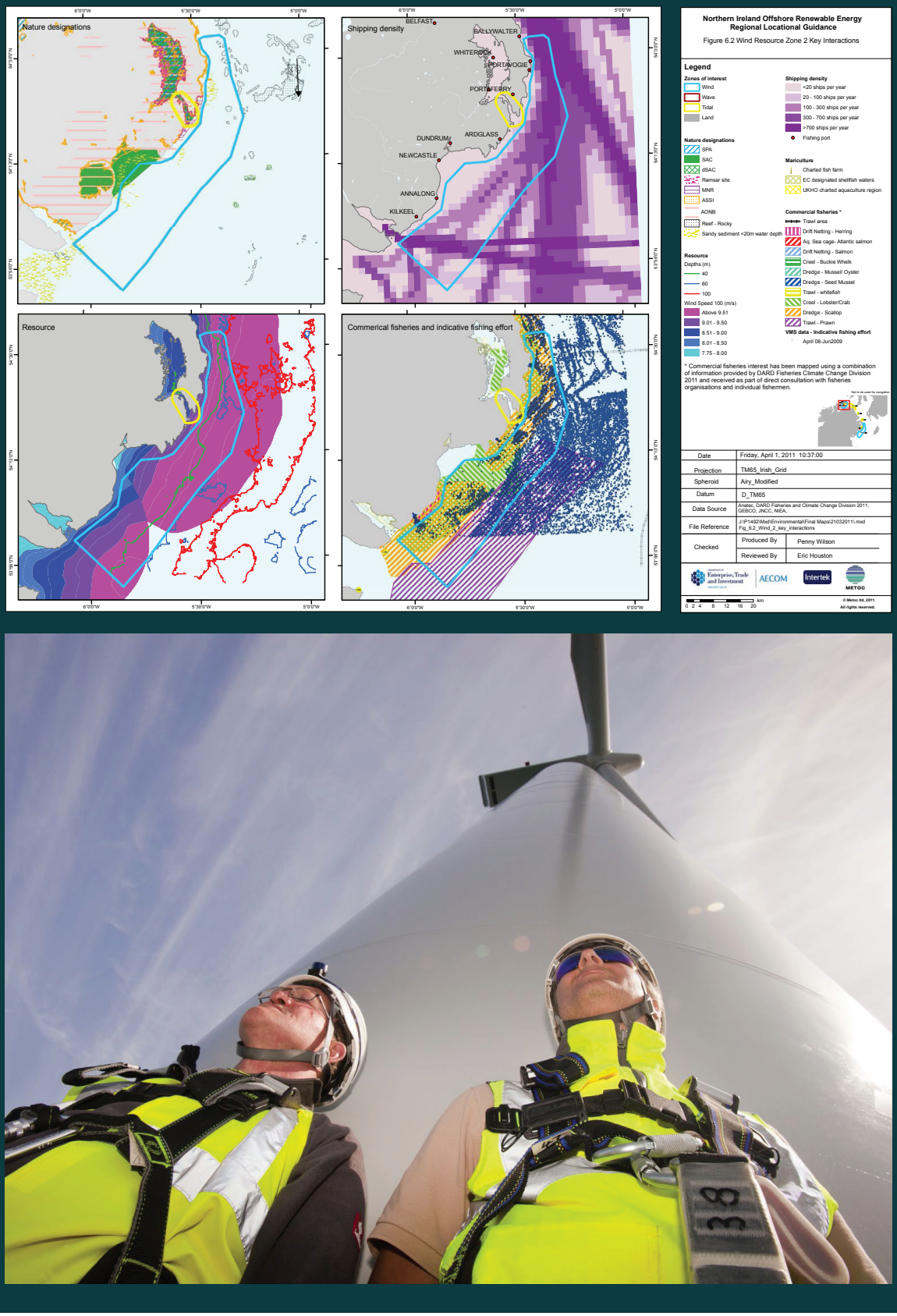
The Crown Estate Leasing Round

In December 2011, following consultation, The Crown Estate launched a tender to select a developer for a 600MW offshore wind project in the zone off the south east coast of Co. Down (see panel 8).

In October 2012, the First Flight Wind consortium was selected to develop the 600MW project. The right to develop is subject however to First Flight Wind being successful in gaining the necessary consents from Northern Ireland statutory bodies (see panel 10) for the construction, operation and eventual decommissioning of the offshore wind farm.

Future Statutory Marine Spatial Plans

Under the Northern Ireland Marine Bill (as currently drafted) it is proposed to enhance marine nature conservation by allowing the Department of Environment (NI) to designate areas as marine conservation zones.


Nature designations
Shipping density
BELFAST
BALLYWALTER
WHITEROCK
PORTAVOGIE
PORTAFERRY
DUNDRUM
ARDGLASS
NEWCASTLE
ANNALONG
KILKEEL
Resource
Commerical fisheries and indicative fishing effort
Northern Ireland Offshore Renewable Energy
Regional Locational Guidance
Figure 6.2 Wind Resource Zone 2 Key Interactions
Legend
Zones of interest
Wind
Wave
Tidal
Land
Nature designations
SPA
SAC
dSAC
Ramsar site
MNR
ASSI
AONB
Reef - Rocky
Sandy sediment <20m water depth
Resource
Depths (m)
40
60
100
Wind Speed 100 (m/s)
Above 9.51
9.01 - 9.50
8.51 - 9.00
8.01 - 8.50
7.75 - 8.00
Shipping density
<20 ships per year
20 - 100 ships per year
100 - 300 ships per year
300 - 700 ships per year
>700 ships per year
Fishing port
Mariculture
Charted fish farm
EC designated shellfish waters
UKHO charted aquaculture region
Commercial fisheries *
Trawl area
Drift Netting - Herring
Aq. Sea cage- Atlantic salmon
Drift Netting - Salmon
Creel - Buckie Whelk
Dredge - Mussel/ Oyster
Dredge - Seed Mussel
Trawl - whitefish
Creel - Lobster/Crab
Dredge - Scallop
Trawl - Prawn
VMS data - Indicative fishing effort
April 08-Jun2009
* Commercial fisheries interest has been mapped using a combination of information provided by DARD Fisheries Climate Change Division 2011 and received as part of direct consultation with fisheries organisations and individual fishermen.
Date
Friday, April 1, 2011 10:37:00
Projection
TM65_Irish_Grid
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Checked
Produced By
Penny Wilson
Reviewed By
Eric Houston
AECOM
Intertek
METOC
0 2 4 8 12 16 20 km
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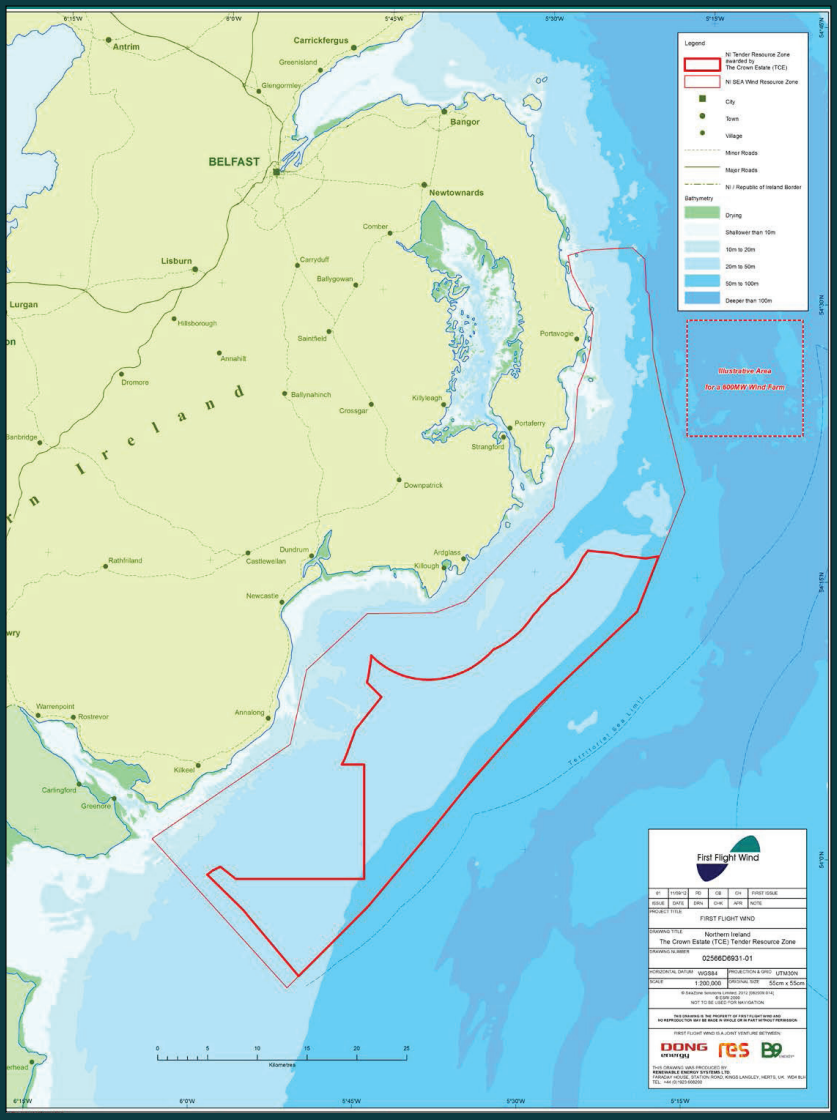
8 Zone Characterisation and Assessment to Identify a Project Development Site

First Flight Wind

The Crown Estate Tender Resource Zone is a large area and the wind farm will not fill the entire zone



First Flight Wind will carry out studies across the whole zone to identify a proposed project location that will meet the technical requirements and environmental constraints for a wind farm. These studies will be informed by stakeholder consultation and the whole zone characterisation process is anticipated to last approximately 18 months. At First Flight Wind's second round of consultations in 2013, you will be able to comment on the options for the project location within the zone.

Map showing area identified through Strategic Environmental Assessment and subsequent smaller area tendered and awarded by The Crown Estate. The First Flight Wind project location will be identified within area tendered by The Crown Estate

9 Zone Characterisation and Assessment to Identify a Project Development Site

First Flight Wind

The following key activities and studies are planned for the next 12 months to support our analysis of the zone. They are just some of the full range of studies required over the next 18-24 months to identify the project site and then submit an application for consent:

Physical Processes

• **Geophysical surveys** where the seabed will be mapped to determine the bathymetry (water depth) and geological features of the area	Early 2013
• **Geotechnical surveys** where core samples will be taken to determine ground conditions	To be determined
• **Metocean surveys** where equipment will be deployed on the seabed in order to measure such things as wave height, tidal currents and other environmental variables	To be determined

The data collected will feed into the subsequent engineering studies, physical processes modelling and marine archaeology studies.

Biological Environment

Stakeholders will be consulted on the specific scope of these studies.

• **Bird and marine mammal surveys** to be conducted over a 24 month period both on and offshore	October 2012
• **Fish surveys** to identify species, spawning areas and spawning periods	To be determined
• **Seabed (benthic) surveys** to include sediment samples and video transects of the seabed	Early in 2013

Human Environment

• **Shipping and navigation surveys** in order to better understand marine traffic movements (eg.key shipping routes, fishing and recreational activities)	To be determined

10 Consent Requirements

First Flight Wind

The tables below illustrate the current consenting requirements for offshore wind farms in Northern Ireland and the bodies that are involved in the licensing and consenting process. This is not a comprehensive list and is provided as an overview of the principal requirements.

	Principal Consents	Organisation / Department	Notes
1	Marine Licence [Note 1]	Northern Ireland Environment Agency (NIEA)	A Marine Licence is required under Part 4 of the UK Marine and Coastal Access Act 2009. The Act came into effect in April 2011. NIEA will be the licensing and enforcement authority for the Marine Licence in Northern Ireland's inshore waters.
2	Consent under Article 39 of the Electricity Order [Note 1]	Department of Enterprise, Trade and Investment (DETI)	A consent under Article 39 of The Electricity (Northern Ireland) Order 1992 is required from DETI for the construction and operation of any electricity generating station in Northern Ireland (onshore or offshore).
3	Planning consent	Planning Service of Department of Environment (DoE)	Planning consent under The Planning (Northern Ireland) Order 1991 is required for all onshore works associated with the project.
4	Licence under Article 10 of the Electricity Order	Utility Regulator Electricity Gas Water for Northern Ireland (UREGNI)	A Licence under Article 10 of the Electricity (Northern Ireland) Order 1992 is required from the utility regulator in order to generate electricity for supply to the Northern Ireland grid.

Principal Legislation Governing Consents

- Environmental Impact Assessment (EIA) under The Marine Works (Environmental Impact Assessment) Regulations 1999 (as amended)
- Habitat Regulations Appraisal (HRA) incorporating Appropriate Assessment under the Conservation (Natural Habitats) Regulations (Northern Ireland) 1995
- The Offshore Electricity Development (Environmental Impact Assessment) Regulations (NI) Order 2008
- Environmental Impact Assessment relating to onshore works under The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012

Note 1: Under the Marine Bill that is currently going through legislative stages in the Assembly, there are provisions to enable the Marine Licence application and the application for Consent under Article 39 of the Electricity Order to be considered through a single combined process.

11 Environmental Impact Assessment Process

First Flight Wind

An environmental impact assessment is required for applications for the Marine Licence, the Article 39 Consent and any planning approval.

The Regional Location Guidance for Offshore Wind Renewable Energy Developments in NI Waters published in September 2009 describes the application process for a Marine Licence. First Flight Wind will follow this process when undertaking its environmental assessments requirements, as illustrated in the diagram opposite.

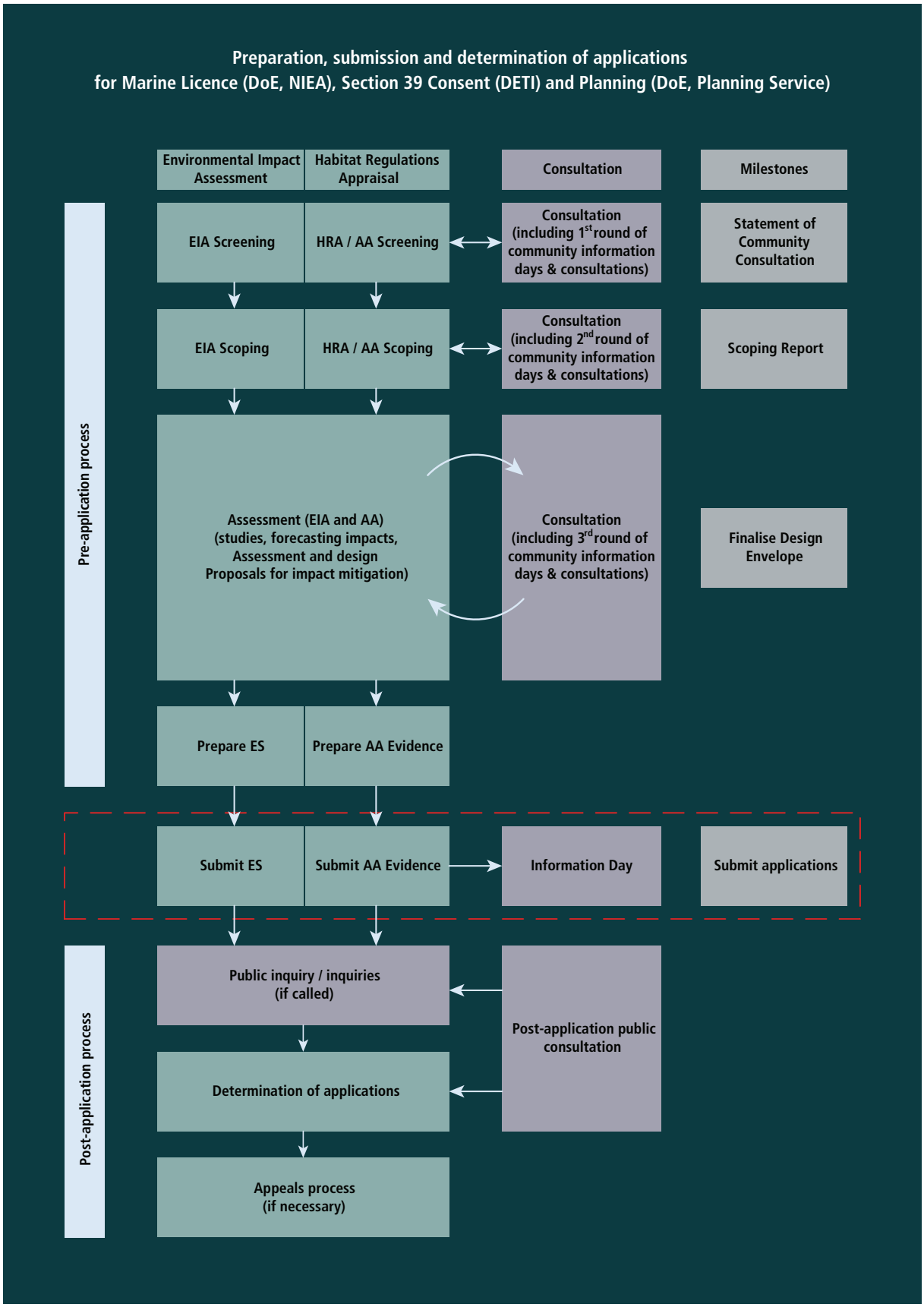
Prior to undertaking the EIA, First Flight Wind will consult with the relevant authorities in the preparation of a Scoping Report. The Scoping Report will provide an overview of the project and the potential impacts and sensitive receptors that will require detailed consideration within the subsequent EIA.

Pre-application consultation will take place with relevant coastal communities and environmental bodies, shipping & navigation and commercial fishery stakeholders throughout environmental assessment process.

As part of the EIA process, a suite of monitoring surveys (desk based and site based) will be undertaken to establish the existing environmental baseline and subsequently to assess any potential anticipated impacts. The issues to be covered are likely to include:

- Shipping and navigation
- Commercial fisheries
- Mariculture
- Protected sites and species
- Nature conservation and ecology (benthic, intertidal and onshore)
- Marine mammals
- Ornithology (offshore and onshore)
- Marine reptiles
- Fish Ecology
- Seascape and landscape
- Recreation and tourism
- Traffic and population disturbance
- Existing infrastructure
- Ports and harbours
- Dredging and disposal sites
- Marine users and land use (for onshore works)
- Cultural and archaeological heritage (marine, coastal and onshore)
- Water quality
- Coastal processes and sediment
- Radar interference and EMF
- Climate change
- Soil and water (for onshore works)
- Noise and vibration
- Air quality and dust (for onshore works)

In addition, cumulative and in combination impacts are an important aspect of the EIA process. The Environmental Statement will include sufficient detail of the offshore and onshore infrastructure to allow the consenting authorities and stakeholders to understand the relationship between all of the elements of the project, including any potential cumulative effects and in combination effects.


Preparation, submission and determination of applications
for Marine Licence (DoE, NIEA), Section 39 Consent (DETI) and Planning (DoE, Planning Service)
Environmental Impact Assessment
Habitat Regulations Appraisal
Consultation
Milestones
EIA Screening
HRA / AA Screening
Consultation (including 1st round of community information days & consultations)
Statement of Community Consultation
EIA Scoping
HRA / AA Scoping
Consultation (including 2nd round of community information days & consultations)
Scoping Report
Assessment (EIA and AA) (studies, forecasting impacts, Assessment and design Proposals for impact mitigation)
Consultation (including 3rd round of community information days & consultations)
Finalise Design Envelope
Pre-application process
Prepare ES
Prepare AA Evidence
Submit ES
Submit AA Evidence
Information Day
Submit applications
Public inquiry / inquiries (if called)
Post-application public consultation
Determination of applications
Appeals process (if necessary)
Post-application process

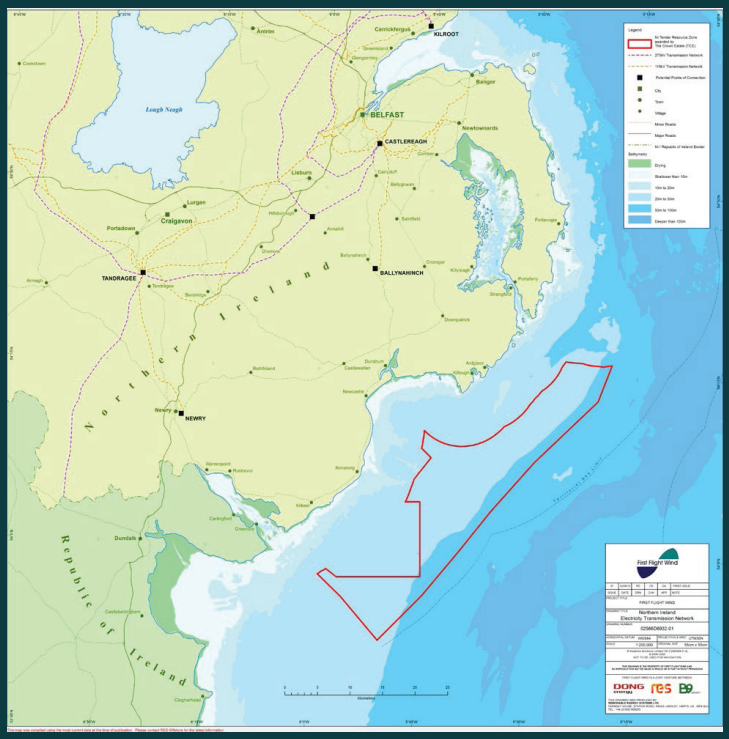
12 Grid Connection

First Flight Wind

The offshore wind farm will supply electricity to Northern Ireland consumers by connecting to the Northern Ireland electricity transmission network, 'the grid'.

At this early stage it is not known exactly where the project will connect to the grid or what infrastructure will be used to make the connection. The map, below, shows possible options for locations on the network where the wind farm could connect. At the second round of exhibitions in 2013, First Flight Wind will present for consultation a number of options for:

- where the seabed cables will come ashore (the "landfall");
- where the project will connect to the grid (the "grid connection location"); and,
- the routes and methods for connecting these two points.



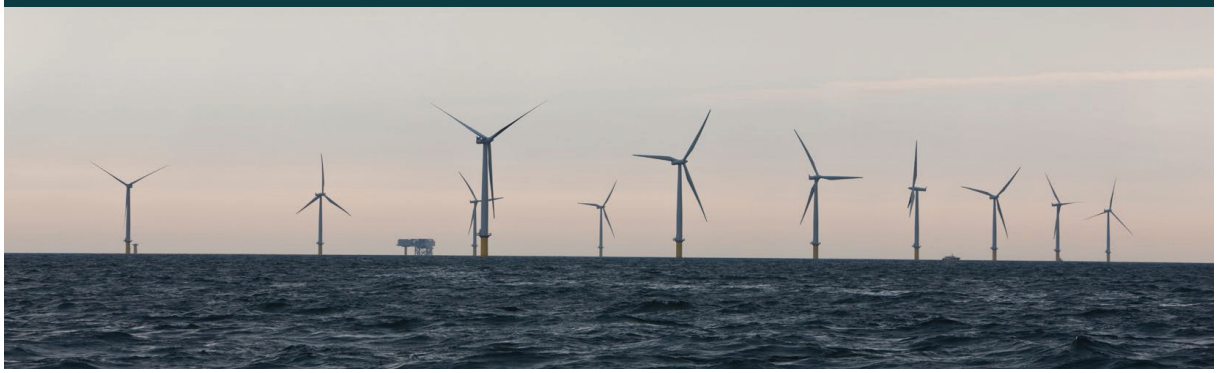
After considering the views of stakeholders arising from that consultation and the results of detailed engineering and environmental studies, First Flight Wind will identify how it intends to develop the grid connection for the project.

13 Grid Assessment Considerations

First Flight Wind

All grid connection works, both offshore and onshore, will form part of the detailed environmental assessment work to be undertaken before any consent application is made. Some considerations to be taken into account are as follows:

- For the offshore cable route a detailed survey of the seabed sediments to identify biological communities and any obstacles that may exist between the landfall and the wind farm will be conducted as part of the environmental assessment.
- To determine suitable grid connection locations we will consult with the owners and operators of the grid and undertake engineering and environmental feasibility studies.
- For the landfall, the effects of bringing cables ashore tend to be temporary and short term in nature, such as ground disturbance or vegetation removal, but are typically only within the main cable working corridor. Specialist engineering techniques may be required to bring the cables ashore whilst preventing any damage to sensitive habitats.
- For connecting the landfall to the grid connection location, a detailed assessment of the technical and environmental factors specific to each option will be carried out to determine the most appropriate cable solution. Whilst it may be possible to connect to the existing grid network with underground cables, in some options grid reinforcements or upgrades may be required that may involve the installation of new overhead lines.



14 Pre-application Community Consultations

First Flight Wind

Aims of our consultation

We believe that involving the community from the early stages of the project design process is essential to achieve better outcomes for everyone involved. Today we are asking you to provide your views on the suitability of our plans to consult with you. The aims of our consultation are:

1. To provide early, transparent, timetabled and comprehensive engagement with the local community;
2. To reach all sections of the community who have an interest in the project and help everyone understand the process for developing this wind farm;
3. To maintain the flow of information to the community by using a wide range of methods;
4. To create the opportunity for the community to ask questions and tell us their views; and,
5. To explain how comments made by the community have been considered during the pre-application phase and how they have influenced the project design.

Who will we consult?

We have drawn up a detailed consultation list of organisations and individuals whom we will keep informed. Further groups or individuals are invited to join this list via www.firstflightwind.com, by ringing or writing to us, or by filling out a feedback questionnaire today.

- MPs, NI MLAs, Local Councillors
- Public Sector, government advisors, Local Authorities
- Enterprise support and development bodies
- Business representative organisations and private sector & social business groups
- Education sector and children's/young people's interests
- Environment sector
- Community organisations
- Local churches & religious organisations
- Voluntary sector representative bodies
- Sporting organisations
- Maritime representative groups
- Tourism businesses and organisations
- Trade unions
- Transport, health and housing sectors
- Members of the general public

15 Pre-application Community Consultations

First Flight Wind

What are we consulting on and when?

	Information Day	Information that we will provide	We will consult on
1	Launch Winter 2012	• The project and development process • Meeting the project team • Our proposed community consultation programme	• Appropriateness of our community consultation plans • Consultation period ends 11th January 2013
2	Feasibility Summer 2013*	• Scope of the Environmental Impact Assessment • Options for project layouts and locations • Options for connecting to the grid	• All of these
3	Assessment Summer 2014*	• Reporting on the Environmental Impact Assessment • Final design "envelope"	• Final design "envelope"
4	Consent Applications Spring 2015*	• Results of Environmental Impact Assessment • Final engineering design assessments • Details of the consent applications	

*Indicative Dates

Stakeholder Panel

We are establishing a Stakeholder Panel comprising independent people with a local community interest, experience with community relations or other relevant expertise. The Stakeholder Panel is not a technical forum but will provide independent advice on the scope of the stakeholder engagement and consultation programme and will hold us to account in relation to the implementation of that programme. This will ensure our commitment to engage is effectively carried out.

Statement of Community Consultation

Once the district councils, the public and the Stakeholder Panel have had their say on our draft proposals for community consultation following Information Day 1, the plans for community consultation will be updated and published locally as a "Statement of Community Consultation".

Reporting back

A Feedback questionnaire will accompany the three consultation rounds. The results of these and other community contact such as meetings, will be recorded in mini consultation reports to be made available after consultation rounds one to three. A full Consultation Report detailing the results of the entire pre-application consultation process will be submitted with the applications for consent.

16 Pre-application Community Consultations

First Flight Wind

What methods will you use to consult the community?

Different individuals and groups will have different needs in terms of how we engage with them. To ensure that everyone has an opportunity to receive information and give us their views we will use the following range of methods. Please see our leaflet "How We Will Consult" for details and please fill in a feedback questionnaire to let us know whether you feel our community consultation plans are appropriate.

- Direct communications by phone, post or email
- Website
- Engagement with political representatives
- Meeting community groups and other local stakeholders
- Information Days
- Education Outreach
- Local media
- Twitter, Facebook, Vimeo
- Information Points

Though their focus will be to ensure the effective delivery of our consultation commitments, we believe the Stakeholder Panel's independent membership will allow individuals to raise issues via the panel that they might not be comfortable to raise directly with First Flight Wind.

Look out for the following sources of information

The following documents will be available as the project goes forward at the Information Points (see Panel 20), at meetings and Information Days or as downloads from the website.

- Project leaflets and feedback questionnaires for each round of consultation
- Project newsletters
- News releases
- Statement of Community Consultation
- Information Day boards
- Mini consultation reports on each of the three rounds of consultation
- Final full consultation report to accompany the application for consent

17 Economic Opportunities

First Flight Wind

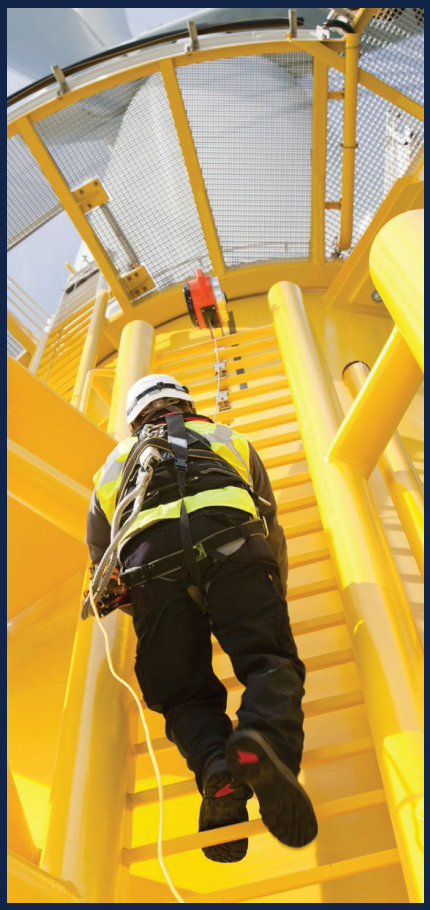
Procurement plays a key role in the offshore wind market. Building relationships with capable, competitive and innovative suppliers is essential to delivering new projects successfully. First Flight Wind will work closely with Invest NI to try to maximize opportunities for Northern Ireland companies where possible although we will need to buy certain supplies and services in the global market.

The construction of an offshore wind farm is a significant undertaking. For example, on DONG Energy's Walney wind farm off Cumbria, over 5,500 people (drawn from global specialist suppliers and local contractors) were registered as working, at some point, either on site in Barrow-in-Furness or on the construction site offshore. Many local services - including hotels and restaurants - benefitted from the increased number of people in the area during the construction period.

First Flight Wind will seek to contract suitable, skilled companies from the local area during construction and to involve local services where possible. Both onshore and offshore there are opportunities during construction that include such activities as transfer and guard vessel provision or building the onshore infrastructure.

Most wind farms have a dedicated operations and maintenance (O&M) base located in a port usually near to the wind farm. Direct access to a boat means that the team of engineers and technicians based in the O&M building are able to carry out routine maintenance and, if necessary, emergency repairs. If a wind farm were to go ahead, we would expect to employ a team of local technicians and administrative staff whose number will depend on the size of the wind farm.

The location and scale of the O&M base for the First Flight Wind project has not yet been determined and we are looking at a broad range of locations, including options in Co. Down. However, as an example, at the Walney offshore wind farm the O&M base employs over 60 staff, many from the local area.



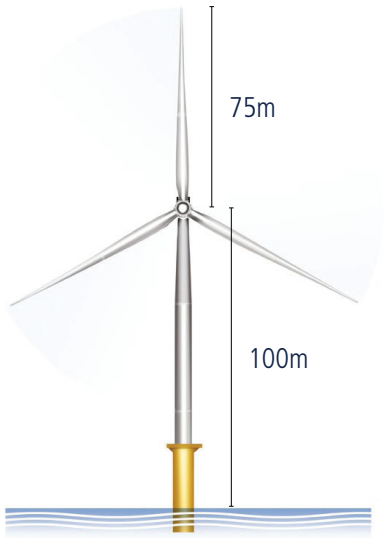
18 Constructing an Offshore Wind Farm

First Flight Wind

The construction of the foundations and installation of the wind turbines involves a large variety of vessels including jack-up barges, guard vessels, crew transfer boats and other types of installation and support vessels.

They have a number of specific functions from installation of foundations and the wind turbines, to moving a giant offshore substation into position, or laying a protective stone mattress on the sea bed, as well as moving the maintenance or construction teams on- and offshore. Many of the vessels used during the construction and operation period, for jobs including crew transfer, guarding and fishing surveys, are sourced from the local area providing they meet the working requirements to undertake these tasks, whilst more specialist vessels usually arrive on site to perform specific tasks.

A typical 6MW offshore wind turbine



The amount of time that it takes to construct an offshore wind farm varies depending on the size of the wind farm; First Flight Wind expects that construction - both onshore and offshore - for this project would take around two years.

An offshore turbine is made up of five main parts:

1. **Foundation** - this is embedded in the seabed to provide a stable base on which to build. There are a number of types of foundation; the most commonly used being the steel monopole. This is prefabricated onshore and driven into the seabed by a hydraulic hammer.
2. **Transition Piece** - connecting the foundation to the tower, normally bright yellow to be easily visible from sea and air. It is the access point for maintenance teams.
3. **Tower** - tall and thin, this will measure 80 – 100m high depending on turbine power rating.
4. **Nacelle** - this houses the generator and is the part to which the rotor and three blades are attached.
5. **Blades** - on a typical 6MW turbine, the blades are approximately 75m. They must be a minimum 22m above the mean high water spring tide, and normally turn between 10-12 times per minute depending on the wind speed.

19 Generating Electricity and Decommissioning

First Flight Wind

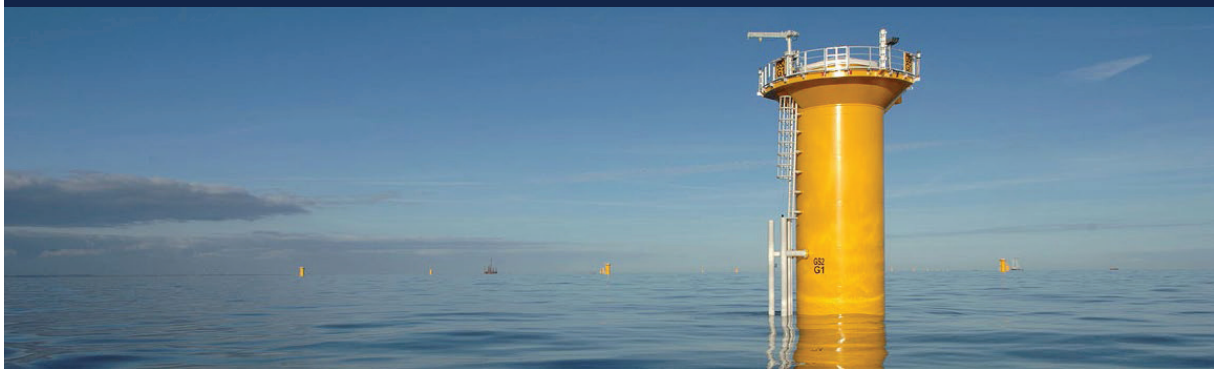
How does a wind turbine generate electricity?

The blades catch the wind causing the rotor to turn a shaft attached to the generator which creates electricity. Wind turbines start to generate power at only 4 metres per second (m/s) wind speed, and reach maximum output at 14m/s. If the wind speed exceeds 14m/s, the turbine will automatically and gradually pitch the blades out of the wind to prevent overload. If the wind speed gets above 25m/s, the turbines automatically shut down for safety reasons. Offshore wind turbines are designed to withstand gusts of up to 70 m/s.

Each wind turbine in a wind farm has its own computer that is controlled from the onshore base. Here, the team are able to monitor the performance of each individual turbine, and are alerted when there is a problem. An offshore wind turbine usually requires around five days scheduled maintenance per year. This will normally take place during better weather conditions and lower levels of electricity generation in order to be most efficient and effective.

Decommissioning

The detailed decommissioning plan for this project will reflect the statutory requirements introduced as part of legislation to be consulted on in 2012. Decommissioning of a wind farm would broadly follow the same basic steps of construction but in reverse. Turbines are completely removed with the foundations cut-off at, or below, the seabed. The rock layer used around the foundations for stability and the sub sea cables are left in-situ. Decommissioning takes approximately the same amount of time as construction. When decommissioning is finished, as much material as possible will be recycled and the site will be restored to the same state as it was in pre-construction, as far as practically possible so as to avoid environmental damage.



20 Next Steps and Keeping In Touch

First Flight Wind

We hope you found this first Information Day informative and useful. Please take the opportunity to ask questions and complete a feedback questionnaire today. However, you can also visit our website to fill in a questionnaire or contact us to request one after this event.

This first consultation round will end 11th January 2013. We will compile the feedback results into a mini consultation report and use them to write our "Statement of Community Consultation". First Flight Wind will publish this document in the local media and make it available on the website or on request.

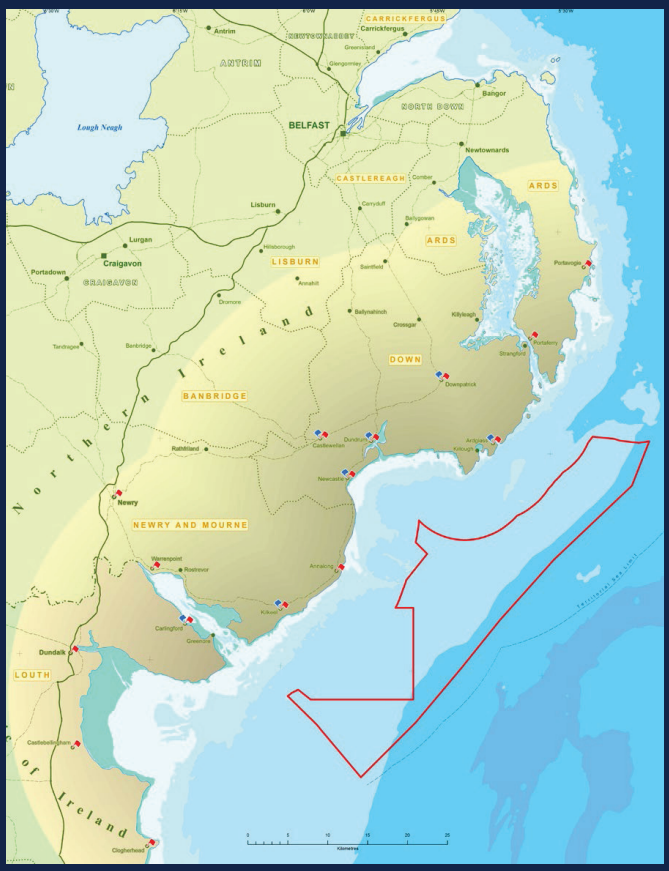
Information points

We will make copies of our published information available at Information Points in the following places throughout the pre-application period.

Annalong, Ardglass, Castlewellan, Downpatrick, Dundrum, Kilkeel, Newcastle, Newry, Portaferry, Portavogie, Strangford, Warrenpoint, Carlingford, Castlebellingham, Clogherhead and Dundalk. We are happy to set up other Information Point locations if requested.

How to contact us

The Community Liaison Team members are available to talk, answer questions or meet to discuss the project or consultation programme. Please see leaflet "How We Will Consult" for full details and visit www.firstflightwind.com for the latest information. We value your comments and feedback and look forward to hearing from you.



Consultation Round One
Feedback Questionnaire

First Flight Wind

Now that you have had an opportunity to read our information, we would be very grateful if you could take a moment to complete this questionnaire. We are asking for your views on our plans to consult you (Part 1) and on some general questions about energy and the environment (Part 2). Your address details are important as they allow us to accurately reflect the views of your community but these will remain confidential. **Please return to First Flight Wind by Friday 11th January 2013.**

Title: Name: Date:

Organisation (if applicable) and your role in it:

Address: Town: Postcode:

Telephone: Email: Age: Under 20 / 21-30 / 31-40 / 41-50 / 51-65 / 66+

☐ Local Resident ☐ Local Business ☐ Local Government ☐ Non-governmental organisation ☐ Visitor

PART 1: Consultation plans

How did you first hear about the wind farm proposal? (please tick as relevant)	TV/radio	Print media	Internet	Word of mouth	Invitation	Other, please specify	
Where did you hear about this Information Day? (please tick as relevant)	TV/radio	Print media	Internet	Word of mouth	Invitation	Other, please specify	
We are using the following tools to keep the community informed. Please tick all those which you find useful	Information Day	Adverts/Posters	Internet	Social Media (e.g. Facebook /Twitter)	Brochures	Newsletters	Presentations at meetings

For each of the following please tick to what extent you agree or disagree with all the statements below.	Agree strongly	Agree	Neutral	Disagree	Disagree strongly
First Flight Wind is using a sufficient number of methods to keep the community informed about the proposed projects					
The materials provided are clear and easy to understand					
There are enough information points					
First Flight Wind is taking the exhibition to enough locations					
The Stakeholder Panel is a good idea					

Having seen our plans to consult, do you feel they are	Very good	Good	Average	Poor	Very poor
Please let us know here if you have any comments about how we could improve our consultation process					

PTO To see Part 2 Energy and Environment

PART 2: Energy and the environment

Were you aware that NI Department of Enterprise Trade and Investment had carried out a Strategic Environmental Assessment (SEA) and identified the area off the south Co. Down coastline as the most appropriate location for the potential development of an offshore wind farm? (please tick which is relevant)	Yes	No	Not sure

Please state your level of interest in the following where 1 = no interest and 5 = high interest			
Construction disturbance		Tourism and recreation	
Visual impact of wind turbines on landscape and seascape		Birds, sea mammals and marine wildlife	
Commercial Fishing		Grid connection	
Local economy		Property values	
Job creation		Noise issues	
The reduction of carbon dioxide and other greenhouse gases		Other (please name)	

For each of the following please tick to show to what extent you agree or disagree	Agree strongly	Agree	Neutral	Disagree	Disagree strongly
We need to reduce NI's carbon footprint in order that we can play our part in reducing climate change					
We need to make more use of local renewable energy sources to reduce NI's dependence on imported fuel					
NI needs to take part in the growing renewable energy industry and benefit from local job creation					
Offshore wind energy is a vital component of the NI renewable energy mix					
Both renewable energy and energy efficiency are required to help us meet our renewable target					
Offshore wind energy can co-exist with tourism and leisure activities					
Offshore wind energy can co-exist with other marine users					

What do you feel in general about the prospect of an offshore wind farm in this area? (please tick relevant box)	Very positive	Positive	No view	Negative	Very negative

Please write any comments, feedback or questions. Feel free to attach another page

Would you like to be kept informed about this proposal? ☐ Yes by email ☐ Yes by post ☐ No thanks

Please return to First Flight Wind c/o B9 Energy, 18 High Street, Holywood BT18 9AZ Tel 02890423165 info@firstflightwind.com www.firstflightwind.com

Consultation Round Two Questionnaire

First Flight Wind

First Flight Wind Ltd is keen to engage with the local community and its elected representatives as part our approach to design and development. Your views are very important to us and as such, we would be grateful if you could take a moment to answer the questions which relate to the panels of our Information Day exhibition. These Information Panels contain much of the detail you require to complete the questionnaire and are colour coded to help you. Your contact details are important for analysing public opinion about the project. Please be assured that personal details will remain confidential. **The deadline for completion of this questionnaire is 31st October 2013.**

Please complete the details in this section if you wish your views to be counted

Title: Name: Surname:

Town: Postcode:

Organisation (if applicable) and your role in it:

Age: Under 16 / 17-25 / 26-40 / 41-60 / 60+

Would you like to be kept informed about this proposal?

☐ **Yes**, by Email Email: Telephone:

☐ **Yes**, by Post House Name/No and Street: Telephone:

☐ **No**, thanks

Environmental scoping (Panels 7-8)

1. After considering Information Panels 7 & 8 and the information leaflets, if you have any comments on the issues listed, please state them here.

Identifying the location for the wind farm (Panels 9-12)

2. For each topic please indicate using a scale of 1-5 (1 being not important at all and 5 being very important) which factors you believe are most important when considering the location of an offshore wind farm

	1	2	3	4	5		1	2	3	4	5
Cost of electricity						Changes to tides and waves					
Fishing						Fish and Crustaceans					
Recreational boating						Sea-mammals					
Shipping						Distance to shore and to grid connection					
Visual impact						Seabed conditions					
Benthos (seabed life)						Water depth					
Birds						Wind speeds					

3. Do you have any preference for having all the turbines together in one group or, split into two separate smaller groups? (Please tick appropriate box)	No strong preference	One group	Two separate groups

P.T.O. Questionnaire continues over leaf

Turbine numbers and heights (Panels 13-15)

4. Looking at the three hypothetical layout arrangements in panel 14 please tick which you prefer?	No strong preference	A	B	C
5. Looking at the three hypothetical layout arrangements in panel 15 please tick which you prefer?	No strong preference	A	B	C
6. Please describe the reasons for your answers to questions 4 and 5 above.				

Viewpoints (Panels 16-17)

7. Please tick which three viewpoints are most important to you?

1	Murlough		3b	Head Road		6	Tyrella Beach	
2	Newcastle / Promenade		4	Annalong (Location)		7	Kilkeel	
3a	Slieve Donard summit		5	St. John's Lighthouse		8	Ballagan (ROI)	

8. If you feel we need to add further viewpoints, please provide details.

General

9. How do you feel about the prospect of an offshore wind farm in this area? (Please tick as appropriate.)	Very positive	Positive	No view	Negative	Very negative
10. How do you feel about the provision of information and methods (please see Information Panels 6 and 21) used throughout this consultation process?	Very good	Good	Average	Poor	Very poor

11. Please write any comments, feedback or questions here.

100% recycled paper

Thank you for taking the time to complete this questionnaire, your views are important to us. Please return to a member of staff or in the freepost envelope provided. You can also complete a questionnaire on line at www.firstflightwind.com/haveyoursay. All questionnaires must be returned by **31st October 2013**.

P.T.O. Questionnaire starts over leaf

First Flight Wind

Round One Consultation Report

Responses to Proposed Pre-Application Community Consultation

04 April 2013

This report provides an overview of the first round of consultation held by First Flight Wind Ltd during 10 October 2012 to 11 January 2013, the responses received and how First Flight Wind Ltd will respond to the views submitted.

Doc. no. 07-04-0001

Status: FINAL, For Publication

First Flight Wind Ltd, is a consortium comprising B9 Energy, DONG Energy and RES
Registered address: Murray House, Murray Street, Belfast BT1 6DN. Registration Number: NI611390

Document Control			
Item	Content		
Title	Round One Consultation Report		
Subtitle	Responses to Proposed Pre-Application Community Consultation		
Doc. no.	07-04-0001		
Status	Final		
Nature of Document	For Publication		
Date of Edit	04 April 2013		
Document Description	This report provides an overview of the first round of consultation held by First Flight Wind Ltd during 10 October 2012 to 11 January 2013, the responses received and how First Flight Wind Ltd will respond to the views submitted.		
Responsibilty	Name	Company	Date
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Revision History			
Date	Version number	Author	Notes on alteration
19/03/2013	02	Michael Harper	Amended content following first review
26/03/2013	03	Jack Farnham	Amended content upon review

Disclaimer

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Round One Consultation Report

Responses to Proposed Pre-Application Community Consultation

Contents

INTRODUCTION

This report provides an overview of the first round of consultation held by First Flight Wind Limited (Ltd) during 10 October 2012 to 11 January 2013. It has been reviewed by the independent Community Stakeholder Panel established for the project[1].

We would like to thank everyone who participated in this initial consultation process.

The focus of first round of consultation was to review the appropriateness of the proposed programme for community engagement and consultation for the period leading up to the project consent applications, in early 2015. In addition, the consultation also sought to gain an initial understanding of the community's attitudes towards the project, renewable energy and the environment. In this report we outline the methods we used to communicate with the community; the issues raised and how we intend to respond to the comments made during Round One of the consultation programme.

[1] Please click here to view more information on the independent Community Stakeholder Panel.

HOW WE COMMUNICATED

This section sets out what methods we used to communicate during the consultation process.

WHAT	WHEN	
Information provision to political representatives and the media	From 10/10/2012	First Flight Wind Ltd met the local MP and MLAs and local media between the time of the announcement of the results of The Crown Estate Tender (10/10/2012) and First Flight Wind Ltd's community engagement launch (24/10/2012).
Community engagement launch event in Newcastle	24/10/2012	Representatives from DETI, The Crown Estate and the First Flight Wind project team presented on the project development process and the proposed community consultation programme. There was also an exhibition on the project. A total of 160 stakeholders were invited, 46 attended.
Project literature	From 24/10/2012	The following project literature were published: • Leaflet 01 ("Project Introduction"); • Leaflet 02 ("How We Will consult") including questionnaire; and • Newsletter One (October 2012).
Website, email contact details and social media sites established	From 24/10/2012	A project specific website (www.firstflightwind.com) was established to facilitate information provision and communications with stakeholders. The project team also established a Facebook page; Twitter feed and Vimeo site to inform the public about the project by sharing the latest project news, images and footage as well as providing updates on the Information Days and venues.
Information Days held at Kilkeel, Castlewellan, Carlingford, Downpatrick, Newcastle and Ardglass	5/11/2012 to 13/11/2012	The Information Days included hosting an exhibition that explained the government policy background, described the project, development programme and introduced the community consultation process. The Information Days provided an informal opportunity for people to 'drop in' anytime between 10am and 9pm at a local venue and view the project programme, discuss particular areas of interest and ask questions about the project. Attendees were asked to sign an attendance register upon which they could provide comments as an additional avenue for feedback. They were able to complete a project related questionnaire on the day, or take it away and post into the project team at a later date. A total of 235 people attended the six Information Days. These were predominantly local residents (62%), community group members (17%), local business owners (13%) and visitors (6%).
Different means of advertising and communication	24/10/2012 to 11/01/2013	• 8 press releases were released resulting in over 40 features, articles and editorials about the project covered in local media and specialist journals; • The first newsletter, the two project brochures, a

WHAT	WHEN	
were used to raise awareness about the Information Days project and consultation process.		poster and feedback questionnaire were mailed to over 700 political representatives (including Co. Louth TDs & Councillors, Newry and Mourne Councillors, Down Councillors and Ards Borough Councillors and the NI Assembly ARD, ETI and Environment Committees), community groups, churches, sports clubs, marine users, schools and tourism businesses; • 22 groups without conventional address listings were reached via Facebook; • A one quarter page advertisement was placed in seven local (& ROI) newspapers; • A community news alert was broadcast on the Q-Radio Network; • A copy of the First Flight Wind project newsletter (October 2012) was provided as an insert in the circulation of two local newspapers (with circulation of 22,000); and • Twitter and Facebook were used to broadcast before during and after all events.
18 Information Points established within Co. Down and Co. Louth	From 24/10/2012	Information Points were established to provide project literature at the following locations: Annalong Barbican; Ardglass Community Centre; Sea Gems, Ardglass; Castlewellan Library; Downpatrick Library; Dundrum Post Office; Kilkeel Nautilus Centre; Kilkeel Library; Newcastle Library; Newcastle Tourist Information; Newry Library; Portaferry Library; Warrenpoint Library; Portavogie Post Office; Carlingford Tourist Office; Castlebellingham Post Office; Clogherhead RNLI shop; and Dundalk Tourist Office.
Project enquiry telephone number	From 24/10/2012	A project enquiry line was advertised in the poster, newspaper advertisements, website pages, social media, project leaflets and questionnaires, electronic and written correspondence, to provide the community with an opportunity to discuss the proposed project, ask questions or seek further information.
Meetings and presentations	From 24/01/2012	First Flight Wind Ltd has a policy to meet stakeholder groups and we are more than happy to give a presentation explaining the proposal to groups, upon request. Details of past and upcoming presentations are viewable on the First Flight Website (www.firstflightwind.com/meetings)

WHAT YOU TOLD US

The focus of the first round of consultation was to review the proposals for consulting over the two and half years of development leading up to a consent application, in early 2015. The consultation also attempted to establish an understanding of respondents' attitudes to renewable energy and the environment.

There were a number of ways for the public to provide feedback on the project: through a printed or online feedback form (74); on the Information Day registration sheets; through direct email or letter correspondence to the project team (51 emails, 4 letters); or through verbal comment made by phone or in person at any of the public information days to members of the project team, who actively recorded questions and comments made during each event.

The main issues and responses are discussed in the table below.

1. Qualitative responses

WHAT YOU SAID	OUR RESPONSE
Theme 1: Consultation Process	
Overall there was a high satisfaction level with First Flight Wind Ltd's current consultation methods. However, a number of improvements were identified:	
• Requests for improvement include:	
"Provide more information on the Stakeholder Panel and publish more information on stakeholder meetings with regards to the local community."	We will publish information on the Stakeholder Panel on our website. This will include details on the overall purpose/remit, members, date of meetings, agenda, minutes and expenses. We will issue a press release and image following each Stakeholder Panel meeting. We will host a video of the Chairman explaining his role in the Community Stakeholder Panel. We will also share an image gallery on our website of the Panel in due course. Updates on the activities of the Stakeholder Panel will also be made available through First Flight Wind social media channels and the First Flight Wind newsletter.
"Consider holding community Information Days in Warrenpoint and Portaferry."	We will host Information Days at Warrenpoint and Portavogie/Portaferry in our second consultation round. We will continue to respond to requests to hold Information Days in other locations where necessary.
"Ensure that First Flight Wind Ltd's printed material caters for those who are visually impaired - currently the brochure print size is too small."	We will ensure that all published material is available in a sufficient format and optimum size for readability. We will guarantee that all published material is available on CD for the visually impaired and advertise

WHAT YOU SAID	OUR RESPONSE
	that large print leaflets are available upon request. NOTE: In terms of our website, we are committed to making the information and resources provided accessible to all users. The central section of our Website has been designed to meet Level AA (2) of the World Wide Web Consortium's (W3C-AA) Web Accessibility Initiative (WAI) Web Content. Further to this, it is possible to increase or decrease the size of the text onscreen via following the instructions included on our website http://www.firstflightwind.com/accessibility
"Make the questionnaire easier to complete. "	The First Flight Wind project questionnaire return rate could be considered low (74), though it is consistent with survey response rates of other similar projects at this stage. Key ideas for improvement are noted below. We will structure the questionnaire to mirror the layout of the exhibition panels at the next round of Information Days so as to facilitate easy completion of the questionnaire. We will seek to improve the questionnaire return rate by including Reply-Paid Envelopes or a Reply-Paid questionnaire designed into the next project leaflet.
"Consider 'simplifying' your information - at the moment it's too detailed and there is too much jargon."	We will review the content and style of future project leaflets; however, we will provide detailed briefing sheets on key topics and areas of interest, which will ensure that we still provide the necessary level of data to allow detailed responses to technical issues.
"Further develop your educational programme."	We have already contacted schools in the local area and provided over 6,000 project leaflets. However, we will further develop our educational programme to include courtesy school visits/presentations on the project and age-appropriate information material. We will also invite schools to the morning of an Information Day when fewer members of the general public tend to come.
• Other key points include:	
"Ensure Councillors are kept informed throughout the project."	We will work through a District Council liaison committee to ensure that all affected Councils receive regular updates and are provided with opportunities

WHAT YOU SAID	OUR RESPONSE
"Councillors from the Portavogie area should be involved."	to comment. This will also involve regular liaison with District Councils potentially affected by any onshore grid infrastructure.
"Ensure that First Flight Wind Ltd continues to reach community with no digital access"	We will continue to post material to those stakeholders who have requested to be kept informed via post. We will also maintain formation at the 18 Information Points.
"Provide some consultation material in Irish"	According to the Northern Ireland Equality Commission, First Flight Wind Ltd is not bound by the rule of law (Section 75, NI Act) to consult in different formats as we are not a public body. 2011 Census data[2] shows that the main language spoken in South Down is English (98%).Given this, First Flight Wind will consult primarily in English, but will consider dealing with requests in other languages. We will include the following statement in our publications. "*These documents may also be available in other languages/formats; please contact us to discuss your requirements*".
"Further engage with other areas in Northern Ireland. Also involve and engage stakeholders beyond the immediate coastal area."	All consultations conducted locally will be put on First Flight Wind's website and advertised via our social media channels for all interested parties to. Material will be provided more widely where appropriate. For example, the Statement of Community Consultation will be given to authorities in Republic of Ireland and Isle of Man for consultation.
Theme 2: Commercial fishing	
Key areas of interest with regards to Commercial Fishing included how First Flight Wind Ltd intends to consult with the community with regards to:	
• *Engaging directly with fishermen, specifically in Ardglass and Kilkeel.*	We are establishing a Commercial Fisheries Working Group that will provide a forum meeting up to four times per year, to allow flow of information between the project team and representatives of the fishing industry, government and government advisors. In addition we will employ a Fisheries Liaison Officer, appointed by First Flight Wind Ltd, and two Fishing Industry Representatives, nominated by the fish producer organisations to represent the fishing community.
• *Minimising the effects on the fishing*	The location of the project will be identified in

[2] Source: NISRA 2011 Census

WHAT YOU SAID	OUR RESPONSE
industry.	consultation with representatives from the fishing industry. Location and design options will be presented at the second round of consultation in late summer 2013.
• *Minimising the risk of gear snagging with cable installation design for sea anglers.*	Following the geophysical survey, we will identify route options, methods for burying the cables which restore the seabed conditions, post installation.
• *Providing 'softer' anchoring points within the offshore wind farm for sea anglers.*	This suggestion will be considered as part of the detailed design work and will be presented at the third consultation round in summer 2014.
• *Providing more information on:* ○ *The effects of Electromagnetic Frequencies and underwater noise on pot fishing* ○ *Pilling of monopoles scaring crabs/lobsters away*	This issue will be considered under the Environmental Impact Assessment. We will add a new response under the Frequently Asked Questions (FAQs) (http://www.firstflightwind.com/faqs) to provide additional information covering this issue.
• *Providing more information on post construction access to the area (specifically in relation to exclusion zones for fishing vessels and yachts).*	We do not envisage any restrictions for fishing vessels or yachts other than a 50-metre safety zone around each turbine during operation (the turbines are expected to be spaced between 800 and 2,500-metres apart). We will add a new response under the Frequently Asked Questions (FAQs) to clarify this issue.
• *Providing the Fish Processors with more information regarding the impact on fishing stock.*	Fish processing organisations have been included in the stakeholder list and will be consulted as more information emerges.
Theme 3: Economic opportunities	
Key areas of interest with regard to economic opportunities focused on training, jobs, education and procurement.	
• *Questions were asked regarding the economic benefits surrounding the project, with a specific focus on job opportunities (including training and work placements), procurement and the value of the project for the local area*	We will review existing studies carried out on the economic benefits of offshore wind farms in our socio-economic study as part of the Environmental Impact Assessment (EIA). We will present the results in the third round of consultation in summer 2014.
• *First Flight Wind Ltd should provide more opportunities within the offshore industry for the fishing community.*	From previous development experience, First Flight Wind Ltd considers that the provision of opportunities for local suppliers can lead to better project development outcomes for all interested parties. Accordingly, First Flight Wind Ltd has been working with Invest NI to establish what goods and services can be delivered from Northern Ireland. With regards

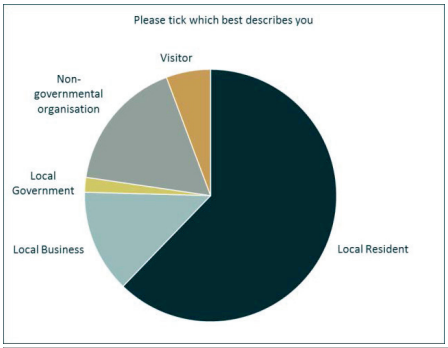
WHAT YOU SAID	OUR RESPONSE
	to the fishing community, Invest NI have compiled a list of fishing vessels which First Flight Wind Ltd shall consider as offshore surveys and services are required.
• *Interest was expressed regarding the possibility of introducing a project Community Benefit Scheme.*	We will explore various ways in which we will be able to provide support to local communities and will consult with District Councils on a 'Community Benefit Scheme' before consent application. NB: Monies provided through any Community Benefit Scheme will be in addition to any funds provided from the Coastal Communities Fund that derives from rental paid by developments that form part of the Marine Estate of The Crown Estate. Details of the CCF can be found at http://www.biglotteryfund.org.uk/global-content/programmes/uk-wide/coastal-communities.
• *First Flight Wind Ltd should provide more information on the positive contribution of the project in regards to securing a clean energy supply for Northern Ireland.*	The scope of the Environmental Impact Assessment will include consideration of the energy policy rationale for the project. We will consult on the scope of the Environmental Impact Assessment at the next round of consultation in late summer 2013.
• *Clarification required on possible locations for the Operation and Maintenance (O&M) facility.*	The scope of the Environmental Impact Assessment will include possible locations for an Operations & Maintenance facility. We will consult on the scope of the Environmental Impact Assessment at the next round of round of consultation in late summer 2013.
Theme 4: Visual Impact of wind turbines	
• Specific concerns were expressed related to; ○ *The colour of turbines;* ○ *Impact on property values;* ○ *Offshore wind turbines versus onshore turbines;* ○ *Negative visual impacts in relation to many of Northern Ireland's leading areas of outstanding natural beauty, including the Mournes and Tyrella.*	The scope of the Environmental Impact Assessment will include consideration off visual impacts and potential location/layout options. The locations, from which the photomontages will be taken, (in the Environmental Impact Assessment) will also be subject to consultation during the second consultation process in 2013.
Theme 5: Landfall and Onshore Connection	
• *Uncertainty was expressed regarding First Flight Wind's landfall requirements and locations*	Options for landfall will be considered and presented at the next consultation round in summer 2013.
• *Uncertainty was expressed regarding*	We will seek to avoid the use of overhead lines where

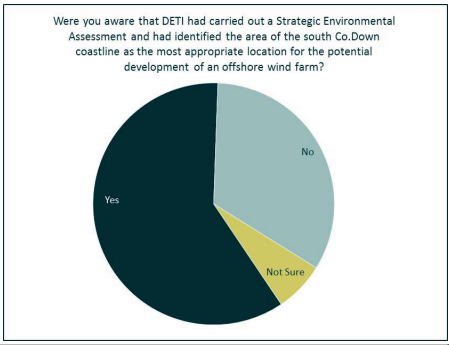
WHAT YOU SAID	OUR RESPONSE
the grid connection process (such as routing of overhead lines and environmental damage to grassland)	it is technically and environmentally feasible. Options for line routing will be presented at the next consultation round in late summer 2013.
Theme 6: Tourism and Recreation	
• *Key areas of interest focussed on how First Flight Wind Ltd intends to consult with the local tourism industry. Interest was also expressed in further exploring avenues whereby the wind farm could be seen as a positive asset to the current tourism offering.*	The scope of the Environmental Impact Assessment will assess effects on tourism. We will also carry out a socio-economic impact study and establish a Socio-Economic & Tourism Working Group to identify and discuss potential issues and opportunities.
• *Clarification required regarding the potential positive impacts in the area for tourism. For example, developing a dedicated visitor centre.*	As above.
Theme 7: Environmental Impacts	
• *Uncertainty was expressed regarding the impact on birds, specifically those who use the designated zone in their migration path.*	Surveys have begun and include coastal vantage point surveys for migratory wildfowl, aerial surveys for birds and marine mammals. We will consult on the scope of the Environmental Impact Assessment at the second round of consultations in late summer 2013.
• *Clarification is required regarding the availability and sharing of data from the Environmental Impact Assessment.*	We will publish both the full environmental statement and a non-technical summary to ensure that stakeholders are fully informed of the results of the Environmental Impact Assessment.

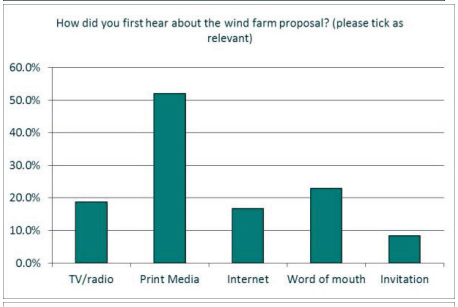
2. Quantitative responses

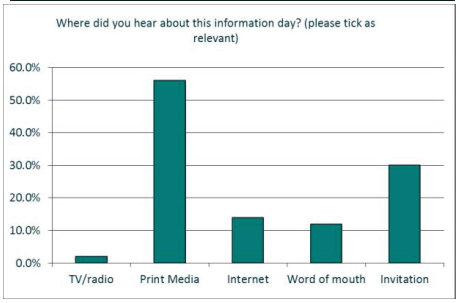
In addition to other forms of communication, a questionnaire was provided which allowed members of the public to provide structured feedback to the project team on specific questions. 74 completed questionnaires were submitted. However the following analysis has been made with a base size of 53 as a single group of 21 students were excluded the final review total.

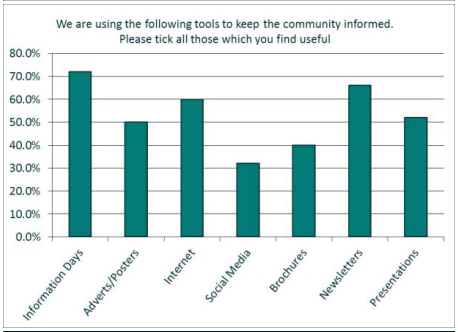
Analysis of questionnaire

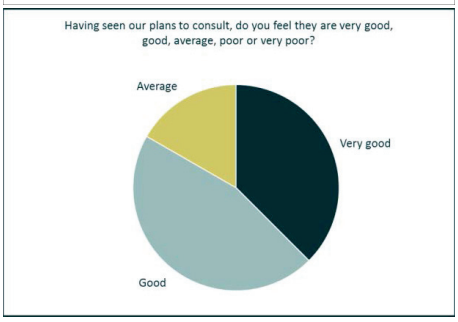


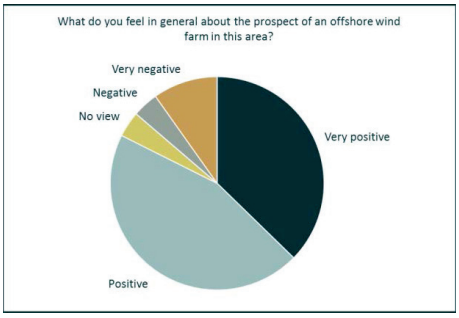


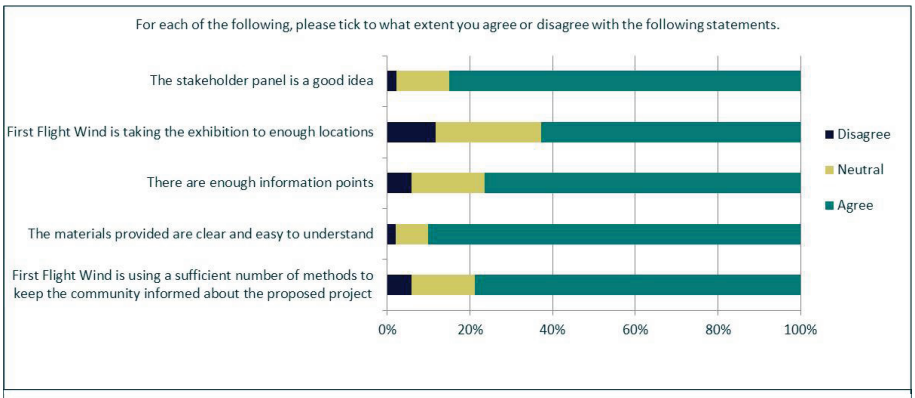


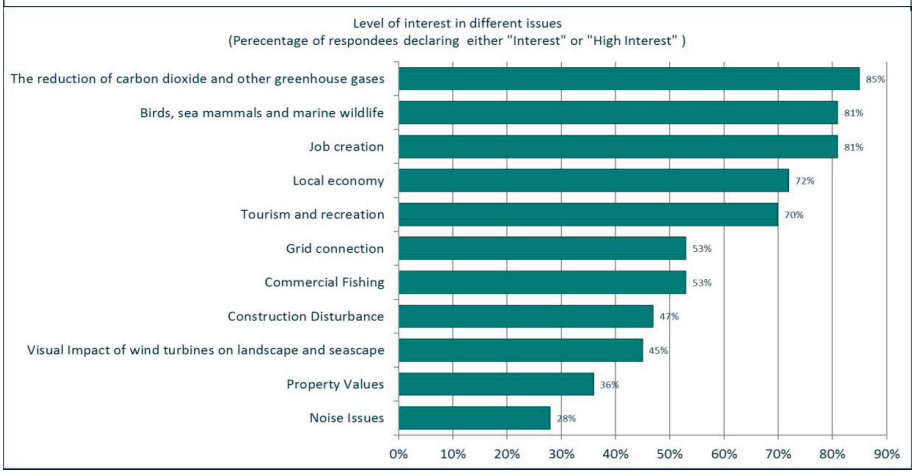


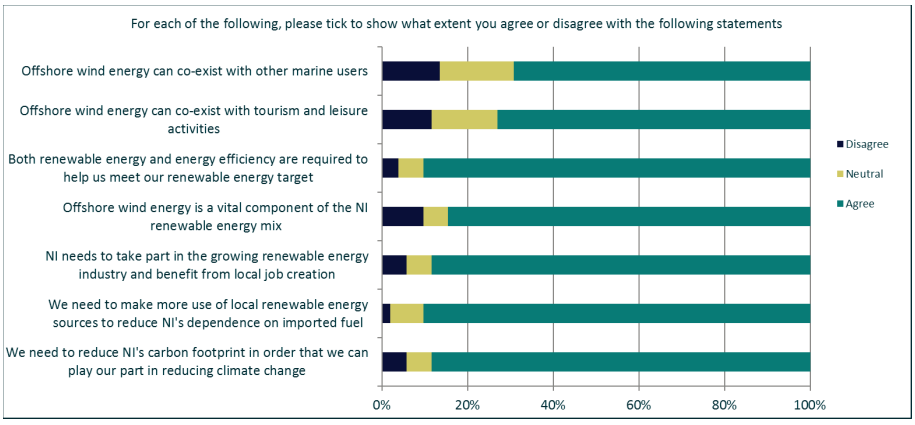







For each of the following, please tick to what extent you agree or disagree with the following statements.
The stakeholder panel is a good idea
First Flight Wind is taking the exhibition to enough locations
There are enough information points
The materials provided are clear and easy to understand
First Flight Wind is using a sufficient number of methods to keep the community informed about the proposed project
Disagree
Neutral
Agree
0%
20%
40%
60%
80%
100%


Level of interest in different issues
(Perecentage of respondees declaring either "Interest" or "High Interest")
The reduction of carbon dioxide and other greenhouse gases
Birds, sea mammals and marine wildlife
Job creation
Local economy
Tourism and recreation
Grid connection
Commercial Fishing
Construction Disturbance
Visual Impact of wind turbines on landscape and seascape
Property Values
Noise Issues
85%
81%
81%
72%
70%
53%
53%
47%
45%
36%
28%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%


For each of the following, please tick to show what extent you agree or disagree with the following statements
Offshore wind energy can co-exist with other marine users
Offshore wind energy can co-exist with tourism and leisure activities
Both renewable energy and energy efficiency are required to help us meet our renewable energy target
Offshore wind energy is a vital component of the NI renewable energy mix
NI needs to take part in the growing renewable energy industry and benefit from local job creation
We need to make more use of local renewable energy sources to reduce NI's dependence on imported fuel
We need to reduce NI's carbon footprint in order that we can play our part in reducing climate change
Disagree
Neutral
Agree
0%
20%
40%
60%
80%
100%

NEXT STEPS

Following this report, we will produce a 'Statement of Community Consultation' that will set out the scope our consultation process with local communities and stakeholders. This will be available early summer 2013.

Our Round Two Consultation events will take place in late summer 2013 and will aim to cover the scope of the environmental assessment, options for project location, layout and options for how we will connect to the NIE transmission network.

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Please note this document may also be available in other languages/formats; please contact us to discuss your requirements.

Round One Consultation Summary Report

First Flight Wind

April 2013

WELCOME to our summary report on the first round of consultation events for the proposed First Flight Wind offshore wind project. In this summary we outline how we consulted with the community, what you told us and how we intend to respond to the comments you made. A copy of the full Round One Consultation Report is available to download on the First Flight Wind website *www.firstflightwind.com/downloads*

We would like to thank everyone who participated in this initial consultation process.

PURPOSE

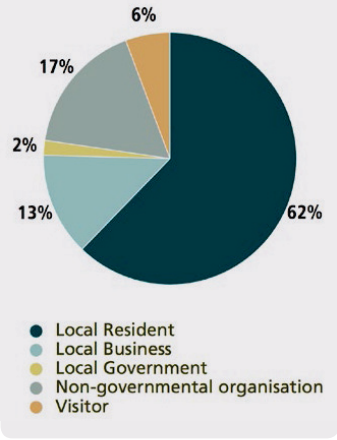
The focus of this first round of consultation – which ran from 10 October 2012 to 11 January 2013 – was to gain feedback on the appropriateness of the proposed programme for community engagement and the consultation activities planned for the period leading up to the project consent applications, in early 2015. In addition, the consultation also sought to gain an initial understanding of the community's attitudes towards the project, renewable energy and the environment. This has been used to develop our Statement of Community Consultation (SoCC) which we intend to publish early summer 2013. [1]

HOW WE CONSULTED

We used a number of different tools to communicate with the local community, ranging from traditional methods like 'drop in' style Information Days to newer internet-based social media channels such as Facebook and Twitter.

We held six Information Days in Ardglass, Carlingford, Castlewellan, Downpatrick, Kilkeel and Newcastle, which 235 people attended. As indicated in Figure 1, over half of the attendees were local residents, with the remainder comprising local community group members, local business owners and visitors.

Figure 1.
Please tick which best describes you



To raise awareness about the Information Days, we issued press releases in local media and to specialist journals; placed newspaper adverts; broadcasted a community news alert on the Q-radio network; and distributed copies of our first newsletter and two project brochures to over 700 stakeholders. We also established 18 Information Points within Co. Down and Co. Louth to make the project literature easily available locally. A project enquiry phone line was advertised in an A4 poster, the newsletter and newspapers and digital media to provide the community with an opportunity to discuss the project or seek further information. We also gave presentations to local organisations such as Lecale Conservation Group and universities, including Queen's University, Belfast. Full details of past and upcoming presentations are viewable on *www.firstflight wind.com/meetings*

[1] The SoCC is a published document and will set out how First Flight Wind Ltd. intend to consult with the local community as part of the proposed offshore wind project.

Members of First Flight Wind Ltd's independent community stakeholder panel

The project website was established in addition to a Facebook page and Twitter feed to share project news and provide updates on project events such as the Information Days.

WHAT YOU TOLD US

We collected your responses to our consultation through a printed or online questionnaire, letter or email correspondence that we received directly; or through verbal comment made to members of the project team by phone or in person at any of the public events. All of these comments were recorded in a stakeholder database and have formed the basis of our full Round One Consultation Report, available to download on the First Flight website ***www.firstflightwind.com/downloads***

The questionnaire allowed stakeholders to provide structured quantitative feedback to the project team on specific questions. 74 completed questionnaires were submitted. In terms of key insights we discovered that print media is by far the most effective method of communication and that word of mouth is considered just as effective as TV/radio, and more popular than Internet, *[See Figure 2 below]*.

As demonstrated in Figure 3 below, more than 75% of respondents felt either very positive or positive about the prospect of an offshore wind farm off the south east coast of Co. Down.

Figure 2.
How did you first hear about the wind farm proposal?*

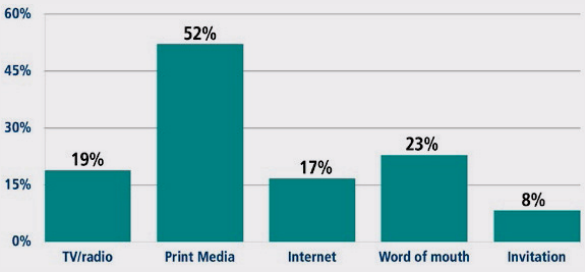
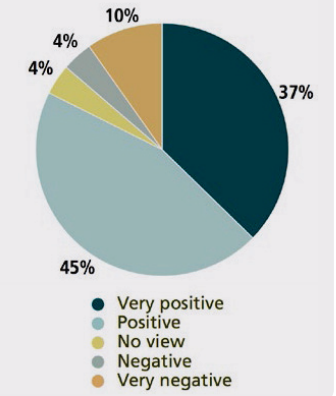


Figure 3.
What do you feel in general about the prospect of an offshore wind farm in this area?



As shown in Figure 4 (overleaf), 88% agree that Northern Ireland needs to take part in the growing renewable energy industry and benefit from local job creation. A further 90% agree that we need to make more use of local renewable energy sources to reduce Northern Ireland's dependence on imported fuel.

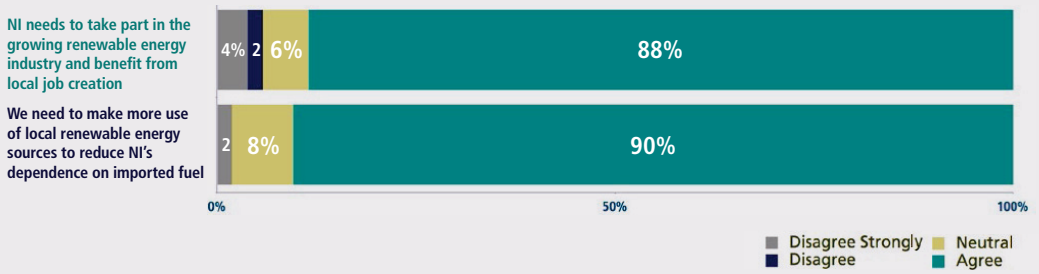
For ease of analysis, we grouped all the qualitative views, opinions and comments expressed to First Flight Wind Ltd. during the consultation process into seven key themes: the consultation process itself; commercial fishing; local economic opportunities; visual impacts; onshore grid connection arrangements; tourism and recreation; and environmental impacts. For each comment raised, we provided a response with a detailed commitment of action where appropriate.

In summary, consultation responses indentified

For detailed information on the comments we received under each of the seven themes noted above and our response, please view the full Round One Consultation Report that is available on our project website *www.firstflightwind.com/downloads*

*Please note, some respondents ticked more than one answer.

Figure 4.
Please tick to show what extent you agree or disagree with the following statements.



a degree of sensitivity to the proposals regarding potential effects on the local commercial fishing industry. Further to this, there was a requirement for First Flight Wind Ltd. to provide clarification concerning the landfall requirements and grid connection arrangements. Consultation responses identified support for the project in terms of its provision of opportunities for local economic activity as well as its contribution to reducing carbon dioxide emissions in Northern Ireland. Key improvements we intend to take forward at the next round of consultation include hosting future Information Days at Warrenpoint and Portavogie/Portaferry, ensuring that all published material is available in a sufficient format and optimum size for easy readability and further developing our education programme to include courtesy school visits and presentations on the project. Our responses to the comments we received were submitted for review and approval to an independent Community Stakeholder Panel in February [2].

Please view a copy of our full Round One Consultation Report which provides a detailed overview of our responses to the comments you made on *www.firstflightwind.com/downloads.*

NEXT STEPS

Following the conclusion of round one consultation, we will set down our final plans for Community Consultation in a document called a 'Statement of Community Consultation' (SoCC) in early summer 2013. The SoCC is a published document and will set out how First Flight Wind Ltd. intends to consult with the local community as part of the proposed offshore wind project.

Our second round of consultation events will take place in late summer 2013 and will aim to cover the scope of the environmental assessment itself, options for where the project might be sited within the whole zone that is currently under assessment and options on how we might connect to Northern Ireland Electricity (NIE) transmission network.

In the interim…

please feel free to give us a call to tell us your views, email us or sign up to our Newsletter, Facebook and Twitter feeds to keep up to date with the latest news and developments. Your views are important to us and we are really keen to hear what you have to say.

Who is First Flight Wind?

First Flight Wind is a consortium comprising of B9 Energy, DONG Energy and RES.

First Flight Wind

B9 ENERGY

DONG energy

res power for good

Contact Us

First Flight Wind
c/o B9 Energy Offshore Developments Ltd
18 High Street, Holywood
Co.Down BT18 9AZ
T: 028 9042 3165
E: info@firstflightwind.com
www.firstflightwind.com

Please note this document may also be available in other languages/formats; please contact us to discuss your requirements.

Please note, the questionnaire results contained within this report are based on a small sample size and therefore should not be taken as representative of the Northern Ireland population as a whole.

[2] This panel has been established to advise the First Flight Wind Ltd. project team on our community consultation process. Please visit www.firstflightwind.com/community-stakeholder-panel for more information and to view a copy of the Terms of Reference and Minutes.

100% recycled paper

First Flight Wind

Fishermen's Bulletin No. 1
December 2013

Welcome to the first Fishermen's Bulletin; designed to answer your questions and keep you informed about the proposed offshore wind farm. We are aiming to design a wind farm that allows the fishing sector to continue to thrive as a valuable and successful industry and we hope this Bulletin will be a useful part of that process.

John Hooper,
First Flight Wind, Fishing Liaison Officer

How and when you can have your say?

The process leading to an operational wind farm is years long, involves many stages and success is not guaranteed. The project will need four approvals. We would like to make applications for these approvals at the end of 2015. Before that, and over the next two years, we would like to have detailed discussions with fishermen and their representatives to make sure that our assessments of commercial fishing issues are complete. And we also want to make sure that we have appropriately modified our designs to take account of any significant concerns that are identified. Your experience will be invaluable in this regard.

We will regularly meet your PO, your political representatives and fish processor organisations. You can pass your views to us through two fisheries industry representatives (FIRs), Stephen Kearney and Davey Hill. Or, you can speak directly to First Flight Wind Fisheries Liaison Officer, John Hooper. We are keeping track of all questions or concerns raised during these discussions and are providing a regularly updated Questons and Answers sheet. This is made widely available or can be obtained from the FIRs or from us directly.

Project Location

Following a "strategic environmental assessment" of the entire Northern Ireland coast by DETI, the Crown Estate, who owns the seabed, selected First Flight Wind Ltd to investigate an area off Co. Down coast for a possible wind farm. Any change to this particular area is a matter for the Crown Estate. It is known as an 'area of search' and we will only be using a part of it for the wind farm. The final location of the project will depend on the final number and size of turbines and several design and engineering factors. All of this will require the use of commercial fishing data to be collected over the next two years.

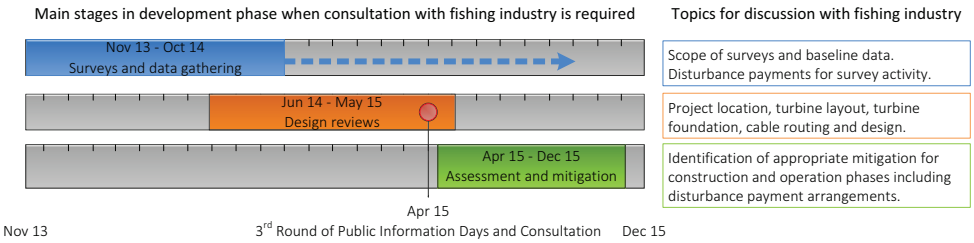
Study trip

We held a valuable study trip to Walney Wind Farms in November and will look to see how we can provide further opportunities for gaining experience from existing offshore wind farms through 2014.

Changing designs in offshore wind farms

A typical wind farm operating in the Irish Sea today might have turbines of around 3.6MW in capacity about 700m apart. For this project we are looking at the feasibility of using turbine designs of 10MW and bigger which could be between 1.1km and 2.5km apart. This would greatly reduce the number of turbines needed to generate the same amount of electricity and allow us greater flexibility in designing layouts for safer vessel movement.

Two year timeline showing when you can have your say



Winter 2013/14 activities

- Boat-based bird and marine mammal surveys;
- Met-ocean surveys to measure wave, temperatures, sediment, current and salinity;
- Preparations for geophysical surveys in spring 2014, which will be timed to avoid the peak cod spawning period.

Answers - what I want to know is…

Will I be able fish within the wind farm when it is operational? We do not intend to introduce any restrictions on fishing or vessel movement within the wind farm when it is fully constructed except for an advisory 50m safety zone around the base of each turbine. We intend to design the project to reduce risks associated with vessel movements within the project.

How do we trawl in the wind farm if there are cables on the seafloor?

We will be burying cables up to 2m deep. If not possible because of ground conditions we will be placing rock mattresses over the cables.

Will there be local jobs?

Yes, local companies will be required to help survey, build and operate the project, subject to meeting working specifications and health and safety standards. A wind farm operations base will be needed on the coast as close as possible to the project. Around 70-80 permanent technician and engineer jobs could be created to operate and maintain the project throughout its 25 year machine life.

Is this just the first of many wind farms off this coast?

This project is for a maximum of 600MW and no more offshore wind energy has been identified for connection to the Northern Ireland system.

When will this wind farm be built?

Building could start around 2018 at the earliest but only if our applications to build are successful. We intend to submit applications by the end of 2015.

Why build this offshore wind farm?

The Northern Ireland Executive wants to reduce the need for importing so much coal, oil and gas which make us vulnerable to fuel price changes caused by events outside our control. The Executive also wants to cut pollution and to ensure Northern Ireland can position itself for future long term job opportunities across the Irish Sea and beyond.

Notice to Mariners

Ahead of project surveys and other offshore operations, we will distribute Notices to Mariners to the following organisations and publish them on our website:
AFBINI, ANIFPO, Belfast Coastguard, CIL, Cruising Association, DARD, DOENI, Greenore Port Authority, Irish Cruising Club, Irish Sailing Association, Kingfisher Information Services, Loughs Agency, MCA, NELCO, NIFPO, NIFHA, RNLI, RYA, The Crown Estate, UKHO, Warrenpoint Harbour Authority.

Contact details

Have a question, like to receive a copy of the more detailed answers or to receive regular updates? Here's how to find us.

Fisheries Industry Representatives

- Stephen Kearney
  T: 07974735202 / cookie11@live.co.uk
- Davey Hill
  T: 077 0942 3506 / davey@sea-source.com

First Flight Wind contacts

- John Hooper – FFW FLO
  T: 01923 608 102 M: 077 7172 2407
  j.hooper@firstflightwind.com
- Sacha Workman - Community Liaison Team
  T: 9042 3165 / 18 High Street, Holywood, BT18 9AD
  s.workman@firstflightwind.com

Gaelectric

Gaelectric Developments Ltd.
Portview House, Thorncastle Street,
Ringsend, Dublin 4, Ireland.

Tel: +353 (0)1 643 0800
Fax: +353 (0)1 643 0890
Email: info@gaelectric.ie

Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast BT4 3XX

28th February 2014

By email to: committee.environment@niassembly.gov.uk.

Re: Response to Wind Energy Inquiry

Dear Chairperson Lo,

Gaelectric Developments Ltd (GDL) is an independent Irish wind development company operating within Northern Ireland, Republic of Ireland and North America. To date GDL has a wind energy portfolio of 9 projects with planning permission in Northern Ireland, with a total capacity of 123.3MW of which Dunbeg Wind Farm (42MW) is currently under construction. Our first operational wind farm, Skrine Wind Farm in Co Roscommon was commissioned in June 2011 and our second operational wind farm, Carn Hill Wind Farm, Co Antrim was commissioned March 2013. The company also has seven consented wind farms in Republic of Ireland with a total capacity of 34MW; while a further 2 projects are currently at various stages in the permitting process. In the USA, GDL controls a portfolio of land options equivalent to 500MW of capacity.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our low-carbon energy future.

We support the positions taken by NIRIG and reiterate the following points:

- It is clear that the benefits of developing our free wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development
- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland

- We strongly believe that the forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond
- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments
- Buffer zones or separation distances are not required by statute in the UK or Ireland and are a crude instrument to mitigating potential noise impacts and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector is considered a leader in good practice on community engagement in Northern Ireland

We would also like to highlight the need for positive leadership from across the political spectrum for the development of our substantial renewable energy resources. Our sustainable energy targets as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital. We continue to look forward to and are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind.

In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our low-carbon commitments.

Please do not hesitate to contact Gaelectric should you wish to further discussions on any of the matters raised in this submission.

Yours sincerely,

For and on behalf of Gaelectric Developments Ltd.

Carmel Daly

Geoffrey Simpson

Summary of Information of Concern Relating to Wind Energy in Northern Ireland – Geoffrey Simpson

Wind Farms Operate Illegally

Aarhus Convention contravention .

Environmental Impact Studies are not carried out by independent governmental bodies.

Guidelines regarding "set back" distances etc. have not been reviewed properly. Why has a 2Km., or more, set back distance been omitted?

Health Issues

Inability of Public Health Bodies to measure sound related aspects like "Infrasound" and effects on Humans/Wildlife.

Attention to Sleep Depravation and resulting relationships to development of afflictions like obesity, diabetes , depression and cardiovascular disease. Research by Chris Hanning University of Leister, Prof. Alun Evans Q.U.B. and Prof. Elliot I.C.L in addition to many other international studies should be examined.

Hearing degeneration and the effect of "Flicker" especially from multiple installations and the consequences to people within the autistic spectrum or having epilepsy should be considered.

Other safety related matters for scrutiny involve Blade Disintegration, Ice Throw & Fire Safety. (Fire Emergency Services do not have equipment to deal with Turbine Fires). I believe many incidents go unreported ! Some turbines, I understand may lack "machinery plates" in compliance with regulations.

Environmental Concerns

The lack of governmentally supervise Environmental Impact Studies leaves the system open to abuse e.g. projections concerning sound influences I believe can be largely arbitrary. Readings from one area may be applied to another by computer "cut & paste" exercises. I ask " who checks?"

The use of A.S.S.I. & E.I.A. zones (often in O .N.B. areas) for wind energy projects is unforgivable. One wonders why such designations were given in the first place , when there is now flagrant disregard demonstrated.

I can provide information on the adverse effects on flora & fauna , blanket bog and watercourses, but I am quite sure that in many applications for planning permission that serious omissions have been made in order to gain a favourable outcome for the applicant. Once again I ask "who checks?"

One only has to examine the effects of wind farm construction on Derrybeg in the R.O.I. to see the disastrous environmental consequences of peat disturbance & slippage.

To suggest , as the Wind Industry does, that turbines are "Green & Carbon Neutral" is erroneous when considering the disturbance to what is considered one of the greatest "carbon sinks" in existence - the peat bog . Foundation extraction , roadway construction etc. all are so detrimental in that not in ten times the lifetime of turbines will this damage be recoverable . Consider also the carbon volume produced in the manufacture of turbines.

Ignored by the wind industry is the environmentally disastrous consequences of the extraction of Rare Earth Elements in Mongolia for turbines — Scary Stuff !

The Visual Impact of turbines amounts to the imposition of an industrial process on a rural landscape. This is hardly compliant with rural planning policy, after all, how difficult is it for a native to get planning permission for a modest home in his locality as applications are often deemed "detrimental to landscape character"?

Consider too the effect on landscape and the environment in general, of the necessity for the related infrastructure associated with the wind industry - pylons, cables & substations. If it were not for the crazy notion of wind farms then it would not be necessary to "upgrade" the existing grid. The argument that population increase necessitate this, does not hold water given that the demography and rate of increase does not exhibit any great change in this island for the future.

Socio Economic Matters

The statement that wind farms are economically beneficial is misguided. Erratic wind speeds necessitate back up from traditional sources. Logically, the example of continental Europe & North America should be followed, whereby, the emphasis has turned away from so called "renewable " to "clean burn" fossil and nuclear sources.

The declaration of the wind energy proponents that job creation is to the fore is again in question. Beyond construction, very few permanent jobs have actually come to fruition.

The methodology of advertising used by the wind industry has been suspect , there are instances of contravention of standards by those applying for planning permission and n.b. the large S.S.E. fine. One wonders about the accuracy of the information disseminated to schools.

So called "Community Benefits " amount to little more, in my opinion, to bribes. These are given to community groups up to 8 miles from the wind farm who are not directly affected like those living closer. Thus community division is created. Similarly, communities or individuals are often in conflict with neighbours who have had turbines erected on the promise of wealth for the next decade, regardless of the consequences to others.

If it were not for the payment of subsides the wind industry would not exist, "renewables" received £150 million in this respect during the last 3 years, paid for by increased tariffs on the bills of ordinary consumers who are gulled into believing that this is "clean energy". This nonsense is further compounded by money given to the wind industry for "constraint payments" (amounting to £30 million last year alone). It is no wonder that so many households in Northern Ireland are in "Fuel Poverty"

An examination of he payment of aggregate tax paid on the construction materials allegedly used in the creation of wind farms may lead to some interesting results. Does anyone check on this aspect? The revenue generated for government coffers must be considerable , so accuracy would be important!

Quarry owners and those involved with construction of wind farms ought to be scrutinised more thoroughly to ensure that employees are from this country and that claims made in local papers that materials are entirely sourced locally are actually the case.

In the review of wind energy being undertaken I ask that consideration be given to the above points. I can verify my statements and provide relevant research references and have, in the interests of readability, tried to condense information.

When taken in the context of submissions from other individuals within the concerned groups throughout Northern Ireland it may provide something of an overview for your members. Should you require clarification on any point I may be contacted at any time.

Geoffrey Simpson . 27 02 2014

Gerard Flynn

As ESBNG is the MOU between ESB and SONI,and now EirGridplc and SONI are contractually bound, I am voicing my opposition to Northern Ireland's wind energy policies. The more wind energy Northern Ireland takes onto the National grid the more Southern Ireland's energy becomes unstable, unreliable, unpredictable, more subsidised, and the more carbon emissions it releases. It's a fallacy, to acknowledge wind as an alternative energy resource. The fact that wind energy needs conventional fossil fuel plants to be kept idling during wind generation so that they can be turned on when the requirement arises alone cancels out any positive generation we might attribute to them. This idling of plants not only creates greater level of carbon dioxide emissions, because they need to be geared up and down as needed, but it significantly adds to the cost of generation. As well as this the fact that the wind is subsidies through PSO levies, REFIT2 and other loans provided by our government through investment companies make this energy economically unsustainable. In fact in today's bloomgberg report: 'Germany should scrap its clean-energy subsidies because the system has driven up electricity costs for consumers and hasn't spurred innovation or reduced greenhouse gases, a group of government advisers said. Adding renewable-energy plants in Germany doesn't cut Europe's emissions because they're released elsewhere, the Commission for Research and Innovation said in a report handed to Chancellor Angela Merkel today. The uncapped aid provided by the system known as EEG – about 23 billion euros ($31 billion) last year – doesn't encourage new technologies, it said. "The EEG isn't a cost-efficient instrument for climate protection nor does it have a measurable impact on innovation," the commission said in the report. "That's why there is no basis for the continuation of the EEG."http://www.bloomberg.com/news/2014-02-26/merkel-advisers-urge-germany-to-end-clean-energy-subsidy-program.html . How can NI commit to an energy policy that has directly impacted European gas energy cost to 300% more expensive than the US. The EU has agreed that if they don't do anything Europe will lose significant competitiveness, and this is BAD NEWS FOR ECONOMIC GROWTH AND BAD NEWS FOR JOBS..... Ireland's industrial energy costs are at presently some of the highest in Europe.

http://www.vieuws.eu/energy/if-europe-had-one-voice-energy-prices-could-be-reduced-claimsieas-fatihbirol/?utm_content=buffer7c98d&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

Additionally, the negative impact of wind on tourism, real estate, agriculture, human health and the rezoning of land from agriculture to commercial, all substantially accumulatively impact the South of Ireland because the economies, cultures and histories are so closely tied to each other.

Gianni Alen Buckley

From: Gianni Alen-Buckley
Sent: 28 February 2014 10:36
To: +Comm Environment Public Email
Subject: Inquiry into wind energy

To Whom It May Concern on the Panel of the Inquiry into Wind Energy in Northern Ireland

Energy costs

- Wind energy due to the enormous subsidies paid is very expensive energy and not sustainable. The EU have already stated that subsidies to the mature energy industry must cease. If Northern Ireland continues to pursue the overly ambitious renewable target for electricity this will create a noncompetitive climate for industry in the future and thus lead to future job losses as is now happening in Germany. A competitive and unreliable supply of electricity , is what actually protects manufacturing and supports jobs. An over reliance on expensive wind energy will become a barrier to inward investment resulting in Northern Ireland failing to attract new jobs in the future.

Jobs

- Europe is now realising that we can never be competitive with our high price of electricity which is primarily as a result of the subsidy / rates system and these subsidies only benefit private wind-farm developers. There are very little jobs in Wind energy in Northern Ireland as Northern Ireland has no history or prospect of wind turbine manufacture. The potential for jobs in Wind energy in Northern Ireland isn't "huge". Northern Ireland has no background in mechanical engineering and is unlikely to acquire the expertise to build turbines in the near future. In Scotland for the few jobs created in larger than Northern Ireland wind energy sector, it is estimated to cost **£154,000 per job in subsidies**

Tourist Jobs Loss

- Jobs will be lost in the Tourist industry if the Northern Ireland Government and private wind farm operators get their way and turn the very valuable Northern Ireland landscape into an industrial landscape. Europe and the Northern Ireland Government are effectively destroying its beautiful and priceless nature by providing huge subsidies to private wind-farm developers and promised large guaranteed returns to the investors.

Unstable Grid

- The number of wind farms envisaged to meet the target for Northern Ireland will make the Northern Ireland Grid unstable and dangerous, therefore it will lead to more episodes of 'lights out' and therefore a problem for economic recovery. No Cost benefit analysis completed for NREAP
- The Government and its agencies thus far appear unable to provide any data to justify NREAP and Grid upgrade. A seriously flawed NREAP that has a very high risk of becoming a huge white elephant and therefore puts Northern Ireland at risk of going into another recession as a result of the wasted billions , resulting in very expensive and non-competitive energy cost. Northern Ireland need to push alternatives - such as retrofitting insulation which would generate much needed jobs for Northern Ireland's unemployed workforce. Marie van der Hoeven of the International Energy Agency has said, 'Energy efficiency is our first fuel'.

Substantial installed wind capacity already

- Northern Ireland already has substantial installed wind capacity the technical and financial limit of wind in the energy mix is a maximum of 20%. There would be little need for continuing grid investment except for the expanding wind industry which threatens to destabilise the grid. The full costs of the Grid are spread across all consumers, rather than being charged to the wind farm developers. If the Northern Ireland government pursues higher renewable target for electricity, then this will mean large increases in electricity bills for the hard pressed consumer. Why not provide subsidies for retrofitting of the housing stock and thus it would give more disposable income by way of cheaper energy bills and thus relief for the hard pressed consumer. Retrofitting will result in more direct jobs and indirect jobs created as a result of more disposable income in the consumer's pocket. It will also lead to substantial reduction in CO2 emissions.

There appears to be a lack of environmental information, total lack of any cost benefit analysis and/or any other economic analyses and assumptions.

- The citizens of Northern Ireland have the right to be properly informed, to participate in the decision making and to have access to justice in relation to projects that have an environmental impact. (UN Aarhus Convention)

Yours faithfully

Gianni Alen-Buckley

Harland and Wolfe

Harland and Wolff

HEAVY INDUSTRIES LTD

QUEEN'S ISLAND BELFAST BT3 9DU
TEL (028) 90 458456 FAX (028)90 458515
www.Harland-Wolff.com

Committee Chairperson Anna Lo MBE
Committee for the Environment
Parliament Buildings
Ballymiscaw
Stormont
Belfast
BT4 3XX

28th February 2014

By email to: committee.environment@niassembly.gov.uk.

Re: Response to Wind Energy Inquiry

Dear Chairperson Lo,

Harland and Wolff is one of Northern Ireland's longest standing heavy engineering companies. We specialise in design and construction services to the offshore maritime, oil, gas and renewable energy sectors. We have completed a very wide range of offshore wind farm projects across the UK and into the Continent.

We welcome the opportunity to respond to the Environment Committee's Wind Energy Inquiry. We support the NIRIG response to this inquiry, and would like to reiterate that a stable policy framework is required to allow clear and necessary progress towards our low-carbon energy future.

We support the positions taken by NIRIG and reiterate the following points:

- We believe that the benefits of developing our wind resources far outweigh the perceived negatives, and a considerable number of policies are already in place to mitigate any of the potential impacts of wind energy development.

- PPS18, the key planning policy document for renewable energy in Northern Ireland, is the product of extensive public consultation, and we believe that PPS18 and the associated guidelines are balanced and fit for purpose in assessing wind farm developments in Northern Ireland.

- We strongly believe that the forthcoming Strategic Planning Policy Statement should maintain the current language and approach of PPS18 to enable our Strategic Energy Framework targets and beyond.

- Planning policy has been based on robust evidence and scrutinised by experts in their field. Based on the advice of planning policy, a wind farm which can operate within the noise limits which have been derived according to ETSU-R-97 is considered to be acceptable. An additional Good Practice Guidance now underlies the policy and we believe that such expert-led policies are appropriate for the purposes of wind farm noise assessments.

- Buffer zones or separation distances are not required by statute in the UK or Ireland and we believe that an effective means of managing wind turbine noise impacts is to set noise level limits at the noise sensitive receptors likely to be significantly affected, and require these to be met by planning conditions.

- We would like to highlight that positive community engagement over and above statutory requirements is regularly carried out by wind farm developers in Northern Ireland and we believe that the renewables sector may be considered a leader in good practice on community engagement in Northern Ireland.

We would also like to highlight the need for positive leadership from across the political spectrum for the development of our substantial renewable energy resources. Our sustainable energy aims as laid out in a wide range of Executive and Departmental policies, as well as party political manifestos, will only be met through an increasingly diverse and low-carbon electricity system. In delivering these aims the combined efforts of policy-makers, industry and communities will be vital. We continue to look forward to and are committed to making progress on developing our renewables sector, and in particular the most cost-effective scalable technology: onshore wind.

In conclusion we would like to thank the Committee for the opportunity to engage on this issue and look forward to continued support for the development of our enviable renewable resources and the necessary progress towards meeting our low-carbon commitments.

Yours sincerely,

DAVID MCVEIGH
Sales and Marketing Manager

Heritage Council Kilkenny

From:	Alison Harvey [mailto:aharvey@heritagecouncil.ie]
Sent:	24 December 2013 10:29
To:	+Comm Environment Public Email
Cc:	Alison Harvey; Kate Moloney
Subject:	RE: NI Assembly Inquiry into Wind Energy - Response from the Heritage Council, Kilkenny, Republic of Ireland (RoI)

Dear Ms Mawhinney

The Heritage Council notes with interest the recent announcement by the Northern Ireland Assembly's Committee for the Environment of the setting up of a full *Inquiry into Wind Energy in Northern Ireland*.

The Heritage Council wishes to inform the NIA Committee for the Environment that it has recently prepared a number of environmental policy research and proposal reports in relation to this important land use issue, which has potential trans-boundary impacts. The Heritage Council's reports are available to download from the link below:

http://www.heritagecouncil.ie/planning/news/view-article/article/new-report-on-the-onshorewindfarm-sector-in-ireland-produced-by-the-heritagecouncil/?tx_ttnews%5BbackPid%5D=1150&cHash=d5f335de346c2597d6200db7fa205f79

For example, the Heritage Council's policy research report (Volume 1) includes a short chapter on Northern Ireland and highlights opportunities for enhanced landscape planning and management on an all-island basis. These reports have also recently been submitted to the Department of Communications, Energy and Natural Resources and the Department of the Environment, Communities and Local Government in the Republic of Ireland, as part of the first public consultation phase of the emerging Renewable Energy Export Policy and Development Framework for RoI. We hope that the Heritage Council Reports may be of use to the committee.

We would also wish to draw your attention to the Heritage Council and Partners' Community-led Village Design Statement (VDS) Toolkit and associated Multi-disciplinary Training, which includes effective ways to engage local communities in the Irish Panning System – it is hoped that this resource, which was launched in late 2012, might also support the work of the NIA Committee for the Environment (please note that the Heritage Council and Partners' Community-led Toolkit/Training has recently been shortlisted for an Irish Planning Institute (IPI) National Planning Award). The Toolkit and Training Progamme are available to download from the link below:

http://www.heritagecouncil.ie/planning/our-initiatives/village-design-statementprogramme/vds-toolkit/

If you require further information in relation to these studies, or if you have any difficulty downloading the reports, please do not hesitate to get in touch.

Best wishes for a Merry Christmas and a peaceful New Year.

Yours sincerely

Alison Harvey MIPI AILI

Irish Planning Institute

Irish Planning Institute **Institiúid Pleanála na hÉireann**

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The Courtyard,
25 Great Strand Street,
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T/ +353 1 8788630
F/ +353 1 8788682
E/ info@ipi.ie
W/ www.ipi.ie

Sheila Mawhinney
Committee Clerk
Northern Ireland Assembly's Committee for the Environment
Stormont
Belfast

14th February 2014

Dear Sheila

Re: Submission by Irish Planning Institute (IPI) to NI Inquiry into Wind Energy

Thank you for the invitation to respond to this important and timely Inquiry. The all-island Irish Planning Institute (IPI) has the largest professional membership of spatial planners in Ireland, and the Institute welcomes the opportunity to collectively make a submission on planning matters relating to development of Wind Energy in Northern Ireland. Before turning to the specifics of the Terms of Reference, as issued, the Inquiry is respectfully requested to take into account the following relevant points:

1. At the IPI National Conference 2013, which was held at Belfast City Hall for the first time, the President of the IPI, Joanna Kelly MIPI, highlighted the overwhelming need to prepare an *All-island Landscape Strategy*. Without prejudice to the decision-making authority of the respective jurisdictions, it is considered that this overarching landscape strategy would allow the public, private, and voluntary sector bodies, both north and south, to develop a consistent and robust assessment approach to **all major infrastructure plans and projects**, including, but not limited to, wind energy development. In particular, such a strategy would provide a joined-up framework from which to address transboundary land use issues raised by planned cross border projects, e.g. the North-South Interconnector.

2. This All-island Landscape Strategy could subsequently be enshrined in the Programme for Government for Northern Ireland, the Regional Development Strategy 2035, the development plans for the 11 no. new super councils and the emerging Strategic Planning Policy Statement (SPPS), which is currently out for public consultation. In much the same way, the strategy could be embodied in the National Development Plan (NDP) in the Republic of Ireland, the planned National Spatial Strategy (NSS) along with regional and development plans at a regional and local authority level.

3. At present, proposals for energy infrastructure are assessed on an ad hoc basis and, as a result, their cumulative impacts (landscape character, biodiversity, visual impact, etc.) are inadequately assessed. This is contrary to European environmental legislation as statutorily expressed in the EIA, SEA and AA/Habitats Directives. While it is acknowledged that there is a landscape-focused Supplementary Planning Guidance (SPG) in place in Northern Ireland to guide windfarm development in sensitive locations in NI, an All-island Landscape Strategy would constitute the first step in ensuring that such advice can extend to all major infrastructure proposals on the island. Such a strategy could also give rise to the development of a shared GIS database (INSPIRE compliant) on which to forward plan,

manage, and monitor development and landscape change. This would be in keeping with the desire of emerging planning legislation in NI to promote evidential based decision-making and would also be in accordance with the European Landscape Convention (ELC), which has been ratified by both jurisdictions.

Mindful of the above points, the response of the IPI to the Terms of Reference for the Committee's Inquiry into Wind Energy is as follows:

1. To assess the adequacy of PPS18 and related supplementary guidance in regulating proposals for wind turbines on a consistent and strategic basis, with due regard for emerging technologies and independent environmental impact assessment;

As with all Planning Policy Statements (PPSs), PPS18 provides both strategic objectives and operational policies to help manage renewable energy-based development in Northern Ireland. Having stated this, it must be noted that its contents will soon be replaced and subsumed in a more concise fashion in the emerging Strategic Planning Policy Statement (SPPS).

It is submitted that planning policy should be in keeping with the key tenets of the UNECE Aarhus Convention and the European Landscape Convention (ELC). The IPI congratulates the NIEA for its recent work in producing the *Northern Ireland Landscape Charter*, which was formally endorsed by the IPI in January 2014. The Institute would recommend that the principles set out in the Charter are reflected in an updated PPS 18 and beyond.

The IPI would strongly recommend that PPS18 and its associated SPG should be updated to contain a policy framework on *environmental* assessment utilising 3D modelling and scenario analysis to meet the modern demands of SEA, EIA and AA processes. Advanced 3D modelling would also enhance public accessibility, engagement, and awareness of environmental decision making processes, in accordance with the UNECE Aarhus Convention.

In addition, PPS18 needs to be explicit in its intent to protect, manage, and promote sensitive cultural landscapes including Areas of Outstanding Natural Beauty (AONBs), the UNESCO World Heritage Site (WHS) at the Giant's Causeway (one of only three such designated sites on the island), and Areas of Scenic Quality, the latter of which were identified in the Landscape Character Assessment (LCA) 2000. These Areas of Scenic Quality have been incorporated into Development Plans as Areas of High Scenic Value. At present PPS18 does not differentiate between sensitive landscape areas and other areas. Clarity on this would avoid any room for misinterpretation by both advocates and assessors of proposed wind energy development. This clarification may also need to apply to SACs and SPAs, which are also recognised as sensitive areas in PPS18.

In terms of accessibility, the Supplementary Planning Guidance to PPS18 runs to 322 pages, wherein the Landscape Assessment Sheets for each of the 130 LCAs in NI account for 240 of these pages. While not wanting to undermine the comprehensive contents of this document, its size could be

construed as a deterrent for effective consultation. These Landscape Assessment Sheets that offer guidance for windfarm proposals would be better committed to the LCA database that currently exists on the NIEA website and cross-referenced to the DOE (NI) Planning Portal.

2. Compare the perceived impact of wind turbine noise and separation distances with other jurisdictions and other forms of renewable energy development; and

The NI Environment Committee is probably already aware of the current review of two sections of the Republic of Ireland's 2006 Guidelines on *Wind Energy Development*, which deal with the specific environmental considerations of shadow flicker and noise. A draft of the review has been published for public consultation. The revised noise and shadow flicker sections of the

Wind Energy Development Guidelines (2006) which are currently out for public consultation propose:

- *The setting of a more stringent absolute noise limit (day and night) of 40 decibels (dB) for future wind energy developments. This limit is an outdoor limit, in general the reduction of noise levels between the outside of a dwelling and inside would be approximately 10 decibels; ,*
- *A mandatory setback of 500 metres between a wind turbine and the nearest dwelling for amenity considerations;*
- *A condition to be attached to all future planning permissions for wind farms to ensure that there will be no shadow flicker at any dwelling within 10 rotor diameters of a wind turbine. If shadow flicker does occur, the wind energy developer or operator will be required to take necessary measures, such as turbine shut down for the period necessary, to eliminate the shadow flicker.*

The Institute welcomes the establishment of an absolute noise limit as the most appropriate method of controlling noise impacts from wind energy developments. However, the Institute has concerns regarding the appropriateness of the proposed minimum separation distance of 500m is unnecessary. The guidelines should emphasise the importance of carrying out robust assessments of the potential impacts of wind turbines on the host environment. Such assessments should cover all important issues to include noise and visual impact with particular reference to existing and permitted dwellings. Moreover, the Institute contend that, if a threshold approach is to be applied to the issue of shadow flicker, it be clear and unambiguous and should state precisely which modelling scenario these standards should apply to; blue sky/astronomical or cloud/realistic.

These guidelines are due to be finalised by mid 2014.

3. To review the extent of engagement by wind energy providers with local communities and to ascertain how this engagement may best be promoted.

With the impending coming into force of the 2011 Planning Act in 2015, when the 11 new super councils will come into being, prior community consultation on major development projects will become a statutory requirement. Furthermore, in terms of seeking to promote community engagement it must be presented with draft proposals and, if possible, alternative solutions (see earlier recommendation relating to modelling). Too often, communities are confronted with a fait accompli that offers little room for flexibility or consensus. This approach is outdated and needs to adapt to ensure that the system is in accordance with the UNECE Aarhus Convention, which includes public participation in environmental decision-making as one of three key pillars, along with Access to Environmental Information and Access to Environmental Justice.

The IPI would recommend that the UNECE Aarhus Convention is at the core of any new planning policy which provides a framework for environmental decision-making and appeals relating to wind energy development.

The Irish Planning Institute appreciates the opportunity to give its views on the NI Inquiry into Wind Energy and would welcome the opportunity to meet and discuss the opportunities outlined above.

Yours sincerely,

Amy Hastings

Vice President
Irish Planning Institute

Jason Kerr

In this email I intend to express my personal views on wind energy in Northern Ireland, firstly I want to point out Northern Ireland's current position in regard to energy, Ireland is an island off an island in the Atlantic it is totally reliant on imported coal, oil and gas for its electricity and this is unlikely change in the short, medium to long term even though there are some proven oil and gas deposits of the coast and an early prediction of shale gas, these are unlikely to impact on this reliance on imports, Ireland is the least forested country in Europe which rules out biomass as a substantial energy source, bio gas from grass e.g. anaerobic digestion is a growing source of energy but again is unlikely to significantly impact our fossil fuel reliance, solar is also becoming popular but again it will only be a small energy source in comparison to our energy needs, hydro would also be clean energy but due to the limited number of viable sites this to is unlikely to impact energy production, nuclear energy generation is banned in the Republic of Ireland and is to expensive to contemplate for a relatively small energy user on the European level like Northern Ireland although import of nuclear energy is possible through the 2 sub sea electricity interconnectors.

So where does this leave us, continuation of the status quo importing all or the vast majority of our energy requirements? Or do we look to what strengths Northern Ireland has.

There is no doubt Northern Ireland has enviable topography and location in regard to wind, second only to maybe Scotland or Norway in Europe for this, currently this free source of energy is quite literally blowing in the wind, it has been harnessed by growing number of wind farms but the question is should wind energy capture by wind turbines continue to grow given the growing public opposition to them and the current inadequacy of the electricity grid to connect these wind farms.

Northern Ireland's landscape and location lends itself well to wind farm developments gently sloping mountains with flat tops , local construction expertise readily available, reasonable road infrastructure and most importantly a government backed subsidy guaranteeing income for 20 years paid for by consumers, the problems that subsequently arise from all these positives for the developers are that unlike Scotland Northern Ireland's population are far more spread out into the countryside, this means wind farms no matter how remote they might look are still in relative close proximity to dwellings, noise can then be a problem although if sited properly this shouldn't be an issue and generally this is dealt with through planning, there has been some complaints regarding low frequency noise affecting people but to my knowledge this has not been proven although it could be a problem going forward, wind farms do not create large volumes of jobs or least in the long term although jobs are supported during construction but this is comparable with energy production through coal or gas, they too use automation in their generation apart from control and maintenance, currently there is very little local benefit other than for the land owners however there are some wind farms that provide funding for local projects and groups and this type of scheme should encouraged, extended and possibly written into planning permissions, one company recently has announced an allowance for residents within the vicinity of their wind farms towards their electricity bill however I would be cautious about this approach as is looks like bribery in return for support, Development zones could be something which could be looked into, in this scenario a particular district could be identified for intensive wind farm development in return these districts would receive a higher than normal investment in local services, investment in job creation and possible improved local infrastructure this approach has been taken in other parts of the EU. especially in Germany and is proven to work, the other 2 main issues then are the visual and environmental impacts of these developments, environmental impacts should be dealt with through the planning system and from what I have seen this has been successful in holding wind farms to account, there is no doubt that environmental damage does occur but this has to be weighed up against the benefits, all mitigating measures should be and from what I can see are being implemented as far as possible. Visually wind turbines provoke debate everywhere you go and is purely a perception

issue again this needs to be balanced between the need for energy and there visual impact I don't think anyone, even the developers are suggesting or even sticking there neck out to apply for planning in areas of outstanding natural beauty and rightly so, however if Northern Ireland is to maximise this opportunity areas with low population and low tourism potential should be look at seriously for development. I would challenge anyone who says that wind turbines de-value the landscape I would be surprised if when asked a tourist would say that wind turbines adversely affect their view of the Northern Ireland landscape and in my view it very unlikely to affect property values but again this is down to individual perception. It should be noted that wind farms only have planning for 25 years and will have to re-apply to retain these wind turbines at this stage all the issues can be re-examined and the wind farms will have to be dismantled if planning is not granted or the wind turbines are no longer viable all this is in contrast to traditional generation which in most cases with be in place for 50 plus years with no time limit whilst all the time emitting and polluting the air we breath something which wind turbines will never do.

Wind Turbines if looked at as a stand alone do not make commercial sense, they are expensive to install, intermittent in supply, located in areas far from need and grid infrastructure and require subsidy to become viable however taken as part of a total approach to electricity production and given our commitment to carbon reduction wind turbines are the only renewable source that has proven track record no other renewable source has the capacity or is advanced enough to become viable, once installed and generating their overall cost is comparable to coal and gas and has the potential in the future of likely increases in fossil fuel import costs of driving down electricity costs and is really the only show in town for Northern Ireland to reduce booth our carbon emissions and to reduce our reliance on imported fossil fuels all this together with Northern Ireland's position in regard to topography and high average wind speeds mean that in my opinion wind energy benefits far out weigh the negatives and onshore and offshore wind farms should be promoted and should be seen as local resource to be proud of and we should aim to be an exporter of energy at peak times rather than an importer and given mainland GB's challenging targets for renewables, export should be seen as the ultimate goal. To be an exporter of energy rather importer would be a much needed boost to our economy with proven long term benefits. It should be embraced by government and industry while incentives are in place and treated as positive including promoting Northern Ireland as a good place for wind turbine companies to set up not only for the maintenance of their installed wind turbines within the country but to do research and development, use our universities, use of our proven engineering ability and expertise, and use of our landscape and seas as test sites for new equipment. Government property should be investigated for potential wind energy sites eg. Our forested areas owned by Forest service, Wind energy should be promoted and sold to the public by stormont and should be explained that some short term pain will be required in our electricity bills to provide the infrastructure needed to facilitate this wind energy especially interconnection North - South and East -West to facilitate export. Wind energy will never replace fossil fuels even in the long term but should be seen as part of the solution in an energy mix.

I mentioned above the possibility of using Forested land owned by the Forest Service for wind farm sites in addition to this the possibility of selling or leasing the commercially forested land owned by the forest service to private investors and companies should be looked at seriously, in my view this land is totally under utilised by government and should be in the hands of private investors who will maximise returns from these forests including using all waste and unviable timber as a green energy source to benefit everyone in Northern Ireland, I know this is off specific topic but I feel it is something which should be looked into. I'm not sure how useful this will be to the inquiry but I felt compelled to submit something to try show some sort of balance in the debate.

Regards

Jason Kerr

Joanne Addie

To the Northern Ireland Assembley:

Wind Energy Inquiry 2014

This is a submission against the Wind Industry up in Northern Ireland and a list of concerns about it that I feel need to be addressed and investigated in a full and unbiased manner. As a resident in the republic of Ireland, we are facing major applications and we have uncovered a number of issues that I find are common in many countries around the world.

I believe the Wind Industry does not work. This has been proven in Denmark, Germany and Spain among other countries to which some have been forced to pull back on the subsidies to this unreliable and intermittent and extremely expensive source of energy. At present in the UK and Ireland heavy subsidies are paid from consumers bills whether they want this or not! This ends up making the economies being uncompetitive. Also the German Industry is moving out to cheaper countries, some giving up on Wind altogether as an energy source and China among others are actually building many more new powerstations to have a reliable source of power.

The UNECE has ruled that the United Kingdom and the Republic of Ireland are in a breach of their obligations under the Aarhus Convention. It is ruled that the EU is also in breach. This convention sets out how the SEA must be carried out and four important concepts are included :

1 Public participation, at a time before the final decision is made.

2 Access to Information. This is transposed in Northern Ireland!

3 Consideration of alternatives. This includes finding an alternative way to achieve the same objective. In this part the actual CO2 saving of the Wind programme must be assessed and clearly stated.

4 Cheap access to the courts to challenge decisions. This is partially transposed. In the Edwards case in England it was decided that costs in environmental cases should be in accordance with the means of the applicant to pay.

All of this has been by-passed and therefore all planning applications will be invalid until it is done!

Rather than writing a full on explanation to you, I think all these short points should apply and speak for themselves on what should be done:

1 **A moratorium** on all Wind Projects until wind research is complete by fully independent researchers not suggested or paid for etc by the Wind Industry.

2 **Alternative energy** technologies have not been looked at (hydro, tidal, nuclear etc)

3 We need an **increase in set-back distances** from turbines to residences. At the moment current guidelines are either ignored or not adhered to by the planning office/applicants/wind industry etc. Eg: It has dropped from 2000m to only 500m and unfortunately many homes affected now or in the future are well UNDER recommended safety separation parameters. The impact on residents in close proximity and effects on sleep and health should be vigorously investigated. A set back distance of 10 x base to tip height is required based on conclusions by many experts including Dr Chris Hanning, Consultant in Sleep Disorders UK who discusses adverse impacts on sleep at distances of up to 2km and greater. (See Health Below).

4 Wind energy is **not free** and is very expensive. Wind Energy is a high cost for low benefit means of producing electricity and is not a "stand alone" reliable product. Wind Energy must have a fast responding, augmenting source of power available 24/7/365 days a year. NO other conventional source of electricity has this requirement. Integrating the **variable capacity** of wind energy, undermines the time tested science driven technology plan required of all utilities. All economic factors for wind energy MUST take note of the required back up plant. A full Cost Benefit Analysis should be conducted for every wind farm application to ensure it is sustainable development.

5 Wind may make some contribution as low levels of penetration, but as the penetration increases the contribution of **wind drops** to zero.

6 Constrained/**curtailment fees** are paid to companies to turn OFF their machines.

7 Wind farms are paid **capacity payments** when they cannot guarantee supply if called upon to deliver power due to the unreliability of the wind.

8 The **PSO levy** on bills amounts to only a tiny portion of the real cost.

9 There are **HUGE HIDDEN COSTS** involved in Wind Energy.

10 Wind energy affects **property prices** for the worse. The affect is particularly significant with 2km.

11 Wind farms/turbines create different types of noise including **Low Frequency Noise** which has already driven people from their homes eg: Michael and Dorothy Keane, Roscommon and the Davis case below. People DO NOT abandon family homes they love and invested all their money and time in for absolutely NO reason. (See Health below for more).

> *Jane and Julian Davis from Lincolnshire, had been seeking 2.5million in compensation, said the low frequency hum made them ill. In court, the defense said the couple were "oversensitive". The judge was then told that the couple and the wind farm owners and operators had agreed a settlement under terms of strict confidentiality. The couple said the problems began immediately after the eight turbine wind farm began operating half a mile from their home in 2006. They moved within 6 months claiming the noise had disturbed their sleep, given them headaches and made their house effectively worthless.*

http://info.valuationtribunals.gov.uk/decision_document.asp?Decision=&appeal=/decision_documents/documents/CT_England/2525475651/032C

12 Over 7 studies have shown wind energy to be very **expensive** and of little use.

13 Tests should be completed to state the actual **saving from CO2** and fossil fuels from Wind farms. Tests also for noise must involve actual field tests and this would involve observing noise near wind farms/turbines at night for several hours for a long period of time.

14 The **European Landscape Convention** should be taken into account in order to promote democracy, human rights and rule of law. Landscape is so important as it promotes quality of life and well-being.

15 **Biodiversity** is essential for human life. It generates goods and services including the provision of food and medicines, the protection and regulation of water flow, the support of soil formation together with numerous social and cultural benefits. Without which, there would be no economies, no societies – and no human life.

16 **Health, Noise & Shadow Flicker**: Draft guidelines introduces the concept of Shadow Flicker being an issue with 10 rotor diameters of a dwelling which should be dealt with appropriately.

> *"A condition should be attached that there will be NO shadow flicker at ANY existing dwelling or other affected property . A further condition should also apply that if Shadow Flicker does*

occur then necessary measures such as shut down during the time periods will be taken by the wind energy developer or operator to ELIMINATE the shadow flicker."

The language of these guidelines is too loose and does not put any legal obligation on the developer. I suggest that **MANDATORY ELIMINATION** of shadow flicker is a must!! Shadow Flicker is affecting many people who suffer with Epilepsy, Migraine Headaches, certain types of Autism (with particular light and noise issues on their spectrum) (among other proven Health issues). This should be taken into account as these can be debilitating disorders and as of yet are NOT taken seriously. A very important Health issue!!

- In 2010 Michael Nissenbaum M.D.carried out an in-depth study of two groups of people. One group lived close to wind turbines and the second group lived a considerable distance away. He stated :

  —we conclude that the noise emissions of the IWT's (Industrial Wind Turbines) disturbed the sleep and caused daytime sleepiness and impaired mental health in residents living within 1.4Km of the two IWT's studied.

- In 2003 a study by Stansfeld and Matheson stated that:

  —it is likely that children represent a group which is particularly vulnerable to the nonauditory (infrasound) health effects of noise—in view of the fact that children are still developing both physically and cognitively, there is a possible risk that exposure to an environmental stressor such as noise may have an irreversible negative consequence for this group.

- In 2010 a study by Steigler and Davis found :

  —of over 17,000 children with Autistic Spectrum Disorders(ASD), over 40% were hyper-sensitive to sounds and that noise sensitivity is a particular problem for children with ASD.

- In 2001 Dr. Martin Shain reported that:

  —anxiety, headaches, extreme fatigue, reduced concentration and nausea may result from the loss of sleep caused by noise from Industrial Wind Turbines.

- In 2004 the World Health Organisation stated that:

  —people who experience noise-induced sleep disturbance are at greater risk of suffering depression, migraines and high blood pressure.

- The National Institutes of Health and the U.S. Dept. of Health and Human Resources state

  —wind energy turbines will undoubtedly create noise, which increases stress, which in turn increases the risk of cardiovascular disease and cancer.

The **principle of precautionary action should be applied to any wind development** within the country until a full independent study, based on the World Health Organisation model, is completed into EVERY aspect of the wind industry as there are a huge amount of reports/ studies from many doctors, professors and acousticians which conclude that it warrants further studies. The department of health should be involved in the process as well as acoustic engineers to determine whether or not there are health implications and not take the word of developers who have a vested interest in these projects going ahead. See below:

The following are a list of specialists speaking out about their concerns for further studies:

1. Professor Mariana Alves Pereira, Biomechanical Engineer (Portugal, 2007)
2. Dr Ian Arra, Public Health Physician (Canada, 2013)
3. Mr Stephen Ambrose, Noise Engineer (USA, 2011)
4. Associate Professor Jeffrey Aramini, Epidemiologist (Canada, 2010)
5. Dr Huub Bakker, Engineer, (New Zealand, 2010)

6. Dr Linda Benier, Ear Nose & Throat specialist (Canada, 2011)
7. Dr Owen Black, Ear Nose & Throat specialist (USA, 2009)
8. Mr Wade Bray, Noise Engineer (USA, 2011)
9. Professor Arline Bronzaft, Psychologist & Researcher (US, 2010)
10. Dr Nuno Castelo Branco, Pathologist (Portugal, 2007)
11. Dr Micheal Cooke, General Practitioner (Ireland, 2012)
12. Mr Steven Cooper, Acoustician (Australia, 2011)
13. Dr Herb Coussos, Medical Practitioner (US, 2010)
14. Dr R Crunkhorne, Ear Nose & Throat specialist (UK, 2013)
15. Mrs Jane Davis, Nurse (UK, 2010)
16. Professor Phillip Dickinson, Acoustician (New Zealand, 2009)
17. Associate Professor Con Doolan, Mechanical Engineer (Australia, 2012)
18. Mr Chuck Ebbing, Noise Engineer (USA. 2013)
19. Dr Alun Evans, Epidemiologist (Ireland, 2011)
20. Dr Amir Farboud, Ear Nose & Throat Specialist (UK, 2013)
21. Dr. Robert A. Frosch, Senior Research Fellow, Harvard University; ex Administrator of NASA; member of the National Academy of Engineering, the AAES, the UK's RAE, etc. (2013)
22. Professor Jerome Haller, Neurology and Paediatrics (US, 2008)
23. Professor Colin Hansen, Mechanical Engineer, International Expert in Low Frequency Noise & Vibration (Australia, 2010)
24. Dr Chris Hanning, Sleep Physician (UK, 2010)
25. Professor John Harrison, Physicist (Canada, 2010)
26. Dr Amanda Harry, Rural Medical Practitioner (UK, 2003)
27. Professor Henry Horn, Ecology and Evolutionary Biology (US, 2008)
28. Mr Richard Horonjeff, Acoustician (USA, 2010)
29. Mr Les Huson, Acoustician (Australia, 2011)
30. Dr Jan van Ingen Schenau, MD, Retired Physician (Netherlands, 2013)
31. Dr David Iser, Rural Medical Practitioner (Australia, 2004)
32. Associate Professor Rick James, Noise Engineer (USA, 2009)
33. Dr Roy Jeffrey, Rural Medical Practitioner (Canada, 2010)
34. Dr Mauri Johansson, Occupational Physician (Denmark, 2012)
35. Mr George Kamperman, Noise Engineer (USA, 2009)
36. Professor Ralph Katz, Epidemiologist (US, 2008)
37. Dr Noel Kerin, Occupational Physician (Canada, 2010)
38. Professor Nicholas Kouwen, PhD., P.Eng., FASCE, University of Waterloo, ON (Canada, 2013)
39. Ms Carmen Krogh, Pharmacist, Researcher (Canada, 2009)
40. Dr Eckhard Kuck, Oral Surgeon (Germany, 2012)
41. Dr Nicole Lachat, Biologist (Switzerland, 2011)

42. Dr Sarah Laurie, Former Rural Medical Practitioner (Australia, 2010)
43. Dr David Lawrence, Rural Medical Practitioner (USA, 2012)
44. Professor Joel Lehrer, Earn Noise & Throat specialist (US, 2008)
45. Dr Lu Lombardi, Medical Practitioner, Ontario (Canada, 2010)
46. Dr Hazel Lynn, Medical Officer of Health, Grey/Bruce County, ON (Canada, 2012)
47. Dr Robert McMurtry, Former Dean of Medical & Dental School, University of Western Ontario (Canada, 2010)
48. Peter Mitchell, Engineer, Founder and Chairman of the Waubra Foundation (Australia, 2010)
49. Dr Andja Mitric Andjic, Rural Medical Practitioner (Australia, 2011)
50. Dr Sarah Myhill, Rural Medical Practitioner, Wales (UK, 2012)
51. Dr Michael Nissenbaum, Medical Practitioner (US, 2010)
52. Mr Bill Palmer, Engineer (Canada, 2010)
53. George Papadopoulos, Pharmacist (Australia, 2011)
54. Dr Helen Parker, Psychologist (US, 2011)
55. Dr Robyn Phipps, Researcher (NZ, 2007)
56. Dr Eja Pedersen, Medical Sociologist (Sweden, 2006)
57. Dr Nina Pierpont, PhD, MD, Specialist Paediatrician, Fellow American Academy of Paediatrics (US, 2009)
58. Professor Carl Phillips, Epidemiologist (USA, 2010)
59. Mr Jerry Punch, Audiologist (USA, 2013)
60. Mr Rob Rand, Noise Engineer (USA, 2011)
61. Mr Bruce Rapley, Scientist (NZ, 2013)
62. Dr Sandy Reider, Medical Practitioner (USA, 2013)
63. Linda J Rogers, Primary Health Care Nurse Practitioner (Canada, 2013)
64. Professor Alec Salt, Neurophysiologist (USA, 2010)
65. Dr Paul Schomer, Noise Engineer (USA, 2012)
66. Mrs Norma Schmidt, Retired Nurse (Canada, 2010)
67. Dr Daniel Shepherd, Psychologist, Psychoacoustician (New Zealand, 2010)
68. Dr Wayne Spring, Sleep Physician (Australia, 2011)
69. Mr Mike Stigwood, Acoustician (UK)
70. Dr Malcolm Swinbanks, Acoustician, (UK, 2010)
71. Dr Scott Taylor, Rural Medical Practitioner (Australia, 2011)
72. Dr Henning Theorell, Medical Practitioner (Sweden, 2012)
73. Dr Bob Thorne, Psychoacoustician (Australia, NZ)
74. Mr Peter Trask, Psychologist (Australia, 2012)
75. Dr A Trinidade, Ear Nose & Throat specialist (UK, 2013)
76. Dr Alan Watts, Rural Medical Practitioner (Australia, 2011)
77. Dr Colleen Watts, Scientist, former Board Member of the EPA in New South Wales (Australia, 2011)

17 Limited Local Benefits:

- Most projects are to benefit developers and there is a disproportionate benefit to nonlocals. There are NO jobs guaranteed for the people in the immediate area as the jobs all go to tender.
- The wind industry state: " jobs are concentrated in the construction phase with very few long-term sustainable jobs. Many of the construction jobs are specialist and are filled by foreign contractors." "Jobs & Investments in Irish Wind Energy" 2009 page 24-29 (Deloitte & Touche).
    - All wind energy developments are first proven to be SUSTAINABLE DEVELOPMENT.
    - HEALTH must be addressed in this review and, given the reports from around the world and in the British Medical Journal, the precautionary principle must apply where there is "a social responsibility to protect the public from exposure to harm".
    - SAFETY must be strictly addressed given the numerous accidents that have occurred in Ireland alone.
    - All EU legislation and directives are adhered too.
    - Public Consultation is meaning full and not a tick box exercise.
    - Wind speeds must be sufficient to ensure sustainable development.
    - A Property Value Guarantee scheme must be in place
    - A fund for Community Controlled environmental tests on any house complaining of Noise or Shadow flicker.

The present government policy for wind energy is based on political and ideological considerations rather than scientific considerations!!

We need the members of the Assembly to start listening to the public who can and will be affected by the Wind Industry and to act in an open and unbiased manner to help the general public and to also investigate the claims the Wind Industry make.

Yours truly,

Joanne Addie

Dr Jackie Paddison

From: John Paddison
Sent: 24 February 2014 10:34
To: +Comm Environment Public Email
Subject: Northern Ireland Inquiry into Wind Energy - Information submission

There are a number of important issues with wind energy that require careful consideration many concern human health. These are as follows:

The unacknowledged fact about wind farms is that very few people want to live near them and very few people like them except from a distance. Why? They are huge industrial machines and their visual appearance and noise dominate an otherwise peaceful landscape. The other important point to make here is that wind turbines are constantly moving and we are programmed to respond. Our ancestors relied on peripheral vision to warn them of impending danger. We are unable to focus with peripheral vision, it only exists to pick up movement at the side of us. When we see movement in our peripheral vision we are warned that we may be in danger and need to react. When we live near wind turbines the movement is constantly registered by our peripheral vision and it is a natural response to look at them - so we are always reminded they are there. It is difficult to ignore them and therefore difficult to shut off the noise and visual impact.

Noise Assessment

The noise assessment for most applications is based only on the dB(A) weighting. This alone is not a sufficient assessment. Acoustician Richard James states that, "Sound measured as dB(A) is biased toward 1000Hz, the centre of the most audible frequency range of sound pressure."[1] The report has completely ignored any analysis of low frequency sound or infrasound which is "in the range below 200Hz and is more appropriately measured as dB(C) for low frequency sound or in dB(G) for infrasound."(ibid) The World Health Organisation (WHO) is very clear that when prominent low frequency components are present noise measures based on the 'A' weighting are inappropriate.[2]

In 1985 researchers identified that the source of annoyance for the residents living near a single wind turbine was:- "Impulsive infrasound and low frequency noise, which resonated within the building structures."[3] They clearly established that: "The perception of the sound range was below the audibility thresholds for the hearing in the infrasound range." Unlike audible sound, low frequency sound can pass into a building through small cracks.[4]

All too often it is asserted, particularly by wind farm companies and others with a vested interest, that it is only the audibility thresholds which are to be considered and not the much lower infrasound perception thresholds. Many acoustical engineers have been taught that if you cannot hear a sound, it cannot harm you. According to Salt, *"Large wind turbines generate very low frequency noise (LFN) and infrasound (below 20 Hz). The amount of LFN and infrasound depends on turbine manufacturer, wind speed, power output, local topography, and the presence of nearby turbines (increasing when the wake of one turbine enters the blades of another). The LFN/infrasound cannot be heard and is unrelated to the loudness of the sound that you can hear. You cannot hear the LFN/infrasound at the levels generated by wind turbines but your ears certainly detect and respond to it. The ear is most sensitive to LFN/infrasound when other audible sounds are at low levels or absent (ibid)*. For this reason the interior of

1 James ,R.R; 'Review of Noise Studies and Related Material' March 2011

2 Burgland, B; Linvall, T; Schwela, D.H; 'Guidelines for Community Health', World Health Organisation, Geneva.

3 Kelley, N; Solar Energy Research Institute. Presented at the American Wind Energy Association Wind Power Conference 1987 sponsored by the US Department of Energy.

4 Salt, A. N. 'Wind Turbines can be Hazardous to Human Health' Washington University St.Louis2013.

homes and quiet rural areas can suffer most from this problem. The WHO recommend that, "special attention should be given to noise sources in an environment with low background noise."[5]

Styles et al identified LFN/infrasound as a component of wind turbine noise in its report for the MoD stating that "When the wind farms start to generate at low wind speeds, considerable infrasound signals can be detected out at circa. 10 kilometres"[6]. Since the report, the MoD has banned wind turbines from a 31 mile radius of its Eskdalemuir monitoring station.[7] In addition in Germany Ceranna et al reported that elements of wind farm infrasound were measured at a distance of 30 kilometres from wind turbines.[8] Therefore, as Dumfries and Galloway has a scattered rural community, a characteristic of most of Scotland, it is simply not possible to adequately maintain separation between the existing rural population and such strong outputs of low frequency noise and infrasound.

Low Frequency Noise and its Effect on Human Health

Protection from hazards to health is the social responsibility of the state. Protection from noise emissions, particularly infrasound, presents new administrative and judicial challenges. There is no doubt that wind turbines produce substantial amounts of infrasound[9] this is now well established in the literature. According to Michael Nissenbaum 'there is not a single study or any peer reviewed literature representing original work that finds that wind turbine noise is harmless to human health. On the contrary there is an emerging body of literature informing us that wind turbine noise can have substantial adverse health impacts on a community'. Illogically some people refuse to apply the known science, of adverse effects of noise and sleep loss, to the issue of wind turbines. Although 'modern turbines produce less sound per unit of energy nevertheless because they are larger they still produce considerable amounts of sound energy'[10]. In addition, the situation is worsened by placing wind turbines closer to homes. It is now well accepted in scientific literature that wind turbines produce infrasound and that this causes a hierarchy of problems to the individual's health. The mechanisms are well established in the literature of at least three different disciplines. Many of the health problems arise from 'vestibular disorders' or disorders of the inner ear. There are different cells in the ear, those that provide hearing, these are relatively insensitive to infrasound but other cells in the ear are much more sensitive and this has been demonstrated by electrical recordings. Responses to infrasound reach the brain through pathways that do not involve conscious hearing[11] but instead produce sensations of fullness, pressure, tinnitus, balance problems and headache. Activation of subconscious pathways by infrasound stimulates the release of adrenaline initiating the 'flight or fight' response. To physiologically accommodate the perceived threat of danger there is a burst of circulating adrenaline. This increases the heart rate, blood pressure, causes sleep disturbance and a rare response is Tako Tsumo heart attack (adrenaline related but no adrenal tumour present)[12]. The symptoms are researched by disciplines other than medicine such as acousticians and occupational health physicians. Dr Malcolm Swinbank an acoustician measuring low frequency noise (infrasound) states that he first became aware of the physical effects of infrasound when working with industrial gas turbines in 1980. He experienced

5 Burgland, B; Linvall, T; Schwela, D.H; 'Guidelines for Community Health', World Health Organisation, Geneva.

6 Syles, P; Stimson, I; Toon, S; England R: and Wright, M. 'Micro seismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Wind farms: Recommendations on the Siting of Wind Farms in the Vicinity of Eskdalemuir, Scotland." Report prepared for the MOD 18 July 2005. P.76.

7 'Wind farms banned as MOD listening post demands hush.' The Scotsman 10th February 2010.

8 Ceranna, L; Hartmann, G; and Henger, M. 'The inaudible Noise of Wind Turbines.' Infrasound workshop. Nov-Dec 2005.

9 Quammbusch, E. Lauffer,M (2008) 'Infrasound from Wind Turbines as a Health Hazard' ZFSH/SGB

10 Nissenbaum, M. Aramini, J. Haning, C. (1012) 'Effects of Industrial Wind Turbines on Sleep and health' Jrn of Noise and Health, Oct 2012, Vol.14:60. P237-243

11 Salt, A. Kaltenbach, J.A. (2011) 'Infrasound from Wind Turbines could Affect Humans' Bulletin of Science Technology and Society, 31(4) p296-302

12 Op cit

symptoms similar to sea sickness indicating that there was some interaction with the balance mechanism in the inner ear[13]. Other acousticians Robert Rand and Steven Ambrose[14] report similar experiences while recording low frequency noise.

Sleep deprivation is a common symptom reported by people living near wind turbines. This has long term sequellae with problems such as cardiovascular disorders (ischaemic heart disease, hypertension, angina), diabetes, mental health disorders, impaired immunity (may lead to repeated infections and cancer). Tissue damage from chronic exposure includes pericardial thickening, mitral and tricuspid valve thickening and psychological stress.

Considering the amount of research available about infrasound and its effects, it appears that the Scottish Government and local Councils are failing to protect the general public from environmental development that can cause serious harm to human health.

Bats and Birds

The World Council for Nature (WCFN) report that insects are attracted to wind turbines for some reason and this food source then attracts birds and bats in large numbers. Bats have been monitored flying 14km off shore to feast on insects swarming around a wind farm only for many of them to be killed by the turbine blades. It is reported that several million bats are killed every year in Spain alone, and similar findings are reported in America[15, 16, 17, 18, 19]. The scientific agency of the United States Government estimated the insecticide function of bats is worth ...$37 to $53 million per year and if bat numbers decrease substantially the knock-on effects to agriculture will be enormous[20][20]. This does not account for the detrimental effect of pesticides on ecosystems. Bats do not reproduce easily and therefore cannot make up the numbers being killed by wind turbines both on and off-shore. Conservationists are equally concerned about the fate of raptors and songbirds that are likewise attracted to wind farms. Almost a third of birds killed by wind turbines are hirundines (swift, swallow and martins) that are attracted to turbines to feed on insects. From an insect population point of view this would exacerbate the problems of reduced bat numbers[21, 22, 23, 24, 25] that is an increase in the insect population. Song birds feed from the insects but it is not certain why raptors are attracted to turbines.

13 Lorrie, S. 'The range of Clinical Pathology and Symptoms reported Directly to the Waubra Foundation with Exposure to Operating wind Trubines and Other Sources of Infrasound and Low Frequency Noise and Vibration. Response to Senate Inquiry into 'Excessive Noise from wind Farms Bill' at www.waubrafoundation.com.au

14 http://wind-watch.org/documents/bruce-pcpherson-infrasound-and-low-frequencynoise-study/

15 http://savetheeaglesinternational.org/spanish-wind-farms-kill-6-to-18-million-batsa-year.html

16 http://savetheeaglesinternational.org/spanish-wind-farms-kill-6-to-18-million-batsa-year.htm

17 Ahlén, I. et al. (2009). Behaviour of Scandinavian bats during migration and foraging at sea. Journal of Mammology, 90, 1318-1323. http://www2.ekol.slu.se/Personliga_filer/Ahlen/JmammBatsatSeaDec09

18 Ahlén, I. et al. (2007). Bats and offshore wind turbines studied in southern Scandinavia. Swedish Environmental Protection Agency. Report 5571 http://www.naturvardsverket.se/Documents/publikationer/620-5571-2.pdf

19 http://windfarmaction.wordpress.com/2013/04/08/brief-summary-of-recentinternational-research-on-the-risk-to-bats-from-wind-turbines/

20 http://www.nwhc.usgs.gov/diseas_information/white-noise_syndrome/wns_.jsp) (scroll down to Bats Worth Billions to Agriculture: Pest Control Services at Risk.

21 Humber, C. http://blog.bird-guides.com/2013/06/white-throated-needletail.html C. Humber is lecturer in biological sciences, Hertford College, University of Oxford.

22 Ahlén, I. (2010). Fågelarter funna under vindkraftverk i Sverige. Var Fågelvärld, 4/2010, 8-12 http://www.slu.se/PageFiles/8390/artiklar/BirdsWindPowerVF2010.pdf

23 Ahlén, I. (2010). Fågelarter funna under vindkraftverk i Sverige. Var Fågelvärld, 4/2010, 8-12 http://www.slu.se/PageFiles/8390/artiklar/BirdsWindPowerVF2010.pdf

24 Long, C. V. et al. (2011). Insect attraction to wind turbines: does colour play a role? European Journal of Wildlife Research, 57, 323-331 http://peer.ccsd.cnrs.fr/docs/00/62/51/48/PDF/PEER_stage2_10.1007%252Fs10344-010-0432-7.pdf

25 Ahlén, I. (2002). Wind turbines and bats – a pilot study. Report to Swedish National Energy Association. http://publikationer.slu.se/Filer/08WindBatFinalReport.pdf

The WCFN received a communication from the BTO on August 14 2013. A decline in Swift numbers is stated for UK and Ireland in June / July of this year. The 'Birdtrack' chart indicated around a 10% decrease in numbers compared to previous years reports.

WCFN and Save the Eagles International believe there is more than enough evidence to apply the precautionary principle and call for a moratorium on wind farm construction. The wind industry is quick to point to weaknesses in research. However, all research has weaknesses, which is why academics work on the 'body of knowledge' principle. This means that while a small number of studies may be interesting more studies become more believable with several research papers producing similar findings and conclusions. We have a growing 'body of knowledge' relating to bat and bird mortality as a result of collision with wind turbines. In addition, where there is lack of scientific certainty the phrase 'more research is needed' is often used to excuse the lack of measures to prevent serious environmental damage. Similarly the 'wait and see and we will monitor the effects of a wind farm' is useless because It is already too late for some species.

Regards

Dr Jackie Paddison

John Weigel

From: John Weigel
Sent: 28 February 2014 16:53
To: +Comm Environment Public Email
Subject: wind_energy_review

Dear Ms. Mawhinney,

I am attaching several documents relating to your enquiry into the dangers associated with electromagnetic radiation associated with wind turbines and power lines.

Please be aware tha Broadband over Power LInes is especially dangerous. Among one of the items I'm forwarding is an article about Victor Nixon, a former member of the SAS who was expert in this area.

I would also like to bring to your attention the issue of infrasound which is also dangerous.

Finally, I'm attaching a PowerPoint presentation by Prof. Henshaw of Bristol University two weeks ago at a public forum sponsored by MEP Marian Harking at Trim, Co. Meath as well as recent scientific papers relating to the issue.

Wind farms 'make people sick who live up to a mile away'

http://www.telegraph.co.uk/news/uknews/1452529/Wind-farms-make-people-sick-who-live-up-to-a-mile-away.html

Kind regards,

John Weigel

Risk Analysis, Vol. 28, No. 1, 2008 DOI: 10.1111/j.1539-6924.2008.01009.x

Aggregating Disparate Epidemiological Evidence: Comparing Two Seminal EMF Reviews

Michael J. O'Carroll[1] and Denis L. Henshaw[2]*

Two seminal reviews (IARC, 2002; CDHS, 2002) of possible health effects from power-frequency EMFs reached partly different conclusions from similar epidemiological evidence. These differences have an impact on precautionary policy. We examine the statistical aggregation of results from individual disparate studies. Without consistent exposure metrics, the advantage of meta-analysis to estimate magnitude of effect is lost. However, counting positive and statistically significant results yields important information. This is not a substitute for meta-analysis, but a fall-back when meaningful meta-analysis is not available. Representative results from 33 independent adult leukemia studies tabled by IARC yielded 23.5 positives ($p \approx 0.01$) and 9 significant-positives ($p < 10^{-7}$). From 43 representative results from CDHS, there were 32 positive ($p < 0.001$) and 14 significant-positives ($p < 10^{-12}$). There were no significant-negative results in either list. Results for adult brain cancer gave a similar, but less clear, message. Childhood leukemia EMF studies have been sufficiently comparable to allow selective pooled analysis, which was important in classifying carcinogenicity. Aggregating all the studies suggests that results for childhood leukemia are not stronger, numerically, than those for adult leukemia. CDHS did not note the number of significant-positives, but noted the meta-analytic summary and the number of positives, forming a view about the strength of these findings. IARC shows no evidence of considering the aggregation of results other than subjectively. It considered individual studies but this led to a tendency to fragment and dismiss evidence that is intrinsically highly significant. We make recommendations for future reviews.

KEY WORDS: Adult leukemia; aggregating evidence; brain cancer; childhood leukemia; electric and magnetic fields; EMFs; health effects; risk; statistical significance

1. INTRODUCTION

Our motive for this article has been to try to understand how two seminal reports from major health bodies, reviewing the possible health effects of exposure to power frequency electric and magnetic fields (EMFs), reached different conclusions from what was largely the same body of evidence. While there are constitutional and procedural differences between the review bodies, we have focused on a striking difference in how they went from critical review of the many individual studies of EMF health effects to a summative assessment of the overall weight of evidence.

The review bodies were the International Agency for Research on Cancer (IARC), an agency of the World Health Organization, and the California

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EMF Program Team of the California Department of Health Services (CDHS). Both published the reports of their reviews of EMFs and health in 2002. Both rated power-frequency EMFs as "*possibly carcinogenic to humans*" (the IARC Class 2B), on the basis of epidemiological evidence relating to childhood leukemia. In respect of all other cancers, IARC concluded the epidemiological evidence was "*inadequate,*" whereas CDHS concluded it was "*limited*" for four other health outcomes, including two cancers. The "*limited*" assessment supports Class 2B for the agent.

There have been other reviews, before and since 2002. For example, the NRPB reviews in the United Kingdom have consistently recognized the possibility of cause of cancer, but did not use a formal classification system for assessment. Some reviews never reached publication, for example, in the United States the NCRP review in 1995, though its conclusions were leaked. The subject of power-frequency EMFs has been controversial. In the 1990s there were calls to halt research funding on the basis that any potential risk had been dismissed. However, the evidence of adverse health effects has persisted to the point that precaution against exposure to EMFs is now being considered.

The U.S. National Institute of Environmental Health Sciences (NIEHS) EMF-Rapid Program concluded in 1998 that the evidence for both childhood and adult leukemia supported a 2B classification, the latter being "somewhat weaker" and specifically for "chronic lymphocytic leukemia in occupationally exposed adults." Two key pooled analyses, Ahlbom *et al.* (2000) and Greenland *et al.* (2000), reinforced concerns, showing, by statistical aggregation, that the fragmented findings for childhood leukemia became stronger when pooled, the former revealing a two-fold increase in risk associated with time-weighted average magnetic field exposures above 0.4 μT, the latter a 1.7-fold increase above 0.3 μT.

When IARC made its formal 2B classification in 2002 against this background, a basis was set for precautionary policy that is under development in several countries and in the WHO. Policy based on the risk of childhood leukemia alone tends to be limited because the normal incidence is comparatively rare and the attributable risk very small. The question of additional risk of other diseases then becomes important. Hence the California review, by recognizing five health outcomes corresponding to the 2B classification, challenges the limitation of proportionate precautionary measures to those of very low cost.

An understanding of the differences between these seminal reviews is therefore important to the present development of precautionary policy for EMFs.

2. THE TWO SEMINAL EMF HEALTH REVIEWS OF IARC AND CDHS

Both IARC (2002) and CDHS (2002) evaluated the possible risks to public health from EMFs at supply frequency. CDHS considered only power-frequency EMFs, whereas IARC considered other frequencies but specifically assessed power frequency (or ELF). IARC assessed carcinogenic risk whereas CDHS assessed both carcinogenic and other health outcomes. Nevertheless, the two reviews had a large area of common ground in the body of evidence relating to power-frequency fields and various cancer outcomes.

The formative work for IARC (2002) was carried out at a Working Group meeting in June 2001. The CDHS program extended over several years with *Consultation Draft 3* published in April 2001. IARC (2002) did not refer to recent CDHS drafts but did refer to an earlier progress review (Neutra *et al*., 1996). The final report of CDHS (2002) referred to IARC (2001 in press) and particularly addressed the question of their differing conclusions.

IARC (2002) listed some 800 references, covering both ELF (mainly power-frequency) and static fields. CDHS listed some 400 references (ELF only).

The IARC classification system formally combines assessments of evidence in humans (essentially epidemiology) and evidence in animals. Both reviews were agreed in assessing the evidence in animals as "*inadequate.*" A particular difficulty in relation to childhood leukemia is that animal studies could be considered inappropriate because there is no animal model for acute lymphoblastic leukemia, the common leukemia type in children. Both reviews were agreed in assessing the evidence in humans in relation to childhood leukemia as "*limited,*" and hence were led by the formal classification system to the overall IARC 2B assessment.

CDHS (2002) uses another formal system of assessment, a "*qualitative Bayes*" approach, which is a central feature of the review and an interesting innovation. However, for the purpose of comparison, they also provide assessments on the IARC classification system. The five health outcomes identified by CDHS as each warranting IARC 2B classification of EMFs were childhood leukemia, adult leukemia,

adult brain cancer, miscarriage, and amyotrophic lateral sclerosis (ALS), a form of motor neurone disease.

This article compares the bases of epidemiological evidence in the two reviews, specifically for adult leukemia and adult brain cancer. Both reviews, directly or indirectly, consider selection and quality of studies, and the epidemiological holy trinity of chance, bias, and confounding at some length. We find that the more material differences lie in their approach to aggregation rather than in the body of evidence.

3. STATISTICAL AGGREGATION OF DISPARATE EVIDENCE FROM EPIDEMIOLOGICAL STUDIES

It is not unusual to find a range of reasonably independent epidemiological studies, each with its limitations and statistically weak findings, but nevertheless with an overall tendency to indicate a possible effect. One way of aggregating the evidence from such studies is by meta-analysis or pooling, which may be defined in slightly different ways.

This has the advantage of estimating the magnitude of an effect and providing confidence limits from the aggregate evidence. Such estimates are most meaningful when aggregating on a like-for-like basis with regard to exposure metric, specificity of cases, relevant subsets of population, and study methods.

Sometimes, the evidence is more disparate, so that only limited numbers of similar studies can be pooled to give very meaningful estimates of parameters such as risk estimates representing magnitude of a possible effect. For example, in the context of EMF, the majority of studies have been concerned with the effects of exposure to magnetic fields. Studies may vary according to type of exposure (residential, occupational), subsets of population (gender, race, age, susceptibility), exposure metric or proxy (measurement, proximity, job title, average, peak), or risk measure (odds ratio or standardized incidence rate), and so on.

While taking account of the caveats and qualifications relating to significance and hypothesis testing, as discussed, for example, in Rothman and Greenland, 1998, ch. 12), it is nevertheless possible to make some assessment of the strength of aggregate disparate evidence. This may be useful in supporting formal assessment of evidence, in comparing different aggregate sets of studies, and in comparing different conclusions reached by review bodies.

By "disparate" we mean evidence that does not readily support meaningful meta-analysis. By implication this may relate to a broad underlying hypothesis, such as a class of exposures through varying metrics affecting biological systems in different ways among differently susceptible populations manifesting in a range of health outcomes showing only weak associations in the general population. In this broad sense "disparity" is not necessarily the same as "heterogeneity" as sometimes evaluated within meta-analysis. The present situation is not so broad, the main disparate feature being lack of a well-defined common exposure metric, especially for occupational exposure.

The two reviews each address a range of different health outcomes that might lead to compound hypotheses such as causation of both childhood and adult leukemia (or both acute and chronic), or alternatively of one and not the other, but we shall consider them more specifically, as did the reviews. CDHS did briefly address the implications for one outcome of findings for another, and the IARC evaluation structure addresses the carcinogenicity of an agent rather than hypotheses for specific outcomes, but neither review formulated or examined compound hypotheses *per se.*

This article illustrates two simple methods of aggregation: counting numbers of positive findings and counting numbers of statistically significant-positive findings. The more disparate the studies and findings considered, the blunter the implied hypothesis, whose negation is the null hypothesis under examination. For example, aggregating both residential and occupational studies implies a hypothesis that both "exposures" are causal risk factors for the specified disease. That is more demanding than a choice of either sharper hypothesis with a more consistent exposure. It is not the purpose of this article to provide a formal analysis of sharp, blunt, and compound hypotheses.

Some epidemiologists might feel that such a simple method of aggregation is too simplistic to consider and that epidemiology has long progressed to more sophisticated analyses. However, such simplistic aggregation is fundamental statistically and provides the sort of elementary test that should always be considered prior to more sophisticated analysis, especially if it yields an unexpected result.

Thus, these counting methods are not a substitute for meta-analysis or pooling, when available, but

can be a fall-back for when they are not available. These are indicative, rather than conclusive, methods. Not all of the statistical information is used. For example, the varying size of studies is lost in counting positive results. On the other hand, there is some importance of different studies when they are independent. Counting significant results does reflect the statistical strength of the findings, though not the statistical power of the studies, so it partly overcomes the problem of failing to discriminate between studies of different size and power. We do not advocate these methods as a panacea, but we do suggest that in the absence of anything better, they should not be overlooked. What is surprising in this instance is that there is a similar underlying statistical strength of data in both reviews, partly observed in one but seemingly overlooked in the other.

4. GENERAL COMPARISON OF EVIDENCE BASES FOR ADULT LEUKEMIA

IARC selected and tabled results including odds ratio (OR) or standardized incidence ratio (SIR) with confidence interval (CI) data from 37 (33 independent) human epidemiology studies for adult leukemia, and CDHS did so for 43. However, despite the reviews' publication in the same year and despite the common reference to previous reviews, these sets of studies had surprising differences. Both reviews identify residential and occupational studies specific to adult leukemia. IARC's 37 included 6 residential whereas CDHS's 43 only included 2 residential.

The 43 studies listed by CDHS are derived principally from the same reference source (Kheifets *et al.*, 1997a). Of the 41 occupational studies, 17 are included in the IARC tables for adult leukemia, 18 are not (of which 5 are, however, listed in IARC's references), and the other 6 refer to similar studies by the same authors (e.g., with different dates), so may overlap.

Of the 32 occupational studies considered by IARC, after deducting 17 common and 6 similar studies, there remain 9 that are not in CDHS. Of the 6 residential studies listed by IARC (Table 25), only 1 (Severson 1998) is listed in the CDHS table for adult leukemia. The second residential study listed by CDHS is of Wertheimer and Leeper, (1982), which is not in IARC's Table 25.

Of the 41 occupational studies listed by CDHS, there are two sets of multiple studies from the same source (three from Theriault *et al.* (1994) and two from Tynes *et al.* (1994); the bibliography lists two studies by Theriault *et al.* (1994) and two by Tynes *et al.* (1994)). IARC lists three studies by Theriault *et al.* (1994), in Quebec, France, and Ontario, and a fourth updating paper by Miller *et al.* (1996).

Both reviews take account of the caveats and qualifications in the various studies, comment on their shortcomings, and draw on previous reviews in that respect. Neither review body is unaware of these qualitative considerations. Both are aware of the potential for bias and confounding and both address this specifically. Their conclusions, however, do give different weight to the human epidemiology studies in aggregate; this was the main observation in the CDHS comparison of the two reviews and reasons for their differences.

This article examines the statistical aggregation of evidence for the two reviews' sets of studies. Given the different conclusions from the two reviews, it might be expected that the content of their respective sets of studies, albeit overlapping, might differ in the strength of evidence for association. The CDHS conclusions drew on some aggregate statistics to support association, whereas IARC found limitations in the separate studies and did not support association. It was surprising, therefore, to find that the aggregate statistics for the IARC set of studies showed similar support for association as did the CDHS set.

5. STATISTICAL AGGREGATION OF THE CDHS SET OF ADULT LEUKEMIA STUDIES

In the CDHS set of adult leukemia studies, there are similar relative risks or odds ratios for the residential and the occupational studies. While the exposures are disparate between residential and occupational studies, the strengths of association are similar. The summary table (fig. 8.1.1, p. 121) combined one odds ratio (OR) result, with its 95% confidence interval (CI), from each of the 43 studies. Taking all 43 studies together, the meta-analytic summary was OR = 1.2 with CI = 1.12–1.24. (The CI was given in the draft 3 CDHS report but not in the final version.) The summary notes that 29 had OR > 1 with $p \leq 0.01$. That is, in aggregate, the occurrence of positive results is statistically significant at a 99% confidence level. The selection of studies and of results from each study was derived principally from a previous reviewer (Kheifets *et al.*) and adopted by CDHS in preference to introducing its own selection. Hence the 43 results were taken as reasonably independent

Table I. Aggregation of the Adult Leukemia (AL) Studies Considered by CDHS (2002)

CDHS/AL (1 per Study)	No. of ORs	Positives	*P*-Value for Positives	Significant-Positives	*P*-Value for Sig-Pos*
Residential	2	2	0.25	1	0.049
Occupational	41	30	0.002	13	1×10^{-11}
Total	43	32	0.001	14	1×10^{-12}

*One-sided, $p < 0.025$.

and representative of a random sample of the population of all possible relevant studies.

There were six results with OR = 1.00 within the truncation of the report. It is more appropriate to count such results as half negative and half positive, as that would give an unbiased estimate of the true value (50%) under the null hypothesis. Some studies in other sets have a coarser truncation to only one decimal place, with a more substantial truncation bias. While CDHS deploy what it calls the sign test, it uses a biased version of it that substantially understates the strength of evidence. In the above, including results with OR = 1.00 as half positive and half negative gives 32 positive results with $p < 0.001$, which is highly significant.

A much stronger statistical observation, not made by CDHS, is the number of significant-positive results. They are results with 95% confidence intervals wholly above 1. Although the intervals may be based on two-sided *p*-values of 0.05, they invariably correspond to one-sided values of 0.025 for positive results. There are no significant-negative results in the reviewers' lists for adult leukemia. Whether the confidence limits have been calculated by a fully frequentist approach or by inference from sample to whole population, each occurrence of a significant-positive result will have, by the same statistical model as used in the calculation, a probability $p < 0.025$.

There are nine such occurrences, that is, strictly significant-positive results from the 43 listed results, with lower confidence limit (CL) strictly > 1, plus five results with lower CL = 1.00, and no significant negatives. The significance boundary is different from the 50-50 split for simple positives, so that a marginal occurrence with lower confidence limit equal to 1 might now be counted as with $p = 0.025$ for the occurrence. Although the truncation may slightly bias an estimate of a true value under a null hypothesis, it will be a good approximation as long as the truncation error (here, 0.005) is small compared with OR –1, which it is.

Therefore, such marginal occurrences of significant-positives should reasonably be fully counted as instances with $p = 0.025$, giving 14 in all. As long as these results are independent and represent a random sample, and considering only random error and not bias or confounding (which have been addressed in the reviews), the probability of 14 such results out of 43 can be calculated by the cumulative binomial distribution as about 10^{-12}, which is extremely significant. Even that is conservative, for most of the separate *p*-values will be strictly less than 0.025. If the five marginal occurrences were only counted as halves there would still be 11.5 occurrences with aggregate *p*-value approximately 10^{-8}, which is still extremely significant, although that would not be the appropriate form of counting.

Although CDHS did not note the number of significant positives, it did note the meta-analytic summary and the number of positives, and formed a view about the strength of these findings that led it to give them greater weight than, seemingly, did IARC. The aggregation of the studies considered by CDHS is summarized in Table I.

6. STATISTICAL AGGREGATION OF THE ADULT LEUKEMIA RESULTS CHOSEN BY IARC

IARC discusses a range of adult leukemia studies and selects 37 studies with ORs or SIRs with CI data for summary description in Tables 25, 29, and 30 in their work. The tables list some 176 results, including multiple results from single studies, and including both high- and low-exposure categories. These are not independent, for example, some are totals of other results for subtypes of leukemia, so aggregating them by cumulative binomial distribution would not be valid.

It is surprising however, not least since low-exposure categories may dilute the overall apparent significance that simply lumping all the IARC-reported results together (omitting only base or

Table II. Aggregation of Studies of Adult Leukemia in IARC (2002) on the Basis of Selection Criteria to Identify One Representative Result per Study

IARC/AL (1 per Study)	No. of ORs	Positives	*P*-Value for Positives	Significant-Positives	*P*-Value for Sig-Pos
Residential	5	3.5	0.19–0.5	2	0.0059
Cohort occupational	17	11.5	0.07–0.17	4	0.0007
Case-control occupational	11	8.5	0.03–0.11	3	0.002
Total	33	23.5	0.007–0.018	9	1×10^{-7}

reference levels) would show an apparent strong aggregation, with 111.5 positive results and 31 significant-positives out of the 176. If the 176 results were independent and a random sample, those counts would have *p*-values of 0.0003 and 3×10^{-15}, respectively, which we note for reference when considering the effect of selecting more independent subsets of results. Truncated marginal ORs or lower CLs are again counted as explained above for CDHS.

In order to obtain a more independent set of results for aggregation, select at most one representative result from each study, using a common set of selection criteria:

- Omit studies and results that do not record either the OR or the CI.
- Where there are multiple results for subtypes of leukemia, select only the total or "all leukemias" results, if available, so that subtype results are not repeated. While this loses specificity, and so may dilute findings, the alternative would be to apply the same specificity throughout all selected studies. Similarly, take Theriault *et al.* (1994) combined cohort results, not the separate ones for France, Quebec, and Ontario.
- Where there are separate results tabled for different exposure bands from the same study, select only the highest band, so that the most relevant test to detect an effect (positive or negative) is used. That will typically be with a cut-point at 0.2 μT, which is lower than the principal categories of Ahlbom *et al.* and Greenland *et al.* for childhood leukemia.
- Where there are separate results for different occupations, select the results for the occupation likely to be most exposed, and if that is not known, select the most populous result.
- Where there are different results for males and females, and no combined gender results, select the most populous results (usually males). While this loses specificity, the alternative would be to seek separate results for males (or females) throughout all selected studies.
- Where the choice remains ambiguous on the above criteria, and yet would make a difference, select an appropriate balance, e.g., half positive and half negative.
- Where two articles from the same source draw on the same data set but analyze it in different ways, select only one result using the above criteria.

We emphasize that these are our selection criteria. They were not applied by either of the review bodies.

Such a selection leads to the summary in Table II. While still showing highly significant results, selection has moderated, not exaggerated, the strength of the crudely aggregated original data. For example, the results would have been slightly stronger if the significant-positive finding by Alfredson *et al.* (1996) for 10 lymphocytic leukemia cases for ages 20–64 years were included; while some significant information was lost, the objective selection criteria chose 20 all-leukemia all-ages cases instead.

Further selection may be made according to the additional criteria:

- Omit results that give low cumulative exposures in μT-years, typically below average 0.2 μT.
- Omit occupational studies that give no estimate of exposure.

This gives the results in Table III.

As would be expected, the effect of our selection is to reduce numbers of results admitted, and to reduce *p*-values, while increasing the percentage both of positive results and of significant-positive results.

IARC also summarizes four studies of electric fields (EF) and adult leukemia (Table 31). Leaving out the baseline (reference) exposure bands, there are 23 ORs, of which 13 are positive, with 2

Table III. Aggregation of Studies of Adult Leukemia in IARC (2002) on the Basis of Additional Selection Criteria to Identify Results with Comparable Exposures

IARC/AL (Select Results)	No. of ORs	Positives	*P*-Value for Positives	Significant-Positives	*P*-Value for Sig-Pos
Residential	4	3.5	0.06–0.31	2	0.0036
Cohort occupational	4	4	0.0625	2	0.0036
Case-control occupational	5	4	0.1875	2	0.0059
Total	13	11.5	0.002–0.01	6	3.6×10^{-7}

significant-positives and no significant-negatives. The *p*-values are 0.34 for the positives and 0.11 for the significant-positives. Selection of high-exposure results does not substantially change the picture. These studies do not give the same kind of message as the magnetic field results.

7. COMPARISON OF REVIEWS FOR ADULT BRAIN CANCER

CDHS again addresses the question of aggregation, citing 32 studies for adult brain cancer in Table 9.1.1 of their study, comprising 29 for occupational and 3 for residential exposures, and listing one representative result for each study (OR or other risk measure, with confidence limits). CDHS refers to a meta-analysis by Kheifets of the 29 occupational studies with overall OR of 1.2 (95% CI: 1.1–1.3) and to numbers of positive results and numbers with OR above 1.2. CDHS did not count numbers of significant results.

In Table 9.2.2 CDHS includes 7 additional studies to the 32 in Table 9.1.1 but gives confidence intervals for only 5 of them. One study combines residential and occupational exposure, and one is for electric fields (with a significant positive result). While CDHS discusses these additional seven studies, they are not included in its aggregation (and make little overall difference to it). Our summary for the 32 cited studies is given in Table IV.

While these aggregations are not as strong as those for adult leukemia, they are highly significant.

IARC selects 38 studies with brain cancer results for setting out in its main tables, of which 5 are residential (Table 26), 15 are occupational cohort studies (Table 29), and 18 are occupational case-control studies (Table 30). The respective numbers of results with risk measures and confidence intervals are 24, 32, and 53, that is, 109 in all, but these include repetition of subtype results in totals and include low-exposure as well as higher-exposure results from the same studies.

These include two studies (Spinelli, 1995; Ronneberg *et al.*, 1999) that are for exposures to static magnetic fields. They would have been better excluded when assessing results for ELF (principally power-frequency) fields, as the two exposures are quite different. However, the CDHS lists also included one of these studies, Spinelli (1995), with results for both brain cancer (positive) and for leukemia (negative). IARC includes these plus the negative results from Ronneberg *et al.* (1999). In treating CDHS and IARC comparably, these inappropriate results are here left in. The effect is slight, by way of diluting any overall findings.

Of the 109 crude results, 71 are positive and 16 are significant-positive. That would be highly significant under a null hypothesis for a random sample of independent results. There are also three significant-negative results, each with the upper confidence limit just on 1.0. That would not be remarkable under a null hypothesis for 109 independent results ($p = 0.51$), but could be under a stronger alternative test hypothesis with a positive association.

One significant-negative result is for a low-exposure category residential study in Table 26; that study is declared for "nervous system" cancer rather than brain cancer *per se* but it is included in Table 26,

Table IV. Aggregation of Studies of Adult Brain Cancer in CDHS (2002)

CDHS/Brain (1 per Study)	No. of ORs or Risk Measures	Positives	*P*-Value for Positives	Significant-Positives	*P*-Value for Sig-Pos
Residential	3	2	0.5	0	1.0
Occupational	29	23	0.001	6	7×10^{-5}
Total	32	25	0.001	6	0.0001

Table V. Aggregation of Studies of Adult Brain Cancer in IARC (2002) on the Basis of Selection Criteria to Identify One Representative Result per Study

IARC/Brain (1 per Study)	No. of ORs	Positives	*P*-Value for Positives	Significant Positives	*P*-Value for Sig-Pos
Residential	5	3	0.5	0	1.0
Cohort occupational	15	9.5	0.15–0.3	3	0.0057
Case-control occupational	15	10	0.15	3	0.0057
Total	35	22.5	0.04–0.09	6	0.0002

which is for brain cancer. The other two significant-negatives are in Table 29 and are for males, while they are accompanied by nonsignificant-positives for females; the selection criteria chose the more populous males, though if males and females were combined the significance would be lost. One significant-positive result was similar but the other way round, being just significant-positive for males alongside a nonsignificant-negative for the less populous females. Some significant-positives listed for Cocco *et al.* (1999) in Table 30 may look suspicious at first sight, as three are reported as having OR as 1.2 (95% CI = 1.1–1.2), which seems odd but could be accounted for by round-off from, for example, 1.17 (1.11–1.24) consistent with the usual log-normal model.

Applying our selection criteria obtains a more independent set of results, at most one per study, although as noted above it selects more populous male studies that would be partly countered by female studies. One study remained ambiguous and offered alternative opposite results of fairly equal weight (in Table 29, the Floderus *et al.* (1994) study of engine drivers or railway workers from the 1960s or 1970s); it was represented here as half positive and half negative. The result of selecting one result per study is summarized in Table V.

At this point the selection process has greatly weakened the aggregate evidence, largely because so many stronger results were in subsets. The selected evidence remains significant, if marginally so, and should not be dismissed, although it would not have the same statistical weight in assessment as that for adult leukemia. In addition, the significance of the number of significant-positive results is tempered by the existence of three marginal significant-negatives in the crude data set, two of which survived selection of one result per study.

Applying the extra set of selection criteria loses even more strength of evidence, as so many of the brain cancer studies do not have an exposure assessment in terms of field strength. The result, in Table VI, has now lost significance, bearing in mind that one significant-negative result was also selected.

8. COMPARISON WITH EVIDENCE ON CHILDHOOD LEUKEMIA

The same approach to aggregation may be applied to the CDHS set of 19 studies for childhood leukemia listed in Table 8.1.2. As with other health outcomes, CDHS applies its "sign test" and observes the 16 positive results out of 19, citing $p = 0.0004$ although our cumulative binomial calculation for 16 or more out of 19 gives $p = 0.002$. CDHS does not consider the number of significant results (3 out of 19; $p = 0.01$). There were no significant negative results and no results for OR or CLs truncated to 1.00.

IARC tables detailed results for childhood leukemia for 14 childhood leukemia studies in Tables 18, 19, and 23, comprising 10 residential exposure studies and 4 relating to use of domestic appliances. Applying the same processes as for adult leukemia, we find out of 14 results (one per study) there are 13 positive and 3 significant-positive results, with *p*-values of 0.0009 and 0.005, respectively.

On this assessment of the value of the listed sets of studies, the evidence for adult leukemia appears

Table VI. Aggregation of Studies of Adult Brain Cancer in IARC (2002) on the Basis of Selection Criteria to Identify Results with Comparable Exposures

IARC / Brain (Select Results)	No. of ORs	Positives	*P*-Value for Positives	Significant Positives	*P*-Value for Sig-Pos
Residential	5	3	0.5	0	1.0
Cohort occupational	4	3	0.3	2	0.0036
Case-control occupational	5	3	0.5	0	1.0
Total	14	9	0.2	2	0.047

more significant than that for childhood leukemia. However, we have not taken into account consistency of exposure type or measurement, or magnitude of apparent effect such as represented by ORs. CDHS refers to Wartenberg (2001), with a meta-analytic summary OR of 1.3 (1.0–1.7) for childhood leukemia. This might reasonably be compared with the meta-analytic summaries cited for adult leukemia of 1.2 (1.12–1.24) and for brain cancer of 1.2 (1.1–1.3) with reference to Kheifets *et al.* (1997a). There is not much difference between all three cancer groups at this level of meta-analysis.

The two-pooled analyses for childhood leukemia, with ORs of 1.69 (1.25–2.29) for exposures above 0.3 μT by Greenland *et al.* (2000) and 2.00 (1.27–3.13) for exposures above 0.4 μT by Ahlbom *et al.* (2000), provide stronger results by focusing on fewer more coherent and comparable studies. Although the adult leukemia and brain cancer studies may be more disparate than those entirely residential studies pooled for childhood leukemia, it would seem plausible that if they had better exposures measurements that could be used for selection, the result would also be to strengthen the overall finding.

9. CONCLUSIONS

There is a risk that review bodies, however august, may overlook the statistical weight of aggregate evidence in a collection of disparate studies that are individually inconclusive. It would be helpful in improving confidence in their reviews and assessment decisions if the issue of aggregation of disparate evidence could be seen to be addressed explicitly, preferably by a formal pooled analysis or meta-analysis to give an overall risk estimate, or if that is not available, at least by the sort of significance analysis that we have demonstrated in this article.

In aggregating evidence by the simple significance analysis we illustrate, when using the "sign test" (counting numbers of positive results), odds ratios reported as truncated at 1.0 or 1.00 etc. should be counted as half positive and not discounted. Counting numbers of significant results in this case gives stronger information than the simple sign test. If using the cumulative binomial distribution to assess the significance of numbers of positive results or of significant-positive results, it is important that the individual results are independent. We have suggested a set of selection criteria to produce at most one result per study for this purpose. However, one disadvantage of this approach is that a genuinely raised risk in a particular cancer subtype could become lost in considering all subtypes in one group, for example *all leukemia*, or *all brain cancer*.

The CDHS has addressed the aggregation of results, using the sign test and referring to external meta-analytic summaries, but it has not considered counts of significant results. The IARC review shows no evidence of having considered the aggregation of results other than subjectively. It has considered individual studies in detail and identified their shortcomings, but this has led to a tendency to fragment and dismiss evidence that is intrinsically highly significant.

Review bodies have a right to dismiss evidence on rational grounds, taking into account potential bias, confounding, and methodological limitations, as well as statistical strength, but should not do so without being seen also to take statistical aggregation into account.

The CDHS review offers a useful complementary insight into the weight of epidemiological evidence in human studies. It adds a perspective that the mainstream EMF international review bodies seem to have overlooked.

The differences in the conclusions of the IARC and CDHS reviews are not explained by differences in the sets of studies they considered. Their overlapping data sets on adult leukemia, while surprisingly different in the studies included, both represent a highly significant body of aggregated evidence. In the case of brain cancer, the crude sets of data both appear highly significant in aggregate, though our selection criteria applied to the IARC data produced only a marginally significant aggregate result.

It is debatable whether the IARC classification system should be used to distinguish between specific diseases, since it seems to be designed to classify agents. It would be reasonable for the IARC classification to refer to evidence on childhood leukemia in reaching a 2B classification. The additional evidence on adult leukemia and brain cancer might then add further support, when taken in addition to childhood leukemia.

By separating the evidence in humans for "all other cancers" (besides childhood leukemia) and summarily classifying it as "inadequate" (Section 5.5, p. 338) IARC may be seen as effectively promoting a hypothesis that EMFs may be a cause of childhood leukemia alone and of no other cancers. That is how we see policymakers interpreting it. We do not think this is rational for complex multicausal diseases, especially bearing in mind evidence for possible systemic effects that could affect causation of several

diseases. IARC does not seem to have addressed the question of compound hypotheses.

This exclusive attribution of the IARC 2B classification to childhood leukemia has repercussions in precautionary policy, as manifest in the draft WHO Precautionary Framework (2006). Owing to its rarity, childhood leukemia has relatively little impact on society and its avoidance therefore has relatively little benefit, compared with the substantially more prevalent adult leukemia and brain cancer, as well as the other outcomes rated as 2B by CDHS.

An earlier review by the NIEHS (1999) had associated both adult and childhood leukemia with a 2B classification, and both the IARC and CDHS reviews were informed by this. Given the extent and aggregate strength of the evidence for adult leukemia, both in itself and in comparison with that for childhood leukemia, it is difficult to see a clear division that would support an exclusive hypothesis of carcinogenicity of EMFs for childhood leukemia but not for adult leukemia.

Postscript: Since our first writing of this article, the study by Lowenthal *et al.* (2007) has appeared, as has our commentary in the same journal (O'Carroll and Henshaw, 2007). These results reinforce our conclusions in respect of adult leukemia, though our argument is principally about methodology.

10. RECOMMENDATIONS

The following recommendations are made for future reviews of EMF health effects.

(i) IARC and other review bodies should incorporate expressly into their methodology some assessment of aggregate value of disparate evidence. Such assessment should not itself determine the overall assessment decision, but it is better to be aware of the nature of the aggregated data.

(ii) A focused pooled analysis should be undertaken for adult leukemia to parallel, as far as possible, those of Ahlbom *et al.* and Greenland *et al.* for childhood leukemia.

(iii) Advisory bodies considering precautionary policy relating to EMFs should take into account both the IARC and CDHS reviews, including the failure of IARC to demonstrate any assessment of aggregate value of evidence.

(iv) The WHO EMF team, in forming its Precautionary Framework, should expressly address the impact of possible health outcomes other than childhood leukemia, noting especially their relatively high incidence compared with childhood leukemia, and giving particular attention to the five outcomes classified by CDHS as corresponding to IARC Class 2B.

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Induction of genomic instability, oxidative processes, and mitochondrial activity by 50 Hz magnetic fields in human SH-SY5Y neuroblastoma cells

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abstract

Epidemiological studies have suggested that exposure to 50 Hz magnetic fields (MF) increases the risk of childhood leukemia, but there is no mechanistic explanation for carcinogenic effects. In two previous studies we have observed that a 24-h pre-exposure to MF alters cellular responses to menadione-induced DNA damage. The aim of this study was to investigate the cellular changes that must occur already during the first 24 h of exposure to MF, and to explore whether the MF-induced changes in DNA damage response can lead to genomic instability in the progeny of the exposed cells. In order to answer these questions, human SH-SY5Y neuroblastoma cells were exposed to a 50-Hz, 100-fLT MF for 24 h, followed by 3-h exposure to menadione. The main finding was that MF exposure was associated with increased level of micronuclei, used as an indicator of induced genomic instability, at 8 and 15 d after the exposures. Other delayed effects in MF-exposed cells included increased mitochondrial activity at 8 d, and increased reactive oxygen species (ROS) production and lipid peroxidation at 15 d after the exposures. Oxidative processes (ROS production, reduced glutathione level, and mitochondrial superoxide level) were affected by MF immediately after the exposure. In conclusion, the present results suggest that MF exposure disturbs oxidative balance immediately after the exposure, which might explain our previous findings on MF altered cellular responses to menadione-induced DNA damage. Persistently elevated levels of micronuclei were found in the progeny of MF-exposed cells, indicating induction of genomic instability.

1. Introduction

The possible carcinogenicity of extremely low frequency (ELF) magnetic fields (MFs), associated with the use of electricity, has been a focus for public and scientific concern since the first findings suggesting an association between residential ELF MFs and childhood leukemia [1]. This association was supported by several later epidemiological studies, and the International Agency for Research on Cancer (IARC) has classified ELF MFs as "possibly carcinogenic to humans" [2]. However, despite decades of research, the mechanism for how MF could cause childhood leukemia, or carcinogenicity in general, is still not understood.

Radiobiological research conducted during the last decades has shown that ionizing radiation causes delayed damage (chromosomal aberrations, mutations, micronuclei, apoptosis) many cell generations later in the progeny of exposed cells [3,4]. Such delayed effects did not fit with the prevailing paradigm of radiobiology, and were termed radiation-induced genomic instability. Although ionizing radiation is currently the best known inducer of genomic instability, several studies have reported that induced genomic instability (IGI) can result from exposure to other agents, such as UV radiation, heavy metals, and a dioxin [5–11]. This phenomenon, IGI, is clearly highly relevant to cancer [12], as it might lead to the accumulation of mutations required in cancer formation.

Both theoretical considerations and empirical evidence indicate that ELF MFs alone do not cause direct DNA damage [2]. However, we have observed that pre-exposure to a 50 Hz, 100–300 fLT MF alters cellular responses to menadione-induced DNA damage [13,14]. The latter study indicated that DNA repair rate was increased in the MF-exposed cells, but the fidelity of repair and the post-repair integrity of the genome were compromised, as indicated by increased level of micronuclei (MN) measured at 72 h after the menadione treatment. However, the study did not include follow-up beyond 72 h to assess IGI. We have recently shown a similar altered response to menadione-induced DNA damage in cells exposed to the nongenotoxic carcinogen,

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2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) [11]. As the TCDD-related changes in DNA damage response were associated with IGI [11], it is highly interesting to study whether also ELF MFs can induce genomic instability.

This study aimed at identifying cellular changes that develop during the first 24 h of ELF MF exposure and might explain the previously observed altered responses to menadione-induced DNA damage [13,14], and at exploring whether the MF-induced changes can lead to genomic instability in the progeny of the exposed cells. The cellular changes measured included oxidative stress-related parameters and the functionality of mitochondria. These endpoints were selected because menadione increases the production of reactive oxygen species (ROS) in mitochondria, and because oxidative stress and mitochondria may be involved in IGI [7,15–18]. Furthermore, several studies have provided evidence of ELF MF effects on oxidative stress-related parameters [19–24], although there are also negative findings [13,25,26]. The development of IGI was followed by measuring MN, an easily detectable indicator of chromosomal injuries, which have been widely used for detecting genomic instability induced by ionizing radiation as well as other exposures in a variety of cell types [11,27–30].

2. Materials and methods

2.1. Reagents

Following reagents were used in this study: dihydroethidium (DHE) (Fluka Biochemika, Buchs, Switzerland); NaCl (FF Chemicals, Haukipudas, Finland); Dulbecco's modified Eagle medium (containing 4.5 g/l glucose), fetal bovine serum (FBS), 5000 unit/ml penicillin and 5000 fLg/ml streptomycin (Gibco, Carlsbad, USA); ethidium monoazide bromide, MitoSOX Red (3,8-phenanthridinediamine, 5-(6'-triphenylphosphoniumhexyl)-5,6-dihydro-6-phenyl) (Invitrogen Life Technologies, CA, USA); 2',7'-dichlorofluorescein-diacetate (DCFH-DA), diphenyl-1-pyrenylphosphine (DPPP), fluorescent beads (6 fLm), monochlorobimane (MBCL), propidium iodide (PI), SYTOX Green (Molecular Probes, Eugene, USA); sucrose (MP Biomedicals Inc., South Chillicothe, Ohio, USA) citric acid, sodium citrate (Riedel-de Haën, Seelze, Germany) 3-[4,5-dimethythiazol-2-yl]-2,5-diphenyl tetrazolium bromide (MTT), diethyl maleate (DEM), digitonin, IGEPAL, menadione sodium bisulfate, methyl methanesulphonate (MMS), RNase A, tert-butylhydroperoxide (Sigma–Aldrich, Steinheim, Germany).

2.2. Cell culture

Human SH-SY5Y neuroblastoma cells (obtained from Dr. Sven Påhlman, University of Uppsala, Sweden) were cultured in Dulbecco's modified Eagle medium (containing 4.5 g/l glucose) supplemented with 10% heat-inactivated fetal bovine serum (FBS) and 50 U/ml penicillin and 50 fLg/ml streptomycin. The cells were maintained in a humidified atmosphere containing 5% CO_2 at 37 °C and harvested by 0.02% EDTA in Ca^{2+}- and Mg^{2+}-free phosphate buffer saline (PBS). The cells were seeded approximately 20 h before the beginning of the each experiment. For experiments immediately after exposure (0 d), 2×10^5 cells were plated on a 24-well plate (Nunc, Roskilde, Denmark). For the 8 d and 15 d experiments, 1.8×10^6 cells were placed on a 60-mm petri dish (Nunc, Roskilde, Denmark) and seeded one time (8 d) or two times (15 d) before the analysis. In the 8 d experiments, 0.5×10^6 cells were seeded on a dish at 3 d. In the 15 d experiments, 0.5×10^6 cells were seeded on a dish at 3 d and 9 d.

However, the seeding of the cells for the micronucleus and mitochondrial activity assay was different from above mentioned protocol. In micronucleus assay, we placed 0.4×10^6 cells on a dish for both 8 and 15 d experiments. In the 8 d experiments, 0.1×10^6 cells were plated on a 48-well plate (Costar, Corning, NY, USA) 5 d before the analysis. In the 15 d experiments, 0.4×10^6 cells were seeded on a dish at 6 d (and plated on a 48-well Plate 5 d before the analysis). As the assay for mitochondrial activity did not allow the normalization of the results to the relative cell number, 0.1×10^6 cells were plated on a 48-well plate (Costar, Corning, NY, USA) 24 h before the analysis.

2.3. MF exposure

The exposures to 50 Hz MF were conducted at a magnetic flux density of 100 fLT for 24 h. A comprehensive description of the exposure system has been published previously [13]. Briefly, a pair of 340 mm × 460 mm coils in a Helmholtz-type configuration (220 mm distance between the coils) generating a horizontal magnetic field was housed inside a temperature-controlled cell culture incubator (Heraeus HERACell) with 5% CO_2. The cell cultures were located at the center of the coil system for ensuring a uniform magnetic flux or in an identical control incubator for the exposure time period. The MF were generated by a function generator Wavetek Waveform Generator model 75 (Wavetek, San Diego, CA, USA) and amplified by a Peavey M-3000 Power Amplifier (Peavey Electronics corp., Meridian, MS, USA). The background MF levels of 50 Hz were below 2 fLT inside the incubators and the static magnetic field was ~52 fLT in the room containing the incubators. Magnetic flux density was monitored with a Hirst GM08 and Hirst Axial Fluxgate Probe AFG100 (Hirst Magnetic Instruments Ltd., Cornwall, UK).

2.4. Experimental protocol

The exposure protocol (Fig. 1) was selected to be identical to that in our previous study [14]. The cell cultures were exposed in four groups: (1) sham-exposed control, (2) MF-exposed, (3) sham-exposed + menadione treatment, and (4) pre-exposed to MF + menadione treatment. After the 24 h MF or sham exposure, the cells entered into the assay (control and MF alone exposed group) or were incubated or exposed to menadione for 3 h. However, in the experiments measuring delayed effects, the control and MF alone exposed groups were incubated aside the chemical exposure group for 3 h, which was followed by incubation for 8 or 15 d.

In the experiments measuring immediate effects, the menadione concentrations were 0.1, 1, 10, 15, 20, and 25 fLM. In the experiments studying delayed effects, a low (1 fLM) and a high (20 fLM) menadione concentration was used. Also the following positive controls were used: 10 fLg/ml methyl methanesulfonate for 24 h (micronucleus frequency), 0.015% diethyl maleate for 1 h (ROS production measured by DCFH-DA), and 0.5 mM tert-butylhydroperoxide for 3 h (lipid peroxidation).

2.5. Micronucleus frequency

For micronucleus analysis, the cells were stained with ethidium monoazide bromide (EMA; staining of necrotic and mid/late stage apoptotic cells), photoactivated with a visible light, stained with SYTOX Green (staining of all cells) and measured by flow cytometry [31]. The formation of micronuclei requires at least one cell division after exposure, and the frequency of directly induced micronuclei starts do decline soon thereafter. Therefore, 72 h after the end of the menadione treatment was considered as time zero, and the measurements for delayed effects were performed 8 or 15 d after this point in time.

Medium was removed from the wells of a 48-well plate (2 wells per each exposure group) and the cell cultures were incubated on

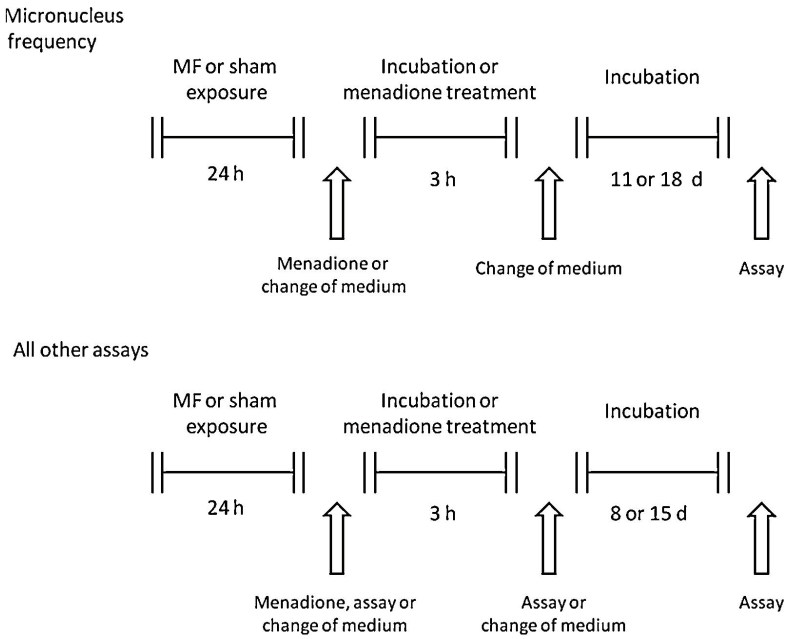

Fig. 1. The exposure protocol. As the formation of micronuclei requires at least one cell cycle after the treatment, 3 d after the end of the exposure was considered as time zero. The final incubation times were therefore 3 d longer in the micronucleus assay than in the other assays.

ice for 20 min. After this, 150 fLl of 8.5 fLg/ml EMA-solution (+4 ˚C) was added into each well, followed by light activation on ice for 30 min under a table lamp 15 cm above the plate (without a lid). The cells were then washed once with 500 fLl 2% FBS in PBS (w/o Ca^{2+} and Mg^{2+}, +4 ˚C), which was followed by addition of 250 fLl Lysis 1-solution (0.3 fLl IGEPAL/ml, 0.584 mg NaCl/ml, 0.5 mg RNase A/ml, 1 mg sodium citrate/ml, and 0.4 fLM SYTOX Green in MilliQ-water, +4 ˚C) and incubation at +37 ˚C in the dark for 1 h. Following the incubation, 250 fLl of Lysis 2-solution (15 mg citric acid/ml, 85.6 mg sucrose/ml, 0.4 fLM SYTOX Green, and 1 drop of 6 fLm fluorescent beads, +20 ˚C) was added per each well and samples were incubated in the dark at room temperature (+20 ˚C) for 30 min. Finally, the samples were transferred into flow cytometer tubes, resuspended, and analyzed with a flow cytometer (Becton Dickinson FACScalibur, Becton Dickinson, San Jose, CA). Instrumentation settings and gating were done according to Bryce et al., 2007 [31]. Data were acquired and analyzed by CellQuest Pro software v.5.2.1 (Becton Dickinson, San Jose, CA). A total of 2×10^5 gated events were scored per sample.

2.6. Mitochondrial and cytosolic superoxide production, ROS production, and reduced glutathione level

Mitochondrial and cytosolic superoxide production, ROS production, and reduced glutathione (GSH) level were analyzed using similar assay protocols. The only differences between these assays were different probes, buffers, and emission and excitation wavelengths (Table 1).

In the experiments immediately after exposures (0 d), the medium was removed from the wells of a 24 well plate and the cell cultures were loaded (30 min, +20 ˚C, in dark) with the assay-specific probe in 0.5 ml of buffer (Table 1). Fluorescence was then measured by a Perkin Elmer HTS 7000 Plus Bio Assay Reader (Perkin Elmer, Norwalk CT, USA).

In the 8 d and 15 d experiments, medium was removed from the dish and cells were scraped in 5 ml of buffer, suspended carefully, and 3.0 ml of this suspension was transferred to two separate 24 well plates (3 × 0.5 ml for each plate). This was followed by either determination of the endpoint or measurement of relative

Table 1
Probes, buffers, and measurement parameters used in the assays for cytosolic and mitochondrial superoxide production, ROS production and GSH level.

Endpoint	Probe	Buffer	Excitation/emission
Cytosolic superoxide production	10 fLM DHE[a]	PBS	485/595 nm
Mitochondrial superoxide production	1 fLM MitoSOX Red[b]	PBS	492/595 nm
ROS production	40 fLM DCFH-DA[c]	HBSS	485/535 nm
GSH level	100 fLM MBCL[d]	PBS	380/465 nm

[a] DHE = dihydroethidium.
[b] MitoSOX Red = 3,8-phenanthridinediamine, 5-(6'-triphenylphosphoniumhexyl)-5,6-dihydro-6-phenyl.
[c] DCFH-DA = 2',7'-dichlorofluorescein-diacetate.
[d] MBCL = monochlorobimane.

cell number (see below). After this, the cell cultures entering to endpoint or measurement were loaded (30 min, +20 °C, in dark) with the assay-specific probe. The results were normalized to relative cell number.

2.7. Lipid peroxidation

The peroxidation of cellular lipids was measured using diphenyl-1-pyrenylphosphine (DPPP) fluorescent probe. Cells were loaded with a final concentration of 50 fLM for 80 min (+37 °C, in dark) before the end of the exposure or incubation time. In the experiments immediately after exposure (0 d), the medium with DPPP probe was replaced with 0.5 ml of HBSS buffer and fluorescence was measured (Perkin Elmer HTS 7000 Plus Bio Assay Reader, Norwalk CT, USA, excitation 340 nm/emission 405 nm).

In the experiments with follow-up for 8 or 15 d, the medium with DPPP probe was removed from the dish and cells were scraped into 5 ml of HBSS buffer, and 1.5 ml of this suspension was transferred into two separate 24 well plates for either determination of lipid peroxidation or measurement of relative cell number (see below).

2.8. Mitochondrial activity

Mitochondrial activity was assayed using 3-[4,5-dimethythiazol-2-yl]-2,5-diphenyl tetrazolium bromide (MTT). In the experiments immediately after exposure (0 d), 30 fLl of 5 mg/ml MTT was added to 300 fLl of medium 2 h before the end of the incubation or exposure period. After the exposure, medium and MTT were removed from the wells of a 48-well plate and 450 fLl of DMSO was added into the wells. This was followed by shaking the samples on a plate shaker for 1 min and measurement of absorbance (Perkin Elmer HTS 7000 Plus Bio Assay Reader, Norwalk CT, USA, 550 nm).

2.9. Viability of cells and relative cell number

Viability of cells was assayed with propium iodide (PI), a fluorescent probe that binds to chromatin if membrane integrity is lost. After the first measurement of PI fluorescence, digitonin was used for demolishing cell membrane integrity. This enables PI to enter all cells allowing measurement of the maximum PI value (relative cell number). Viability of cells was expressed as a relative PI value before and after digitonization [32].

A final concentration of 50 fLM PI was added into the samples before incubation for 20 min in the dark (+20 °C). This was followed by measurement of fluorescence (Perkin Elmer HTS 7000 Plus Bio Assay Reader, Norwalk CT, USA, excitation 540 nm/emission 610 nm). The samples were then supplemented with 160 fLM digitonin, incubated on a plate shaker for 20 min (in the dark, +20 °C), and fluorescence was measured as describe above.

2.10. Statistical analysis

As the study was a factorial experiment, i.e., the experimental design allowed testing the effects of multiple factors and their interactions, an ANOVA model appropriate for analyzing factorial experiments was used. The analysis was performed using three-way ANOVA, with MF and menadione as fixed factors and replicate as random factor. Replicate was included as a random factor in the analysis because there were in several cases statistically significant differences between the replicates. Interaction of MF and menadione was included in the model. The analysis was performed using the general linear model procedure of SPSS for Windows release 19 (SPSS Inc., Chicago, Illinois, USA) using raw or logarithm-transformed (micronucleus data) values. The experiments were replicated 3–4 times. The data are expressed as mean ± SEM values. A p-value of less than 0.05 was considered statistically significant.

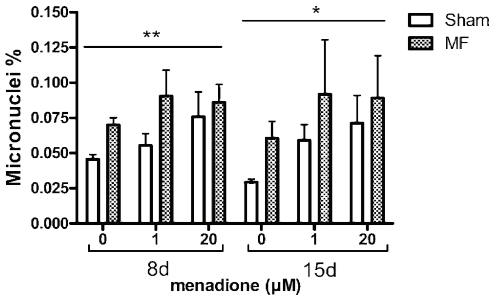

Fig. 2. Micronucleus frequency in Human SH-SY5Y neuroblastoma cells 8 or 15 d after exposure to a 50-Hz, 100-fLT magnetic field (MF) for 24 h, followed by a 3-h incubation with 0, 1 or 20 fLM menadione, and further incubation for 72 h. Menadione treatment increased micronucleus frequency statistically significantly at 8 and 15 d (both $p < 0.05$). The interaction MF*menadione was not significant either at 8 or at 15 d. The significances for MF effect are given in the figure: *$p < 0.05$, **$p < 0.01$. The data shown are expressed as mean ± SEM values, n = 4.

3. Results

In this study, the cells were exposed to MF for 24 h, followed by incubation with fresh medium or menadione treatment for 3 h. In addition, the effect of MF exposure alone was measured also without the 3-h incubation time (data not shown in graphs). The endpoints were measured immediately, 8 d, and 15 d after the exposures. The menadione concentrations were 0.1, 1, 10, 15, 20, and 25 fLM in the experiments measuring the immediate effects, and 1 and 20 fLM in the experiment measuring the delayed effects. The measurements included both oxidative stress and mitochondria related assays. In addition, the frequency of MN was measured as an indicator of genomic instability at 8 and 15 d after the exposures.

3.1. Genomic instability

Exposure to MF increased the frequency of MN both at 8 and 15 d ($p = 0.001$, $p = 0.014$, respectively, Fig. 2). Menadione treatment also induced a statistically significant increase of MN frequency at both time points (8 d: $p = 0.040$, 15 d: $p = 0.011$). As expected, the positive control (10 fLg/ml methyl methanesulfonate for 24 h, % micronuclei = 0.166 ± 0.024) increased the level of micronuclei statistically significantly compared to the control cells (3.6-fold increase, $p < 0.001$). Interestingly, the size of MF effect did not seem to depend on menadione concentration or whether cells were treated with menadione or not, as indicated by statistically non-significant values of the MF*MQ interaction both at 8 and 15 d ($p = 0.387$, $p = 0.289$, respectively). Furthermore, the effect size of MF appeared to be about same order of magnitude as the effect of menadione.

3.2. Measurements immediately after exposures

In the measurements immediately after treatments, MF exposure increased ROS production measured by DCFH-DA ($p = 0.007$, Fig. 3A). Contrary to expectations, menadione treatment decreased the ROS measured by DCFH-DA ($p < 0.001$). However, the positive control (0.015% diethyl maleate for 1 h, RFU = 1435 ± 34.93) produced the expected increase of ROS production compared to the control cells (1.6-fold increase, $p < 0.001$). Consistently with the increased ROS levels, MF exposure resulted in generally decreased

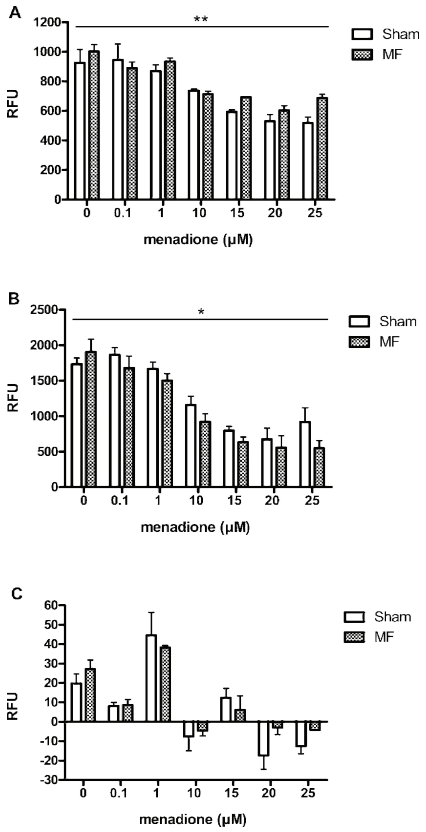

Fig. 3. ROS production (A), reduced glutathione (B) and lipid peroxidation (C) in Human SH-SY5Y neuroblastoma cells immediately after exposure to a 50-Hz, 100-fLT magnetic field (MF) for 24 h, followed by a incubation or a 3 h treatment with menadione (0.1, 1, 10, 15, 20, or 25 fLM). Treatment with menadione decreased ROS production and reduced glutathione levels and affected lipid peroxidation level ($p < 0.001$, in all three cases). The MF*menadione interaction was not statistically significant for any of the 3 endpoints. The significances for MF effect are given in the figure: *$p < 0.05$, **$p < 0.01$.The data shown are expressed as mean ± SEM values, n = 3, RFU = Relative Fluorescence Unit.

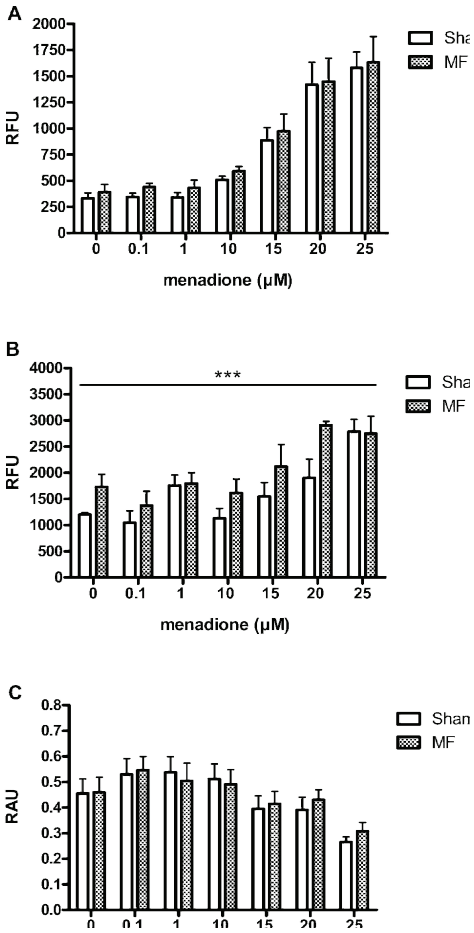

Fig. 4. Cytosolic (A) and mitochondrial (B) superoxide level and mitochondrial activity (C) in Human SH-SY5Y neuroblastoma cells immediately after exposure to a 50-Hz, 100-fLT magnetic field (MF) for 24 h, followed by a incubation or a 3 h treatment with menadione (0.1, 1, 10, 15, 20, or 25 fLM). Menadione treatment increased cytosolic and mitochondrial superoxide levels and affected mitochondrial activity ($p < 0.001$, in all cases). The MF*menadione interaction was not statistically significant for any of the 3 endpoints. The significances for the MF effects are given in the figure: ***$p < 0.001$. The data shown are expressed as mean ± SEM values, n = 3, RFU = Relative Fluorescence Unit, RAU = Relative Absorbance Unit.

level of reduced glutathione ($p = 0.017$), which was observable systematically at all menadione doses but not without menadione (Fig. 3B). Exposure to menadione also decreased the level of reduced glutathione ($p < 0.001$). The level of lipid peroxidation was not affected by MF (Fig. 3C), but was affected by menadione ($p < 0.001$). The dose response to menadione appeared to be biphasic, with an increase of lipid peroxidation at 1 fLM and decrease at higher concentrations. The positive control (0.5 mM tert-butylhydroperoxide for 3 h, RFU = 330.4 ± 34.38) increased the level of lipid peroxidation statistically significantly compared to the control cells (16.7-fold increase, $p < 0.001$). If the measurements were performed without the 3 h incubation, no MF effects on ROS, reduced glutathione, or lipid peroxidation were observed (results not shown).

Mitochondrial superoxide level measured immediately after the exposures (Fig. 4B) was increased both by MF exposure ($p < 0.001$) and menadione ($p < 0.001$). The dose response to menadione was non-monotonic, with a first peak at 1 fLM and then a gradual increase from 10 to 25 fLM. Menadione treatment increased also cytosolic superoxide production (Fig. 4A, $p < 0.001$). However, although cytosolic superoxide levels were higher in all MF exposed groups compared to non-MF-exposed groups, this finding was not statistically significant ($p = 0.052$). Mitochondrial activity of the cells was not affected by MF exposure (Fig. 4C), but was affected by menadione ($p < 0.001$). Similarly with the lipid peroxidation findings (Fig. 3C), the dose response was biphasic, with increase of mitochondrial activity at 1 fLM and decrease at higher concentrations. In the measurements performed without the 3 h incubation,

no MF effects on mitochondrial or cytosolic superoxide levels or mitochondrial activity were observed (data not shown).

Viability of the cells was not affected by menadione or MF exposure immediately after the exposures (with or without 3 h incubation, data not shown).

3.3. Measurements at 8 and 15 d after exposures

Radical level measured by DCFH-DA was increased by MF exposure at 15 d after the exposures ($p = 0.023$, Fig. 5A), but not statistically significantly at 8 d. The effect of MF was most obvious in cells treated with 20 fLM of menadione, but appeared to lack when menadione concentration was 1 fLM. Menadione treatment did not significantly affect ROS level measured by DCFH-DA at 8 or 15 d. Although the GSH levels in MF-exposed samples were consistently lower than in the corresponding controls at 15 d (Fig. 5B), the difference was not statistically significant ($p = 0.066$). Menadione treatment did not affect GSH level at 8 d. However, menadione treatment altered GSH level at 15 d ($p = 0.042$). Consistently with increased ROS level, lipid peroxidation was increased in the MF-exposed cells at 15 d ($p = 0.004$, Fig. 5C). Interestingly and consistently with the ROS findings (Fig. 5A), MF effects were not seen in cells exposed to 1 fLM menadione. A similar pattern was observed at 8 d after exposure, but no statistically significant MF effect was observed at this point in time ($p = 0.097$). Menadione did not affect the level of lipid peroxidation at 8 or 15 d.

Mitochondrial activity was increased significantly in the MF-exposed cells at 8 d ($p = 0.014$), but not at 15 d (Fig. 6C). Consistently with the ROS and lipid peroxidation findings (Fig. 5A and C), no MF effect was observable in cells treated with 1 fLM menadione. No menadione-related differences in mitochondrial activity were observed at 8 or 15 d. The levels of cytosolic superoxide were systematically higher in the MF-exposed groups at 8 d (Fig. 6A), but this difference was not statistically significant. Similarly, no significant MF-related differences were observed at 15 d. Menadione treatment was associated with a dose-dependent decrease of cytosolic superoxide 15 d after the exposures ($p = 0.022$) but no significant effect was observed at 8 d. The level of mitochondrial superoxide was not significantly affected by MF exposure or menadione at 8 or 15 d (Fig. 6B), although it may be worth noting that, in cells treated with 1 fLM menadione, the level of mitochondrial superoxide was higher in the MF-exposed groups both at 8 d and 15 d.

Viability of the cells was not altered by MF exposure or menadione treatments at 8 or 15 d after the exposures (data not shown).

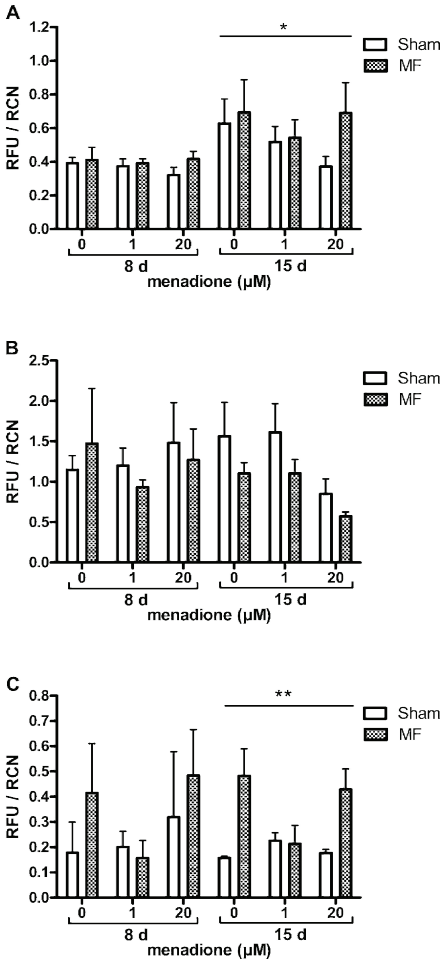

Fig. 5. ROS production (A), reduced glutathione (B) and lipid peroxidation (C) in Human SH-SY5Y neuroblastoma cells 8 or 15 d after exposure to a 50-Hz, 100-fLT magnetic field (MF) for 24 h, followed by a incubation or a 3 h treatment with 1 or 20 fLM menadione. At 8 d, treament with menadione did not affect the level of ROS production, reduced glutathione, or lipid peroxidation statistically significantly. Similarly, the MF*menadione interaction was not significant for any of the 3 endpoints at 8 d. At 15 d, menadione decreased the level of reduced glutathione ($p < 0.05$), but did not alter ROS production or lipid peroxidation statistically significantly. The MF*menadione interaction was statistically significant for lipid peroxidation ($p < 0.05$), but not for ROS production or reduced glutathione at 15 d. The significances for the MF effect are given in the figure: **$p < 0.05$, **$p < 0.01$. The data shown are expressed as mean ± SEM values, n = 3, RFU = Relative Fluorescence Unit, RCN = Relative Cell Number.

4. Discussion

The main finding of this study was IGI in MF exposed cells, observable as an increased level of micronuclei in the MF-exposed groups at 8 and 15 d. To the best knowledge of the authors, the current study is first one to report IGI in MF-exposed cells, although the increased microsatellite mutations reported in a previous study [33] might also be interpreted as an indication of IGI. A previous study has reported that a "bystander effect" (which is believed to be closely related to IGI) was induced by the MF of a Magnetic Resonance Imaging machine [34]. It is of interest that IGI was caused also by MF exposure alone, in contrast to our previous studies [13,14] showing cellular responses to MF only when it was combined with menadione treatment. The present results also support the emerging evidence [5–11] that other agents besides ionizing radiation can induce genomic instability. Although the size of the MF effect was comparable to that of menadione, it was relatively small (the level of micronuclei in the MF-exposed cells was, on the average, less than 2-fold compared to the corresponding sham-exposed cells), and the biological significance of the finding thus remains unknown.

Exposure to MF was also found to increase mitochondrial superoxide levels and ROS production and to decrease GSH levels immediately after the treatments. As effects were consistently

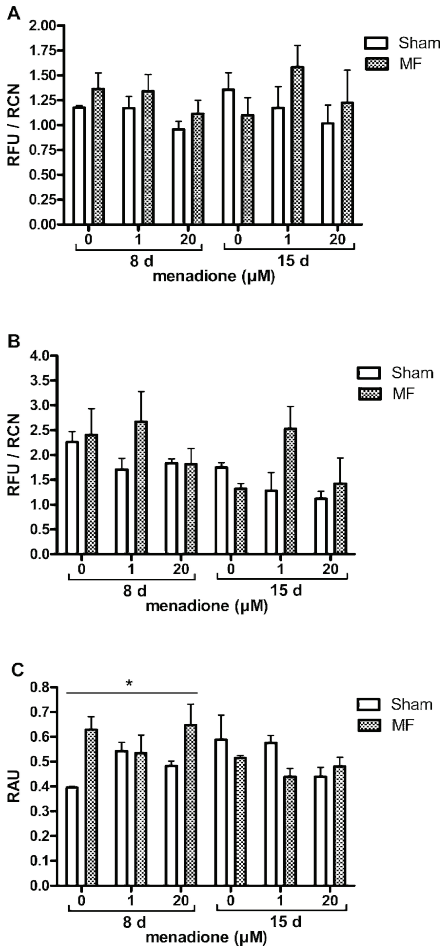

Fig. 6. Cytosolic (A) and mitochondrial (B) superoxide level and mitochondrial activity (C) in Human SH-SY5Y neuroblastoma cells 8 or 15 d after exposure to a 50-Hz, 100-fLT magnetic field (MF) for 24 h, followed by a incubation or a 3 h treatment with 1 or 20 fLM menadione. At 8 d, menadione treatment did not affect cytosolic and mitochondrial superoxide levels or mitochondrial activity. The MF*menadione interaction was not significant for any of the 3 endpoints at 8 d. At 15 d, menadione decreased cytosolic superoxide production ($p < 0.05$), but it did not affect mitochondrial activity or superoxide production. The MF*menadione interaction was significant for cytosolic ($p < 0.01$) and mitochondrial superoxide production ($p < 0.05$), but not for mitochondrial activity at 15 d. The significances for the MF effect are given in the figure: *$p < 0.05$. The data shown are expressed as mean ± SEM values, n = 3, RFU = Relative Fluorescence Unit, RCN = Relative Cell Number, RAU = Relative Absorbance Unit.

observed on several endpoints measuring the oxidative state of the cells, the results suggest that short-term responses to MF exposure include altered balance between oxidants and antioxidants. This conclusion is supported by other studies showing increased radical levels and decreased antioxidant levels in cells and animals exposed to MFs [19–24]. It is noteworthy that oxidative balance was altered by MF only after 3 h incubation/menadione treatment, but not without the incubation period. This indicates a possible involvement of secondary radicals or a late enhancement of radical-producing processes. A commonly discussed hypothesis for explaining the biological effects of weak ELF MFs is the so called radical pair mechanism (RPM), which refers to MF effects on the lifetime of radical pairs and the resulting changes in the intracellular concentration of free radicals [35–37]. Although RPM is theoretically well understood [35,36], and a shown also in biochemical systems [38], its role in biology is still poorly known. Given the small size of the RPM-predicted effect on free radical concentration [36] and the presence of cellular antioxidants, it is unclear whether the findings of the present study can be explained by direct MF effects on cellular radicals. Another possibility is that the changes in the oxidant/antioxidant balance are a secondary consequence of cellular detection of MF. Biological detection of weak MFs occurs at least in animal navigation, possibly based on the RPM and specific magnetosensitive molecules [39]. Anyway, independent of the biophysical mechanism, the MF-induced changes in oxidant/antioxidant balance might be an initiating factor behind the altered DNA damage responses reported in our previous studies [13,14] and the MF-induced genomic instability observed in the present study.

Possible involvement of oxidative stress in IGI has been proposed [7,15]. The role of oxidative stress in the initiation of IGI is supported by the findings of the present study: both menadione and MF exposure induced genomic instability, and both also affected several oxidative stress-related endpoints immediately after the treatments. However, the present results do not support a universal role for oxidative stress in the maintenance of IGI: although menadione was found to induce genomic instability, there was little evidence of persistently elevated oxidative stress in menadione-exposed cells (the only finding indicating increased oxidative level was decreased GSH at 15 d). In MF-exposed cells delayed effects were found on both ROS level and lipid peroxidation. Consistently with these findings, the GSH-levels were generally lower in the MF-exposed groups, but this difference was not statistically significant. The MF-related effects on oxidative stress-related endpoints either lacked at 8 d or were more pronounced at 15 d, consistent with on-going dynamical changes in the development of IGI [40,41]. The increased lipid peroxidation in MF-exposed cells may be considered as a consequence of the earlier changes observed in oxidative-stress-related endpoints. It could be a particularly sensitive indicator of oxidative stress in prolonged incubations, and thus valuable endpoint in further studies investigating the possible involvement of oxidative stress in the delayed effects.

Mitochondria have also been suggested to be involved in the initiation and maintenance of IGI [16–18]. The results of the present study provided some evidence for involvement of mitochondria in the initial phases IGI, as both menadione and MF exposure affected mitochondrial superoxide production immediately after exposure, and menadione affected also mitochondrial activity. However, no changes in mitochondrial activity or superoxide level were observed in menadione-exposed cells 8 or 15 d after exposure, indicating that IGI is not necessarily associated with mitochondrial changes. In MF-exposed cells, mitochondrial activity was increased at 8 d, providing some evidence for the role of mitochondria in later phases of MF-induced genomic instability. The proper function of mitochondria is critical for the cells as mitochondria are the primary energy producers of the cells. Several research groups have [42–44] proposed a theory that the malfunctioning of electron transport chain (ETC) might cause so called "vicious cycle of ROS production". According to this theory, the malfunctioning ETC would lead to a subsequent increase of ROS, which would result in further damage to mitochondria, which would cause even further increase in ROS

production and eventually decline in mitochondrial functionality. The findings of the present study do not indicate that MF-induced genomic instability would be associated with a persistent change in mitochondrial function, as the increased mitochondrial activity had disappeared 15 d after exposure. The increased mitochondrial activity at 8 d may be just one phase in the dynamical process of MF-induced genomic instability, possibly contributing to the increased ROS and lipid peroxidation levels observed at 15 d.

Contrary to expectations, we found a decreasing dose–response in intracellular ROS production in menadione-treated cells (Fig. 3A). A possible explanation for the surprising result might be that the probe used (DCFH-DA) is known to be a poor measure for superoxide anion radicals, the primary radicals produced by menadione [45,46]. As our positive control increased ROS production statistically significantly ($p < 0.001$), it seems that menadione does not induce significant amounts of radicals that can be detected by DCFH-DA, and that the concentration of such radicals even decreases in menadione-exposed cells, possibly due to stimulation of antioxidant systems. In contrast to superoxide, radicals detected by DCFH-DA are generally highly reactive. This lack of highly reactive radicals would also explain why no increase of lipid peroxidation was observed at high concentrations of menadione (Fig. 3C).

The dose-response of menadione appeared to be biphasic in several endpoints measured immediately after exposures. As shown in Figs. 3C and 4B, C, treatment with 1 fLM menadione increased the activity of mitochondria, the level of mitochondrial superoxide, and cellular lipid peroxidation. These effects might be related to each other: stimulated mitochondrial activity would increase the level of mitochondrial superoxide, which in turn might result in lipid peroxidation. At higher doses, menadione-induced increase of superoxide production (Fig. 4B) would cause a toxic effect resulting in decreased mitochondrial activity (Fig. 4C). The anomalous response to 1 fLM menadione might also explain why, in some cases, no MF effect was observable at this menadione dose, although the same endpoints were affected by MF at other doses of menadione (Figs. 4B and 5A, 5C, and 6C).

In conclusion, persistently increased level of micronuclei was observed in the progeny of human SH-SY5Y neuroblastoma cells exposed to a 50-Hz MF, indicating MF-induced genomic instability. This effect was observed both in cells exposed to MF only and in cells exposed to MF and menadione. Menadione was also found to induce genomic instability independently of MF. Both MF and menadione were found to cause changes in the oxidant/antioxidant balance immediately after the treatments, consistently with the hypothesis that such changes are involved in the initiation of IGI. The delayed effects observed in the progeny of MF-exposed cells included increased mitochondrial activity at 8 d, as well as increased ROS and lipid peroxidation levels at 15 d. However, similar delayed effects were not associated with exposure to menadione, suggesting that such changes are not a characteristic to IGI in general, but rather a consequence of the process initiated by MF exposure. Overall, the present results corroborate our previous observations of cellular responses to MF [13,14], suggest that changes in oxidant/antioxidant balance might be involved in such responses, and indicate that the initial responses can lead to genomic instability.

Conflicts of interest statement

The authors declare that there are no conflicts of interest.

Acknowledgements

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Occupational and residential exposure to electromagnetic fields and risk of brain tumors in adults: a case–control study in Gironde, France

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The etiology of brain tumors remains largely unknown. Among potential risk factors, exposure to electromagnetic fields is suspected. We analyzed the relationship between residential and occupational exposure to electromagnetic field and brain tumors in adults. A case–control study was carried out in southwestern France between May 1999 and April 2001. A total of 221 central nervous system tumors (105 gliomas, 67 meningiomas, 33 neurinomas and 16 others) and 442 individually age- and sex-matched controls selected from general population were included. Electromagnetic field exposure [extremely low frequency (ELF) and radiofrequency separately was assessed in occupational settings through expert judgement based on complete job calendar, and at home by assessing the distance to power lines with the help of a geographical information system. Confounders such as education, use of home pesticide, residency in a rural area and occupational exposure to chemicals were taken into account. Separate analyses were performed for gliomas, meningiomas and acoustic neurinomas. A nonsignificant increase in risk was found for occupational exposure to electromagnetic fields [odds ratio (OR 5 1.52, 0.92–2.51)]. This increase became significant for meningiomas, especially when considering ELF separately [OR 5 3.02; 95 percent confidence interval (95% CI) 51.10–8.25]. The risk of meningioma was also higher in subjects living in the vicinity of power lines (<100 m), even if not significant (OR 5 2.99, 95% CI 0.86–10.40). These data suggest that occupational or residential exposure to ELF may play a role in the occurrence of meningioma.

In the past decades the incidence of primary brain tumors has been increased in many countries, a trend probably partly explained by the development of imaging techniques (X-ray computed-assisted tomography, magnetic resonance imaging).[1–4] However, spatial and temporal changes in the incidence of brain tumors also suggest the role of environmental factors. Among them, both high- and low-dose ionizing radiation have been proven to play a role in brain tumors, but they explain only a small proportion.[5] Other hypothetic environmental causes such as pesticides, solvants, metals, nitroso compounds have been suggested by occupational epidemiological studies.[6]

The universal use of electricity and the rapid development of associated technologies in the past decades raise the hypothesis of the potential contribution of electromagnetic fields (EMFs) in the development of some cancers, including brain tumors. The recent rapid increase in the use of cellular phones in the 1990s has stimulated epidemiological research on the contribution of radiofrequencies (RFs) to the development of brain tumors. Several meta-analyses on the effects of RF have been performed, the most recent ones focusing on studies with long-term cell phone use (>10 years).[7,8] Two streams of data have been identified: the ''Hardell group'' studies and the ''INTERPHONE group'' studies. While the first have concluded in elevated risks of developing ipsilateral astrocytoma and acoustic neurinoma,[9] the data from the second international group do not globally support the same conclusion.[10] Extremely low frequency (ELF) fields (power

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lines, electrical appliances, etc.) were considered separately from RFs as any effects they may produce on cells could be due to various mechanisms.[11]

ELFs have been classified as possibly carcinogenic to humans by the International Agency for Research on Cancer because of epidemiological evidence for childhood leukemia, but the evidence concerning brain cancer risk is only inadequate.[12] A recent review confirmed that the available data remain inconclusive concerning the role of RF in brain tumors, and that more studies are needed for slow-growing tumors such as meningiomas as well as for gliomas among long-term users.[7] As the effects of EMFs remain controversial and because the etiology of brain tumors is largely unknown, there is a need for more data from independent studies.

Our study investigated the putative association between residential and occupational EMFs and the risk of brain tumors in a French population-based case–control study.

Material and Methods

Study subjects

A population-based case–control study (CEREPHY) on central nervous system (CNS) tumors was carried out in the French administrative area of Gironde in southwestern France (1,437,863 inhabitants in 2007) to study occupational and environmental risk factors. We briefly summarize here the methods decribed in a previous paper.[13]

Eligible cases were all subjects aged 16 years and over, newly diagnosed with a brain tumor during the period from May 1, 1999 to April 30, 2001 and living in Gironde when diagnosed. Topography codes for primary brain tumors following the International Classification of Diseases for Oncology third edition (ICD-O-3) were included in the study: C70.0–C70.9 (meninges), C71.0–C71.9 (brain) and C72.2–C72.9 (cranial nerves and other parts of the CNS). In addition, cases were grouped according to ICD-O-3 morphology codes as gliomas (codes 9382–9451), malignant and benign meningiomas (codes 9530–9538), acoustic neurinomas (code 9560), lymphomas (code 9590) and other unspecified primary brain tumors. The tumor grade was classified according to the World Health Organization classification. Patients with neurofibromatosis, Von-Hippel Lindau diseases or AIDS were excluded. Other exclusion criteria were metastasis, recurrent tumors, or main residence outside the study area. All diagnoses were confirmed using two methods: (i) whenever histological diagnosis was available, the slides were systematically re-examined by a pathologist not involved in the initial diagnosis, (ii) for cases with no histological diagnosis, an assessment based on clinical and radiological criteria was carried out by a neurosurgeon and a neuroradiologist. Among the 315 eligible cases, 221 (70%) were included in the study. The main reasons for nonparticipation were death (37%), refusal (15%), incapacity because of disease (48%).

Controls were randomly selected from the local electoral rolls, which automatically registered all French subjects aged 18 years and over since 1997. This list contains name, addresses, dates of birth, gender and place of residence. For each eligible case, two controls were individually matched on age (more or less 2 years), sex and department of residence. Among the 642 eligible and reachable controls, 442 controls participated (69%). Two hundreds refused for health (24%) or other reasons (76%).

Data collection

All cases and controls received general information on the study and thereafter were phoned to ask for their participation. Trained interviewers administered a face-to-face standardized questionnaire including detailed information about demographic data (age, sex, educational level and marital status), lifestyle (tobacco and alcohol consumption), medical history (other cancerous pathology, head trauma), environmental risk factors (EMFs, pesticides and chemical agents) including information on mobile phone use. Furthermore, lifetime residential histories (for all places where the individual lived for more than 1 year) and occupational history were obtained for all subjects. For each job held for 6 months or more, job title, the type of industry, dates of beginning and end and detailed tasks performed were collected.

Occupational exposure assessment

Two industrial hygienists blind to case–control status expertised the job histories to determine exposure parameters. Thus, for each job of a given individual, exposure assessment included determination of (i) the type of EMF (ELF, RF), (ii) the exposure duration (D) and (iii) the exposure probability (P). Probability was classified into four categories from nonexposed (0), possibly exposed (1), probably exposed (2) and certainly exposed (3). Duration corresponded to the number of years EMF exposure was considered present in a specific job. In a second step, expert judgement, based on the individual information, was compared to data from a Swedish Job Exposure Matrix.[14] When differences could be explained by variations in jobs between Sweden and France, it was the judgment of our experts which prevailed. For example, while postmen were considered exposed to EMF according to workday mean values in the Job Exposure Matrix, they were not systematically classified as exposed in our study. Indeed in France, some postmen do not sort the mail but only deliver it and thus were not considered exposed to the EMF of the sorting machines.

A cumulative lifetime score (S) for each type of EMF (RF, ELF) was calculated for each subject as follows: $\sum_{i=1}^{P}$ probability $(P)_i \times$ duration $(D)_i$, where i indicates a given job in the calendar. In the analysis, occupational exposure was primarily considered as a dichotomous variable (i.e., exposed vs. never exposed) and then according to the quartiles of cumulative exposure calculated on the whole population.

Residential exposure assessment

Residential exposure to EMFs was assessed by calculating the distance between high power lines and place of residence at

the time of diagnosis for cases and at the time of interview for controls. High (90 kV and 63 kV) and very high (400 kV and 225 kV) power lines were taken into account whether they were overhead or underground. Four steps were completed for geocoding places of residence, blinded to the status disease and without knowledge of the position of the power lines: (i) all addresses collected on the questionnaire at interview time were checked and corrected if necessary and possible. If addresses remained incomplete, they were considered as missing, (ii) these addresses were located on the National Geographic Institute maps (scale 1:25.000°), on city maps (scale 1:5.000°) and on cadastral maps. Additionally, we used a website with aerial photography to help the localization. When all these attempts failed, we went on site to better locate the home, (iii) addresses were geocoded using a Geographical Information System (GIS)—Geoconcept, (iv) consistency of positioning from GIS with location on the maps was checked. A 100-m distance on both sides of the power lines was retained as the threshold for environmental exposure. This distance was consistent with data published previously and relevant according to the attenuation of EMFs with distance.[11] For each subject living within a corridor of 100 m from a power line, the shortest perpendicular distance to the power line was calculated.

As subjects were questioned on their residence near a high-power line, a positive answer to this question was considered. This could reflect high exposure to ELF in previous homes. Use of cell phones and the practice of an amateur radio operation were also collected and were used as dichotomous variables in our analysis.

Potential confounders

Exposure to pesticides and smoking were described in the literature as potential confounders and were taken into account.[15,16] Occupational exposure to some chemicals (pesticides, petroleum, solvents, lead and nitrosamines) was assessed by industrial hygienists through job history and treated as a dichotomous variable (exposed/not exposed). If the individuals were exposed to at least one or more types of chemical exposure, they were considered exposed ''to at least one occupational exposure to chemicals.'' Tobacco consumption was also taken into account as a dichotomous variable (past or present smoker/nonsmoker).

Moreover, three variables were retained to assess environmental exposure to pesticides: residency in a rural area, living in a vineyard area and a generic question on treatment of home plants. Educational level was used as a proxy for socioeconomic status and classified into four categories (no or primary school/middle school/high school/university).

Statistical analysis

Individual characteristics and EMF exposures were described and compared between cases and controls using the usual tests (Chi-square, Student's test). We performed univariate analysis to search for an association between potential risk factors and tumors. Variables associated both with brain tumors and exposure in univariate analysis ($p < 0.25$) were retained in multivariate models. Conditional logistic regression analysis for matched studies was performed with the SAS statistical program (SAS PHREG procedure). Odds ratios (OR) and 95 percent confidence intervals (95% CI) were obtained.

Dose–response patterns were estimated for quartiles of occupational exposures to EMFs. People exposed at background levels to EMFs were considered as the reference category.

Separate analyses were carried out for gliomas, meningiomas and acoustic neurinomas because etiology may differ by tumor type.

Table 1. Distribution of cases according to histological type by sex, CEREPHY study, Gironde, France, 1999–2001

	Males (n = 95)		Females (n = 126)	
Histological type	N	%	n	%
Glioma	60	63.2	45	35.7
Astrocytoma grade 1	4	6.7	2	4.5
Astrocytoma grade 2	5	8.3	5	11.1
Astrocytoma grade 3	5	8.3	3	6.7
Glioblastoma	43	71.7	29	64.4
Other	3	5.0	6	13.3
Meningioma	7	7.4	60	47.6
Neurinoma	18	18.9	15	11.9
Lymphoma	4	4.2	3	2.4
Other types[1]	6	6.3	3	2.4

[1]Haemangioblastoma (n ¼ 7), medulloblastoma (n ¼ 1) and choroid plexus papilloma (n ¼ 1).

Results

Population

The study included 221 cases with the following histological types: gliomas (N ¼ 105), meningiomas (N ¼ 67), acoustic neurinomas (N ¼ 33), brain lymphomas (N ¼ 7) and others (N ¼ 9) and 442 controls (Table 1). Eighty-seven percent of the cases were histologically confirmed and others were ascertained by a clinical expertise. Table 2 presents the demographic characteristics of cases and controls. Participating cases were significantly younger and less frequently presented with gliomas and lymphomas but did not differ for rural/urban residence. Participating controls did not differ significantly from participating controls in age, sex or in rural/urban setting.

Occupational exposure to EMF

Expertise of job histories resulted in 115 subjects (17.3%) occupationally exposed to EMF during their lifetime, 101 (15.2%) exposed to ELF and 35 (5.4%) exposed to RF. Cases

Table 2. Demographic and confounding characteristics of brain tumor patients and controls in a population-based case–control study, Gironde, France, 1999–2001

	Cases (n = 221)		Controls (n = 442)	
	Number	%	Number	%
Sex (N = 663)				
Females	126	57.0	252	57.0
Males	95	43.0	190	43.0
Marital status (N = 662)				
Married/cohabitant	159	71.9	330	74.7
Widow	27	12.2	50	11.3
Single/divorced	34	15.4	62	14.0
Education level* (N = 662)				
No or primary school	74	33.5	122	27.6
Middle school	82	37.1	141	31.9
High school	33	14.9	104	23.5
University	32	14.5	74	16.7
Residency in rural area (N = 663)*				
No	78	35.3	125	28.3
Yes	143	64.7	317	71.7
Smoking (N = 663)				
No	125	56.6	249	56.3
Yes	96	43.4	193	43.7
Occupational exposure to chemicals (N = 663)*				
No	155	70.1	348	78.7
Yes	66	29.9	94	21.3
Treatment of home plants (N = 654)*				
No	195	88.2	422	95.5
Yes	19	8.6	18	4.1

*$p < 0.05$.

were more frequently exposed to EMF than controls (20.4% vs. 15.8%, p = 0.12), a difference explained by a higher proportion exposed to ELF (19.0% vs. 13.4%, p = 0.048). A low and comparable proportion of cases (5.0%) and controls (5.7%) were exposed to RF, and most of them (61.1%) were also exposed to ELF. EMF exposure was considered possible in 66 subjects (57.4%), probable in 27 (23.5%) and certain in 22 (19.1%).

Analysis adjusted on potential confounders (educational level, residency in a rural area, treatment of home plants, occupational exposure to chemicals) is presented in Table 3 for all tumors and for histological subgroups. A nearly significant increase in risk was observed for occupational exposure to EMF (OR = 1.52; 0.92–2.51) and to ELF separately (OR = 1.59; 0.97–2.61). When considering the quartiles of cumulative exposure to ELF, no significant linear trend was observed: the higher risks were observed in the first (OR = 2.20; 0.91–5.34) and third quartiles (OR = 2.58; 1.02–6.53) while the ORs were, respectively, OR = 0.76; 0.28–2.06 and OR = 1.33; 0.54–3.27 in the second and fourth quartiles. The increase in risk remained moderate in gliomas (OR = 1.64; 0.78–3.48), while a doubling in risk was observed for meningiomas (OR = 2.19; 0.76–6.31). This result was not significant because of the small size of our study (only 13 cases exposed). Concerning neurinomas, risk calculation was rather imprecise as based on only four exposed cases. It showed a slight decrease (OR = 0.84; 0.20–3.49).

Results by histological subtypes were more obvious when considering ELF exposure specifically. Risk for glioma was only 1.20 (0.66–2.17) while a statistically significant trebling of risk was observed for meningiomas (OR = 3.02; 1.10–8.25). In the highest quartile of cumulative exposure to ELF, a significant association was observed for meningioma (OR = 6.82; 1.01–45.96) but the trend test was not significant (result not shown).

Environmental exposure

One hundred and fifty-nine subjects (24%) reported that they were mobile phone users. The duration of use exceeded

Table 3. Odds ratios for brain tumors according to occupational and environmental exposure to electromagnetic fields, CEREPHY study, Gironde, France, 1999–2001

	All brain tumors (n = 221)				Gliomas (n = 105)				Meningiomas (n = 67)				Acoustic neurinomas (n = 32)			
	No. of cases[1]	No. of controls[1]	OR[2]	95%CI[3]	No. of cases[1]	No. of controls[1]	OR	95%CI	No. of cases[1]	No. of controls[1]	OR	95%CI	No. of cases[1]	No. of controls[1]	OR	95%CI
Occupational exposure																
Occupational exposure to EMF																
Unexposed	156	339	1		60	165	1		51	119	1		28	55	1	
Exposed	40	63	1.52 [4]	0.92–2.51	18	42	1.64 [7]	0.78–3.48	13	13	2.19	0.76–6.31	4	9	0.84	0.20–3.49
Occupational exposure to ELF																
Unexposed	165	352	1		84	174	1		51	120	1		28	57	1	
Exposed	38	52	1.59[5]	0.97–2.61	21	36	1.20	0.66–2.17	13	12	3.02	1.10–8.25	4	7	1.23	0.26–5.75
Occupational exposure to RF																
Unexposed	148	375	1		71	191	1		61	121	1		31	59	1	
Exposed	7	22	1.50 [6]	0.48–4.70	7	16	1.44 [7]	0.50–4.13	0	2	–	–	1	5	0.40	0.05–3.42
Environmental exposure																
Proximity to power lines																
> 100 m	187	384	1		90	182	1		57	119	1		26	57	1	
100 m	16	20	1.51[5]	0.74–3.07	5	12	0.66 [8]	0.21–2.07	7	6	2.99	0.86–10.40	2	1	3.23	0.28–36.62
Mobile phone																
Unexposed	172	329	1		79	152	1		53	106	1		28	48	1	
Exposed	47	112	0.82 [5]	0.53–1.26	26	58	0.85	0.49–1.49	12	27	0.88	0.38–2.04	4	16	0.39	0.11–1.43

[1]Totals may differ because of missing data. [2]OR: odds ratios. CI: confidence interval. [4]Conditional logistic regression (with age, sex and place) adjusted for education and treatment of house plants. [5]Conditional logistic regression (with age, sex and place) adjusted for education. [6]Conditional logistic regression (with age, sex and place) adjusted for education, treatment of house plants and exposed at least to one occupational exposure. [7]Conditional logistic regression (with age, sex and place) adjusted for antecedents of viral disease and treatment of house plants. [8]Conditional logistic regression (with age, sex and place) adjusted for living in rural city.

10 years only for one subject and 5 years for 12 subjects. Thirty-six subjects (5.3%) reported having been an amateur radio-operator and 125 (19.2%) having lived near a power line during their life. None of these rough indicators of environmental exposure to EMF was found statistically associated with brain tumors (Table 3). A slight increase was observed for reporting a residency near a power line (OR ¼ 1.24, 0.82–1.87) and for amateur radio practice (OR ¼ 1.39, 0.67–2.86), while a nonsignificant decrease in risk was observed in mobile phone users (OR ¼ 0.82; 0.53–1.26), which was similar in the different histologic types.

Geopositioning of the addresses at interview and calculation of the distance to power lines classified 36 subjects (5.9%) as living at less than 100 m from a power line. The lines were mainly 63 kV or 90 kV but 10 subjects lived near a 225 kV or a 400 kV line. Only a few cases lacked data because of incomplete addresses (8.3%) but this was not related to case–control status. These cases were mainly men living in rural areas.

A nonsignificant increased risk of brain tumors was observed for subjects residing less than 100 m from a power line (OR ¼ 1.51; 0.74–3.07). Analysis by histological subgroups revealed heterogeneity: the risk tended to be lower for gliomas (OR ¼ 0.66; 0.21–2.07) and higher for meningiomas (OR ¼ 2.99; 0.86–10.40) and neurinomas (OR ¼ 3.23; 0.28–36.62). Among the 13 meningioma cases classified as living near a power line, 12 lived near a 63 kV line. The average distance to these lines was 53.6 m, and the average duration of residency was 23 years.

Discussion

Even if not statistically significant, an increase in the risk of brain tumors was observed in our study for occupational exposure to EMF, and it was more pronounced specifically with ELF. This increase was higher for meningioma with a statistically significant trebling of risk of meningioma in subjects occupationally exposed to ELF. Moreover, meningiomas were also associated with residential exposure to EMFs in subjects residing near power lines. Thus our results suggest an association between EMF exposure, in particular ELF, and meningiomas.

We did not find any significant association with RF but the frequency of occupational RF exposure and mobile phone use was quite low in our population, while associations with other brain tumor types were weaker or not found.

One strength of our study is the population-based design, with an active enrolment of incident brain tumors over 2 years in a defined geographic area, thus minimizing any selection bias, and a face-to-face interview enabling individual data to be collected. Malignant and benign tumors were identified continuously during the study period in collaboration with several departments of the teaching hospital. Data from the Diagnostic Related Group of the hospital discharge system were obtained as an additional source for identifying cases in the clinics, thus ensuring a high quality registration. It remains possible that some tumors were not collected, in particular in the elderly, for whom surgical indications are more limited. Nevertheless, the major developments in technologies generating EMF have mostly taken place in recent decades, so the elderly have not necessarily been more exposed. We also observed a lower participation rate of subjects with aggressive forms of brain tumors such as gliomas and lymphomas. A Canadian study suggested that the risk association could be stronger for more aggressive forms, which was judged consistent with the hypothesis that magnetic fields act at the promotional stage.[17] If so, the risk we found in our study could be underestimated.

Lifetime occupational and residential histories collected in a face-to-face interview made it possible to assess occupational and environmental exposure to EMF. Thus, exposure assessment did not involve subjects' memory and recall bias could be expected to be lower when compared to studies where exposure assessment was based on subjects' reports. This is especially important in a study exploring brain tumors, a disease likely to impair cognitive functioning. Indeed it is less difficult for subjects to recall their occupations or residences than specific exposure. There are also limitations in the methods used for exposure assessment. Occupational EMF exposure was assessed from job histories and not from individual measurements. To minimize bias, exposure assessment was carried out thoroughly by two hygienists blind to the disease status. Even so, a classification bias cannot be completely ruled out as conditions of work may vary from one job to another and from one period to another in the same job.[18] Real exposure could only have been documented by field measurements in the work place, but this was not feasible for all the subjects and even less so for their whole career. However, it can be assumed that exposure based on expertise is likely to bias the results toward the null as possible classification errors would have smoothed differences of exposure between cases and controls. Thus, it is not likely to explain the positive associations we found.

In the literature, residential exposure to power lines has been investigated for distances from 50 to 500 m.[11] Increasing our 100-m limit around the power lines would have increased the number of exposed subjects but would have decreased the specificity of exposure assessment. Sources of home exposure to EMF other than power lines could be of interest, such as electrical appliances, electric transformers and home configuration. However, this information over a lifetime could not been collected accurately. Moreover, even though electrical appliances may produce high EMFs, they are usually intermittent, so the fields are present over short periods and decrease very quickly with distance. The use of a GIS is an asset in our study. Although a time-consuming task, precise localization of the subjects provided accurate data regarding distance to power lines. Anyway it remains unclear how well the different methods for assessing EMF exposure (spot measurements in specific rooms, prediction models from geospatial propagation models and behavioural characteristics, geocoded distances to sources, self-reported data) represent personal exposure to all relevant sources of

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EMF lifelong. Personal measurements can be considered as the reference method but they are not feasible for collecting information in large epidemiological studies and on long-term exposure. The importance of home appliances as contributors to residential exposure is not clearly assessed. Some authors in United Kingdom have argued that they could be responsible for the main part of residential exposure (77% of exposure above 0.2 **1**T and 57% of those above 0.4 **1**T) while high voltage sources would account for the rest.[19] But some others say power lines represent the major source of residential exposure.[20] Differences might depend on electrical system available in the various countries and the ground current they generate. Further studies on exposure levels and determinants are needed to solve controversies. Anyhow, even if the surrogate for exposure we used (distance to power lines), is likely to have reduced the power of the study and to have lowered the risks, it does not question the association we found.

Occupational exposure to chemicals may introduce confounding in studies on brain tumors and EMF as it may occur together with EMF in the same jobs and has been suspected to play a role in tumorigenesis. Yet it has rarely been taken into account in published literature, and one study even suggested an interaction between EMFs and brain tumors.[21] We controlled our results for this factor with a rough but available indicator for all individuals.

As the study by Wertheimer in 1979,[22] that found a difference in risk of childhood cancer related to the electrical configuration near the home, many studies have explored the role of EMF in tumors, with specific attention being paid to leukemia and brain cancer.[23] Occupational exposure, mainly ELF, deserves specific interest as it is considered greater than that in the general population and thus offers a better opportunity for detecting risks, if any. Several meta-analyses have combined results from studies on occupational ELF and brain tumors, first in large cohorts of electric utility workers[24] and later on populations including a wide range of exposed jobs.[25–27] The latest one identified 48 brain cancer studies exploring occupational exposure and calculated an overall moderate but significant risk of 1.14 (1.07–1.22).[27] Heterogeneity between studies led to the conclusion that exposure assessment is a major challenge, and this has stimulated significant improvements over time in the methodology and quality of research in this area. However, less attention has been paid to consistency and accuracy in health outcome. Few studies have focused separately on histological subtypes and, if they did, it is gliomas that have attracted most attention. However, our results are consistent with the findings of Rodvall[28] who found a nonsignificant increase in risk of meningioma in subjects occupationally exposed to ELF (OR ¼ 1.8; 0.3–3.6) and no evidence in glioma (OR ¼ 1.0; 0.4–2.4). Both these sets of findings underline the necessity to consider not only brain tumors globally but also histological subtypes such as meningiomas.

The role of ELF residential exposure has been mainly studied in children. A recent meta-analysis identified 13 studies exploring this hypothesis and calculated summary effect estimates close to 1.0.[29] In the highest exposure category (above 0.3 or 0.4 **1**T), the estimate reached 1.68 (0.83–3.43). However, these results cannot be extrapolated to adults as histological subtypes differ substantially in age groups and, in particular, meningiomas occur only exceptionally in children. There have been very few studies in adults and most of them were carried out in the 1990s, after which scientific interest shifted toward RF because of the sharp increase in mobile phone use. All the studies on residential ELF in adults found risks close to the unity, but exposure assessment was rough, and the studies considered all types of brain tumors together.[30–35] A more recent study analyzed the risk of brain tumors according to histological subtypes in adults living close to high voltage lines in Norway and found an increase in risk for meningiomas (OR ¼ 2.1; 0.8–5.5) for an exposure exceeding 0.2 **1**T, while the risk was 1.3 (0.6–2.6) for gliomas.[36] In a study exploring the role of several electric appliances used near the head, a strong association was found between meningioma and electric shaver use (OR ¼ 10.9; 2.3–50) although the number of exposed cases was limited (n ¼ 35) and no other study has been performed to date to confirm this result.[37]

Although based on a limited number of exposed participants, our results suggest an association between meningiomas and exposure to ELF. This result warrants attention if one considers that few studies to date have explored the association between ELF and histological subtypes of brain tumors, especially in adults, for whom RF from mobile phone use is now attracting all the attention. Meningiomas are very rare in children and are more common in women than in men.[38] Because studies more frequently included children (for residential exposure) and men (for occupational exposure), there is a need to undertake studies specifically focusing on meningiomas, which account for 20% of intracranial tumors in men and 38% in women, and for which etiological research remains scarce. Recommendations concerning EMF exposure assessment in epidemiological studies have now been clearly laid down[39] and considerable improvement has already been made in recent years from the methodological point of view. Health outcome assessment is also a crucial challenge and poor classification of brain tumors may also lead to inconclusive results or to biased assessement of risks. Additional results from a larger sample will be available in the coming years in France: the analysis of a larger case–control study, the CERENAT study, including 596 brain tumors (218 meningiomas, i.e., three times the number included in our article) is ongoing.

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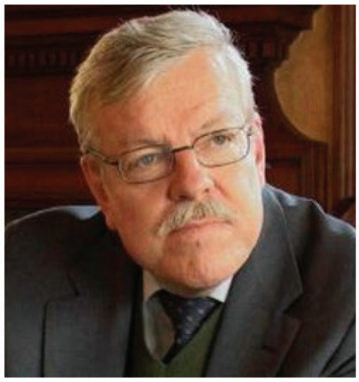

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The Karolinska Institute, Stockholm

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Science and Public Policy Institute, Washington, D..C.

Three Davids, one Goliath

Scientists collaborate to tell the world why microwave guidelines are inappropriate

Of what was believed in as the most reliable—
And therefore the fittest for renunciation
T.S. Eliot
The Four Quartets, No. III: The Dry Salvages
1941

Three of the most prominent minds in modern science have joined forces to produce a document that reformulates how electromagnetism affects living organisms and the failure - through intent or ignorance or indifference - of science, governments and big business to protect all living things.

Their findings - three years in the formulation - explain how health and well-being are damaged / destroyed by artificial electromagnetic radiation and that the present standard of measuring radiation - the Specific Absorption Rate (SAR) which is based on acute heating effects - is totally inappropriate when considering the effects of modern microwave-based technology in everything from microwave ovens, cell phones, wi-fi and pulsed signals such as Wi-MAX and Tetra.

In effect, the three men are saying the entire edifice of monitoring electromagnetic radiation is faulty because the monitoring system is trying to measure the wrong thing.

The three scientists, Dr. Dimitris Panagopoulos, of the University of Athens, Assoc, Prof. Olle Johansson, the Karolinska Institute, Stockholm, and Dr. George Carlo, of the Institute for Healthful Adaptation in Washington, D.C., have produced documentation which strongly suggests that the safety standards governing electromagnetic frequencies are not only inadequate and misleading but ultimately destructive to life.

Panagopoulos was among the first to prove that microwaves from cell phones damage DNA. Johansson early recognized that radiation from CRT computer monitors puts pregnant women and their unborn babies at risk while Carlo, a public health scientist and

epidemiologist, first recruited to establish present standards, broke away when he learned that counter to finding that cell phones were safe, they actually caused harm.

"One of the main fortresses of those who claim that microwave radiation does not cause any adverse health effects is the erroneous measure (=SAR) introduced by them to estimate EMF bioeffects. In the present paper** (included as a pdf together with an errata list), we tear down this fortress," said Johansson. "Our paper is a comprehensive critique and integration of the science around SAR is in conflict with the FCC, IEEE, ICNIRP, and other government safety standards, and the standard approaches used in safety studies of EMR around the world."

Their combined findings affect everything living on the planet today due to the universal use of microwaves. Their assertions rank with Galileo who was vilified for asserting that the planets revolved around the sun. Each of the three, like Galileo, have suffered academic persecution for their efforts. It is relevant that while they personally have been subjected to everything from insults to death threats, their scientific evidence remains unassailable.

Condemned to possible oblivion through the required use of scientific jargon and government and corporate resistance, their paper, *Evaluation of Specific Absorption Rate as a Dosimetric Quantity for Electromagnetic Fields Bioeffects*[1], demolishes SAR as the standard for measuring man-made radiation and the dangers to all living things. There is also emerging evidence that this radiation affects the built environment as well.

Central to their discussion is the definition and understanding of SAR which is defined as the standard used by governments to monitor cell phone radiation. The SAR or Specific Absorption Rate of a cell phone is based on the amount or electromagnetic energy absorbed by living tissue.

SAR is a "way of measuring the quantity of radio frequency (RF) energy that is absorbed by the body," according to the Cellular Telecommunications Industry Association (CTIA). In North America, SAR is measured in watts per kilogram (or W/kg) averaged over one gram of biological tissue while in Europe SAR is averaged over 10 grams. The FCC limit, which averages over one gram of body tissue, is much stricter than the rest of the world.

In North America, a cell phone's SAR rating for the human head is measured between 0.0 and 1.60 with 1.60 set by the Federal Communications Commission (FCC) while in Europe SAR ratings run from 0.0 to 2.0 as adopted by the European Union Council and recommended by the International Commission on Non-Ionising Radiation Protection (ICNIRP).

According to the CTIA website: "From time to time, some researchers report that a study shows a possible connection between radio frequency fields and a health problem. These reports are sometimes the subject of dramatic stories in the broadcast media and sensational material on some websites. Of course, responsible expert authorities do not base their conclusions on just the latest study – they evaluate all of the relevant studies."[2]

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[1] Panagopoulos, D., Johansson, O., Carlo, G. *Evaluation of Specific Absorption Rate as a Dosimetric Quantity for Electromagnetic Fields Bioeffects.* PLOSIone. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0062663

[2] http://www.ctia.org/consumer_info/index.cfm/AID/10371

Thus, industry is in a position to sideline criticism or fuel confusion. This is done most often by scientific reports commissioned by industry through Technology Transfer Offices at any of a number of universities or through the League of European Research Universities. While independent researchers are sidelined and deprived of funds, paid for research invariably returns evidence favourable to the industry that paid for it. Nowhere has this been more obvious than the success of Mike Repacholi, industry consultant former coordinator of the World Health Organization's Radiation and Environmental Health Unit in Geneva until 2006 and Karolinska Institute Prof. Anders Ahlbom who was accused of conflict of interest at the International Agency for Research in Cancer (IARC). It was Swedish writer Mona Nilsson who discovered that Ahlbom was co-founder of "Gunnar Ahlbom AB" a Brussels-based lobby firm aiming to assist the telecom industry on EU regulations, public affairs and corporate communications.

The SAR standard is further compromised by the fact that it was first formulated by the IEEE in 1982. As outlined by Mason, Murphy and Petersen[3], safety standards were established by engineers - not doctors or physicists or biologists - but by technical people. Effects at the cellular, atomic or sub-atomic level were not taken into consideration because there was no way of measuring them and it suits industry to keep it that way.

The argument about the safety of microwave communications is further complicated because people can not feel the effect of microwaves passing through their bodies or see the signals accounting for the general lack of concern and popularity of cell phones. The Panagopoulos/ Johansson / Carlo paper compensates for the overall indifference of the ordinary cell phone user by looking at the mathematics behind the physics - complete with physics equations - and the behaviour of living tissue at the molecular level.

The scientists readily show that SAR can not be realistically measured below the Thermal Effect, when the basic defense of CTIA as well as the entire microwave communications industry in both the media and the witness box is that there are no biological / health effects other than thermal. The three scientists first prove through a series of equations that disturbances or oscillations within cells induced by environmentally accounted microwave fields disturbances or oscillations do not cause heating, and secondly, that heating is not at all necessary to cause damage. This assertion alone has a profound implication for public investigations in both Canada and the United States.

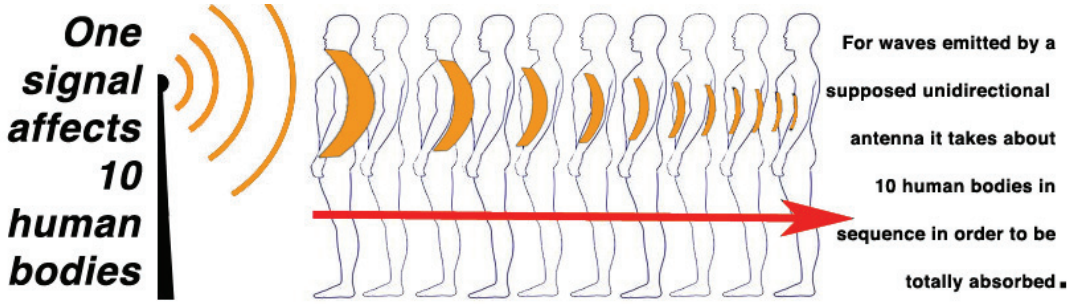
> Even though some scientists still express skepticism regarding the existence of non-thermal effects, there is already a large and constantly increasing number of studies indicating that environmental man-made EMFs can produce severe biological alterations such as DNA damage without heating the biological tissue. This can take place through non-thermal mechanisms that involve direct changes in intracellular ionic concentrations or changes in enzymatic activity. DNA damage may lead to cancer, neurodegenerative diseases, reproductive declines, or even heritable mutations. Brain tumors, decrease in reproductive capacity, or symptoms reported as "microwave syndrome" (headaches, memory loss, fatigue, etc), are observed among people exposed to mobile telephony radiation during recent years. Recently the International Agency for Research on Cancer (IARC) has classified RF/microwave EMFs as "possibly carcinogenic to humans"

This assertion could have an impact on the outcome of the public consultation of the Royal Society of Canada in Ottawa in early July when the RSC's Expert Panel reviews Canadian Safety Code 6. It was Dr. Magda Havas of Trent University, Peterborough who

[3] Mason, Murphy and Petersen. IEEE EMF Health & Safety Standards, Radio Frequency Radiation Branch Brooks Air Force Base, Texas, 78235

prised the admission from Health Canada scientist, James McNamee, that the Safety Code 6 guideline for microwave radiation (which includes radiation from most devices using microwave technology such as cell phones, cell phone base stations, cordless phones (DECT), Wi-Fi, wireless toys and baby monitors, smart meters etc.) is based only on the heating effect where previously Health Canada claimed that Code 6 relates to both Thermal and non-Thermal effects. The discovery stirred even more controversy when it was learned that even the Thermal Effect was narrowed to specific frequencies.

One of the problems of SAR is that it is based on conductivity of living tissue while the



available conductivity measurements have been taken from dead animals. The variations in conductivity which are very large even within a single cell are not taken into account and increase dramatically in live animals and even these conditions change with the age of the creature. This leads to the universally accepted assertion that children are more vulnerable to microwave radiation than adults, According to their paper, the relative "permittivity" of an adult human brain is calculated to be around 40 while the corresponding value for a young child's brain is between 60 and 80 resulting in almost double the radiation absorption and SAR. Permittivity is a physical quantity to describe the "ability" of an electric field to propagate within a medium. Children, they claim, are as much as doubly vulnerable as adults to the bio-effects of electromagnetic fields.

Given the innumerable frequencies in the environment and the innumerable conductivity variations within the human body which vary from individual to individual, the attempt to realistically estimate the SAR from conductivity measurements becomes fruitless. Thus SAR can only be realistically estimated by temperature increases which do not occur at environmentally accounted EMF intensities. "Man-made electromagnetic fields at environmental levels do not normally cause thermal effects (measurable temperature increases within exposed biological matter)", say the scientists, adding, "and this is in agreement both with experimental studies and plausible proposed mechanisms for the action of EMFs on cells. Thereby, it follows that, SAR is not a proper measure to describe the *biological* activity of man-made electromagnetic fields at environmental levels.."

The difficulty of establishing a SAR value is exacerbated by the actual measuring technique. There are three ways to calculate SAR:

- insertion of micro-antennae in tissue
- insertion of thermal probes into tissue
- numerical modeling

The use of micro-antennae, perhaps easy to administer, is limited due to the complexity of the tissue being measured. While the use of thermal probes gives a better result because

temperature is more evenly distributed but the insertion of probes disturbs surrounding tissue and can result in unpredictable outcomes.

While the third method of establishing a SAR value, numerical computer modeling, is considered the best alternative of the three, it, too, has limitations. Just as a digital photograph is composed of digital components called pixels, tissue can be broken down into miniscule cells called voxels. Values are assigned on how well the voxel conducts electricity, its resistance to an electrical charge, and density. But the human body with its widely varying components - skeleton, organs and tissues and fluids and chemicals - is vastly complex leading the scientists to conclude: "all methods of simulation, no matter how much improved, are and will always be, highly simplified compared to living tissue, since they can never take into account the countless variations in the physical parameters of living matter especially at cellular level."

Here, the scientific trio edge into Einstein's Theory of Relativity and the intricacies of physics and the interaction between living beings and any number of microwave signals and frequencies. With countless variations within living matter and consistently increasing and varying microwave frequencies, SAR estimation for non-thermal radiation levels verges on Chaos Theory.

The question arises of how can you correlate two interacting elements which are both changing dynamically while being measured. This, the scientists identify as the "non-linearity between electromagnetic exposure and biological effect". In the same way that laws have been enacted to set a limit for alcohol consumption while driving, the amount of alcohol consumed by a driver results in measurable blood alcohol levels which can be related directly to physical functioning behind the wheel of a car. This is dosimetry, the dose or amount of alcohol which results in an altered state of consciousness that renders a driver unfit to drive. The present SAR dosimetry of microwaves does not work.

The scientists note, "The biological/health effects from man-made EMFs/non-ionizing radiation, do not follow a linear dose-response (or cause-effect) relationship according to the experimental evidence." They explain that there are inconsistencies. "Experiments have shown that, the absorption of a larger amount of energy by the same mass of a given tissue and within the same time-interval, does not necessarily induce a larger biological effect. In other words, a more intense field or larger SAR does not necessarily relate to a larger biological response or consequent health effect."

This is what the scientists refer to as the "non-linear relationship" between exposure and biological effects. It is particularly relevant at the lower end of the non-ionising spectrum "where the largest effects do not correspond to the largest SAR or intensity values". This is a non-linear relationship or what Edward Lorenz identified as the "Butterfly Effect" in his paper of the same name delivered in 1972 to the American Association for the Advancement of Science in Washington, D.C. It is here the entire SAR standard crumbles.

The paper cites several studies where results of tests do not match expected outcomes, particularly a 2008 study by J. L. Eberhardt, B.R.R. Persson, A.E. Brun, L.G. Salford and L.O.G. Malmgren of the Department of Medical Radiation Physics, Lund University Hospital, in Sweden. They recorded damage to the blood-brain barrier in rats while other studies revealed no effect on the blood-brain barrier but the strongest effects were prompted by the weakest radiation intensity. This is chaos, indeed, and could well account for the absence of replication studies, a fact government and industry are quick to point out. It is also possible that when there is such divergence between cause and predicted effect, the SAR standard could further complicate matters, making things even worse.

A further complication is the presence of what the scientists term "windows" where biological effects are more pronounced regardless of the intensity or frequency of the radiation. In particular they cite two different studies in which Panagopoulos was lead author. Both reported DNA damage was more pronounced at 10 μW/cm^2 than at 250 μW/cm^2. "If the corresponding biological effect increased proportionally, there would be no 'windows'' or other non-linear effects in regards to intensity or SAR. Nevertheless such effects exist and they are repeatedly recorded since the mid-seventies."

In the absence of an absolute or linear relationship between exposure and biological effect, the scientists conclude that neither SAR nor radiation rate is proportional to the biological effect. That does not indicate that there is no relationship. On the contrary, they assert that there is a relationship and that it is "intimately associated with living matter" and recommend a method of measurement standard which is much easier to quantify - the amount of radiation reaching the skin. "We should at least use a measure that can be known more precisely," they claim. "Such a more precise quantity is the radiation/field intensity on the surface of the biological object as measured by any qualified and calibrated radiation/field meter - plus the additional physical parameters of the field/radiation which can also be accurately known, such as pulse and/or carrier frequency, waveform, modulation etc."

In discussion, the scientists restate the disparity between the SAR which is actually based on the heating of tissue and the absence of consistent temperature increases. Living tissue is in constant activity and biomolecules oscillate with microwave stimulation.

The difficulty with the SAR standard is that it does not and cannot account for the increased bio-effects of pulsed / modulated microwave signals. "SAR offers no information at all with respect to frequency, waveform, or modulation of the EMF/radiation although these parameters are directly related in the literature to biological (and consequent health) effects," explain the scientists. And this is exacerbated by the fact that - and studies have proven it - "that fields of the same SAR but of different carrier or modulation frequencies produced different biological effects on the same biological sample."

The final two paragraphs of the document are telling. The scientists agree that due to the non-linearity in findings on electromagnetic frequencies and that neither SAR nor radiation field intensity are precise enough to track biological effects, another way must be found to account for the effects of EMFs on living things.

They conclude that SAR should not be held up as the "dosimetric quantity to describe non-thermal effects" and that it should only be used in tandem with measurements of intensity with the variation in measured SAR values included in any results. They assert that the measurement of EMFs could be achieved quite readily in laboratories around the world by properly trained technicians using accurate intensity meters already available in the market place and not be based on complicated, time-consuming and largely inaccurate methods of SAR estimation that cannot be readily performed.

The need is becoming more urgent, they claim, "As increasing evidence is being accumulated for intense biological activity of man-made EMFs with consequent adverse effects on the human health and the natural environment, the need for fast and reliable measurement/dosimetry of such fields is becoming demanding."

Panagopulos, citing his chapter of the book, *Electromagnetic Fields: Principles, Engineer-*

ing Applications and Biophysical Effects[4] says, “just one sentence since the abstract describes everything,” adding, ‘The electromagnetic nature of living matter makes the possibility of *no effect* from man-made electromagnetic fields sound naive and absurd’."

Commenting on the significance of the joint paper, Dr. Carlo said, “our paper has a much more profound message: When the SAR is used as an exposure metric in research studies, the imprecision means that studies which show 'no effect' are likely 'false negatives' and studies that show an effect are likely under-reporting the true risk. This imprecision is a fatal flaw -- derived from a systematic bias toward the null -- that calls in to question the validity of a large percentage of the scientific database that everyone relies upon in assessing risk, danger and modes for protecting the public. It shakes the foundation of the science that we are using to sort out the full range of non-ionizing radiation health effects.”

Assoc. Prof. Johansson, too, agrees with Carlo in the influence industry has had in the recognition of potential biohazards in the environment and the proposed movement to a system of biomarkers in the establishment of safety standards for microwave radiation. “Our paper,” he said, “is a comprehensive critique and integration of the science around SAR, and it is in conflict with the FCC, IEEE, ICNIRP, and other government safety standards, and the standard approaches used in safety studies of EMR around the world.

Essentially, Johansson claims, the paper concerning the short-comings SAR is an important step away from what he calls “plastic doll-based research” and towards biologically-based safety recommendations with genuine relevance for living organisms.

“In our minds,” he said, “this is the only way to approach these issues, especially since children may be at great risk. To continue to use SAR as a safety recommendation after our paper now has been published will only demonstrate total ignorance of and disrespect to the actual facts in the matter. We therefore choose not to wait but to act.”

This willingness to act in the face of vast financial resources and global power is indicative of the beliefs of the three scientists that they are protecting humanity. The importance of their paper was anticipated by poet T.S. Eliot[5], author of *The Wasteland*, considered by many to be the most influential poetic work of the 20th Century, and contemporary of electricity pioneer Nikola Tesla, who wrote about electricity in anticipation, perhaps, of Dr. Panagopoulos, Prof. Johansson and Dr. Carlo. Said Eliot:

Right action is freedom
From past and future also.
For most of us, this is the aim
Never here to be realised;
Who are only undefeated
Because we have gone on trying...

- John Weigel

[5] Like the three scientists, Eliot, too, rejects the concept of linearity.

Tribute

EMF Warrior

Victor Nixon points to U.S. Federal action

It is the international system of currency which determines the totality of life on this planet. That is the natural order of things today. That is the atomic and subatomic and galactic structure of things today! And you have meddled with the primal forces of nature, and you will atone! Am I getting through to you, Mr. Beale?

Paddy Chayefsky
Network, 1976

Victor Nixon disagreed.

Early on Nixon explained, "I am a listener, the Quiet One; I reap / glean information applicable to the situation at hand. This enables me to decide on the best course of action in minimal time - Fine tuning it as I go. Confrontation I can deal with. In whatever form it may take. Physical confrontation without words I excel at, actually enjoy. I have never lost a physical confrontation of any size with or without weaponry. I have just one confrontation scar physically, one mentally. Paid that latter back in Sudan in 2006; thought I was done; apparently I'm not. This time it's a different kind of fight - 'The pen is mightier than the sword', is an adage that I am using right now – A different form of confrontation."

Nixon had embarked on yet another life-saving mission based on self-preservation, idealism and pragmatism. A friendship began with the self-introduction of "My name is Victor Nixon, originally from England, and a M.Sc. Computer Systems (Automation) Engineer with 28-plus years global experience. Presently I am embroiled in a litigation lawsuit with an electrical utility company via the Pennsylvania Public Utilities Commission which has been on-going for over a year."

The introduction was prompted by a call for submissions to the Irish government's Joint Committee on Environment, Transport, Culture and Gaeltacht which planned to conduct an investigation into the proliferation of electromagnetic signals and operators. The committee door had been prised open by Patricia Faherty in Co. Donegal who innocently asked if she could make a submission outlining the problems associated with microwave technology.

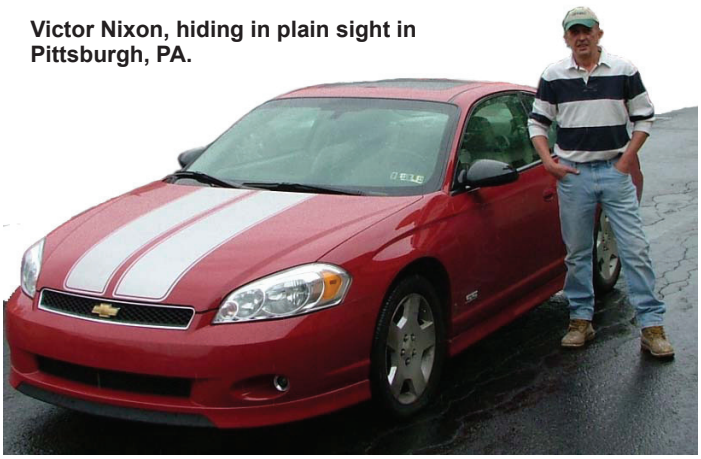
Like-minded individuals such as Dr. William Cohen, Ph.D, claim profit maximization can be perilous. He claims, "What has this to do with you or me? Regardless of our organization and whether it is profit or non-profit, Drucker's truth holds. If we want our organization to be successful we have to remember that while 'profit' is essential to support innovation and marketing actions, profit maximization is not only not the purpose, it is bad for society and hazardous to our organization's health." Unwittingly, Nixon found himself among like-minded individuals like Cohen and Peter Drucker, an Austrian-born American management consultant, author and philosopher who believed, "The most important thing in communication is to hear what isn't being said."

Upon questioning, the Clerk of the Committee admitted that anyone could make a submission. It opened the floodgates as well as Nixon's resurrection: officially, following the Darfur genocide in 2003, Nixon "did not exist".

As the genocide in Darfur continued Nixon wrote two novels, calling his contribution to the cause "entertainment with a purpose." He published *Kalunga: A Global Warning* on President Barack Obama's Inauguration Day and the book made Amazon's "Hot New Releases/Future Best Sellers" list. The word "kalunga" means "between two worlds," which, according to Nixon, is where the book's main character finds himself. "The main character is stuck between a normal life and his past role as an expert life-taker, trained to be that way," he said.

After Darfur

Victor Nixon, hiding in plain sight in Pittsburgh, PA.



Nixon attached supporting documents with his introduction, adding, "Personally, I do not believe that there are people who are 'electrosensitive'; I do, however, believe that the secrecy enveloping the "Mysterious Worldwide Hum" is unlawful and that the perpetrators will shortly be brought to justice. "This 'Hum' and 'electrosensitivity' are caused by a single, ubiquitously utilized piece of equipment and a 40-year-old technology rebranded as Broadband Power Line Communication (B-PLC). I have evidence and proof that confirms this statement," he added, explaining that it had taken him two years of research to solve a mystery with world-wide ramifications.

Nixon ended the e-mail with a challenge, "Your next move I believe." Confrontational. British, definitely SAS.

Thus began a blind correspondence. As events unfolded, Nixon's conclusions became more pressing, the conspiracy of silence more pronounced, the revelations of world-wide corruption, heroism, and self-serving egos grew increasingly malevolent.

Next came a basic lesson in electricity and the creation of currents. Victor's stance emerged more clearly, "OK John - As any Starfleet Officer would say while holding a Phaser to a Borg's head, 'Assimilate this!' Before we begin – I received Power Spectrum samples from DENMARK this morning. The frequency distortion is identical to the UK, NZ, and Australia Same equipment. Incidentally, this entire 'thing' can be likened to the story of 'The King's New Clothes'." A personality emerged. Persistent, intelligent, aggressive. Nixon's humanitarian instinct as well as his grasp of how society functions was revealed in the next short observation, "There is no safer alternative. We as a species need to look further afield than our own backyard and under the streetlamp. Stay tuned for the next exciting episode."

Regarding the Irish enquiry, Nixon was less than sanguine, "You do, of course, realize that the Irish government ELF inquiry will end up giving electrical, EMF, and ELF emissions the

all clear. I gave you a taste of the mentality that an individual must preserve to nail these bastards that are doing this to us.

"It is becoming plain to me, as ridiculous as it may sound, that 'they' and the PTB are attempting to 'offload' a few million 'Boomers' by early death from natural causes - Think about it. I helped a Danish man, Ralph Sylvestersen, to take spectrum analyses over the past couple of days. His 'noise' was 93dBC - As loud as a diesel train pulling away from a station - IN HIS HOME! The same errant frequencies show up on EVERY one of his scans that are showing up globally - But then it would, it's the same equipment. To tackle "them" one must have the tenacity of a Jack Russell Terrier - Sink your teeth in and HANG ON. It's going to be rough ride."

In 2009 Sylvestersen complained that it was then "impossible to find a peaceful place" in Denmark in what he describes as a "noise inferno". Using his logic that "wiring minimizes the electrical field strength" raises the question of what type of inferno is being created by reliance on wireless technology.

In addition to his reference to Sylvestersen, Nixon included a plea from (name withheld at Nixon's request) writing from east Tennessee after fleeing a "sound in Oregon" where she lived for 38 years. To her congressman, Democrat Peter DeFazio, she wrote, " Human hearing is so individual and I am unfortunate in this situation to have good hearing, to be sensitive to radio frequency transmissions and to live in a home that seems to be in direct line of their antenna transmissions. It is so hard to see my dog and the wild animals suffer because if I hear it and it is distressing to me it must be excruciating to them. Help us please." Her plea fell on proverbial deaf ears, as is happening across the world.

Perhaps the best way of describing Nixon is the way he described himself early on. "Ya know John - Some people describe me as having had a very 'colorful' life. But there is one thing that I have always stood for in all of my actions - Doing what I think and know is right, honest, and honorable - No matter if it's the hard way of doing it or not. I do not take the path of least resistance. I take the bull by the horns and fight it to the ground."

His bravado was sorely tested by the Irish. A week before the deadline for submissions Nixon commented, "I will not kow-tow to any 'inquiry' regardless of its origin and seemingly good intent. The Irish inquiry will not even address the issue in its entirety - It's called Smart Grid - And it's global." When he first submitted his complex electrical explanations, complete with diagrams and scientific formulae, the Clerk for the Joint Oireachtas Committee on the Environment, Eugene O'Cruadhlaoich, noted that the computer files could not be opened by the Irish Parliament's (the Dail's) computer system.

Among the documents he submitted were readings taken from around the world, including one from Sylvestersen who commented from Denmark: "Tonight there is a heavy 'hum' so I have made a new measurement. Serious as it can be - I think it is life-threatening, and yes, I am very uncomfortable tonight."

Simultaneously, Nixon had also taken on the West Penn Power Company based in Greensburg, and the Pennsylvania Public Utilities Commission. On 10 Jan. 2012 he submitted a letter to Rosemary Chiavetta, Secretary to the Pennsylvania Public Utilities Commission in Harrisburg, including seven exhibits, bringing to 26 the number of documents relating to the proliferation of microwave radiation, specifically through Broadband over Power Lines. Among the documents submitted were spectrum analysis measurements, power spectrum scans, field measurements, letters of complaint from people across the United States and a NASA research document, "Mechanical Resonant

Frequency of the Human Eye in Vivo" which explains visual disturbance in the 18Hz subharmonic range.

In return, Victor asked for regulatory compliance documents as well as test measurement documents. If these even existed, the documents would prove conclusively that the public was being radiated.

Chiavetta remained evasive. Following a request regarding the status of numerous formal complaints to the PUC, she reminded Nixon, "It is not necessary for you to provide me with a status report of the various complaints and litigation you currently have before this Commission."

"I am sure," countered Nixon, "that these formal complaints are in the process of being legally administered. However, as I have not received any communication regarding any of them from any of the parties concerned utilizing eServe or any other delivery method notification since Nov. 15, 2011 it would be very much appreciated if you could explain and summarize where each is in said legal process."

'I should state the following: Administrative decisions can be made in private. Judicial actions and decisions enacted in camers based on a formal complaint made by a member of the public cannot, and are, illegal.'

-Nixon addressing the Pennsylvania Public Utilities Commission

Chiavetta was not giving anything away and Nixon would not be ignored. His reply prompted Chiavetta to reply in late January that Complaint C-2011-2266144 was being considered by an Administrative Law Judge and a second complaint, C-2011-2270951, had been assign to an ALJ for hearing. Arguably ultimately responsible for correspondence to the Pennsylvania PUC, Chiavetta referred to protocol, explaining that the commission does not accept complaints by e-mail or FAX. "Therefore," she argued. "please refrain from emailing me complaints, pleadings or documents involving your cases before the Commission. Either use the Commission's eFiling system or mail your filings by first class or overnight postage to my Harrisburg address with verification, original signature, and certificate of service to the other parties of record."

She, thus would accept complaints on paper, but not electronically. The proceeding had apparently been initiated but without notifying Nixon. "These (expletive) cut me out of the 'notification' loop and went ahead with legal decisions," said Nixon.

In what should have been a straight-forward explanation, procedures put in place blocked his access to the decision making process. "My original email at the beginning of this, now series of repeatedly asked queries, was simply to discover the legal administration progress of my formal complaints with the PA PUC. I have been informed by you today that they have been enacted upon without notification or informing me of their procedural execution," Nixon told Chiavetta.

To put a fine point to Nixon's argument he explained, "I should state the following: Administrative decisions can be made in private. Judicial actions and decisions enacted in camera based on a formal complaint made by a member of the public cannot, and are illegal. Presently, I am seeking legal advice from the Pennsylvania Attorney General's

office and the U.S. Federal Attorney General's office. The latter being contacted as a Pennsylvania State official has violated my Rights."

The lack of clarity from Chiavetta and the Pennsylvania PUC formed the core of Nixon's complaint to the Unites States Department of Justice that his civil rights had been violated, firstly on the basis that microwaves were being transmitted through his body without permission and secondly that barriers had been erected and used to prohibit him from seeking redress through organizational protocols and red tape. The significance of this complaint to the U.S. Department of Justice is that others planned to support Nixon at the Federal level and the wall of silence would be breached.

With another legal challenge in the process, Nixon turned his attention to the issue of "The Hum" being experienced around the world. The phenomenon was first reported in the United Kingdom but seemed focused on Bristol in Wales in the mid-1960s. The Hum is often known by a local name: the Taos Hum in New Mexico, the Largs Hum (Scotland), the Kokomo Hum (Indiana). It is heard across Northern Europe, the USA, Canada, Australia and New Zealand and has become a global phenomenon. In 2012 The Hum surfaced in Windsor, Canada and in Co. Kerry, Ireland.

According to Nixon, The Hum is a manifestation of the electrical principle of reactance which even challenged Einstein. "Reactance is similar to the standing wave effect on a guitar," explained Nixon. "The strings are fastened between two points and are tightened. Pluck a string and it vibrates, moving the air around it and making what we call a "sound". This vibration depends on the thickness of the string and how tight it has been pulled. Now, if you lightly touch the string once at its centre point the vibration of the string is halved. From this centre point the vibration moves away from the centre point along the string, reflects at the end and moves back toward the centre, where you touched the string. The vibration meets itself and rebounds off itself back along the string again repeatedly. When the two vibrations collide a "sound" is produced that is twice the original frequency – reactance – It is actually a Reactance Standing Wave. This is a harmonic – It is twice the original frequency."

Touching a guitar string anywhere as it vibrates creates two separate waves producing two different frequencies and because these two waves are on the same guitar string they are considered imbalanced. This is the principle of subharmonics or distortions. The word "harmonic" implies a "balanced" wave. A subharmonic is an imbalance. Because of the imbalance, the "sound" only occurs once and is the result of taking one (wave's frequency) from the other and not a doubling as in the above example. This is a subharmonic – It is the result of the canceling out of the main frequency and leaving just the remnant. Unlike a guitar string which eventually stops vibrating after being plucked, modern electronic signals such as Tetra or Wi-MAX are pulsed continuously. When a frequency is produced that doesn't stop, it results in a subharmonic "hum".

"I noticed," he later explained, "that IBM is among the big players in trying to cure reactance in power lines. As stated, 7-9 percent is the historical acceptable loss in electricity transmission lines. My mental arithmetic comes up with six percent to reactance and harmonics. Smart Grid is destined to save each consumer 1-2 percent on their bill; for which the electrical utilities get a whopping $20 Billion in Stimulus money if they realize by August 2012. The driving force behind the "Smart Grid" is taxpayer money at every level."

On the Google Forum Nixon explained what the Hum was: “Today (Sunday) O'Brien (proprietor of the Irish Independent) and Murdoch allowed their Editor in Chief of the Irish (edition of the Sunday) Times to run a misleading article on the (since May 2011) Beaufort Hum.

“The 4th column - Discordant Note - States that one in five (20 percent) people hear it and that it is the note of Eb (Eflat). It's actually Eb2 or F#2 at the frequency of 90.98Hz which is 27-32 cents away from the actual note. It's also not the note that people are hearing but the Electrical Power Subharmonic of that (almost) note. And as these one in five hear in the C-range, guess what it sounds like? A diesel engine. Whooda thought?!

“Octave Harmonics and Electrical Power Harmonics are not the same. It misleads to quote one in terms of the other because the operand differs. Plus the sound you hear is NOT the frequency that is picked up by instrumentation. The sound that you hear is the remnant of the collision of sine waves.

“I've attached the article and a Power Scan showing the 90.98Hz interharmonic right here in Pittsburgh today. Same everywhere - And it would be, it's a global communication system that ‘they’ are denying exists,” Mr. Beale would have approved.

In spite of requesting that Nixon not contact her, PUC Secretary Chiavetta again received another request for up-dates regarding his complaints. His first complaint against emission for equipment owned by West Pennsylvania Power had been assigned a docket number to be adjudicated by an Administrative Law Judge. A second undocumented complaint had been given an Assignment Notice which was change on the same day. A complaint relating to equipment owned and operated by Verizon had been referred to the U.S. Federal Communications Commission (FCC). A third complaint carried a docket number which was not associated with any of Nixon’s other documents in which the FCC bounced the original complaint back to Chiavetta’s desk. “I can only assume,” Nixon told the PUC secretary, “that as WPP did not respond with objections to the complaint in PA PUC Docket No. C-2011-2266144 that there was No Contest to my complaint. Please send me a timetable of expected dates when the associated equipment is to be de-energized and removed.”

He ended his statement with the words, “I have provided you with 100 percent irrefutable proof and hard evidence of this technology’s deadly emissions; you will not allow me to present it in a court of law. Evidence of this technology’s equipment installation is everywhere; in substations and on every electrical power transmission line pole. The cover up of this technology and its destructive emissions must end, the equipment de-energized and removed.”

Chiavetta’s response was short - two lines - telling him it was not necessary for him “to provide me with a status report of the various complaints and litigation you currently have before the Commission.” Nixon had quickly become a nuisance.

The same week up to 10,000 cattle died in Vietnam, 55 buffalo died mysteriously on a Cayuga County, New York farm, 200 cattle died in Wisconsin and the Canadian Department of Fisheries and Oceans reported a large number of dead seals off the coast of Labrador with a number of other unexplained animal deaths in Ontario, Canada, Italy, Brazil, Sweden, the Philippines, the U.K., Haiti, Australia and New Zealand.

As February began Nixon and his son commenced building a tablet computer using the Android operating system for full digital integration with Smart phones and computers. He also reported that the weather was fine except for the "darn noise". It was this "noise" that led Nixon to oppose the so-called Smart Grid system of distribution and metering.

"In October 2009 I began hearing a noise," he explained, "It was, and is, a low-frequency noise, the (musical) notes of B_1 and Bb_1 (B flat 1 – Subscript 1 denoting octave #1) joined together to produce a monotonous fluctuating drone 24/7 in the volume range of 60 decibels (dB), the level of someone talking, to 80dB, the level of a running kitchen garbage disposal unit. Ultimately I discovered that these notes were harmonics in the dBC range of emissions from power lines outside of my home."

In a highly reasoned document to the United States FBI - recommended to him by a police official in South Fayette Township outside Pittsburgh - Nixon explained the results of his research into the sound - an unwanted presence reported across the northern hemisphere. Nixon explained that Federal and State environmental protection agencies no longer regulate noise levels nor do they have at their disposal people who are capable of monitoring Smart Grid emissions.

'Every game piece is set in place for a catastrophe of global proportions to imminently occur.'

-Nixon in a letter to the Federal Bureau of Investigation

"My research has shown that there is no IEEE or NIST Standard governing Smart Grid implementation per se in the USA," said Nixon, "Consequently, the Smart Grid industry is broadly employing equipment that is "iffy" at best; injurious and probably harmful to all life as a given physical fact. Neither is there any higher authority overseeing the installation of Smart Grid other than the Smart Grid industry itself. Every game piece is set in place for a catastrophe of global proportions to imminently occur.

"Whether people can hear this noise or not the physical effects will ultimately be the same. This is the part of the issue at hand that did not, and does not, make sense to me to this day; but my research has proven it to be true. The people that are working on, and rolling out, this technology are also harming, and possibly killing, themselves along with millions of others, human or otherwise."

In his summary Nixon noted how the unseen menace of microwaves began to surface in California with concerns about a tower in San Francisco. Anthony Hilder, writer and filmmaker, painted a more extreme interpretation of Nixon's evidence to the Irish government and the Pennsylvania PUC. "Twenty million death rays hit San Francisco - what else can you call it but murder," said Hilder, "Death rays from the Sutro Tower that overshadows San Francisco. Death from above in the form of rays that you can't see but are going right through you." Nixon's reaction was "Someone, somewhere has to come up a very subtle, non-confusing, 'This is important stuff for all of you to realize folks,' explanation. If Hilder can't get the message across he's wasting his time trying. To fight this in the Courts you have to be specific and 100 percent data backed up to prove it. Right now I'm supplying and trying to fire people (who hear the associated 'noise') up to file formal complaints in their respective areas across the USA. If sufficient people file it'll start to get noticed. If people can't hear it, people don't care."

Hilder, too, had made a submission to the Joint Oireachtas Committee. As the deadline for submissions neared, a member of the committee circulated Nixon's submission and sent it back to Victor. "Why has this person sent me my own file," he asked.

At the same time, Eugene O'Cruadhlaoich, Clerk of the Committee, circulated a letter explaining that due to the pressure of business and in spite of the looming deadline, committee members could not be kept to a schedule. "The Committee recognizes that this is a very important issue and will study your correspondence / submission in detail. However, the Committee has a very busy work schedule and is currently looking at a number of issues. The Committee will continue to work through its work schedule but cannot at this stage say when it will get to carry out a detailed examination of the issue of the 'Effects of Electromagnetic Radiation and the rise in numbers suffering from Electrosensitivity'."

The final sentence was telling. When an official thanks you for your submission it is often subtrefuge - often with an unanticipated outcome. As participants in the national pastime Irish politicians prefer an exceptional amount of "wiggle room" to the point of being inscrutable. O'Cruadhlaoich's "The Committee has asked me to thank you for your correspondence / submission," was professional and noncommittal.

Another recipient of O'Cruadhlaoich's letter, Prof. Johansson, in Sweden, replied, "Thank you so much for your reply. I take it that the procedure is for the committee to review the submission and then decide if / who they wish to speak with and invite them to a meeting on another date. I have been informed that the matter will be considered before Easter." Ever the optimist, Johansson was the first to warn the users of the dangers of radiation from the old fashioned cathode ray tubes in computer monitors and the industry never forgave him. Among other issues, Johansson demanded that the Irish government cease leasing frequencies to companies world-wide to test their technology in a live environment.

Penny Hargreaves, was married to an English stockbroker and lived in England for a while before returning home to New Zealand to set up an equestrian center. She found herself in the middle of the EMF controversy and also made a submission to the Irish government committee. "It occurs to me," she said "that if you can get some kind of enquiry there, we can all fall in behind you. We have scientists and activists around the world available which might have some effect - if only to let government know that they are being watched..."

Hargreaves is, like Nixon, involved in a court battle against the microwave colossus. "I have 64 acres of land in the city which also will be up for subdivision once I get the radio tower relocated which is next to my land - but need some cash input. The 358 foot tower has been damaged and sank so badly in the quake that it has been removed but they are threatening to put it up again - currently they have erected a small 30 metre radio tower on very badly quaked and liquefied land and this is being used to target me and also seems to be used to trigger off quakes."

Just as the invisibility of microwaves leaves most residents of the planet blissfully unaware of the dangers passing through their bodies daily, the obscurity of Hargreave's New Zealand location does not mean it is unimportant. There Landis + Gyr developed a Smart Meter. The company was owned by Bayard Capital, a Swiss-based firm headed by Cameron O'Reilly, an Irish-Australian, who is the son of Sir Anthony O'Reilly, former Irish international rugby star and retired head of Heinz food. Another international financial

house headed by U.S. presidential candidate, Mitt Romney, is also active there. Both O'Reilly and Romney's Bain Capital have links to the Carlyle Group financial cartel.

'Is it just co-incidence that Radio Network was owned by Texans, the Mays family and O'Reilly and now part-owned by these two but the Ouruhia land was sold for 317 million to Bain Capital and Thomas Lee who are big US investment companies and the former is owned by Mitt Romney current favorite to be Republican president.'

-Penny Hargreaves,
Ouruhia,
New Zealand

According to Hargreaves, "Sounds crazy - have you ever read anything about longitudinal interferometers and Eastland 1987 patent - if you have you will find out the incredible info that radio towers placed in strategic locations and several frequencies focused on to fault lines against volcanic rock can make quakes- All the bigger quakes have been only where the radio network frequencies unusually powerful frequencies beam and collide on volcanic rock in a high water table - both the volcanic rock and high water table act as a mirroring effect. Why would this be deliberately done? Is it just co-incidence that Canterbury is full of oil, gas and minerals and only Pegasus Bay - which is currently being scorched earth and people cleared from the land with the claim it is unsafe to live there but no geo reports are presented - Pegasus Bay is the only southerly sheltered big area along the east coast which would be suitable for oil refineries etc. Is it just co-incidence that Radio Network was owned by Texans, the Mays family and O'Reilly and now part-owned by these two but the Ouruhia land was sold for 317 million to Bain Capital and Thomas Lee who are big US investment companies and the former is owned by Mitt Romney current favorite to be Republican president."

It is no small irony that Romney, the first Mormon candidate for the U.S. presidency, is a member of a religious group, properly known as The Church of Jesus Christ of Latter-day Saints, based in Utah. There the U.S. National Security Agency is constructing the world's largest internet spycenter at Bluffdale, Utah, a half hour's drive south of Salt Lake City.

Thus, both U.S. Presidential candidates have embraced wireless technology, albeit for different reasons - Obama has publicly endorsed Smart Meters and Romney, if elected, would be responsible for what happens to all of the information collected by e-mail, Smart Meters and the personal information contained in the genealogical archives of the Mormon Church.

With the Joint Oireachtas Committee on the Environment deadline for submissions approaching, experts such as Dr. Karl Moore, DunLaoghaire, Ireland; Dr. Magda Havas, Trent University, Peterborough, Ontario; Prof. Olle Johansson, the Karolinska Institute, Stockholm, and a large number of people from all walks of life around the world voiced their concerns to the committee headed by Co. Cork politician, Ciaran Lynch.

Dr. Moore, a physicist involved in electro-optical systems for underwater imaging in the United States, told the Committee, "It is a fundamental law of physics that vibrational waves of equal or similar frequency and intensity will interact by resonance. If one wave signal is greater than the other, it will override the weaker signal by modifying it's signature and/or by entraining the weaker signal. If information is carried by such a waveform, it is easy to see how the quality of information will be degraded and the likelihood of

miscommunication will occur when subjected to such interference from the background noise generated by technology operating in the same frequency bands. This has huge health ramifications when the internal communication system of the body is involved."

Dr. Moore advised the committee that the present standards for exposure to electromagnetic radiation in Ireland is based on recommendations by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The commission is a voluntary NGO. Among the founding members is Anders Ahlbom (subsequently disgraced for his involvement with his brother's public relations firm which lobbies the European Parliament on behalf of industry). The Irish Government cites Ahlbom as one of its advisors.

"ICNIRP," said Dr. Moore, "is not the only standard for radiation safety. There are others, more up to date ones, such as the Salzburg Standard (2002), the BioInitiative Standard (2007), and even BMW have come up with their own, which recommend safety levels with radiation levels that are thousands of times less. This should be indicative of the discord and lack of understanding of the health ramifications concerning the telecommunications industry and of what constitutes a safe level."

The standards established by the voluntary group failed to account for a multiplicity of signals, each saturating the planet and everything on it. And even less credible is the fact that ICNIRP's standards are merely recommendations and not legally binding. Thus the Oireachtas Committee was faced with a dilemma - either protect the people and conduct a thorough investigation or hold to standards established by an industry which can not be insured and dominated by individuals who have industry ties.

Although Nixon's work was extremely detailed, he questioned the need for submissions to be summarised by government clerks before presenting them to the lawmakers. "I am concerned," he said, "that the Eire inquiry is going to 'summarise' submitted information. Unless the information contained in what I sent is taken / viewed in its entirety the issues will stay buried." His concerns were not unfounded.

Following completion of his submission to the Irish government, Nixon celebrated his daughter's 16th birthday with the fatherly advice, "You start off life naked, cold, hungry, and broke. Then it gets worse..."

On Valentine's Day - the saint's mortal remains are entombed and venerated at Whitefriar Street Church in Dublin - Nixon remained optimistic after discovering that Broadband over Power Line transmissions were proven to be breaking in on the airwaves used by radio hams in Texas, forcing the offending companies to turn off the signal and remove their equipment. "With proof applied to the Law this thing WILL get shut down. It's simply affecting far more people this time... a light at the end of the tunnel," said Nixon. Meanwhile, O'Cruadhlaoich admitted the crossed communications with Nixon's submission to the committee, noting, "I have checked this and have been informed that an acknowledgement, the same as to everybody else, was issued to Mr Nixon."

Two days later Nixon received two letters. The first was a legal document from Chiavetta's office stating that he had 20 days to respond with objections to the Administrative Law Judge. The letter was dated 23 Dec. 2011. The letter had arrived well past the Public Utilities Commission's deadline.

The second letter from Chiavetta informed Nixon that his "various complaints" had been assigned to the same Administrative Law Judge and assigned a single formal complaint number. "I'm just letting them run with it," said Nixon, informing them that what they are doing does not adhere to legal procedure." The promise of "letting them run with it" was short lived. Four days later he told Chiavetta, "It is considered that my formal complaints to the PA PUC have been illegally processed and administered. Judicial decisions and actions have been carried out in camera without my knowledge and/or notification. Exhibit submissions, numbering in their hundreds, have not been applied to their respective formal complaints or taken into consideration."

Armed with verification of duplicity on the part of the Pennsylvania PUC, Nixon then turned his attention to assembling a citizen panel of people who were following the advance of the technology. In a widely distributed e-mail, Nixon urged contacts that "It may be advantageous to our mutual problem if, instead of just posting complaints, you get your complaints into an on-going legal process. Write to the office of the PA PUC Secretary – The top legal person in this government agency – and explain the nature of your problem. Sounds like a diesel engine, can't find where it's coming from, active 24/7, making you ill, etc., and so forth.

"Let's give 'em some ants in their pants …….. Internationally. Let 'them' know that there are many of us and that we are slowly getting organized," he said. Nixon reflected on a comment on the Nutrimedical Report, an internet radio program hosted by Dr. Bill Deagle who also made a submission to the Irish committee, that judges are "'trashing' the very laws they are paid to enforce" and the difficulty of addressing the issue of electromagnetic radiation through the Federal court system. "So, at the end of the day, it comes back to Constitutional Rights; and thank God that those old geezers thought it through like they did; and long drawn-out court battles in Washington, D.C. which no individual can afford to do unless backed by a business or the ACLU (who won't touch this 'thing' BTW. I asked them; actually, "baited them" is a more descriptive term – Told 'em it was bigger than McCarthyism," explained Nixon.

Undeterred, Nixon prepared to take the issue to the Federal government and prepared a logical progression of how EMFs are affecting the planet:

- When one group of people attack and injure another group of people or individual it is known as Actual Bodily Harm.

- When one group of people attack and injure another group of people or individual and draw blood it is known as Grievous Bodily Harm.

- When one group of people attack and kill another group of people or individual it is known as Murder.

- When one group of people repeatedly attack and injure another group of people with a known destructive weapon it is known as Warfare.

- When one group of people attack and injure another group of people with a known destructive weapon surreptitiously and covertly it is known as Terrorism.

- When one group of people attack, injure and kill a selective group of people indigenous to the population with a known destructive weapon it is known as Genocide.

- When one group of people installs and energizes equipment that has known, widespread, destructive capabilities amongst and targeting a section of a population; deploying a Weapon of Mass Destruction; it is known as Annihilation.

With the above logical outline of circumstances as he viewed it, Nixon set about filing complaints to the Pennsylvania Attorney General, Senator Jim Crawley, president of the Pennsylvania Senate with responsibility for the Public Utilities Commission and the office of the U.S Attorney General.

Simultaneously, Nixon showed he was not yet finished with Secretary Chiavetta at the Pennsylvania Public Utilities Commission. In addition to demanding a formal enquiry into a "blatant disregard of the law as applicable to formal complaints", Nixon enclosed documentation about the recently-labelled fatal medical condition - SADs. "Enclosed is a document entitled 'Sudden Adult Death Syndrome (SADS) and BPL-PLC-induced Reactance Correlation'... International correlation research is incomplete as of the date of this communication. However, as there is a 0.8546 probability of this correlation it is considered that an investigation is conducted immediately. SADS Associations around the world have been notified..."

SADS is a Western label - not yet available even at Wikipedia - which is akin to a Far East condition called SUDS or Sudden Unknown Death Syndrome which was first noted in 1977 among Laotian refugees to the United States. It surfaced again in Singapore where otherwise healthy men died of unexplained causes between 1982 and 1990. In the West, SADS has surfaced among healthy male athletes. A near escape is English footballer Fabrice Muamba who suffered a heart attack during a televised match between his team, Bolton Wanderers, and Tottenham Hotspur on St. Patrick's Day, 17 March, 2012. In Ireland, an incubation centre for microwave research, the Irish Government has earned a reported €450 million for leasing frequencies to global corporations to test their technologies through a program called *Test & Trial*, estimates vary on the number of young athletes dying on playing fields.

Touting its free heart screening service, Irish insurer Laya Healthcare, notes, "Statistics show that two people are lost to Sudden Adult Death Syndrome (SADS) every week." Consultant Joe Galvin, Cardiologist / Electrophysiologist attached to the Mater and Connolly Hospitals in Dublin, has been identified as the principle investigator in what is called the sudden cardiac death project. Galvin has not responded to attempts to contact him. Several years ago Galvin suggested that at least three people a week were dying from SADS. He is responsible for a SADS register, recording when and where people have died.

Galvin's research looks at diseases suffered by patients under two categories: Cardiomyopathies, physical conditions of the heart muscle; and Channelopathies, inherited diseases that control the heart cell electrical impulses. His research is in line with official government guidelines for people who complain of "Electromagnetic Sensitivity." In stark contrast to Sweden where ES is a recognized disability, doctors in Ireland are instructed to prescribe medication or refer patients for psychological assessment.

In Ireland, as elsewhere, responsibility for SADS deaths rests with the dead person as a victim of a pre-existing medical condition and the public accepts SADS as an event because it has a label. As parents are left to pick up the pieces of their shattered lives following the deaths of their children, there is no one to blame, only fate.

And things are even worse in Australia where BPL is ubiquitous. SADS Australia was incorporated in 2010 and estimates that every 16.8 hours an Australian child dies of SADS.

The website *Natural News* reported the deaths of 10,000 cattle in Viet Nam. The Vietnamese cattle deaths follow a trail of other mysterious animal deaths that all began occurring right around the start of 2011. Many of those deaths remain unexplained, while others have been attributed to strange causes like winter storms and even drunkenness. Yet few, if any, of these death cases have been conclusively explained with actual scientific evidence.

In Ireland a farmer found five cattle dead in a field in Co. Wexford but did not report it because he was afraid he would be unable to sell his beef.

By the end of February 2012 one of the first reports of mass deaths of farm animals was reported by the Daily Telegraph in the U.K. which blamed the newly discovered Smallenberg virus. The newspaper reported that in Continental Europe, some farms had lost as many as 50 percent of their flocks, noting scientists could neither identify the source nor cause of the virus. But it was, they were certain, a virus...

In the U.K. another mystery surfaced when radio enthusiasts claimed they could have their own "Bermuda Triangle" in the Cambridgeshire village of Waterbeach. Wojciech Piotrowski, a scientist from Willingham, told the Cambridgeshire News: "A strong electrical interference source was radiating radio signals in one of the ultra high frequency bands at the southern end of the Green." The military, the only known source of the frequency, denied any knowledge of the matter. The Qualcomm company has its research and development facility in Cambridge where they are working on LTE technology. Long Term Evolution (LTE) is a radio platform technology that will allow operators to achieve even higher peak throughputs than HSPA+ in higher spectrum bandwidth.

Nixon remained less than optimistic about a pending lawsuit against the Federal Communications Commission against microwave technology for the sound-noise angle. The sound appeared to be spreading with a woman in Idaho complaining to him, "Could not sleep last night, It's like a freight train running through the house. I think it's in the entire wiring."

Also by mid-March a report in the Cork Examiner about the "Hum" in the townland of Beaufort in Co. Kerry had surfaced. When provided with evidence, the paper did not follow up. Nixon's calculations indicated that the sounds are the results of subharmonics that are mathematical progressions of Broadband over Power Line pulse frequencies. "Everything below 50Hz is a BPL induced subharmonic - Look at similarities in the frequencies. Strength is 40-96dB - Gives a power of between 200 and 40,000 watts. Same all over the world because 'they' are using the same equipment and software." He later added that waves "only occur in <48 Hz and only us old fogeys can hear in that range. Hence we all have tinnitus."

The so-called “Hum” experienced around the world was first reported in Bristol, Wales in the 1970’s and has entered the category of urban myth.

“The Hum” is a generic name for a series of phenomena involving a persistent and invasive low-frequency humming noise not audible to all people. Hums have been reported around and occasionally a source has been located. A Hum on the Big Island of Hawaii, typically related to volcanic action, is heard in locations dozens of miles apart. The Hum is most often described as sounding somewhat like a distant idling diesel engine. Typically, the Hum is difficult to detect with microphones, and its source and nature are hard to localize.

Could not sleep last night, it’s like a freight train running through the house. I think it’s in the entire wiring.’

- Idaho Resident

The Hum is sometimes prefixed with the name of the place where the problem has been particularly publicized: e.g., the "Bristol Hum", the "Taos Hum", or the "Bondi Hum", The Largs Hum overlooking the Firth of Clyde in Scotland, the Kokomo, Indiana Hum and the most egregious and widely experienced - the Windsor Hum - just over the U.S.-Canadian border - which has prompted disagreement over who is responsible.

In a 1998 episode of *The X-Files* titled "Drive", Agent Mulder speculates that extremely low frequency (ELF) radio waves "may be behind the so-called Taos Hum". He may not have been far off the mark if Nixon’s mathematics are correct.

According to Nixon, the problem is getting a signal down the power lines without signal loss. Loss is caused by the interference / equipment on the power lines themselves – Spikes from appliances turning on/off, harmonics from industrial equipment, transformer inductance, capacitors to “smooth” the phase imbalance, etc. This is the reason why the power line communications never got above 300baud in 40 or more years.

“If you can make a persistent signal that’ll go through anything and everything you can send a signal down as fast as you like, right?” questioned Nixon. “This signal would be big (power-wise) and wide (as in not a single line)” and would require a larger supply of electricity which could be one reason why there is world-wide concern about electrical supplies.

Researchers discovered that it was possible to send a multi-frequency waveform down the power lines years ago – but were unable do it fast enough. “Up pops DC-generated digital communication generated by a very, very fast computer,” explained Nixon. “This computer and its associated electronics can output a string of frequencies (which are just numbers so far as the computer is concerned) in a series of pulses (dots) and then inject the pulses into the power lines.

The signal “string” is made up of 16 (hexadecimal 10) separate frequencies in the waveform shape in the waveform graph plot. Being that there are 2048 “dot” pulses this would give a total signal “string” count of 128 one after the other – Very “thick” (wide) signal waveform. Adding just one more bit, 4096 “dots”, and there are 256 signal “strings”.

Very, very persistent signal. Even if half of the signal is lost, -3dB point, there would still be sufficient “dots” left to reassemble the original waveform at the demodulator end.

"Sending each waveform in the real-time domain at singly different angular modulation, 15, 30, 45, 60, etc. out of phase to the last one and you can digitally encode the signals. 15 degrees out of phase = 00, 30 = 10, 45 = 01, 60 = 11, etc. You can set up a whole slew of signal 'types' doing this, right up to video streams – if you can get it to go fast enough... That's the key – speed," said Nixon.

But what happens when these frequencies are introduced into the power lines? The signal pulses "dots" themselves are interharmonics. An interharmonic will generate a harmonic next to it. Both collide, cancel out the difference in the frequencies except the difference in their respective frequencies. This difference is a subharmonic and because all of the "dot" frequencies are multiples of the original frequency, 11.719Hz, there are 16 subharmonics that are all the same. 129 or 256 subharmonics overlaid on top of one another at exactly the same time at 16 different low frequencies.

There's an LF subharmonic at 11.719, 17.578, 23.438, 29.297, 35.156, 40.016, and 46.875Hz at 60Hz mains frequency, at 50Hz it's just an integer division calculation of these frequencies. It is the 11.719 subharmonic that is most frequently present, mathematically in theory, when the Hum manifests.

The Sunday Times addressed the issue of "The Beaufort Hum", classifying it as a natural occurrence. Nixon was not so sure offering his findings to external scientific scrutiny. and as for the "WIndsor Hum" and disagreement between the U.S. and Canada, Nixon charted the provenance of the sound himself. "It is not 'coming from across the border', but, in the case of Windsor, the control signal is originating at grid reference 42.2801284790049. -83.0930023193359," he said. "That grid ref. puts 'em right on the doorstep of the Ontario Hydro building."

'It is not 'coming from across the border', but, in the case of Windsor, the control signal is originating at grid reference 42.2801284790049. -83.0930023193359.That grid ref. puts 'em right on the doorstep of the Ontario Hydro building.'

- Victor Nixon

In The X-Files Agent Mulder was rarely wrong. Nixon seems to have gone one better. "The production of these harmonics and the reactance produced by the capacitor banks at these energy levels are both illegal. They are hundreds of times over the top of the max stipulated by law," he said menacingly, "Now I'm going to kick their asses with the law."

As for experiencing "The Hum", disagreement persists over the term acoustic. Are the parts of the ear involved and the signal carried to the brain? Or, more directly, does the frequency cause vibration of the skull? As with other factors involving microwaves, argument serves to cloud the issue rather than clarify it. Semiotics and semantics confuse rather than elucidate.

In May the Detroit New posted a new article on the U.S.-Canadian border: "'The Hum' driving Canada looney Incident pits Windsor residents against U.S. regulators". (The headline remains but the text is unavailable.)

In 2008 the 11th biennial European Particle Accelerator Conference produced a paper by C-Y Liu, Y-C Chen, H-M Shih, NSRRC, Hsinchu 30077, Taiwan, R.O.C called "Performance Evaluation of the switching mode AC power Supply" which included two waveforms of the Danfysik 8500-859 dipole AC power source for booster ring applications. "These wave forms," said Nixon, "are exactly the waveforms that appear in

part of the Spectrum and are component parts of the “Hum”. I can pull up a frequency tuner anywhere where BPL is installed and operational and get these waveforms. What both of these waveforms actually produce is a 10Hz subharmonic, I can pick that up too with ease.

“This would not playback on anything other than a purpose-built subwoofer speaker. It is so low frequency that turning up the volume in an attempt to make it audible would burn out the electronics; particularly capacitors. In actual fact what this would sound like if you were to play it back would be a capacitor bubbling (a tech term – actually boiling) and just about to explode.

“So, it appears that another block has fallen into place.”

Meanwhile, U.S. President Barak Obama signed a bill extending unemployment benefits passed by Congress. Attached to the law was a rider under Section 332(c)(7) of the Telecommunications Act stating that local government “many not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station”

In America they took the brakes off by taking responsibility for zoning issues away from the community. In Europe the policy of active denial remains in place except in the town of Olvera, Cadiz where the city council unanimously agreed to declare the town an “Electromagnetic Pollution-Free Municipality”. When it's cloudy this hum crap actually reflects off of the clouds, or at least is trapped between the clouds and the ground (As in - It's always warmer when it's cloudy because the atmospheric heat cannot dissipate as easily). And that's another known (esp. by radio hams) frequency ‘thing’ - Ground reflection - The signal bouncing off of the ground.

“Brings me back to my statement of a while back. Why is it that only I have pinned this ‘thing’ down? OK, so those on the payroll are not going to say what ‘they’ know But there are millions of smarter people than me out there. Why Me? I don't want to do this junk, moreover I don't want to be affected by it either.

“I simply do not get why nobody, but nobody, has correlated any of the global events to a single causation. We both know what that is,” Nixon said. As added evidence to his theory Nixon pointed to an explosion of white light during a Fox News traffic segment by Andrea Robinson in Phoenix, Arizona. “This is a typical electrical blowout at night, the camera was a light intensifying type so it looks ‘whiter,’” he explained.

The explosion of light was caused, he claimed, by an electrical decoupler as power companies tune the BPL signal during off-peak hours. According to Nixon, “Owing to the maximum usage of electrical power during hours when populations are awake, thus causing spikes and browns, power companies tend to “tune” BPL couplers/decouplers data modulation/demodulation during off-peak hours. Decouplers are much smaller than couplers due to the fact that they are mounted on lower-voltage power lines. Both share the same design characteristics, that is, both are resistance/capacitance (RC) devices. They are, basically, band-pass filters.

“The function that these RC devices perform leads to energy being converted to heat in their passive components,” said Nixon. “Although the insulators surrounding the tube in which the RC devices are designed also act as cooling elements there is often a sudden

surge in temperature. This is due to electrical power being at a peak during off-peak usage hours and these RC devices not being able to contain (hold back) the power levels present in the cables. The RC elements simply melt, disintegrate, and are blown out of the top of their mounting tube, the body of the coupler/decoupler. There is little external damage to the coupler/decoupler body.

"Investigations of these phenomena usually give explanations that mislead from the actual cause. For instance, recently the town of Clintonville, Wisconsin experienced explosions and flashes mainly at night over an approximately two week period. The USGS gave the reason for the explosive noises as a 1.5 magnitude earthquake. No damage to buildings occurred during this two-week "earthquake" and no reports emerged of antipode tremors."

The manufacturer of the equipment, claimed Nixon, was Amperion, with patents pending in China. In the Wisconsin event, the power company has operational Access BPL. BPL Wireless Access is operational across the country from the Boston Public Library to the public library in Berkeley, California and in Canada as well. Regarding the Flare in Phoenix, Nixon added, "Compare with the street lamp color/brightness. One of these couplers blowing out would only take 0.2 of a second and would leave virtually no garbage as it would all obliterate in instantaneous white heat. I'm on target, right on the button," he said.

The San Francisco-based IT Law Wiki explains, "Access BPL systems can be used to provide high-speed Internet access and other broadband services to homes as well as providing electric utility companies with a means to more effectively manage their electric power distribution operations. Given that Access BPL can be made available in conjunction with the delivery of electric power, it may provide an effective means for "last mile" delivery of broadband services and may offer a competitive alternative to digital subscriber line (DSL), cable modem services and other high-speed Internet technologies."

Nixon also remained on target with Secretary Chiavetta and the Pennsylvania PUC, forwarding further exhibits in support of his claim that illegal dangerous equipment had been installed on his street in Pittsburg. "This equipment is experimental," he said. It operates at 2, 5, and 30 Ghz. By its inventor's own admission it emits at least 25 decibels of energy at the frequencies per pole under normal operating conditions... This equipment's emissions are a danger to the public; this equipment should not be deployed in a highly populated area. The E-Line equipment should be de-energized and removed immediately."

Meanwhile Nixon cracked the elusive problem of BPL dangers and found the answer in a frequency database of the "Hum". " As outlined in the new document, it appears to be based on 11.719Hz and using Fast-Fourier Transform techniques," said Nixon. Included in the solution was a study called "Anger Style, Psychopathy, and Regional Brain Activity" by Jennifer Stewart , et al, at the Department of Psychology, University of Illinois, Champaign-Urbana. The Stewart paper is one of many which show a direct relationship between emotional states and electromagnetic radiation. It is one of those theories evolving from the study of Rock n' Roll and how the closer the beat of a piece of music to the beat of the human heart, the greater the odds the song would become a "hit" and increase revenue.

"Nowadays tech-savvy teenage pranksters know that if they use a readily-available freeware signal generator (i.e. SigJenny), playing a low-frequency (LF) sine wave centered on 17Hz through a sub-woofer, they can 'trick' their friends and parents into feeling frightened and 'freaked out'. Dependent on the volume of the speaker, these teens

observe dramatic increases in people's reactions even though virtually no one can actually the 'noise'. With Smart Grid BPL-generated LF, Power Companies are 'freaking out' entire populations," said Nixon even before stumbling on the 11.719Hz frequency which is subtler still.

The emotional implications of "The Hum" was further explained by German writer-researched Dieter Broers who wrote in late April, "Some years ago I was part of a research team that measured the brain waves of test subjects at regular intervals via EEG. We found that specific electromagnetic fields sporadically acted on the test subjects' brains, without their being aware of this phenomenon. One of our most striking findings was that the test subjects' brain waves could be altered via exposure of the brain to electromagnetic waves; and as if this weren't astonishing enough, we also found that we could even control the test subjects' brain waves using these fields. For example, the EEG frequency of a test subject with a predominant baseline frequency of 10 hertz could be increased to 12 hertz *each time* we exposed the subject to an exogenous 10 hertz electromagnetic field that was then increased to 12 hertz. We concluded from this that endogenous rhythms are governed by their exogenous counterparts."

Broers' comment is important because of his affirmation that there is, indeed, interaction between human cells and electromagnetic fields. "These findings also opened my eyes to processes that were of fundamental importance for my own research in that I now had incontrovertible, empirical proof that electromagnetic fields have a direct impact on brain activity," he said.

The evidence may be found in the burgeoning statistics on autism. Utah has the highest incidence of Autism in the United States where 1 in 32 boys and their parents are suffering. A study at Stanford University of 192 pairs of twins concluded that genetics only accounts for 38 percent of the risk of autism with environmental factors accounting for 62 percent. In Ireland plans were afoot by Irish Autism Action to support the new Autism Centre of Excellence. The number of people in Ireland with a diagnosis of Autism would fill Dublin's Aviva Stadium - 51,700, seated, 95,895 for a concert.

'I One of our most striking findings was that the test subjects' brain waves could be altered via exposure of the brain to electromagnetic waves; and as if this weren't astonishing enough, we also found that we could even control the test subjects' brain waves using these fields.'

- Dieter Broers

While largely unaware of the development by stealth of Broadband over Power Line technology, Physicians for the Environment in Switzerland joined a growing world-wide chorus for implementation of the much vaunted and widely-ignored *Precautionary Principle* and released a press release stating, ""From the medical point of view, it is urgent to apply the precautionary principle for mobile telephony, wifi, power lines, etc." states Dr. Peter Kälin, President of Physicians for the Environment. The Austrian Medical Chamber has moreover just formulated the same requirement in regard to smart meters. In a communication dated 16 March 2012 to the Federal Council of the Federal Assembly, Physicians for the Environment requested to divide the value limits by 10. Dr. Yvonne Gilli, National Councillor, has repeated the demands of the MfE in requesting the Federal Council, if it has to protect the population, to apply the precautionary principle and to lower limit values."

By the beginning of April, enquiries and responses regarding BPL came to a halt. The Irish government's investigation was at a stalemate, a media blackout on the topic held firm. The apparent lull in confrontation gave Nixon the opportunity to pursue one of the new avenues the microwave industry was turning to: the creation of smaller cells of macro-micro-pico masts to circumvent the power and dangers - and obvious physical presence - represented by large masts populated by multiple operators broadcasting numerous frequencies. The danger from these configurations is that - not unlike the Smart Grid with a meter on every house - the macro-micro-pico scenario brings the signal down to street level with masts generally placed at the same level as the upper floor of a two-story house. Nixon found research from a French team working for the Alcatel-Lucent Bell Lab and Supelec in Paris entitled, "Optimizing Cell Sizes in Pico-cell networks". "Apparently, with Micro (Mi) and Pico (P) cell network structure it's not so much about saturating an area with Mi & P modules as it's about where you put them. For instance, a 100 percent "saturation" can be achieved with 75 percent of the modules if you place them in the optimal locations," reasoned Nixon.

The announcement by British Gas that the 400,000 already installed were not "smart enough" was reported by the Daily Telegraph. The paper noted that Centrica, parent company for British Gas, had been criticized for increased energy prices - a complaint long held by those opposed to Smart Meters on both sides of the Atlantic. "We're in the 'wait' stage right now," said Nixon. "People are seeing, for the first time, that here is a very powerful stance and case. Every one of the lawsuits over here right now is on shaky ground, thin ice. Perhaps when the assimilation part is done and people have pieced it all together pragmatically there will be a few in my corner. I don't care one way or the other, I either stop this 'thing' or I die, so I have no choice. And once, just once, I would like something to fight. And then to be left alone."

His sentiments would prove prophetic.

Back home in the U.K. Victor's mother, Frances Ann Hyden, 84, reported that an electrical substation exploded in a Nottingham suburb and more than 200 people were evacuated as a second explosion was expected but didn't happen. People were allowed home mid-morning the next day. This is the fifth to go up around Nottingham. Police statements blame them on copper thieves. Nixon was suspicious of police findings, "There are no large amounts of copper on a substation, only the transformer winding and that's boxed in and weighs 2-plus tons – A small transformer. Her friend at the site verified it. No other reporting was done on it."

Five weeks later, Mrs. Hyden informed her son that Fabrice Muamba had partially recovered. "My Mom told me this morning that now the black footballer is awake. 'They' are saying that it wasn't a heart problem - Specifically NOT ventricular fibrillation - Amazing - Wonder how much longer 'they' are going to get away with this," said Nixon.

Yet another controversy was percolating - this time in Baltimore where preparations were being made for a hearing with the Public Utilities Commission there on the issue of Smart Meters. With four days to the deadline for written submissions, Nixon, as consultant claimed that people were fighting Smart Meters when they should focus on the issue of Broadband over Power Lines. "Everybody else is going after Smart Meters so we're going to as well - The perfect Red Herring," he said.

Meanwhile complaints from India where BPL Global operates were registered regarding mobile phone reception and billing. Complaints from Australia related to exorbitant electricity prices and slow television and internet services. “I don’t get two things,” said Nixon, ”How was it that the ARRL was able to stop it the first time around because of ham radio interference,” he added. The ARRL is the American Radio Relay League, the national association for amateur radio hams around the U.S. “This was in 2003-4 when ‘they’ tried to install it at 8-20MHz. The ARRL actually got ‘them’ to remove the equipment. How is it that the ARRL in 2005 signed off on it at 40MHz with a ‘notching’ agreement that never happened - And the ARRL stayed quiet,” asked Nixon.

“This BPL ‘thing’ is not selective. It hits everyone. It hits regardless of anything (race, education, rich/poor, etc.). mainly it hits the 55-65 year old population. Well, there are some pretty smart and well-off people in that age group. For instance, major political figures are in that age group. ‘The Donald’ has even complained about it. That the ancillary equipment causes major health effects is a given. Heck, it kills people. Why is this being overlooked? Why is it all being overlooked?

“I just don't get it,” he said, pointing to extremely sinister motivations far beyond simple corporate greed.

‘We have had a ram fall over dead on a farm here. It is a repeat of what we had in the past . People dead in their bed, and a cat and sheep falling over dead. Of intrest, the girl who owned the sheep bent down to look at it, and found a humming noise coming from the ground.’

-Catherine G.
Scotland

World-wide, the stifling media embargo on discussion of the issue continued when an Irish radio station owned by digital mogul, Denis O’Brien, invited electrosensitive farmer John Ryan from Dangan, Co. Tipperary to discuss his personal battle to have a mast removed from his land. Staffers for O’Brien, media mogul, globalist billionaire and second richest non-taxpayer in Ireland, pulled the plug on a balanced radio discussion on the safety of cell phones. Production staff contacted Ryan and then failed to air the interview on drive time’s *The Last Word* with Matt Cooper. Instead, Prof. Anthony Swerdlow of The Institute of Cancer Research, Royal Cancer Hospital, London, an unabashed apologist for the industry appeared as a bonafide scientist comforting parents that there is no real evidence that cell phone use is harmful.

One of the few publications to grasp the issue of microwave technology is the *Daily Mail*, part of Lord Rothermere’s empire, currently edited by Paul Dacre. On 24 April it headlined, “The Biggest experiment of our species’: With five billion mobile users in the world, conference calls for research into potential brain cancer risks”. The piece noted the 50 percent increase in brain tumours since 1999 and quoted former World Health Organization expert, Dr. Annie Sasco, of the University of Bordeaux, who said, "We now live in an electro-smog and people are exposed to wireless devices that we have shown in the lab to have a biological impact. It is totally unethical that experimental studies are not being done very fast, in big numbers, by independently funded scientists. The industry is just doing their job, I am more preoccupied with the so-called independent scientists and institutions saying there is no problem.'

“What can I say,” said Nixon, “About frickin' time - now here comes 4G/LTE and Pico/Femto cells.” 4G refers to the fourth generation of communications and LTE (Long Term Evolution). 4G communications are faster while LTE, while also fast has the potential for

wireless mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing and 3D television. In short, the wireless industry has an open door for more permutations with greater opportunity for profit. Simultaneously, word from Jorn Gutbier of Diagnose-Funk (Diagnostic Radio) in Germany revealed that citizens there had awakened: protests in 158 townships with 50 active protest groups in 50 rural districts; 81 municipalities that rejected mast sites recommended by the government; and city councils which called for a moratorium on the roll-out of Tetra.

The English-speaking public is less aware. "This is the crux of 'their' (industry's) argument. 'They' can show a (un-technically minded and/or trained) judge in a court room that the equipment used actually at the sites where it is intended to be installed is harmless," claimed Nixon. "Even those who argue the case for the installer/operator are convinced by their employers that it is harmless, and therefore forward a convincing argument. What 'they' cannot explain, and take great pains to divert attention from, is the fact that the networking schema, the Level 2 equipment, the *SCADA* System, is deadly to living tissue because of the extremely high levels of energy it/they emit(s)."

The courts in Italy have been less gullible. Last year the Vatican was found responsible for illness in the town of Cesano, 25 miles north of Rome caused by 60 communications masts. The Vatican, in turn, blamed the Italian Navy. Another case has surfaces in Ostia Sud, 25 miles southwest of Rome where 30 people are suffering leukemia.

Of particular concern to Nixon was the evolving situation in Idaho. "It's all deregulated over there as normal, but get a load of this: IDACORP owns IDACOMM and Idaho Power and the main Internet service provider (ISP), Velocitus. All of the small electrical supply companies up in the north are owned by Idaho Power - there's a whole slew of 'em. It overspills into the states of Washington and Montana." Idaho has a knowledge-sharing arrangement with Australia under the auspices of the U.S. government to protect critical infrastructure where privacy is subordinate to availability.

According to Nixon Idaho offers a worst-case scenario where one company owns the whole system, electricity power delivery and communications. A monopoly. "Here's the best (worst) part," he said, "IDACORP is partnered with Amperion to supply BPL Internet services *and* TWAC AMI – Smart Grid and 'smart' digital metering. In Q4 of 2009 Idaho Power requested permission from IPUC to install Smart Grid and were given the go ahead. In Q2 of 2010 everybody starts hearing a diesel engine type noise and getting sick from emissions – But obviously didn't and don't know what the Hell was/is going on. Because of the minimal population density up there it's all hybrid wireless/wired and it's hitting one in 3 people, including children unfortunately. What can I say? I'm kinda devastated that I've dis/uncovered this information. This is a nightmare!"

While Nixon ruminated over the problems suffered by the people of Idaho, a rumor swept the internet that microwaves could cause deterioration in the built environment and weaponized microwaves could prompt the collapse of buildings such as the as the Twin Towers of World Trade Center and Building Seven. Speculation about the destruction of the built environment emanates from the work of Dr. Judy Wood, Ph.D. from Virginia Tech and her 500-page book, "Where did the towers go?" in which she gives ample evidence of a scientific effect responsible for, what she calls, the "dustification" of the buildings.

*SCADA – Supervisory, Control, And Data Acquisition.

"Someone has floated the idea that building materials are being eroded, worn away, ground down, by low frequency emissions of BPL." observed Nixon. "The originator(s) have not exactly put a frequency or "block" of frequencies on it as yet, they simply make the statement. It is possible that concrete, mortar, brick, rock, etc. used in building is being eroded by LF. This is simply from the fact that all are made of the same basic stuff – Silicon. Silicon's natural frequency of oscillation – the frequency that the atoms move – is 56Hz."

Here Nixon returned to his original theory regarding reactance. "In both 50 and 60Hz electricity, right now and due to BPL, there is reactance. The top end of this reactance at 50 and the low of 60Hz reactance is, more or less, spot on 56Hz. The reactance emissions are electrons (there are other emissions as we know) in a high-energy state. Entering the atoms of building materials excites the silicon atoms causing them to move more rapidly within the mass of the materials themselves – vibrating more vigorously. Vibrating itself apart, crumbling."

This vibration of electrons closely matches the theory of Dr. Gerd Oberfeld, of the Salzberg (Austria) Department of Health, who identifies unattached electrons as free radicals which cause cancer in humans.

"Vibration Engineering is an engineering discipline in and of itself," said Nixon. "Just like Fluid Dynamics is for instance. Building material degradation could very well, and in all probability is, occurring. But it's going to be like every other problem that BPL is culprit. 'They' will plead ignorance; it won't get followed up on, and 'We don't know' will be the accepted idiom."

The global focus on Smart Meters shifted to Baltimore, Maryland where Nixon was invited to consult on behalf of numerous groups across the state before the Maryland Public Services Commission in May. Nixon's agreement to help Rebecca Hanna-Diener, of Randallstown, and her coalition meant he had to appear in public and shed his anonymity. The decision revealed his basic motivations and, while he would not admit it, his idealism. "Chance to tip the scale minutely, or more smoke screening by "them" and a waste of time and effort? Puts a target on my back, but what the Hell. I don't care. These folks need all the help they can get," he observed.

The date, May 8, proved significant. Nixon would not recognize its significance. In the Judeo-Christian West, May 8 is the feast day of St. Michael, the Archangel, and the Bible notes, "At that time shall Michael rise up, the great prince who protects the children of thy people." (Dan. 12:1). To Jews Michael is the messenger of God's kindness. On May 8 Nixon received corroboration of all his research. Hundreds of miles away from his offices in Ottawa, Ontario, Dr. Andrew Michrowski, of the Planetary Association for Clean Energy, Inc., sent the following message to Hanna-Diener: "Herewith excerpts of measurements for a another case where the 'broadband' + other frequencies introduced by technologies such as SMART meters affect transmission lines... on a Hydro Quebec HV transmission line adjacent to an organic farm in the Eastern Townships. These technically adverse frequencies are affecting standard measurements of magnetic and electric fields as well of microwaves. They result in effects on living systems on people, animals, plant life and soil for more than 100 metres away from the axis of the line. So your inclusion of Victor Nixon's documentation for the Maryland Public Service Commission is complementary to our measurements, which have been presented and accepted as evidence in a Quebec administrative tribunal last year."

Call it fate. Call it Divine intervention. Nixon had received the kind of affirmation that scientists have been largely unable to do. A source unknown to Nixon produced an unsolicited body of research which roughly corroborated Nixon's years of looking for an answer. For the first time in years, Nixon was jubilant. "Pleased?" he said "I've got tears in my eyes. All that work suddenly one hundred percent corroborated. This is awesome!!"

In addition to the work of Nixon and Michrowski, Hanna-Diener also submitted articles by veteran reporter Blake Levitt and Chellis Glendinning writing for Counterpunch, Dr. David Carpenter, director of the Institute for Health and the Environment at the University of Albany School of Public Health, pioneering researcher Dr. Neill Cherry, Curtis Bennett, of the Thermografix Consulting Corporation, and the Bio-Initiative Report which includes the work of Prof. Olle Johansson, of the Karolinska Institute, Stockholm.

Nixon's excape to Idaho proved short. The above photo was taken three months after the photo with his prized Chevrolet (photo above). His physical deterioration had been rapid.

Thus began two weeks of preparation for the May 24 PSC hearing in Baltimore and a search for a killer of a last sentence to his five-minute statement. Meanwhile he continued correspondence with Sylvesteren in Denmark and began investigating problems in Australia and Tazmania as well as notifying the Formal Inquiry team in Co. Durham in England.

The day of the hearing, a large group gathered in the hearing room of the building in downtown Baltimore to witness an astounding five-minute performance. "The most sinister part of this entire issue is that electrical utilities and government agencies alike deny the existence of the BPL communications signal on the electrical power transmission and distribution grid," claimed Nixon to a hushed crowd.

"There is not one of you here today; you, the people that are making the request and the Maryland PSD who are considering the request; that has sufficient knowledge of this technology to make the statements that are included in the BGE Exhibits or to substantiate them. You are not only out of your depth with this BPL technology; you are out of your league.

Smartly dressed with his SAS pin, Nixon was on a roll. Armed with corroboration of his own research and timing and bravado, he told the commissioners judging BGE's exhibits he could supply their customers with the information on how to reset their meters back to zero permanently. To the gallery, according to his script, he said, "Within a year there will be a switcheroo; BGE will inform you that they are replacing their hated digital meters with an indoor replacement for which you will pay $1300." To the chair he said, "If you gave me

48 hours' notice and then 20 minutes with one of your wireless collectors I could shut your Smart Grid down. This is not about anything 'smart'; this entire issue is a dumb move."

In a scene worthy of Hollywood, Nixon pointed to the folly of the entire grid as if his listeners were workmen on the Tower of Babylon. "These emissions are not selective; they do not hit me and millions of others like me and miss you. By continuing with the installation of BPL, across the board, you are also surely endangering yourselves and your families," he said, appealing to their own self-interests.

"There are six (6) major emissions issues; eight (8) major entire population and eco-system detrimental and destructive reactions that will result in enormous consequences.

"Smart Grid, Access BPL, and B-PLC may have their up-side. They may benefit the few in major corporations around the globe that are and continue to profit enormously from their installation and operation for as long as it is allowed to continue. You can ignore the warnings, you can ignore the warning signs, but with this new and substantiated research you cannot escape the oncoming tide of accountability."

Hannah Cho, reporting for the *Baltimore Sun* newspaper carefully explained an interim decision which reflected the Commission's disarray. Instead of a rollout of Smart Meters, customers of three utility companies, Baltimore Gas and Electric, Pepco and Delmarva - all in various stage of deploying Smart Meters - the Commission offered the option for customers to opt out and those who already have the meters installed can request in writing to have the meters removed and replaced with old fashioned analogue meters... for the time being.

Along with Diener and Nixon, Jonathan Libber, 59, president of Maryland Smart Meter Awareness, a citizens group opposed to Smart Meters said afterward, "They are a bad idea. There has been no demonstrated savings for the regulated ratepayer. That's the first problem. The second problem is that they're potentially very dangerous."

The drama continued outside the hearing room. While he was speaking Victor noticed several men who did not fit. His military training and gut instinct told him to beware. When Nixon went to the mens' room, one of the men he had identified as industry plants followed him. Nixon pinned him to the wall, grabbed him by the neck and the genitals and told him,"I don't like you and if I ever come across you again, I'll kill you."

Days after the successful Baltimore outcome, the expectations of people around the world, experts and activists alike - including Nixon, were dashed by a devious Irish parliament. A full three months after their deadline, a sub-committee of the Oireachtas Joint Committee headed by TD Ciaran Lynch, of Cork, agreed *in camera*, that the matter of microwaves / EMFs belonged more properly with the Oireachtas Joint Committee on Health. The Minister for the Environment, Phil Hogan, who had been scheduled to be present, failed to appear and the Taoiseach, Enda Kenny, met with the heads of governments from the EU to discuss - not the economy as might be expected during the current exceptional economic turmoil - but "digital" developments.

It was not until the Joint Oireachtas Committee was challenged that Eugene O'Cruadhlaoich responded on behalf of the members. Rather than admit a deal had been done behind closed doors, O'Cruadhlaoich explained that that submissions had been forwarded to the Oireachtas Joint Committee on Health and Children.

Peremptorily, he added, "Regarding your request for information on 'the membership of the sub-Committee' and your request as to who made the suggestion and if there is an official vote' the Committee has instructed me to inform you that these matters which were conducted in Private Session."

The shutters had been pulled on the issue of electromagnetic radiation in the Irish environment by those elected by the people. This raises questions of propriety, the nature of Democracy and ultimately, the traditional Cui Bono? - who benefits. Beale would have been apoplectic.

While the Irish dithered with indifference, the City Fathers of Ojai became the first government in Southern California to adopt an ordinance officially banning Smart Meters within its jurisdiction and the Dutch government considered buying out those living too close to power lines. The Telegraph and EMF Consultancy both reported that the Dutch Minister for Economic Affairs, Maxime Verhagen, will set a precedent by purchasing 1,300 homes because they are too close to high voltage cables (transmission lines) which, according to scientists, endangers public health.

With the Baltimore hearing our of the way, and the Irish enquiry buried under layers of duplicity, Nixon returned to the theme of the effects of microwaves on the built environment and more duplicity at the Pennsylvania Public Utilities Commission. "It stands to reason and would follow with the 'crumbling masonry' theory that is sitting with insurance companies right now that this BPL **** is shaking buildings apart!

"This ELF stuff passes through anything and everything in a very high energy state. Which means, of course, that even trees are going to be mutated in the long term – but that's just it; all effects are mainly going to be long-term. We're the canaries down the coal mine that no one is taking any notice of right now. The fact that wildlife, particularly insects, are disappearing at an astonishing rate and the occurrence being ignored is simply another facet of the evil behind this entire issue." Saving the most immediate issue for last, he added, "Got another 'final' ruling on the Verizon formal complaint yesterday, first I'd heard of it. The PA PUC has probably ruled in camera and against me again no doubt. Having exhausted that avenue I will take the next rung up the ladder."

He turned his thoughts to an idea for a company specifically for blocking EMFs because he felt the industry is driven by money and not political power. "We keep pushing at these bastards, we keep forcing them to look over their shoulder. We sow the seeds of doubt and instigate second-guessing and in-fighting in and amongst their rank and file. The main problem here is the media, who are actually part of the big picture scenario."

In California, Deborah and her husband, Lou Tavares, stumbled on the effects of microwave radiation and spoke out, first in their community and then attempted to take their finding statewide. In one instance they were blocked from speaking at a city council meeting because they were not from the community. Her campaign was given airtime on the internet radio programs of Alex Jones and Dr. Stan Monteith's *Radio Liberty*. "That people like this lady are beginning to see the big picture is a boon to your and other's efforts," said Nixon. "All it took was for me to stand up (MD), look them in the eye, and make it personal for 'them' to react. 'They' are crapping themselves over the idea of this getting out in its entirety. As previously stated, 'they' have dug themselves a hole so deep that 'they' can't get out of it without major corporate damage. Nabisco? Tiny. ENRON? Small. Mortgage meltdown? Medium-sized. This 'thing', this monster, is massive in

comparison to anything that has occurred in the past. Non-techs have every right to believe in the Conspiracy Theory. It is, however, nothing more than a few major corporations and a few well-placed contacts in governments around the globe. An engineered scenario? Of course. Lock and Load Guys – We're on 'em and we ain't letting go till it's dead."

By late July, and dissatisfied with blocking from Secretary Chiavetta and the Pennsylvania Public Utilities Commission, Nixon upped the ante by placing a formal complaint that the Secretary had violated his civil rights and then blocked redress. The curious behaviour of the PUC as well as West Penn Power is a graphic representation of the close relationship between the regulator and the regulated with the receipt of another dismissal of his complaints. Nixon reported that he had received another dismissal based on the judgement of the Administrative Law Judge. "I expected to be dismissed," explained Nixon. "Again it's another one of those, 'you've got 10 days to respond' from the date of the order, May 22, 2012, packaged by the PA PUC on June 13, 2012, mailed on the 18 July 2012. However, it was dismissed 'with prejudice.' The electrical utility company, West Penn Power (WPP), does not deny the charge made by me that it withheld knowledge and information at and from the original hearing (Court of Law) in April 2011. My charge was that WPP knew of the major health issues to the populace, knew of the extent and the identity of the emissions that would occur prior to BPL et al installation. Knowing this information WPP moved ahead and installed the equipment with intent, aware of the damage that would occur."

Even the judge stated in this latest Formal Complaint response that WPP did not deny Nixon's charges. Nixon had good reason to not be surprised by the verdict of the ADL, a year earlier he offered testimony and the judge was not in the room. In April, 2011, Nixon explained, "There were four (4) expert witnesses for WPP; all had been to the site in question with highly-sophisticated sound recording devices on separate occasions. None of them had picked up or recorded any standing wave audible noise. I was not allowed to present any of my evidence on-the-record and the PA PUC Administrative Law Judge left the hearing room for the entire time that I did present my evidence."

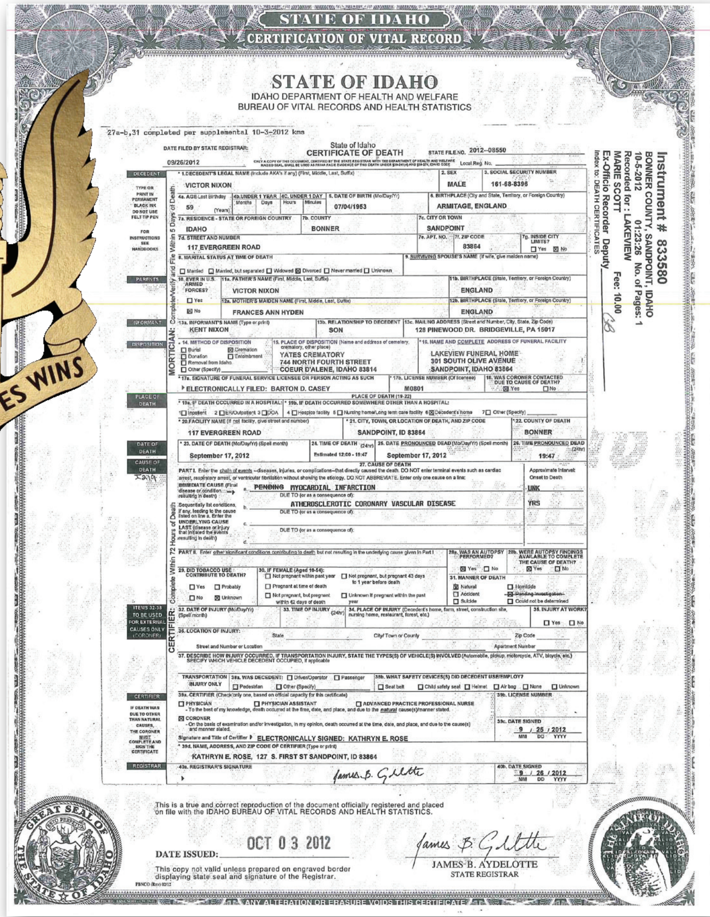
To a subsequent complaint to the U.S. Department of Justice, Nixon received the following response from the department's Correspondence Unit, Civil Rights Division, "This is a reply to your communication to the Attorney General. We apologize for the delay of this response. You have not provided sufficient information to enable us to determine whether a violation of federal civil rights statute is involved. If you will furnish us with a more specific statement as to the circumstances involved in your complaint, the matter will receive our careful consideration."

"Got you a**h***s!" said Nixon, assuming his complaint had struck and secured purchase. "They've checked with PA, they've dug and they don't like what they see. They want to know how much I know and how deep my technical understanding goes. They also want to know the organization behind me. If we do this right we've got the bastards. Obviously, there is a lot of information that they have coming their way."

Confident that he had the necessary evidence for skullduggery by the Pennsylvania Public Utilities, Governor Tom Corbett, and again with the Maryland Public Service Commission, Nixon turned his focus to the U.S. Department of Justice based on health concerns. From his own experience and the experiences of many others in North America, Canada and Europe, with scientists, doctors and activists predicting a resultant series of

epidemics - from cancer to autism to diabetes and a host of other debilitating diseases - Nixon assumed common sense would eventually win.

Central to the concept of Broadband over Power Lines is the amount of power pushed along the lines - not the frequency. Power can be adjusted to reach any of the devices to a wireless grid, ending at all the equipment - including self-powered laptops - needing the signal. Thus added power is needed to push the signal and create the leaking electricity which is actually needed to communicate with things like Smart Meters for the grid to work.


STATE OF IDAHO
CERTIFICATION OF VITAL RECORD

STATE OF IDAHO
IDAHO DEPARTMENT OF HEALTH AND WELFARE
BUREAU OF VITAL RECORDS AND HEALTH STATISTICS

27a-b,31 completed per supplemental 10-3-2012 kms

Instrument # 833580
BONNER COUNTY, SANDPOINT, IDAHO
10-5-2012 01:23:26 No. of Pages: 1
Recorded for : LAKEVIEW
MARIE SCOTT Fee: 10.00
Ex-Officio Recorder Deputy
Index to: DEATH CERTIFICATES

State of Idaho
CERTIFICATE OF DEATH
DATE FILED BY STATE REGISTRAR: 09/26/2012
STATE FILE NO. 2012--08550
Local Reg. No.

DECEDENT
1. DECEDENT'S LEGAL NAME: VICTOR NIXON
2. SEX: MALE
3. SOCIAL SECURITY NUMBER: 161-68-8396
4a. AGE-Last Birthday: 59 (Years)
5. DATE OF BIRTH (Mo/Day/Yr): 07/04/1953
6. BIRTHPLACE: ARMITAGE, ENGLAND
7a. RESIDENCE - STATE OR FOREIGN COUNTRY: IDAHO
7b. COUNTY: BONNER
7c. CITY OR TOWN: SANDPOINT
7d. STREET AND NUMBER: 117 EVERGREEN ROAD
7f. ZIP CODE: 83864
7g. INSIDE CITY LIMITS? ☐ Yes ☒ No
8. MARITAL STATUS AT TIME OF DEATH: ☐ Married ☐ Married, but separated ☐ Widowed ☒ Divorced ☐ Never married ☐ Unknown
9. SURVIVING SPOUSE'S NAME:

PARENTS
10. EVER IN U.S. ARMED FORCES? ☐ Yes ☒ No
11a. FATHER'S NAME: VICTOR NIXON
11b. BIRTHPLACE: ENGLAND
12a. MOTHER'S MAIDEN NAME: FRANCES ANN HYDEN
12b. BIRTHPLACE: ENGLAND

INFORMANT
13a. INFORMANT'S NAME: KENT NIXON
13b. RELATIONSHIP TO DECEDENT: SON
13c. MAILING ADDRESS: 128 PINEWOOD DR. BRIDGEVILLE, PA 15017

DISPOSITION
14. METHOD OF DISPOSITION: ☐ Burial ☒ Cremation ☐ Donation ☐ Entombment ☐ Removal from Idaho ☐ Other (Specify)
15. PLACE OF DISPOSITION: YATES CREMATORY, 744 NORTH FOURTH STREET, COEUR D'ALENE, IDAHO 83814
16. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY: LAKEVIEW FUNERAL HOME, 301 SOUTH OLIVE AVENUE, SANDPOINT, IDAHO 83864
17a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH: ELECTRONICALLY FILED: BARTON D. CASEY
17b. LICENSE NUMBER: M0801
18. WAS CORONER CONTACTED DUE TO CAUSE OF DEATH? ☒ Yes ☐ No

PLACE OF DEATH (19-22)
19b. IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: ☒ Decedent's home
20. FACILITY NAME (If not facility, give street and number): 117 EVERGREEN ROAD
21. CITY, TOWN, OR LOCATION OF DEATH, AND ZIP CODE: SANDPOINT, ID 83864
22. COUNTY OF DEATH: BONNER

DATE OF DEATH
23. DATE OF DEATH: September 17, 2012
24. TIME OF DEATH (24hr): Estimated 12:00 - 19:47
25. DATE PRONOUNCED DEAD: September 17, 2012
26. TIME PRONOUNCED DEAD (24hr): 19:47

CAUSE OF DEATH
27. CAUSE OF DEATH
PART I.
a. IMMEDIATE CAUSE: ~~PENDING~~ MYOCARDIAL INFARCTION — Approximate Interval Onset to Death: UNK
b. DUE TO (or as a consequence of): ATHEROSCLEROTIC CORONARY VASCULAR DISEASE — YRS
PART II.
28a. WAS AN AUTOPSY PERFORMED? ☒ Yes ☐ No
28b. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☒ Yes ☐ No
29. DID TOBACCO USE CONTRIBUTE TO DEATH? ☐ Yes ☐ Probably ☐ No ☒ Unknown
31. MANNER OF DEATH: ☒ Natural ☐ Accident ☐ Suicide ☐ Homicide ~~☒ Pending investigation~~ ☐ Could not be determined

CERTIFIER
39a. CERTIFIER: ☒ CORONER
Signature and Title of Certifier: ELECTRONICALLY SIGNED: KATHRYN E. ROSE
39c. DATE SIGNED: 9 / 25 / 2012
39d. NAME, ADDRESS, AND ZIP CODE OF CERTIFIER: KATHRYN E. ROSE, 127 S. FIRST ST SANDPOINT, ID 83864

REGISTRAR
40a. REGISTRAR'S SIGNATURE: James B. Aydelotte
40b. DATE SIGNED: 9 / 26 / 2012

This is a true and correct reproduction of the document officially registered and placed on file with the IDAHO BUREAU OF VITAL RECORDS AND HEALTH STATISTICS.

DATE ISSUED: OCT 03 2012

JAMES B. AYDELOTTE
STATE REGISTRAR

This copy not valid unless prepared on engraved border displaying state seal and signature of the Registrar.

GREAT SEAL OF THE STATE OF IDAHO

ANY ALTERATION OR ERASURE VOIDS THIS CERTIFICATE

As Nixon explained it, "The signal strength being fed into the transmission lines at every electricity substation is turned up. And so it continues until the required signal strength is present to communicate with all of the remote 'smart' devices out there."

According to Nixon, "One of the results of the above conditions is that certain people can 'hear' the emissions due to a scientifically-proven phenomenon known as the Microwave Auditory Effect. There is also an audible component to these microwave emissions; approximately 20 percent of total emissions. Both of these effects are engineering/ physics fact. The above described people could well be considered as 'the canaries down the coal mine'." Among the earliest testimony by victims is the book, *Black on White: Voices and Witnesses about Electro-Hypersensitivity - The Swedish Experience* by Rigmor Granlund-Lind and John Lind, published in 2000, the same year Michael Tomana founded Amperion.

Nixon's first complaint met with a response asking for more information. While the people of Naperville, Illinois were preparing their action that the Open Meetings Act had been violated numerous times and other cases in the offing, Nixon focussed on his response. Meanwhile Mother Earth News published Dafna Tachover's research that Electromagnetic Sensitivity had already been recognized by the National Institute for Occupation Safety and Health in 2005.

At the Dept. of Justice, Nixon was not having much luck. His response was characteristic: “On March 20, 2012 you were sent a letter and documentation regarding a federal civil rights infringement by the Pennsylvania Public Utilities Commission. On June 29, 2012, three (3) months later you saw fit to reply to said letter and documentation. The letter is enclosed. There is no date of my correspondence being received by you. There is no reference number to which it would be possible to refer to the original complaint letter. There is nothing of any reference or of use in any reply to your 67 word letter. It is a shoddy and completely unprofessional attempt to confound my original complaint.”

Not since Zola’s *J’Accuse* or Wole Soyinka’s *The Man Died*, has a government been under siege by one writer. “I demand justice and a fair, unbiased hearing in a federal court for both myself and for millions of others in the USA that are being affected by these Smart Grid Initiative’s equipment’s emissions which have already claimed thousands of lives across the USA. Until such time that this Smart Grid Initiative equipment is removed you are complicit and guilty with intent of killing and maiming your own population,” said Nixon.

He also copied his complaint to Secretary Chiavetta at the Pennsylvania Public Utilities Commission.

Nixon’s instinct and military training told him he was entering a different arena. He knew he had truth on his side, he had the facts and the evidence. What he did not have was protection. Once the to the DoJ complaint was posted, Nixon had, once again, planned to go, as he said it, “off the radar”. He had long planned to head west to Idaho - of course there was a woman involved - and go fishing. Arrangements were made to post the complaint and Victor Nixon disappeared.

Early in the year, Nixon had indicated that he was tiring of the energy, time, expense and effort it took to alert people to the coming dangers and to push back. It took all of his patience dealing with people around the globe who were drawing on his expertise to fight their own battles.

“Fuuuuuuuuuu!!!” he said in January, “Are my academic achievements and Q's ever in demand. I speak five languages including Farsi, hack into any computer anywhere on the planet, snipe someone between the eyes at 1,300 meters. But guess what? I don't want to any more.”

“Here's the secret,” he confided, “Since Darfur I do not officially exist. The only thing spoiling it is the noise and emissions. But that'll get stopped ultimately. All I want is a couple of $Mil out of the $1.1Billion that I've sued ‘them’ for. Buy a farm, kill something and eat it. Go away, leave me alone. I've done my bit. Die happy with my combat boots off.”

Signs that the pressure was building surfaced just before the Baltimore hearing when Nixon admitted, “Right now I'm dealing with a woman that's seriously considering suicide - That's seriously with a capital "S". These days, with my boy gone, I leave the bathroom light off (there's no window) and hold my head in my hands. No thoughts, just that. I'm on top of it, I do not allow it to get to me.... famous last words be damned.”

The first reference to the fact that Nixon felt he was fighting for his life (and everyone else's) was revealed in late January when he commented, "There is also a gut/chest pain experienced by some, including the author, associated with the BPL 17Hz subharmonic "Ghost Frequency". It is by no means a minor reaction, doubling people over in pain; it is a very serious side effect of BPL/B-PLC interaction with the power spectrum." He backed up his assertion with a reference to a study done by U.K. researchers into the 17 Hz frequency who found nearly a quarter of those exposed to an inaudible signal during a concert, reported anxiety, uneasiness, extreme sorrow, nervous feelings of revulsion or fear, chills down the spine and feelings of pressure on the chest.

A few days later he confessed, "You are probably aware that entire countries have blocked this technology's implementation following pilot projects and recognizing BPL/B-PLC for what it really is; an unfinished and malignant technology. There are at least five (5) U.S. states that have vetoed its installation, more will follow. There are hundreds of thousands of people in the U.S.A. presently suffering, millions around the world. Presently, my left leg is entirely numb, I am going blind in my right eye, suffering stomach and chest pain 24/7; my entire physiology is deteriorating; all because of BPL emissions. I have one path; I either get these emissions stopped or I die, it's that simple."

Three weeks after "going off the radar", an e-mail arrived asking for a telephone call. "Please contact me as soon as you can."

The response was numbing. The voice said simply, "Victor is dead".

He died alone in a cabin in Idaho 17 September 2012, an hour's drive from the border with Canada. He did not know the outcome of his complaint to the Department of Justice. The death certificate cited a myocardial infarction - a heart attack - due to atherosclerotic coronary vascular disease or a blockage or hardening of the arteries of the heart. He was 59 years old.

Early on Nixon cited the following:

> Tender-handed stroke a nettle,
> And it stings you for your pains,
> Grasp it like a man of mettle,
> And it soft as silk remains.
>
> Aaron Hill
> English dramatist (1685 – 1750)

Therein lies the definition of a life well-lived.

To be able to define yourself without allowing someone else to define you - being "manufactured" to use Noam Chomsky's hypothesis in *Manufacturing Consent* - in a world dominated by celebrity, science and technology, is next to impossible.

It is an admirable lifetime achievement.

For his sake, he left us as he wanted, anonymously and quickly with fire and hope.

> No one felt like this before—says the young writer—but *I* felt like this; I have a pride akin to a soldier going into battle; without knowing whether there will be anybody there, to distribute medals or even to record it.
>
> F. Scott Fitzgerald
> Introduction to *The Great Gatsby*

Nixon was a writer. Nixon was a soldier.

There are no medals.

Here, at least, his contribution is recorded.

- John Weigel

Note: Victor Nixon's experiences are recorded as a tribute to the Human Spirit facing monumental forces of power and greed. For the first time in history, the choice of fight or flight no longer exists. As Nixon learned, even the ability to create a dialogue through the media or the courts has been usurped.

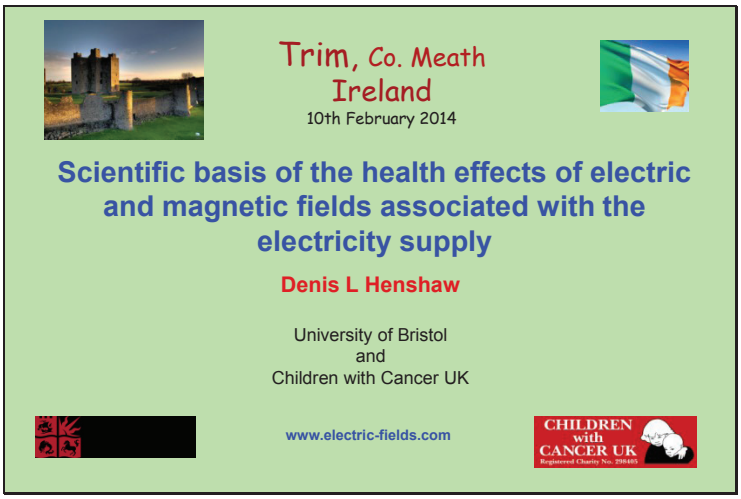
With mainstream science dependent upon government and corporate funding, those scientists concerned about the effects of microwave technology on every living organism on the planet are being starved of research funds or pushed aside. No claims are made on the correctness of Nixon's scientific insights. They are included for physicists and other scientists to replicate and verify.

Nixon is survived by his son, daughter, mother, two brothers and a sister and hundreds of contacts around the world.

Smart Grid World Summit set for London

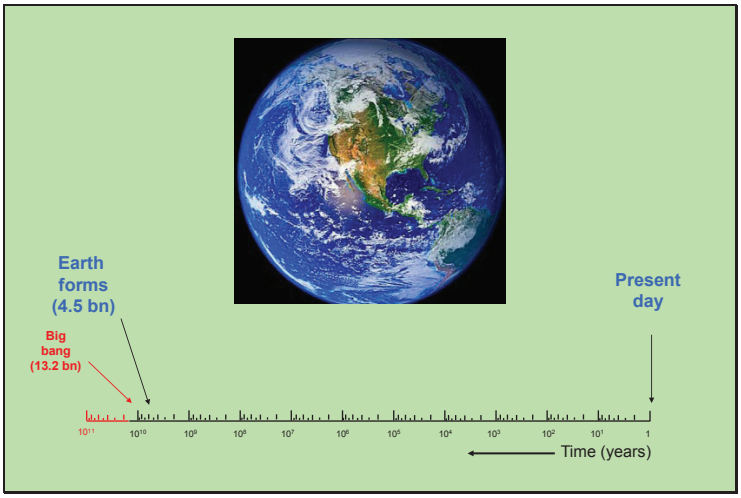
Smart Grid Conference to be held in London, 27-28 November 2012 is billed as the 'Smart Grid World Summit'. The conference is organized by Consumer & Media Intelligence, Ltd. (http://www.smartgridworldconference.com/index.html)

Slide 1



First I will demonstrate a magnetic field and an electric field. They are quite distinct. At power frequencies, the two fields are essentially independent and can be treated separately.

Slide 2



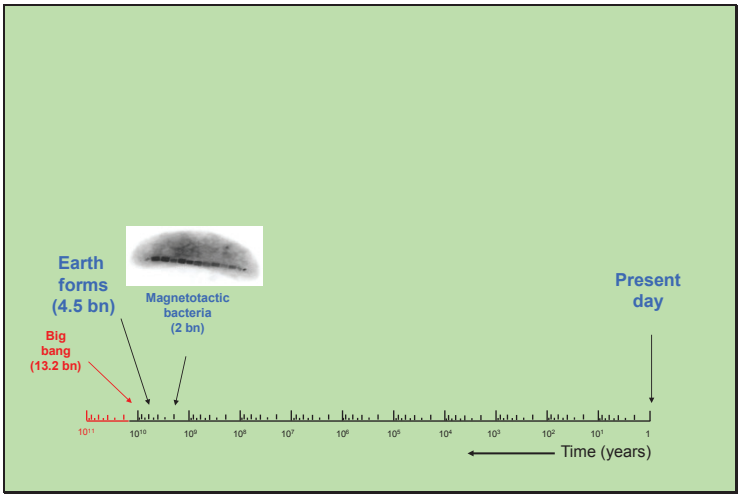
When the Earth was formed 4.5 billion years ago magnetic fields were already present, and had been since the Big Bang some 9 billion years earlier.

2 billion years ago aquatic magnetotactic bacteria evolved which contain a chain of magnetite particles enabling them to swim along the Earth's magnetic field lines to find food.

Over 90 million years ago the avian magnetic compass developed, enabling pigeons to detect magnetic field changes around 0.02 muT, 20 nT, or even lower.

Some 6 million years ago, man evolved, some of whom appear sensitive to solar storm fluctuations in the geomagnetic field of around 0.1 muT or 100 nT.

Slide 3



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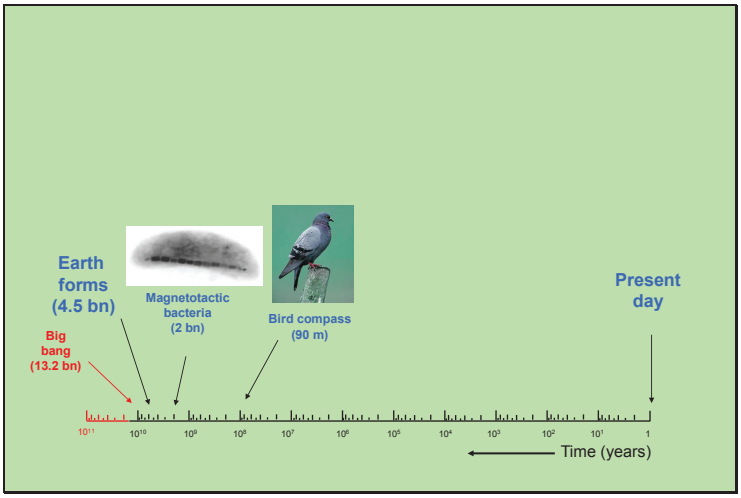

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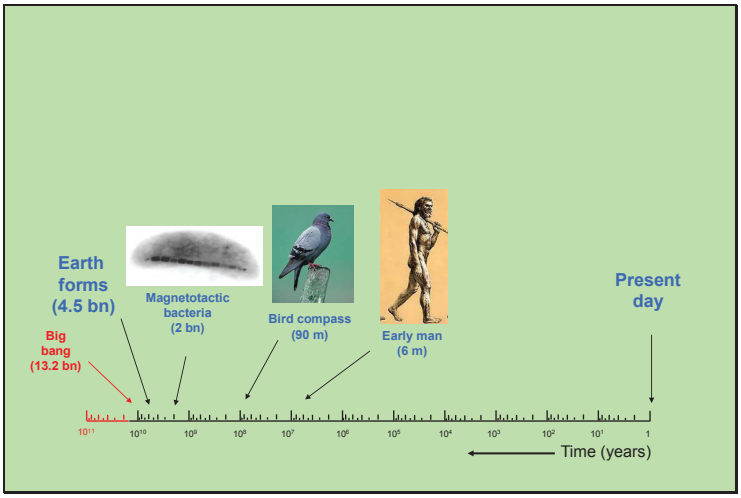

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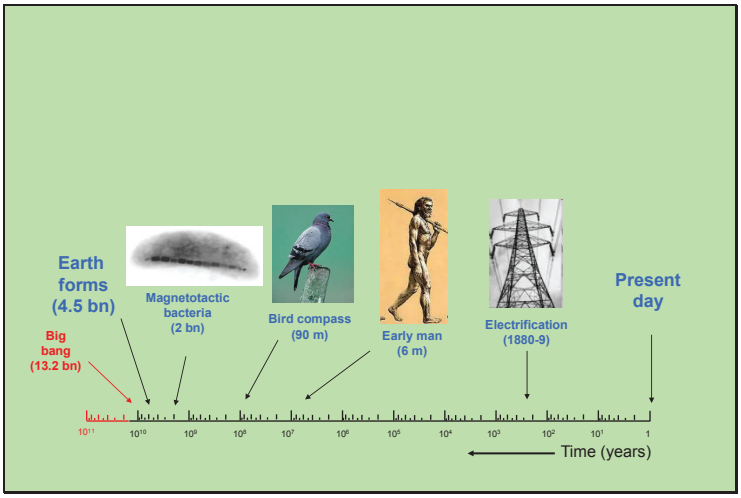

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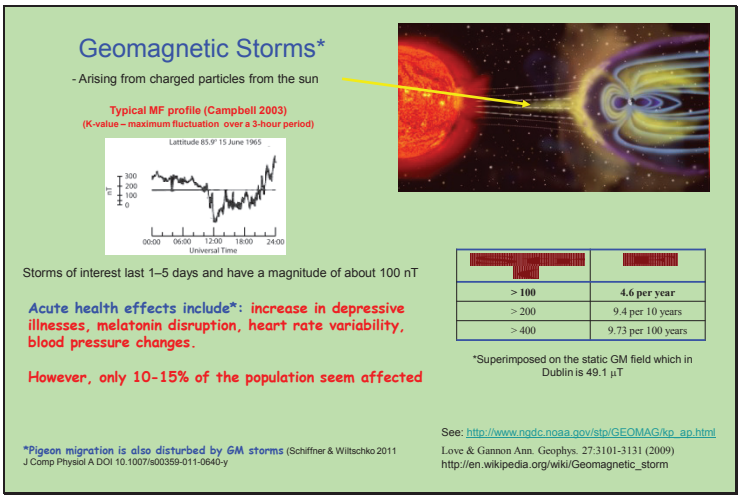
So, by the time the Dublin electric light company was established in 1880 and, soon after, an experimental public light was erected outside the offices of the Freeman's Journal in Prince's St. Dublin, it was already the case that wide sections of the animal kingdom had evolved to detect and exploit magnetic fields at levels below those associated with this new invention, and with hindsight, a hint that there might be adverse health effects in humans.

Notes only:
The species whose magnetic compass has been analyzed so far are not at all closely related. Chickens belong to an ancient line of birds, the Galloanseres, that separated from the remaining modern birds, the Neoaves, more than 90 million years ago in the beginning of the Late Creataceous Finding the same type of

magnetic compass in species of all three groups suggests that this compass mechanism may have already been present in their common ancestor.

From: **Turn On The Lights** Electrification Comes To Rural Ireland:
In 1880, Thomas Edison invented the electric filament lamp in the US. In the same year, the Dublin Electric
Light Company was established and, soon after, an experimental public light was erected outside the
offices of the Freeman's Journal in Prince's St. Dublin, followed by seventeen public lights in the vicinity
of Kildare St., Dawson St. and St. Stephen's Green. In 1889, Carlow became the first provincial town
in Ireland to get public electric lighting, supplied from a generator in a flour mill some four miles away.

Slide 7



So, start by taking as quick look at Geomagnetic storms

Superimposed on the Earth's static magnetic field of 49.1 muT in Dublin, are small fluctuations caused by storms of charged particles emitted by the Sun

They are categorised by their K-value, their maximum variation over a three hour period.

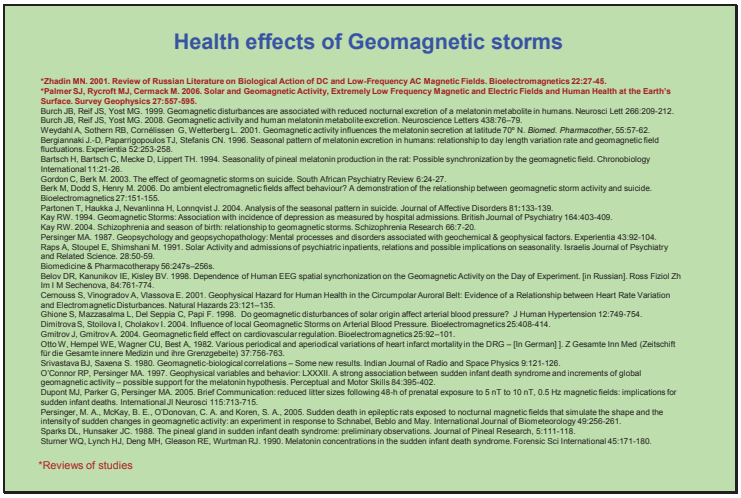
The storms of interest are those around 100 nT, there being about 4.6 such events per year.

Acute health effects include: increase in depressive illnesses, melatonin disruption, heart rate variability, blood pressure changes.

However, only 10-15% of the population seem affected

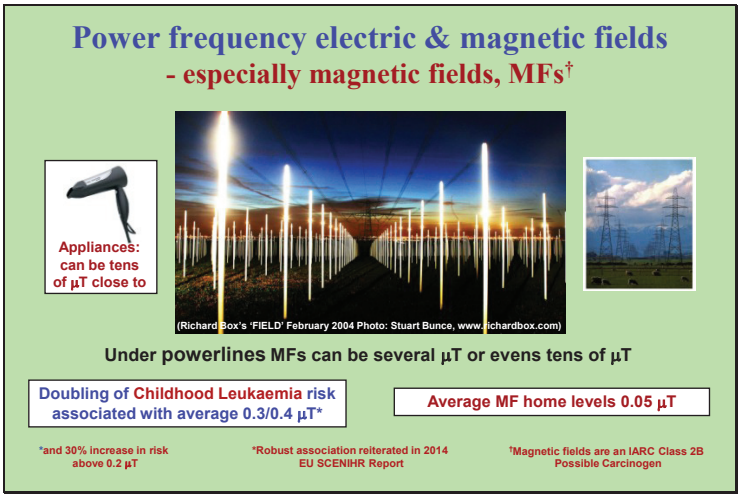
Much of this research was carried out as part of the US and Russian Space Programme

Slide 8



Here is a short list of some of the studies of health effects resulting from geomagnetic storms, the first two are reviews

Slide 9

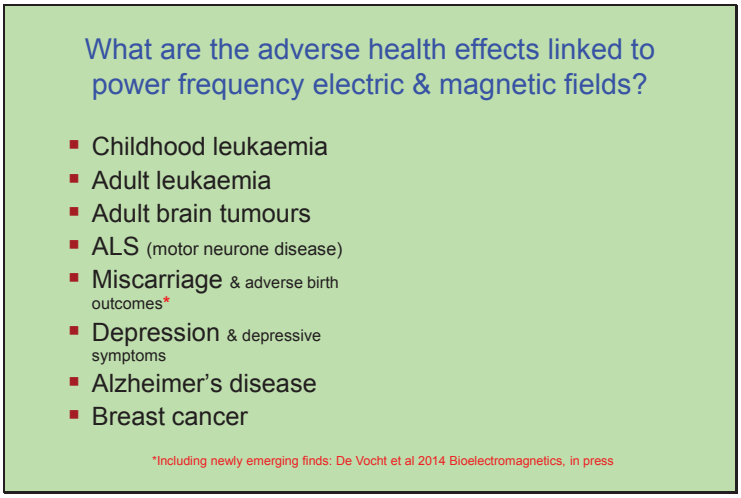


So, let's now look at power frequency magnetic fields. In 2002 these were classified by The International Agency for Research on Cancer (IARC) as a Class 2B Possible carcinogen – similar to coffee: drinking 3-8 cups of coffee per day in pregnancy can lead to a 2-3 fold increase in childhood leukaemia risk in offspring.

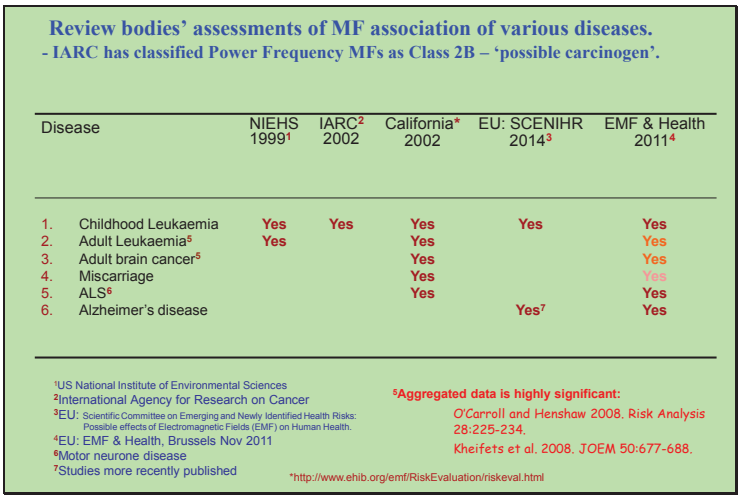
The average exposure to power frequency magnetic fields in the home is only 0.05 microtesla (μυT) or 50 nanotesla (nT). However, close to certain appliances, levels can be tens of muT. Under powerlines MFs can be several muT or evens tens of muT

Crucially a doubling of childhood Leukaemia risk is associated with average exposure of 0.3/0.4 muT. Further analyses of international epidemiological studies indicate a 30% increase in childhood leukaemia risk associated with average magnetic field exposures above 0.2 muT (Zhao et al 2013. Leukaemia Research In press – online early).

Slide 10


What are the adverse health effects linked to power frequency electric & magnetic fields?
Childhood leukaemia
Adult leukaemia
Adult brain tumours
ALS (motor neurone disease)
Miscarriage & adverse birth outcomes*
Depression & depressive symptoms
Alzheimer's disease
Breast cancer
*Including newly emerging finds: De Vocht et al 2014 Bioelectromagnetics, in press

Slide 11



Review bodies' assessments of MF association of various diseases.
- IARC has classified Power Frequency MFs as Class 2B – 'possible carcinogen'.

Disease	NIEHS 1999[1]	IARC[2] 2002	California* 2002	EU: SCENIHR 2014[3]	EMF & Health 2011[4]
1. Childhood Leukaemia	Yes	Yes	Yes	Yes	Yes
2. Adult Leukaemia[5]	Yes		Yes		Yes
3. Adult brain cancer[5]			Yes		Yes
4. Miscarriage			Yes		Yes
5. ALS[6]			Yes		Yes
6. Alzheimer's disease				Yes[7]	Yes

[1]US National Institute of Environmental Sciences
[2]International Agency for Research on Cancer
[3]EU: Scientific Committee on Emerging and Newly Identified Health Risks: Possible effects of Electromagnetic Fields (EMF) on Human Health.
[4]EU: EMF & Health, Brussels Nov 2011
[6]Motor neurone disease
[7]Studies more recently published

[5]**Aggregated data is highly significant:**
O'Carroll and Henshaw 2008. Risk Analysis 28:225-234.
Kheifets et al. 2008. JOEM 50:677-688.

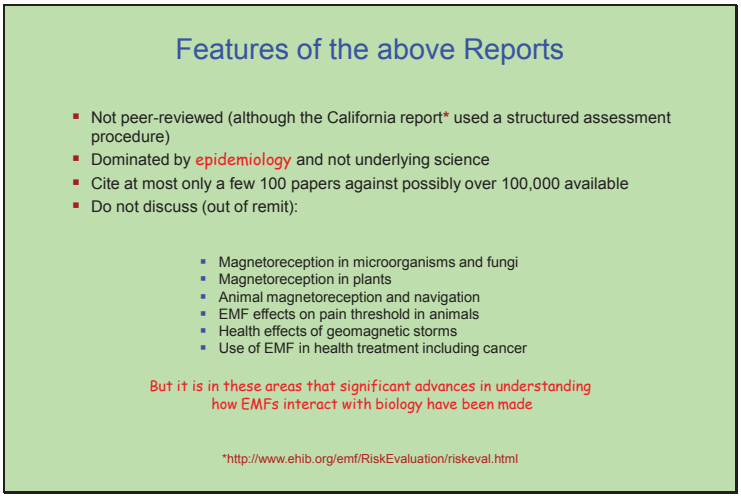
*http://www.ehib.org/emf/RiskEvaluation/riskeval.html

Here is what various review bodies have said about Magnetic Field and adverse health effects

IARC 2002 must have had a bad day because their own listing of studies shows strong evidence of association (See O'Carroll & Henshaw 2008 and also Kheifets et al 2008). In fact the MF link with adult leukaemia is, if anything, even stronger than the link with childhood leukaemia

Representative results from 33 independent adult leukemia studies tabled by IARC yielded 23.5 positives
($p \approx 0.01$) and 9 significant-positives ($p<10-7$). From 43 representative results from CDHS, there were 32 positive ($p<0.001$) and 14 significant-positives ($p<10-12$). There were
no significant-negative results in either list. Results for adult brain cancer gave a similar, but
less clear message.

Slide 12


Features of the above Reports
Not peer-reviewed (although the California report* used a structured assessment procedure)
Dominated by epidemiology and not underlying science
Cite at most only a few 100 papers against possibly over 100,000 available
Do not discuss (out of remit):
Magnetoreception in microorganisms and fungi
Magnetoreception in plants
Animal magnetoreception and navigation
EMF effects on pain threshold in animals
Health effects of geomagnetic storms
Use of EMF in health treatment including cancer
But it is in these areas that significant advances in understanding how EMFs interact with biology have been made
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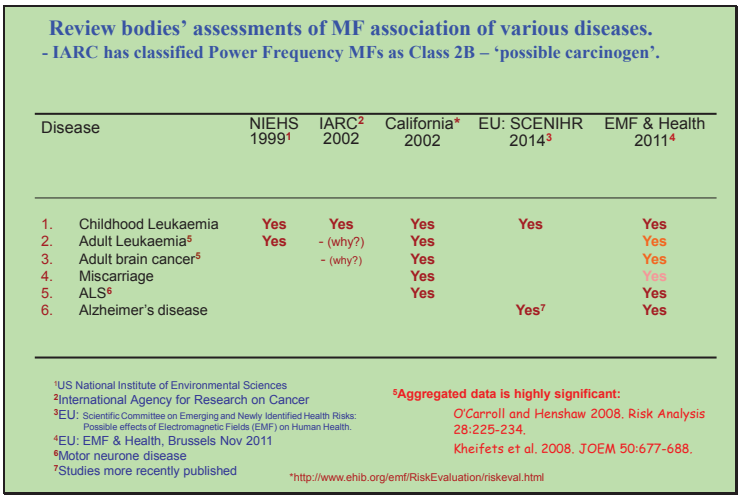
Slide 13



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4. Miscarriage			Yes		Yes
5. ALS[6]			Yes		Yes
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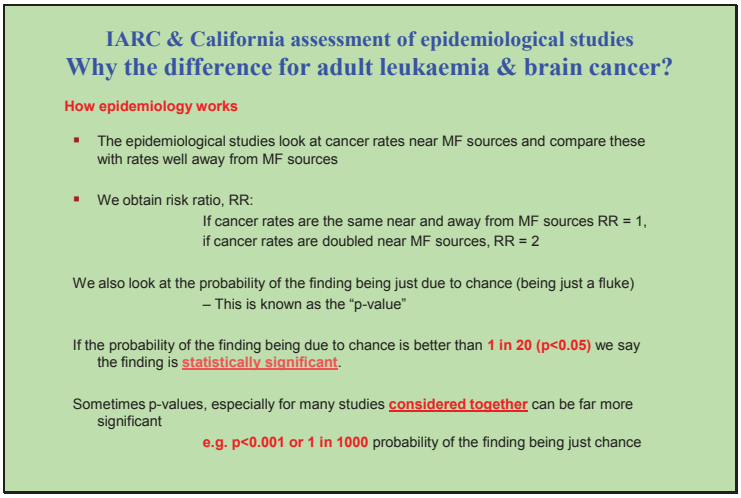
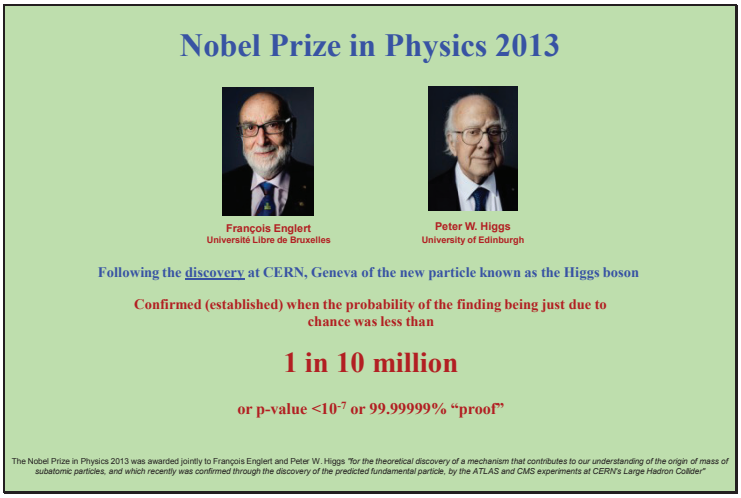
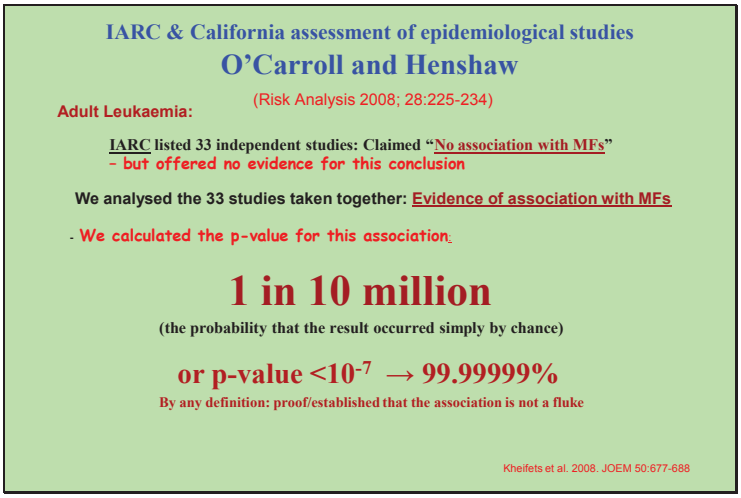
Slide 14


IARC & California assessment of epidemiological studies
Why the difference for adult leukaemia & brain cancer?
How epidemiology works
The epidemiological studies look at cancer rates near MF sources and compare these with rates well away from MF sources
We obtain risk ratio, RR:
If cancer rates are the same near and away from MF sources RR = 1,
if cancer rates are doubled near MF sources, RR = 2
We also look at the probability of the finding being just due to chance (being just a fluke)
– This is known as the "p-value"
If the probability of the finding being due to chance is better than 1 in 20 (p<0.05) we say the finding is statistically significant.
Sometimes p-values, especially for many studies considered together can be far more significant
e.g. p<0.001 or 1 in 1000 probability of the finding being just chance

Slide 15

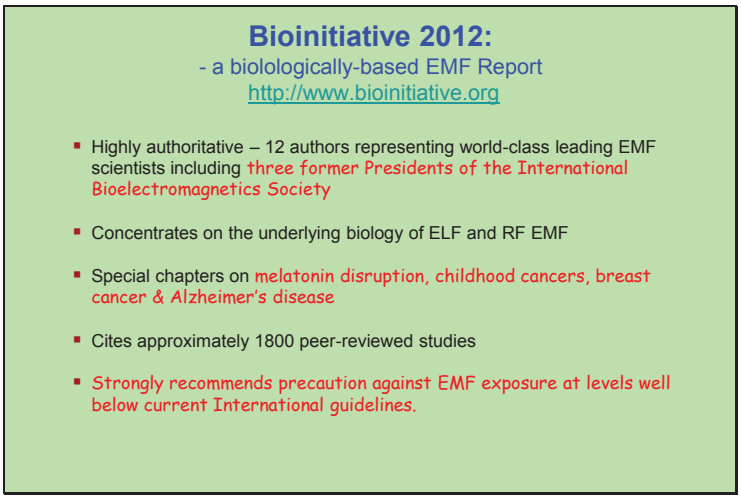

Nobel Prize in Physics 2013
François Englert
Université Libre de Bruxelles
Peter W. Higgs
University of Edinburgh
Following the discovery at CERN, Geneva of the new particle known as the Higgs boson
Confirmed (established) when the probability of the finding being just due to chance was less than
1 in 10 million
or p-value <10-7 or 99.99999% "proof"
The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs "for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider"

Slide 16



By any accepted definition, there is an established association between magnetic fields from the electricity supply and adult leukaemia and brain cancer

Slide 17


Bioinitiative 2012:
- a biolologically-based EMF Report
http://www.bioinitiative.org
Highly authoritative – 12 authors representing world-class leading EMF scientists including three former Presidents of the International Bioelectromagnetics Society
Concentrates on the underlying biology of ELF and RF EMF
Special chapters on melatonin disruption, childhood cancers, breast cancer & Alzheimer's disease
Cites approximately 1800 peer-reviewed studies
Strongly recommends precaution against EMF exposure at levels well below current International guidelines.

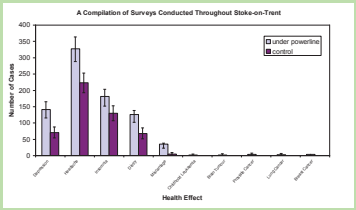
Slide 18

Health effects of people living near powerlines in Stoke-on-Trent*

http://www.electric-fields.com/SAGEsurvey.html

Pooled findings from three surveys in Stoke-on-Trent area from 2002 – 2006
(Males and females combined and scaled for equal number of questionnaires from cases and controls)

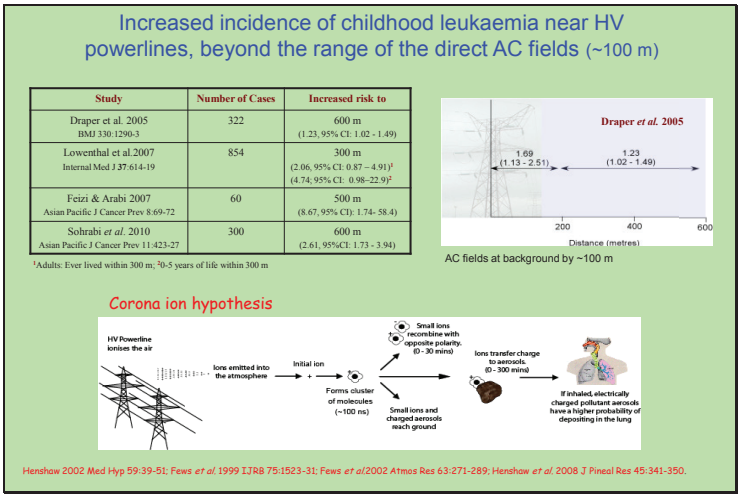
Health endpoint		Living <25 m of powerline	Living > 25 m from powerline
Depression:	Total reported	141	71
	No. requiring doctor	35	3
	No. requiring hospital	10	2
Headache:	Total reported	327	223
	No. requiring doctor	19	5
	No. requiring hospital	4	2
Insomnia:	Total reported	181	130
	No. requiring doctor	15	4
	No. requiring hospital	3	-
Dietary:	Total reported	126	68
No. requiring doctor		23	5
No. requiring hospital		14	1
Miscarriage		35	5
		2	-
Cancer:	Childhood Leukaemia	3	-
	Brain Tumour	2	-
	Prostate Cancer	34	-
	Lung Cancer		-
	Breast Cancer		-



*Surveys carried out by the late Maureen Asbury

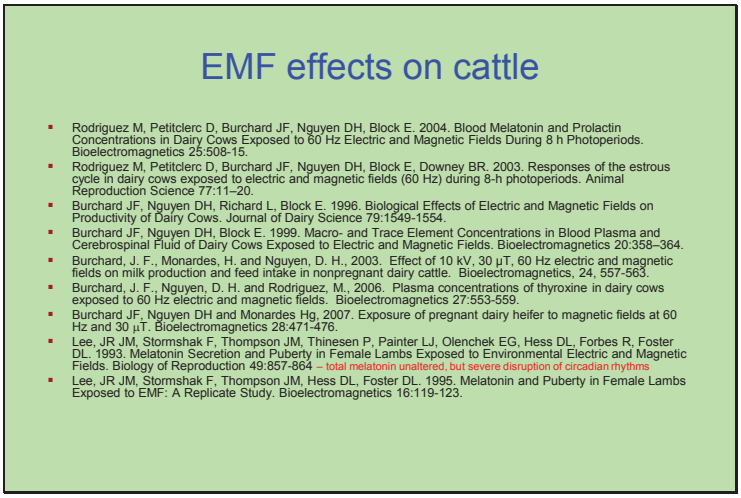
These surveys were carried out in three estates with very similar private housing, away from major roads or sources of industrial pollution. While this is not a professional survey, the findings closely mirror those published in the peer-reviewed literature.

Slide 19

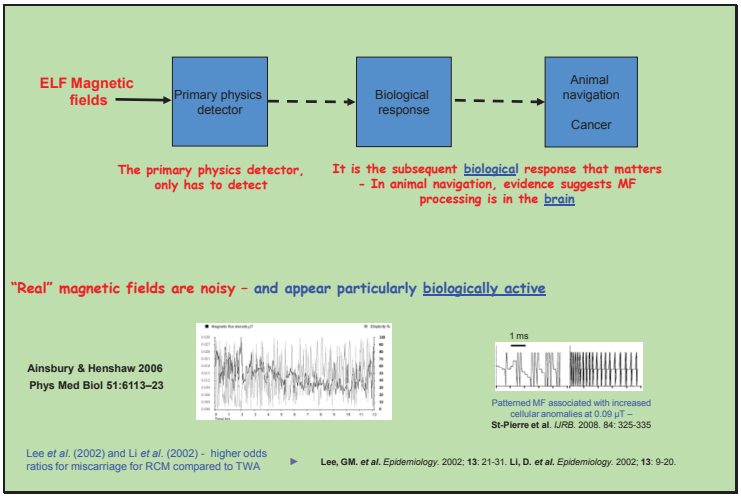


The literature includes four studies showing increased leukaemia risk up to 600 metres from powerlines which is well beyond the range of the AC fields, although well within range of corona ion emission. The findings could be explained by two possible models: that corona ions attach to particles of air pollution making them more likely to be retained in the lung when inhaled, and that corona ion disturbance of the natural electric field of the Earth results in melatonin and circadian rhythm disruption.

Slide 20

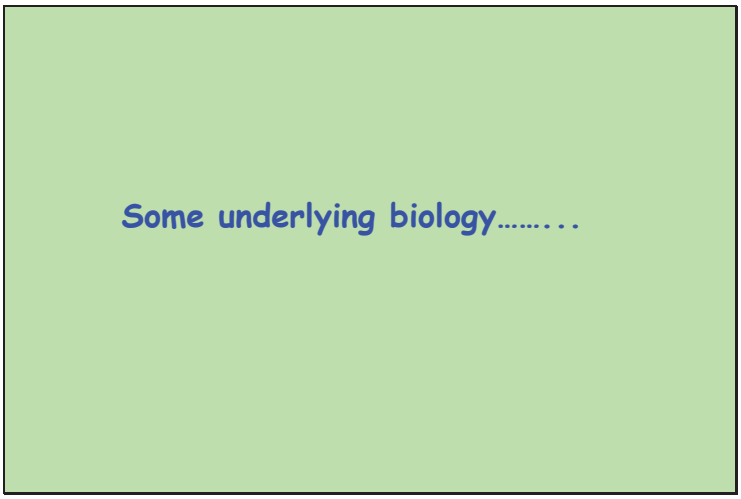

EMF effects on cattle
Rodriguez M, Petitclerc D, Burchard JF, Nguyen DH, Block E. 2004. Blood Melatonin and Prolactin Concentrations in Dairy Cows Exposed to 60 Hz Electric and Magnetic Fields During 8 h Photoperiods. Bioelectromagnetics 25:508-15.
Rodriguez M, Petitclerc D, Burchard JF, Nguyen DH, Block E, Downey BR. 2003. Responses of the estrous cycle in dairy cows exposed to electric and magnetic fields (60 Hz) during 8-h photoperiods. Animal Reproduction Science 77:11–20.
Burchard JF, Nguyen DH, Richard L, Block E. 1996. Biological Effects of Electric and Magnetic Fields on Productivity of Dairy Cows. Journal of Dairy Science 79:1549-1554.
Burchard JF, Nguyen DH, Block E. 1999. Macro- and Trace Element Concentrations in Blood Plasma and Cerebrospinal Fluid of Dairy Cows Exposed to Electric and Magnetic Fields. Bioelectromagnetics 20:358–364.
Burchard, J. F., Monardes, H. and Nguyen, D. H., 2003. Effect of 10 kV, 30 μT, 60 Hz electric and magnetic fields on milk production and feed intake in nonpregnant dairy cattle. Bioelectromagnetics, 24, 557-563.
Burchard, J. F., Nguyen, D. H. and Rodriguez, M., 2006. Plasma concentrations of thyroxine in dairy cows exposed to 60 Hz electric and magnetic fields. Bioelectromagnetics 27:553-559.
Burchard JF, Nguyen DH and Monardes Hg, 2007. Exposure of pregnant dairy heifer to magnetic fields at 60 Hz and 30 μT. Bioelectromagnetics 28:471-476.
Lee, JR JM, Stormshak F, Thompson JM, Thinesen P, Painter LJ, Olenchek EG, Hess DL, Forbes R, Foster DL. 1993. Melatonin Secretion and Puberty in Female Lambs Exposed to Environmental Electric and Magnetic Fields. Biology of Reproduction 49:857-864 – total melatonin unaltered, but severe disruption of circadian rhythms
Lee, JR JM, Stormshak F, Thompson JM, Hess DL, Foster DL. 1995. Melatonin and Puberty in Female Lambs Exposed to EMF: A Replicate Study. Bioelectromagnetics 16:119-123.

Slide 21



There is a key difference between the initial detector which senses magnetic fields, and the subsequent biological response. For example, the ear senses music, but the brain decides whether it likes it or not.

Slide 22

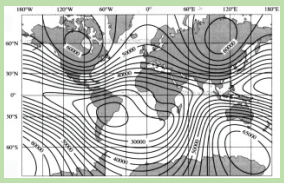


Slide 23

Navigation across the Earth

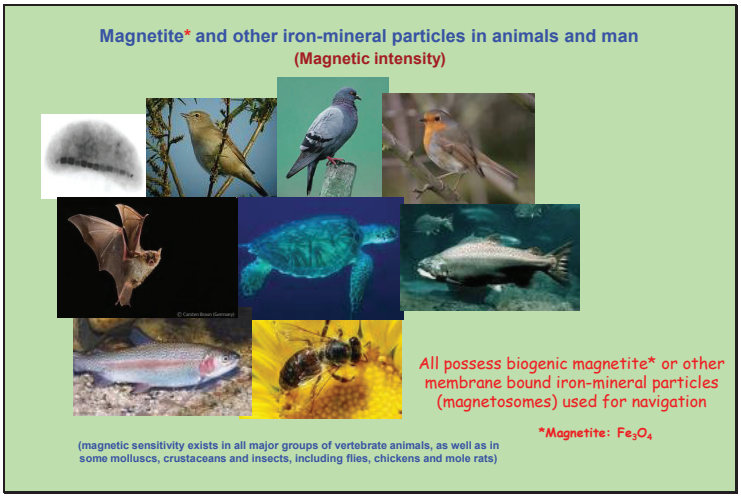
- requires two measurements

Humans use latitude & longitude



Many animals use magnetic intensity and compass direction of the Earth's magnetic field

Slide 24

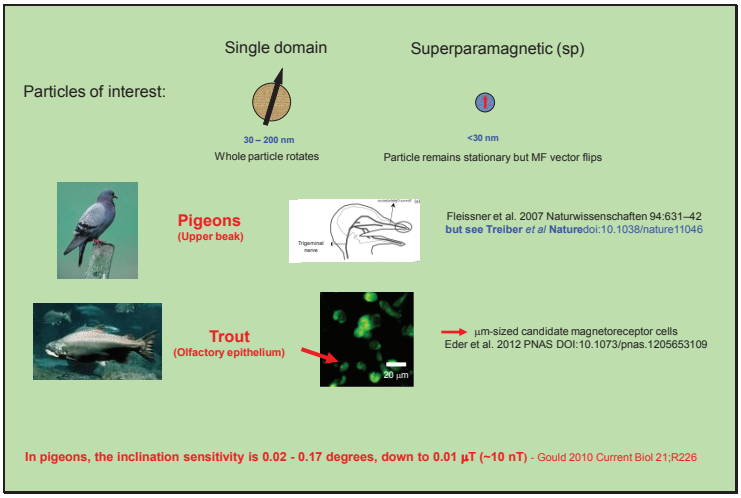


Magnetic sensitivity is widespread throughout the animal kingdom, and these are some of the animals which possess biogenic magnetite or other iron-mineral particles used for navigation

Notes:
Jogler C, Schűler D. 2009. Genomics, Genetics, and Cell Biology of Magnetosome Formation. Annual. Review of Microbiology 63:501–21.

Lohmann: magnetic sensitivity is phylogenetically widespread; it exists in all major groups of vertebrate animals, as well as in some molluscs, crustaceans and insects. The list includes groups such as flies, chickens and mole rats, none of which migrate.

Slide 25



Single domain permanent magnets, particles >50 nm where the whole particle physically rotates in an MF

And

Superparamagnetic particles which remains stationary but the MF vector quantum flips

Flessner et al 2007 Goethe-Universität, Frankfurt
Treiber et al 2012 1Institute of Molecular Pathology, Dr Bohr-Gasse, 1030 Vienna, Austria

Eder & Michael Winklhofer Ludwig-Maximilians-University Munich

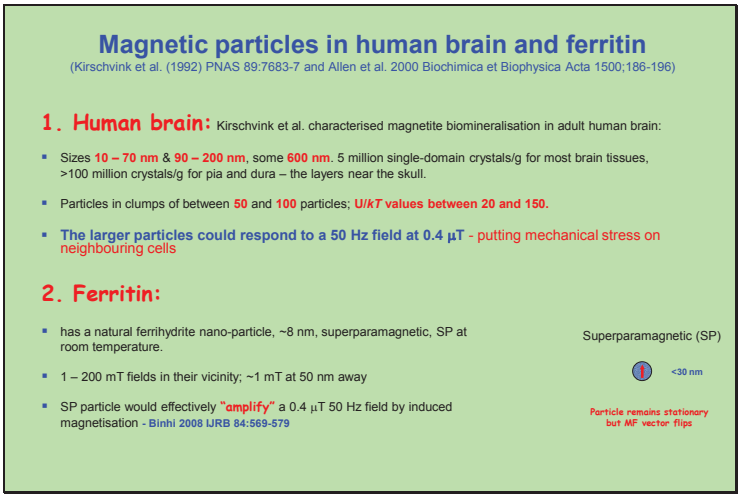
Notes:
Heyers D, Zapka M, Hoffmeister M, Wild JM, Mouritsen H. 2010. Magnetic field changes activate the trigeminal brainstem complex in a migratory bird. Proceedings of the National Academy of Sciences USA 107:9394-9399.

BUT: Zapka M, Heyers D, Hein CM, Engels S, Schneider N-L, Hans J, Weiler S, Dreyer D, Kishkinev D, Wild JM, Mouritsen H. 2009. Visual but not trigeminal mediation of magnetic compass information in a migratory bird. Nature 461:1274-1278. doi:10.1038/nature08528

Falkenberg G, Fleissner G, Schuchardt K, Kuehbacher M, Thalau P, et al. (2010) Avian Magnetoreception: Elaborate iron mineral containing dendrites in the upper

beak seem to be a common feature of birds. PLoS ONE 5(2): e9231. chickens, homing pigeons, European robin, Garden Warbler.

Slide 26



Notes:

Binhi 2008 IJRB 84:569-579

In horse spleen ferritin, up to 30% of the core exhibits magnetite/maghemite structure (Brem et al 2006)

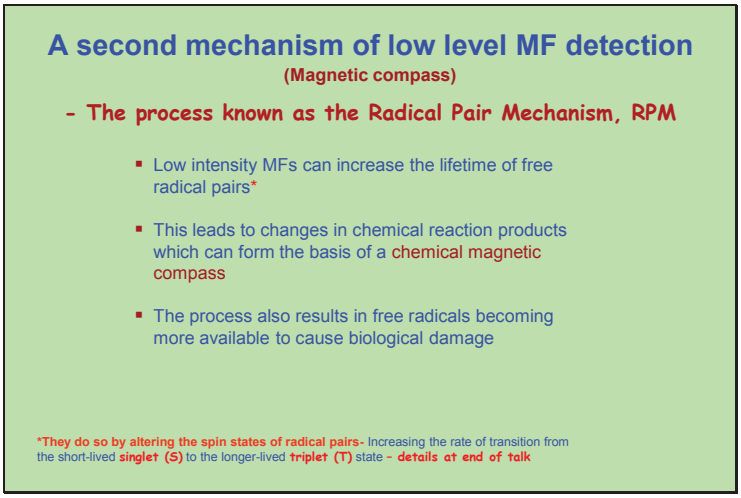
See also, magnetite in the brain of Alzheimer's patients and human heart, liver and spleen
(Dobson 2001, Brem et al. 2006, Collingwood et al. 2008), (Grass-Schultheiss et al. 1997).

Vanderstraeten J. Gillis P. 2010. Theoretical Evaluation of Magnetoreception of Power-Frequency Fields. Bioelectromagnetics 31:371-379

Joseph L. Kirschvink 1996. Microwave Absorption by Magnetite: A Possible Mechanism for Coupling Nonthermal Levels of Radiation to Biological Systems. Bioelectromagnetics 17:187-194 (1996)

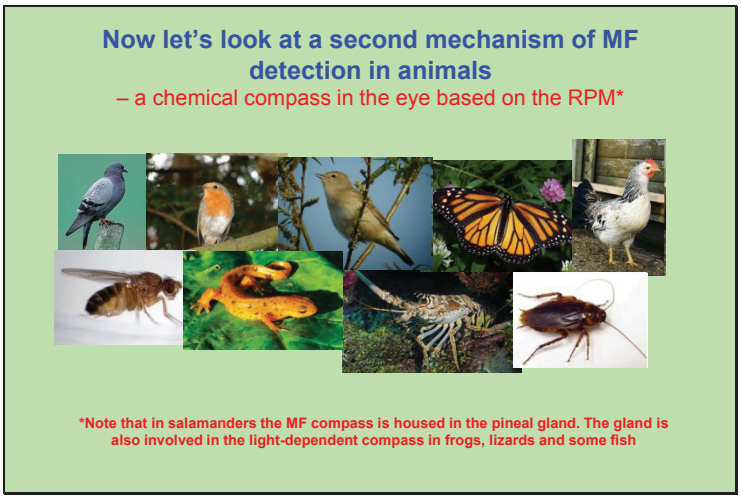
Allen et al. 2000. Low-frequency low-¢eld magnetic susceptibility of ferritin and Hemosiderin Biochimica et Biophysica Acta 1500;186-196

Slide 27



A full explanation of the RPM may be found in slides at the end of this talk.

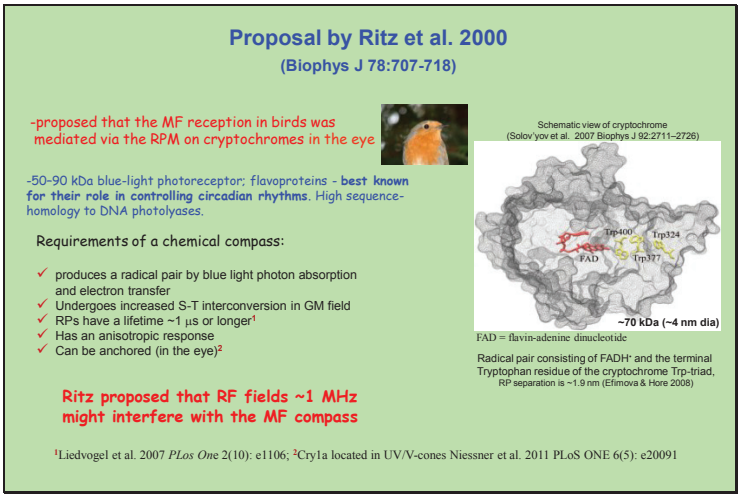
Slide 28



These species all have a light-dependent compass with evidence that it is based on the RPM. Notice that in some cases, this is in addition to magnetite. Notice also the involvement of the pineal gland in some species

From Lohmann 2010: Figure 1 | **Animal magnetism.** Diverse species have magnetic compasses, including (clockwise from
top left) the European robin, the loggerhead sea turtle, the brown bat, the Caribbean spiny lobster and
the red-spotted newt. A few, including turtles, lobsters and newts, also have magnetic maps.

Slide 29



Ritz et al 2000 proposed that the avian compass was based on cryptochrome molecules in the eye and that as an experimental test, this might be interferred with by application of an approprite RF field

RP lifetimes up to 20 ms – five orders of magnitude higher than 1 mS required have been observed: Liedvogel et al. 2007, Chemical magnetoreception: bird cryptochrome 1a is excited by blue light and forms long-lived radical-pairs" *PLos One* 2(10): e1106; and

Cry1a located in UV/V-cones in robins and chickens, in ordered bands along the membrane discs (Niessner et al. 2011 PLoS ONE 6(5): e20091)

FAD = flavin-adenine dinucleotide

Slide 30

Ritz et al. 2004

Nature 429:177-180

Birds: European robins, *Erithacus rubecula*: 12 individually tested in spring migration season.

MF exposure: Local GMF 46 µT, inclination 66° and 565 nm light (control) plus: (i) broadband 0.1 – 10 MHz, 0.085 µT; (ii) single frequency 7 MHz, 0.47 µT; all parallel, 24° or 48°to GMF vector.

Results:

- RF magnetic fields disrupt the magnetic orientation behaviour of migratory birds.
- Robins were disoriented when exposed to a vertically aligned broadband (0.1–10 MHz) or a single-frequency (7-MHz) field in addition to the geomagnetic field.
- In the 7-MHz oscillating field, effect depended on the angle between the oscillating and the geomagnetic fields.
- Birds exhibited seasonally appropriate migratory orientation with no applied RF or when the RF field was parallel to the geomagnetic field, but were disoriented when it was presented at an angle of 24° or 48° at **0.085 µT**.

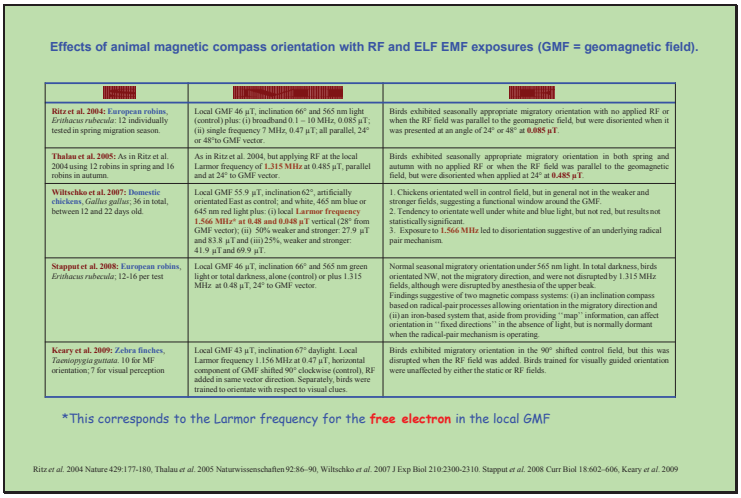
Conclusion:

These results are consistent with a resonance effect on singlet-triplet transitions and suggest a magnetic compass based on a radical pair mechanism.

These findings have been replicated in robins and seen in chickens, zebra finches and American cockroaches

FAD = flavin-adenine dinucleotide

Slide 31



This and the next slide:

The findings of Ritz et al 2000 have now been repeated in robins and also in chickens, zebra finches and American cockroaches

The table is very busy but I just want to point out the very low level of RF fields that disturb the compass and at frequencies corresponding to the Larmor precessional frequency of the free electron

Ritz T, Thalau P, Phillips JB, Wiltschko R, Wiltschko W. 2004. Resonance effects indicate a radical-pair mechanism for avian magnetic compass. Nature 429:177-180.

Thalau P, Ritz T, Stapput K, Wiltschko R, Wiltschko W. 2005. Magnetic compass orientation of migratory birds in the presence of a 1.315 MHz oscillating field. Naturwissenschaften 92:86–90. (DOI 10.1007/s00114-004-0595-8)

Ritz T, Wiltschko R, Hore PJ, Rodgers CT, Stapput K, Thalau P, Timmel CR, Wiltschko W. 2009. Magnetic compass of birds is based on a molecule with optimal directional sensitivity. Biophysical Journal 96, 3451–3457. (doi:10. 1016/j.bpj.2008.11.072)

Stapput K, Thalau P, Wiltschko R, Wiltschko W. 2008. Orientation of Birds in Total Darkness. Current Biology 18:602–606. (DOI 10.1016/j.cub.2008.03.046)

Wiltschko W, Freire R, Munro U, Ritz T, Rogers L, Thalau P, Wiltschko R. 2007c. The magnetic compass of domestic chickens, *Gallus gallus*. The Journal of Experimental Biology 210, 2300-2310.

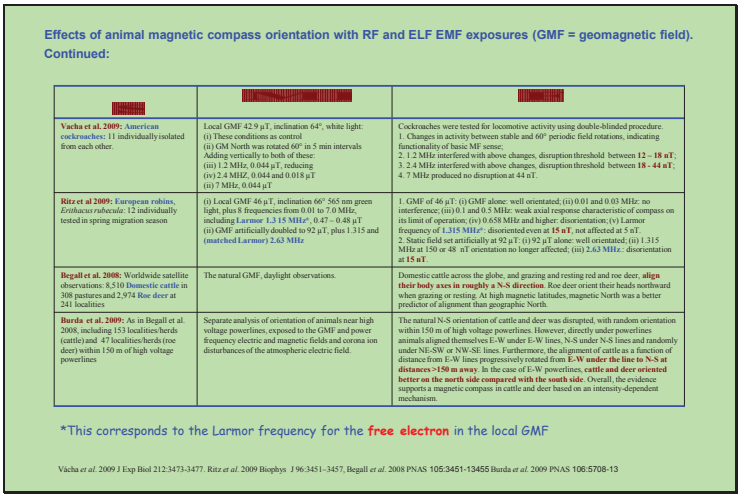
Keary N, Ruploh T, Voss J, Thalau P, Wiltschko R, Wiltschko W, Bischof H-J 2009. Oscillating magnetic field disrupts magnetic orientation in Zebra finches, *Taeniopygia guttata.* Frontiers in Zoology 2009, 6:25.

Vácha M, Půžová T,and Markéta Kvíčalová M. 2009. Radio frequency magnetic fields disrupt magnetoreception in American cockroach. The Journal of Experimental Biology 212;3473-3477.

Begall S, Cerveny J, Neef J, Vojtech O, Burda H, 2008. Magnetic alignment in grazing and resting cattle and deer. Proceedings of the National Academy of Sciences of the USA 105:3451-13455.

Burda H, Begall S, Cerveny J, Neef J, Nemec P. 2009. Extremely low-frequency electromagnetic fields disrupt magnetic alignment of ruminants. Proceedings of the National Academy of Sciences of the USA 106:5708-13, 2009.

Slide 32



Effects of animal magnetic compass orientation with RF and ELF EMF exposures (GMF = geomagnetic field). Continued:

[redacted]	[redacted]	[redacted]
Vacha et al. 2009: American cockroaches: 11 individually-isolated from each other.	Local GMF 42.9 μT, inclination 64°, white light: (i) These conditions as control (ii) GM North was rotated 60° in 5 min intervals Adding vertically to both of these: (iii) 1.2 MHz, 0.044 μT, reducing (iv) 2.4 MHZ, 0.044 and 0.018 μT (ii) 7 MHz, 0.044 μT	Cockroaches were tested for locomotive activity using double-blinded procedure. 1. Changes in activity between stable and 60° periodic field rotations, indicating functionality of basic MF sense; 2. 1.2 MHz interfered with above changes, disruption threshold between **12 – 18 nT**; 3. 2.4 MHz interfered with above changes, disruption threshold between **18 - 44 nT**; 4. 7 MHz produced no disruption at 44 nT.
Ritz et al 2009: European robins, *Erithacus rubecula*: 12 individually tested in spring migration season	(i) Local GMF 46 μT, inclination 66° 565 nm green light, plus 8 frequencies from 0.01 to 7.0 MHz, including **Larmor 1.315 MHz***, 0.47 – 0.48 μT (ii) GMF artificially doubled to 92 μT, plus 1.315 and **(matched Larmor) 2.63 MHz**	1. GMF of 46 μT: (i) GMF alone: well orientated; (ii) 0.01 and 0.03 MHz: no interference; (iii) 0.1 and 0.5 MHz: weak axial response characteristic of compass on its limit of operation; (iv) 0.658 MHz and higher: disorientation; (v) Larmor frequency of **1.315 MHz***: disoriented even at **15 nT**, not affected at 5 nT. 2. Static field set artificially at 92 μT: (i) 92 μT alone: well orientated; (ii) 1.315 MHz at 150 or 48 nT orientation no longer affected; (iii) **2.63 MHz**.: disorientation at **15 nT**.
Begall et al. 2008: Worldwide satellite observations: 8,510 **Domestic cattle** in 308 pastures and 2,974 **Roe deer** at 241 localities	The natural GMF, daylight observations.	Domestic cattle across the globe, and grazing and resting red and roe deer, **align their body axes in roughly a N-S direction**. Roe deer orient their heads northward when grazing or resting. At high magnetic latitudes, magnetic North was a better predictor of alignment than geographic North.
Burda et al. 2009: As in Begall et al. 2008, including 153 localities/herds (cattle) and 47 localities/herds (roe deer) within 150 m of high voltage powerlines	Separate analysis of orientation of animals near high voltage powerlines, exposed to the GMF and power frequency electric and magnetic fields and corona ion disturbances of the atmospheric electric field.	The natural N-S orientation of cattle and deer was disrupted, with random orientation within 150 m of high voltage powerlines. However, directly under powerlines animals aligned themselves E-W under E-W lines, N-S under N-S lines and randomly under NE-SW or NW-SE lines. Furthermore, the alignment of cattle as a function of distance from E-W lines progressively rotated from **E-W under the line to N-S at distances >150 m away**. In the case of E-W powerlines, **cattle and deer oriented better on the north side compared with the south side**. Overall, the evidence supports a magnetic compass in cattle and deer based on an intensity-dependent mechanism.

*This corresponds to the Larmor frequency for the **free electron** in the local GMF

Vácha *et al.* 2009 J Exp Biol 212:3473-3477. Ritz *et al.* 2009 Biophys J 96:3451–3457, Begall *et al.* 2008 PNAS 105:3451-13455 Burda *et al.* 2009 PNAS 106:5708-13

I point also to the findings of Begall et al 2008 and Burda et al 2009

The ICNIRP Exposure Limit is:

0.92 muT at 1 MHz
0.092 muT between 10 – 400 MHZ
0.2 muT at 2 GHz

Note that RF disruption of the animal compass occurs at levels below the ICNIRP limit

Ritz T, Wiltschko R, Hore PJ, Rodgers CT, Stapput K, Thalau P, Timmel CR, Wiltschko W. 2009. Magnetic compass of birds is based on a molecule with optimal directional sensitivity. Biophysical Journal 96, 3451–3457. (doi:10. 1016/j.bpj.2008.11.072)

Stapput K, Thalau P, Wiltschko R, Wiltschko W. 2008. Orientation of Birds in Total Darkness. Current Biology 18:602–606. (DOI 10.1016/j.cub.2008.03.046)

Wiltschko W, Freire R, Munro U, Ritz T, Rogers L, Thalau P, Wiltschko R. 2007c. The magnetic compass of domestic chickens, *Gallus gallus*. The Journal of Experimental Biology 210, 2300-2310.

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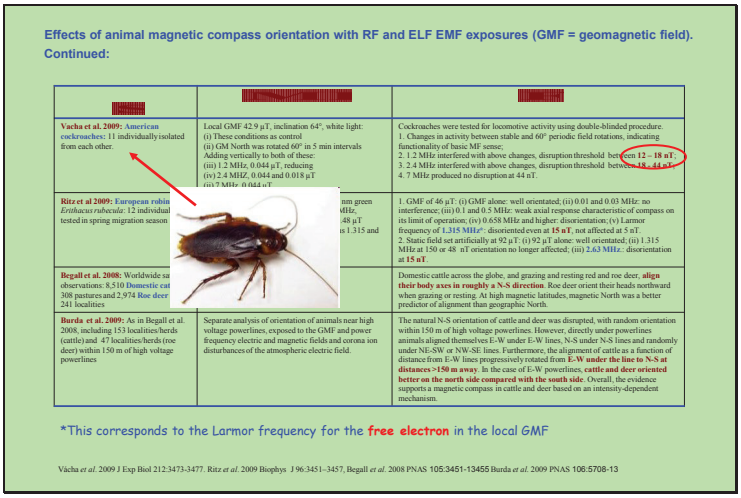
Vácha M, Půžová T,and Markéta Kvíčalová M. 2009. Radio frequency magnetic fields disrupt magnetoreception in American cockroach. The Journal of Experimental Biology 212;3473-3477.

Begall S, Cerveny J, Neef J, Vojtech O, Burda H, 2008. Magnetic alignment in grazing and resting cattle and deer. Proceedings of the National Academy of Sciences of the USA 105:3451-13455. CHECK !!!!!

Burda H, Begall S, Cerveny J, Neef J, Nemec P. 2009. Extremely low-frequency electromagnetic fields disrupt magnetic alignment of ruminants. Proceedings of the National Academy of Sciences of the USA 106:5708-13, 2009.

Slide 33



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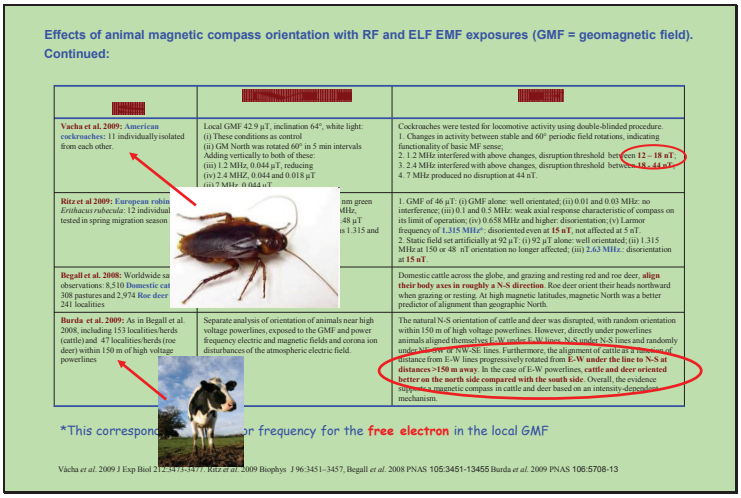
Slide 34



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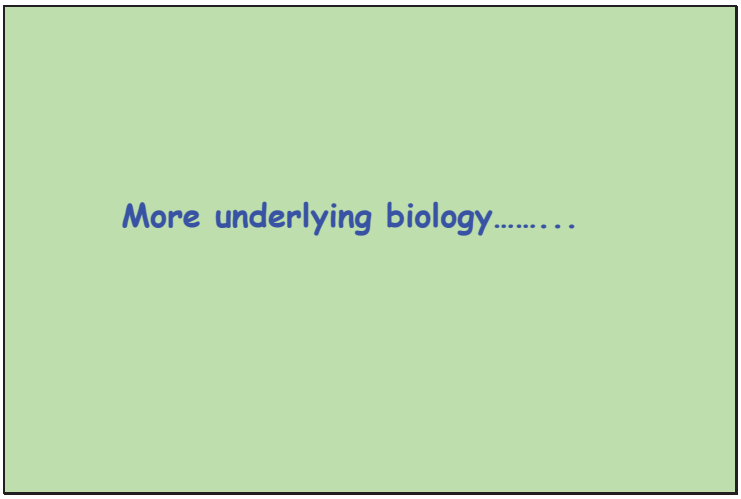
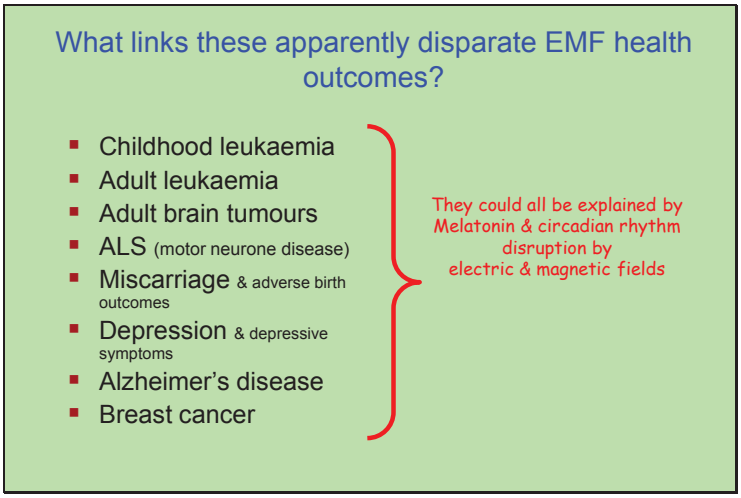
Burda H, Begall S, Cerveny J, Neef J, Nemec P. 2009. Extremely low-frequency electromagnetic fields disrupt magnetic alignment of ruminants. Proceedings of the National Academy of Sciences of the USA 106:5708-13, 2009.

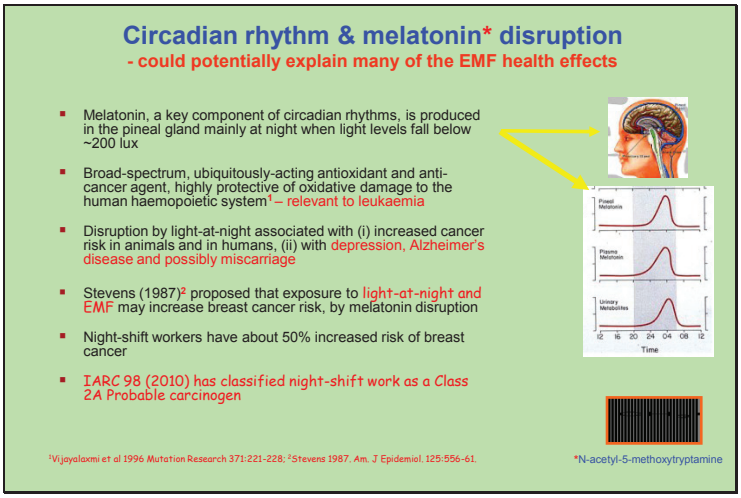
Slide 35



Slide 36


What links these apparently disparate EMF health outcomes?
Childhood leukaemia
Adult leukaemia
Adult brain tumours
ALS (motor neurone disease)
Miscarriage & adverse birth outcomes
Depression & depressive symptoms
Alzheimer's disease
Breast cancer
They could all be explained by Melatonin & circadian rhythm disruption by electric & magnetic fields

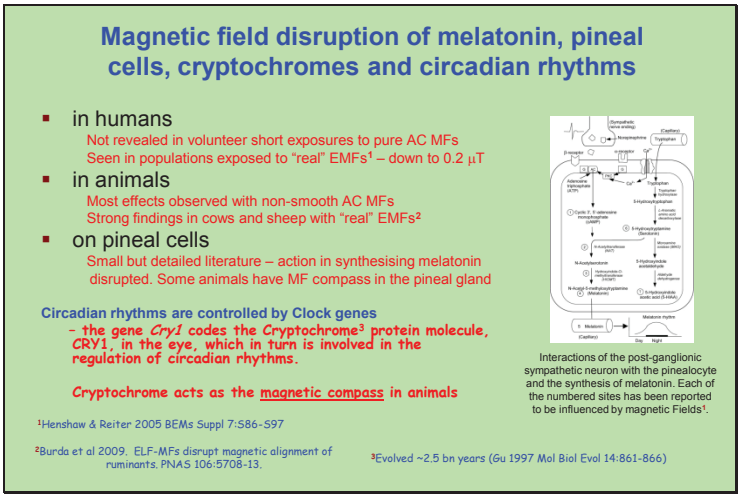
Slide 37



The adverse health effects associated with ELF MF exposure could all potentially be explained by circadian rhythm disruption

Melatonin is a broad-spectrum, ubiquitously-acting antioxidant and anti-cancer agent. Which also reduces growth of human myeloid leukemia cells and whose disruption by light-at-night is associated with increased cancer risk.

Slide 38



Yoshii, Ahmad, Helfrich-Forster 2009 Cryptochrome mediates light-dependent magnetosensitivity of Drosophila's circadian clock. PLoS Biol 7(4): e1000086. doi:10.1371/journal.pbio.1000086

So what about magnetic field effects on melatonin, pineal cells, cryptochromes and circadian rhythms?

Melatonin disruption in humans is really seen in populations exposed to "real" fields – down to 0.2 muT

Similarly in animals, effects are seen in "real" fields, both in the laboratory and outdoors

There's a small but detailed literature – that MFs interfere with the action of pineal cells in synthesising melatonin.

The human light-detection threshold is sensitive to MF exposure

But most importantly, cryptochrome, expressed by the CRY genes **controls the mammalian circadian clock and acts as the magnetic compass in animals**.

And I will be saying more about that later.

Note:
There are 8 Clock genes in humans: PER1, PER2, CLOCK, BMAL1, CRY1, CKId/e, CRY2, BMAL2 (see Cermakian & Boivin 2003)

Gu Age of Eukaryotes & Prokaryotes 2.1-2.9 billion yrs Mol Biol Evol 14;861-66

Slide 39

Are human cryptochromes magnetosensitive? - Yes

Foley, Gegear & Reppert 2011 Nature Comm ncomms1364:

"Human cryptochrome exhibits light-dependent magnetosensitivity"

- **Study:** Magnetic behavioural response of CRY-deficient and hCRY2 *Drosophila melanogaster* (10 – 12 groups of 100-150 individual flies per test), under control of *tim*-GAL4 *driver*.
- **Methods:** Flies exposed between 10 – 500 μT with full spectrum and blocked (>500 & >400 nm) light
- **Findings:** (i) CRY-deficient flies showed no MF response; (ii) Human CRY-rescued flies showed light-dependent magnetosensitivity: positive response under full spectrum light was blocked at >500 nm but partially restored at >400 nm.

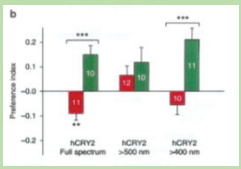


Figure 1b

Slide 40

Electric fields also affect circadian rhythms in humans

Wever (1979)*: In a long series of experiments, human volunteers were exposed for several weeks to 10 Hz square wave **electric fields** of only **2.5 V/m**. The 24 h circadian rhythm was disrupted. Volunteers were immediately entrained to the external signal. Effect lasted for a few days, indicating E-fields acting as zeitgebers

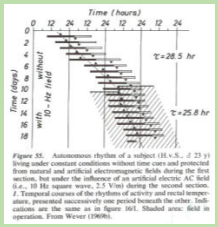
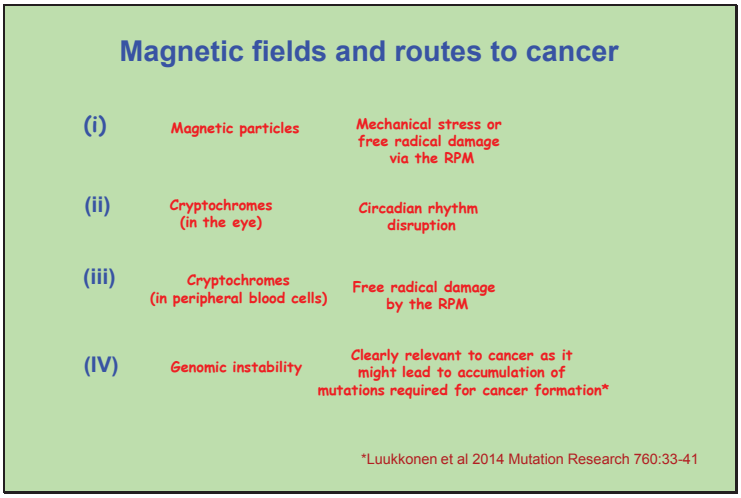


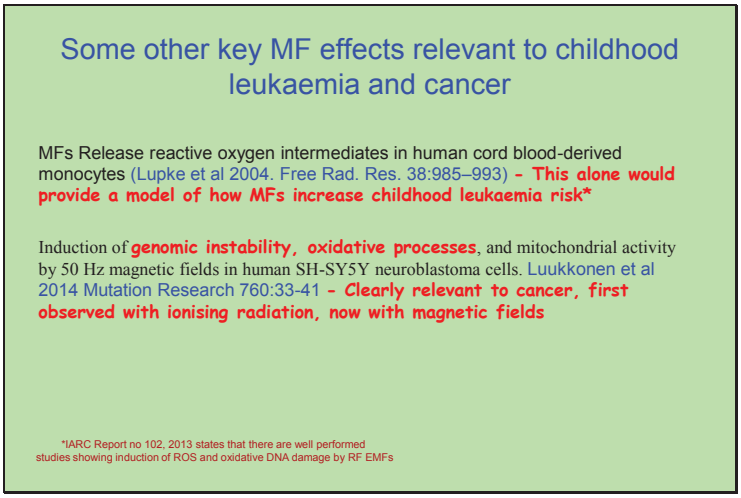
Figure 55. Autonomous rhythm of a subject (H.v.S., ♂ 23 y) living under constant conditions without time cues and protected from natural and artificial electromagnetic fields during the first section, but under the influence of an artificial electric AC field (i.e., 10 Hz square wave, 2.5 V/m) during the second section. *I*. Temporal courses of the rhythms of activity and rectal temperature, presented successively one period beneath the other. Indications are the same as in figure 16*I*. Shaded area: field in operation. From Wever (1969b).

*Wever 1979. The circadian system of man. In: Results of Experiments Under Temporal Isolation. Schaefer KE, ed. Springer-Verlag, New York

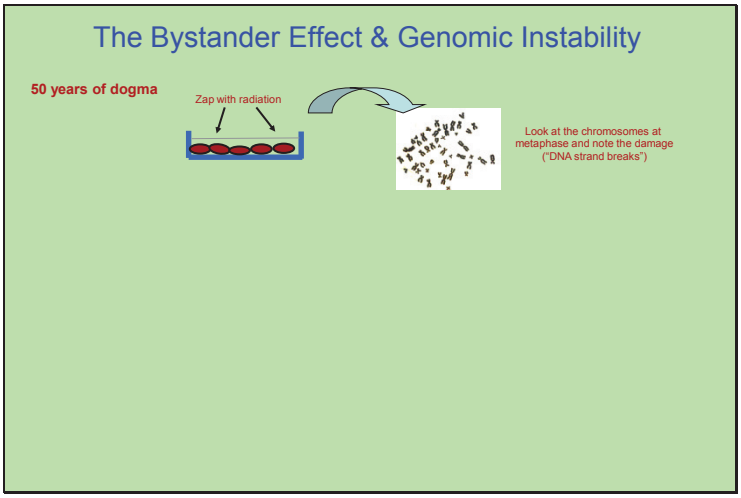
Slide 41


Magnetic fields and routes to cancer
(i)
Magnetic particles
Mechanical stress or free radical damage via the RPM
(ii)
Cryptochromes (in the eye)
Circadian rhythm disruption
(iii)
Cryptochromes (in peripheral blood cells)
Free radical damage by the RPM
(IV)
Genomic instability
Clearly relevant to cancer as it might lead to accumulation of mutations required for cancer formation*
*Luukkonen et al 2014 Mutation Research 760:33-41

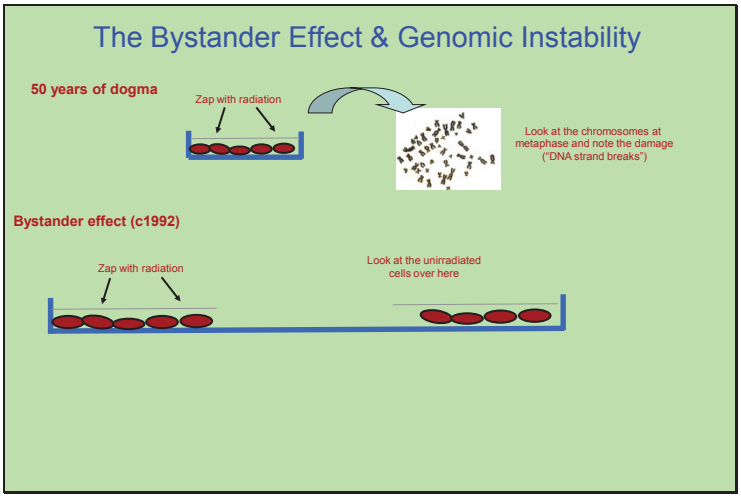
Slide 42


Some other key MF effects relevant to childhood leukaemia and cancer
MFs Release reactive oxygen intermediates in human cord blood-derived monocytes (Lupke et al 2004. Free Rad. Res. 38:985–993) - This alone would provide a model of how MFs increase childhood leukaemia risk*
Induction of genomic instability, oxidative processes, and mitochondrial activity by 50 Hz magnetic fields in human SH-SY5Y neuroblastoma cells. Luukkonen et al 2014 Mutation Research 760:33-41 - Clearly relevant to cancer, first observed with ionising radiation, now with magnetic fields
*IARC Report no 102, 2013 states that there are well performed studies showing induction of ROS and oxidative DNA damage by RF EMFs

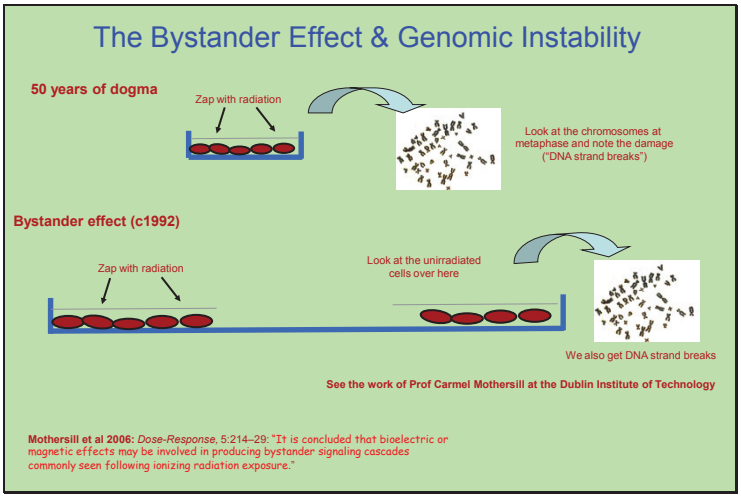
Slide 43


The Bystander Effect & Genomic Instability
50 years of dogma
Zap with radiation
Look at the chromosomes at metaphase and note the damage ("DNA strand breaks")

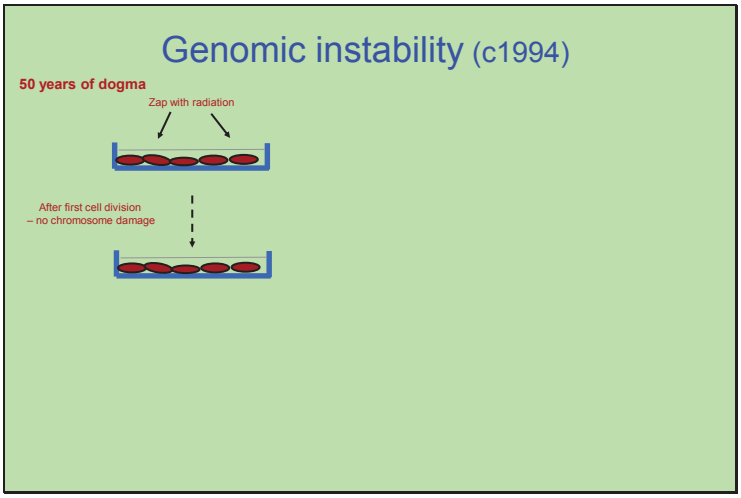
Slide 44


The Bystander Effect & Genomic Instability
50 years of dogma
Zap with radiation
Look at the chromosomes at metaphase and note the damage ("DNA strand breaks")
Bystander effect (c1992)
Zap with radiation
Look at the unirradiated cells over here

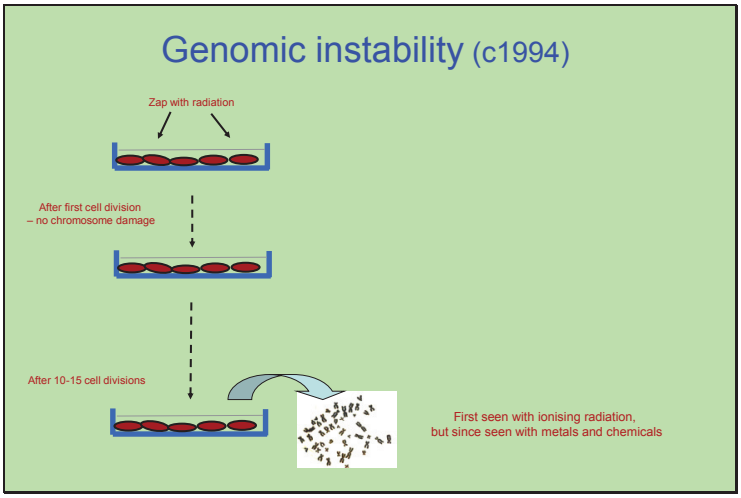
Slide 45


The Bystander Effect & Genomic Instability
50 years of dogma
Zap with radiation
Look at the chromosomes at metaphase and note the damage ("DNA strand breaks")
Bystander effect (c1992)
Zap with radiation
Look at the unirradiated cells over here
We also get DNA strand breaks
See the work of Prof Carmel Mothersill at the Dublin Institute of Technology
Mothersill et al 2006: Dose-Response, 5:214–29: "It is concluded that bioelectric or magnetic effects may be involved in producing bystander signaling cascades commonly seen following ionizing radiation exposure."

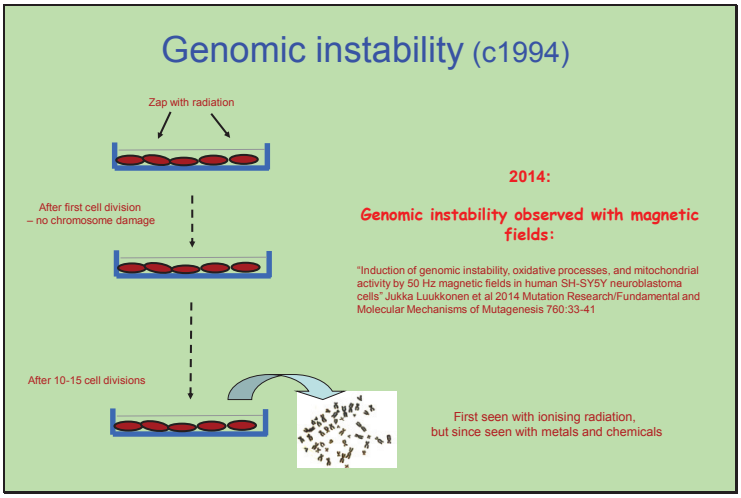
Slide 46


Genomic instability (c1994)
50 years of dogma
Zap with radiation
After first cell division
– no chromosome damage

Slide 47


Genomic instability (c1994)
Zap with radiation
After first cell division
– no chromosome damage
After 10-15 cell divisions
First seen with ionising radiation,
but since seen with metals and chemicals

Slide 48


Genomic instability (c1994)
Zap with radiation
After first cell division
– no chromosome damage
After 10-15 cell divisions
2014:
Genomic instability observed with magnetic fields:
"Induction of genomic instability, oxidative processes, and mitochondrial activity by 50 Hz magnetic fields in human SH-SY5Y neuroblastoma cells" Jukka Luukkonen et al 2014 Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis 760:33-41
First seen with ionising radiation,
but since seen with metals and chemicals

Slide 49

Summary

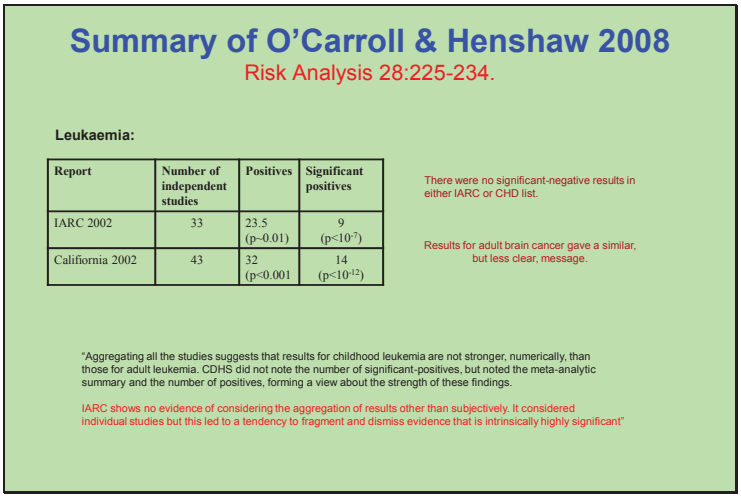
- Biological studies show that magnetic fields have key hallmarks of a carcinogen
- Epidemiological studies strongly associate magnetic field exposure with a range of adverse health outcomes
- Precaution against EMF exposure is highly warranted and cost-beneficial

In the case of high voltage overhead powerlines, the solution is to bury the lines over populated areas. This eliminates the electric fields and corona ions, and can strongly attenuate magnetic fields

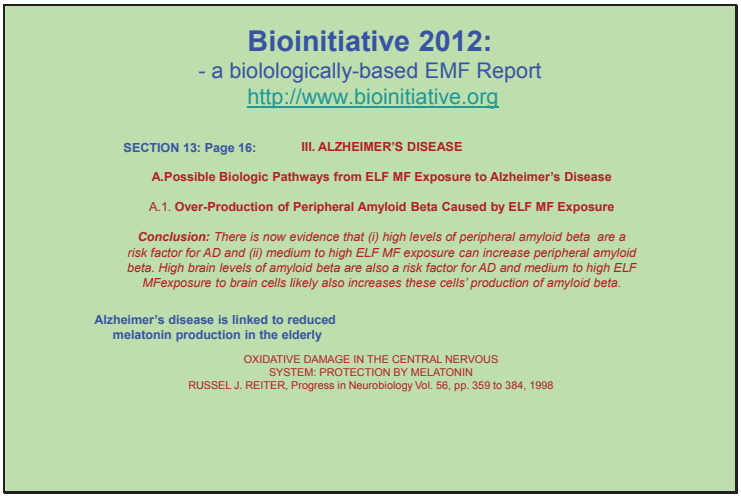
Slide 50

Last slide

Slide 51

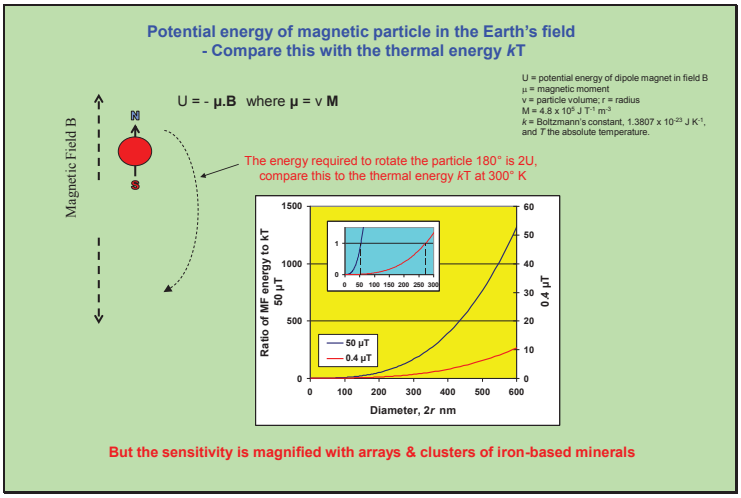

Summary of O'Carroll & Henshaw 2008
Risk Analysis 28:225-234.
Leukaemia:
Report
Number of independent studies
Positives
Significant positives
IARC 2002
33
23.5 (p~0.01)
9 (p<10-7)
California 2002
43
32 (p<0.001
14 (p<10-12)
There were no significant-negative results in either IARC or CHD list.
Results for adult brain cancer gave a similar, but less clear, message.
"Aggregating all the studies suggests that results for childhood leukemia are not stronger, numerically, than those for adult leukemia. CDHS did not note the number of significant-positives, but noted the meta-analytic summary and the number of positives, forming a view about the strength of these findings.
IARC shows no evidence of considering the aggregation of results other than subjectively. It considered individual studies but this led to a tendency to fragment and dismiss evidence that is intrinsically highly significant"

Slide 52



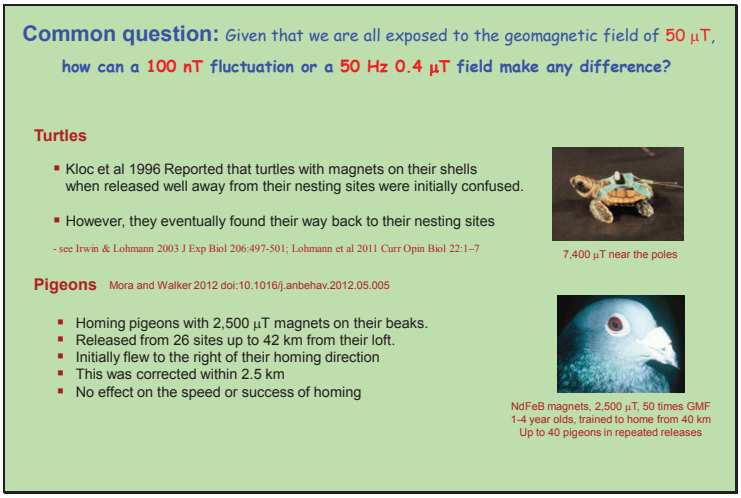
A selected extract from the 2012 Bioinitiative report

Slide 53



Magnetite can readily transduce a 0.4 muT 50 Hz field
See: Vanderstraeten J. Gillis P. 2010. Theoretical Evaluation of Magnetoreception of Power-Frequency Fields. Bioelectromagnetics 31:371-379

Slide 54



Now a common question that physicists ask is how can a field of 0.4 muT (at ELF frequency) make any difference alongside the existing DC field from the Earth?

The results of these studies show that turtles and pigeons respond changing magnetic fields and are not disturbed by a static (DC) field.

Slide 55

Static MFs alter circadian rhythms via cryptochromes

Yoshii *et al* 2009 (PLoS Biol 7(4): e1000086)

Study: *Drosophila melanogaster.* 23-29 flies per group: mean circadian period under blue light 25.8 ± 0.14 h.

Methods: Wild type flies exposed 0 and 300 µT, red light, then 0, 150, 300, 500 µT, blue light plus:
(i). FAD impaired (*cryb*)
(ii). Mutants lacking CRY (*cryOUT*)
(iii). Clock-gene promoter/CRY over-expressed (*tim-gal4/uas-cry*) flies

Findings: No MF effect under red light. Under blue light circadian rhythm lengthened >0.5 h at 300 µT and (i) *cryb*: no MF effect; (ii) *cryOUT*: no MF effect and (iii) *tim-gal4/uas-cry*: at 300 µT, 2 h period lengthening and most flies arrhythmic

What about effects in humans?

Wever (1979): In a long series of experiments, human volunteers were exposed for several weeks to 10 Hz square wave **electric fields** of only **2.5 V/m**. The 24 h circadian rhythm was disrupted. Volunteerss were immediately entrained to the external signal. Effect lasted for a few days, indicating E-fields acting as zeitgebers

Wever (1979)

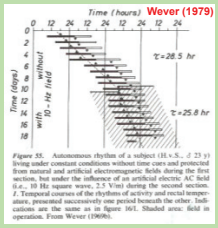


Figure 55. Autonomous rhythm of a subject (H. v.S., ♂ 23 y) living under constant conditions without time cues and protected from natural and artificial electromagnetic fields during the first section, but under the influence of an artificial electric AC field (i.e., 10 Hz square wave, 2.5 V/m) during the second section. *I*. Temporal courses of the rhythms of activity and rectal temperature, presented successively one period beneath the other. Indications are the same as in figure 16/I. Shaded area: field in operation. From Wever (1969b).

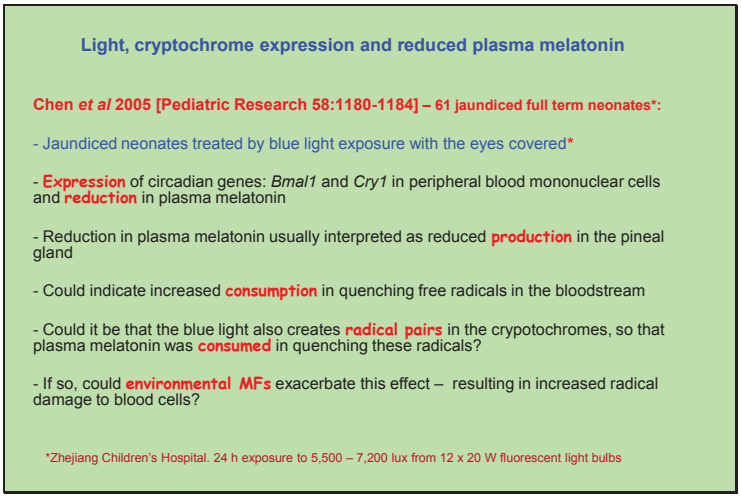
FAD = flavin-adenine dinucleotide

Wever 1979. The circadian system of man. In: Results of Experiments Under Temporal Isolation. Schaefer KE, ed. Springer-Verlag, New York

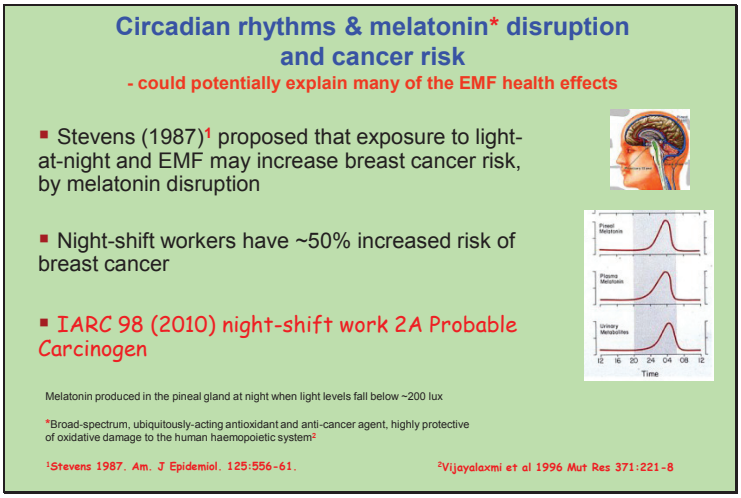
Here I talk through the significance that cryptochromes control circadian rhyth
Yoshii T, Ahmad M, Helfrich-Fo¨ rster C (2009) Cryptochrome mediates light-dependent magnetosensitivity of Drosophila's circadian clock. PLoS Biol 7(4): e1000086.
doi:10.1371/journal.pbio.1000086

FAD = flavin-adenine dinucleotide

Slide 56


Light, cryptochrome expression and reduced plasma melatonin
Chen et al 2005 [Pediatric Research 58:1180-1184] – 61 jaundiced full term neonates*:
- Jaundiced neonates treated by blue light exposure with the eyes covered*
- Expression of circadian genes: Bmal1 and Cry1 in peripheral blood mononuclear cells and reduction in plasma melatonin
- Reduction in plasma melatonin usually interpreted as reduced production in the pineal gland
- Could indicate increased consumption in quenching free radicals in the bloodstream
- Could it be that the blue light also creates radical pairs in the crypotochromes, so that plasma melatonin was consumed in quenching these radicals?
- If so, could environmental MFs exacerbate this effect – resulting in increased radical damage to blood cells?
*Zhejiang Children's Hospital. 24 h exposure to 5,500 – 7,200 lux from 12 x 20 W fluorescent light bulbs

Slide 57

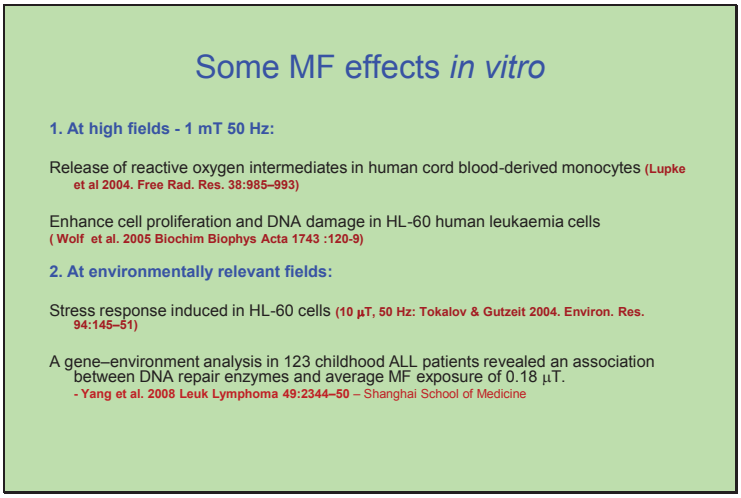


The adverse health effects associated with ELF MF exposure could all potentially be explained by circadian rhythm disruption

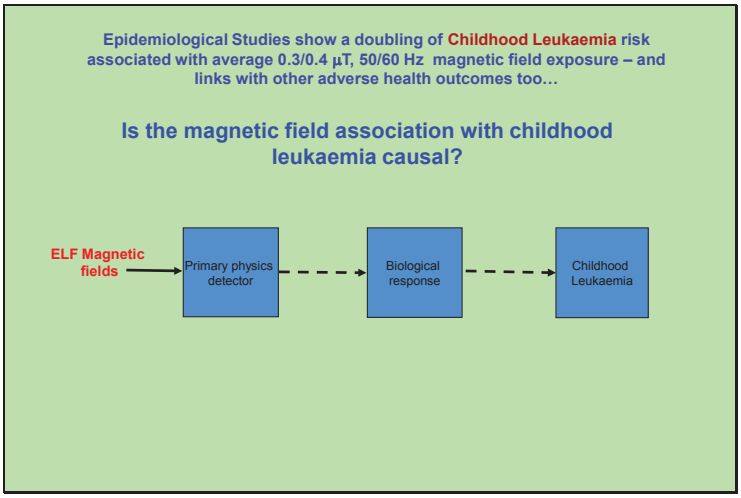
Melatonin is a broad-spectrum, ubiquitously-acting antioxidant and anti-cancer agent. Which also reduces growth of human myeloid leukemia cells and whose disruption by light-at-night is associated with increased cancer risk.

Richard G. Stevens 2012 Hypothesis: Does electric light stimulate cancer development in children?
Cancer Epidemiology Biomarkers & Prevention, doi:10.1158/1055-9965.EPI-12-0015

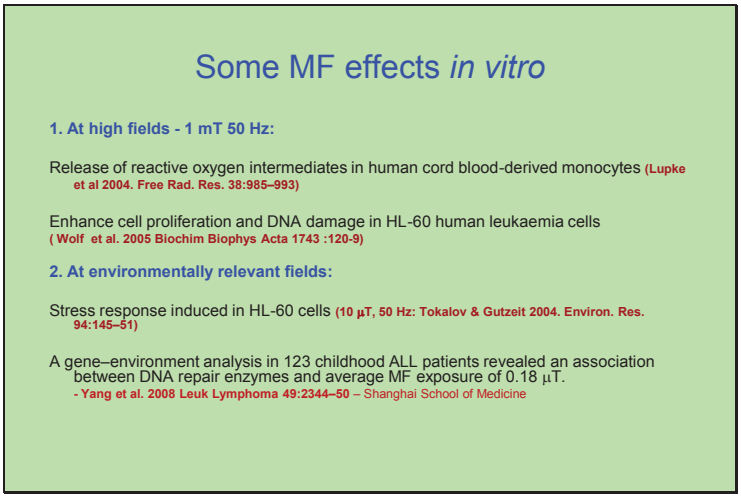
Slide 58


Some MF effects *in vitro*
1. At high fields - 1 mT 50 Hz:
Release of reactive oxygen intermediates in human cord blood-derived monocytes (Lupke et al 2004. Free Rad. Res. 38:985–993)
Enhance cell proliferation and DNA damage in HL-60 human leukaemia cells
(Wolf et al. 2005 Biochim Biophys Acta 1743 :120-9)
2. At environmentally relevant fields:
Stress response induced in HL-60 cells (10 μT, 50 Hz: Tokalov & Gutzeit 2004. Environ. Res. 94:145–51)
A gene–environment analysis in 123 childhood ALL patients revealed an association between DNA repair enzymes and average MF exposure of 0.18 μT.
- Yang et al. 2008 Leuk Lymphoma 49:2344–50 – Shanghai School of Medicine

Slide 59


Epidemiological Studies show a doubling of Childhood Leukaemia risk associated with average 0.3/0.4 μT, 50/60 Hz magnetic field exposure – and links with other adverse health outcomes too…
Is the magnetic field association with childhood leukaemia causal?
ELF Magnetic fields
Primary physics detector
Biological response
Childhood Leukaemia

Slide 60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- Yang et al. 2008 Leuk Lymphoma 49:2344–50 – Shanghai School of Medicine

Slide 61

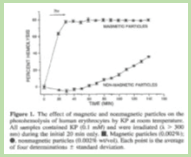
- An evidence-based possible cause of childhood leukaemia should in any reasonable interpretation for the public mean an adverse effect. People don't want to expose their children to an evidence-based possible cause of childhood leukaemia, even if there isn't not a fully proven cause.
- Further down the web page, this paragraph (which is given in quotes in the article) is blatant spin by the well used but crude technique of saying what was NOT said but hiding what WAS said:
- "National and international health and scientific agencies have reviewed more than 30 years of research into electromagnetic fields. None of these agencies has concluded that exposure to electromagnetic fields from power lines or other electrical source is a cause of any long-term adverse effects on human, plant or animal health."
- They did of course conclude on the basis of evidence that the exposure was a possible cause.

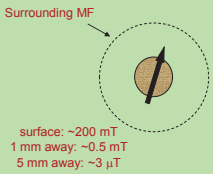
Slide 62

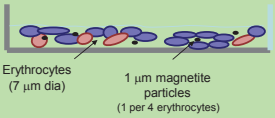
The RPM may act due to the MF around magnetite particles
- increasing the lifetime of free radicals

Chignell & Sik 1998 (Photochem Photobiol 68: 598-601):

1 μm Magnetite particles encapsulated in polystyrene dramatically decreased the time for 50% haemolysis of UV irradiated human erythrocytes.

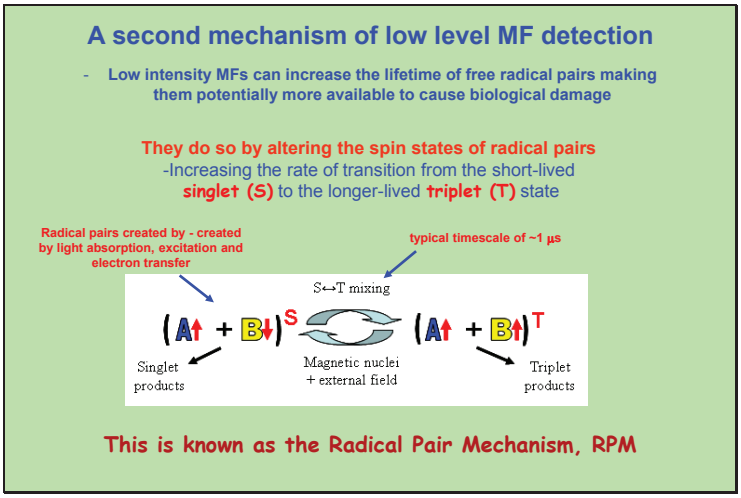




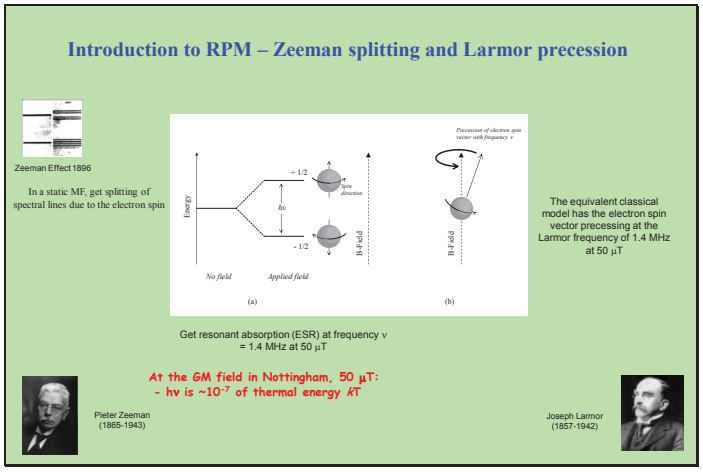


Binhi 2008 (IJRB 84:569-79): - Hypothesised childhood leukaemia arose from SP magnetite particles in blood which transduced/amplified 50 Hz fields, creating free radicals by the RPM

Slide 63


A second mechanism of low level MF detection
- Low intensity MFs can increase the lifetime of free radical pairs making them potentially more available to cause biological damage
They do so by altering the spin states of radical pairs
-Increasing the rate of transition from the short-lived singlet (S) to the longer-lived triplet (T) state
Radical pairs created by - created by light absorption, excitation and electron transfer
typical timescale of ~1 µs
S↔T mixing
Singlet products
Magnetic nuclei + external field
Triplet products
This is known as the Radical Pair Mechanism, RPM

Slide 64



As an introduction to the RPM this slide goes back to basics

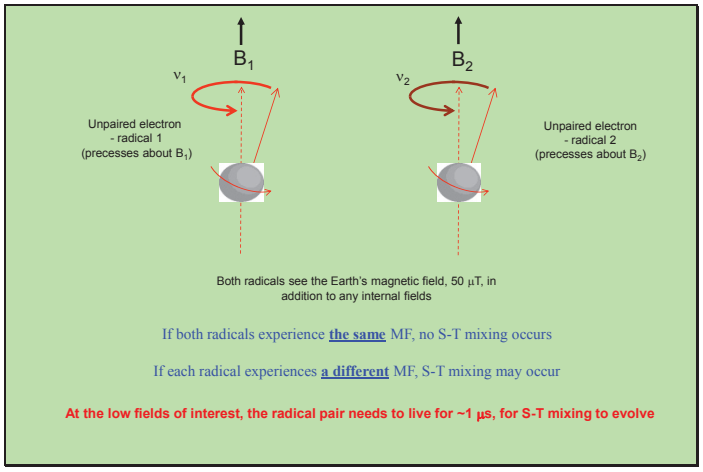
On the left we see the familiar Zeeman effect. If you put an electron in a static magnetic field, it will align its spin vector either up or down with respect to the field direction.

This energy difference between these states may be represented by a photon of energy hnu where h is Planck's Constant and nu is the photon frequency. A spectroscopic transition can be induced between these energy states by applying radiation at the correct frequency. At 50 muT, nu = 1.4 MHZ.

I am showing this to point out that the energy difference is ~10^-7 of the thermal energy kT. i.e. the phenomenon is not only well below kT, but is has nothing to do with classical energies, rather we are talking about the quantum-mechanical interaction of the magnetic field with the electron spin.

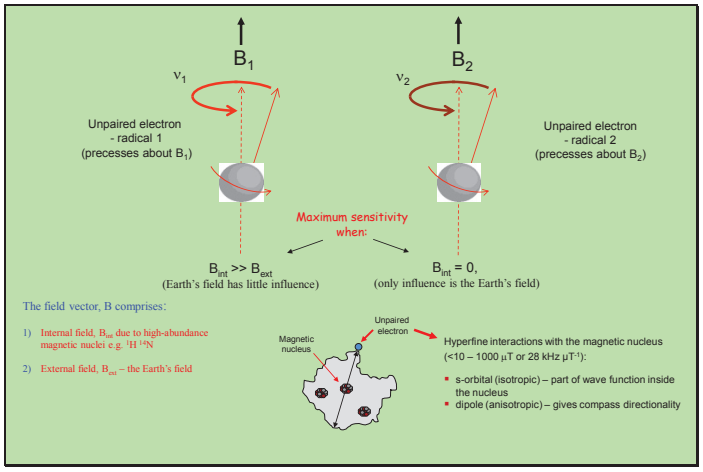
On the right is the classical physics model of this, taken from NMR & MRI, that the electron is precessing about the magnetic field at frequency nu, 1.4 MHz, the so-called Larmor frequency. I will be using this model in a moment.

Slide 65



Here I talk through how RP mixing occurs, using the precession model

Slide 66



Continued:

The field vector, B has two components: (i) due to high-abundance magnetic nuclei e.g. 1H 14N, and (ii) due to the Earth's field.

For a compass, maximum sensitivity occurs when the Earth's field has little influence on precession on radical 1, but is the only influence on radical 2

The precession is governed by hyperfine interaction with the proton in the nucleus, consisting of an isotropic S-wave, or S-orbital interaction, and an anisotropic dipole interaction.

Slide 67

Radical pair scheme in cryptochrome

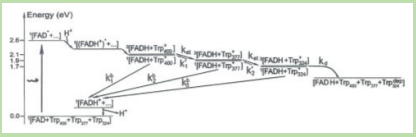


Figure 2. Schematic presentation of the radical-pair reaction pathway in cryptochrome.

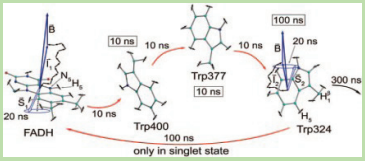


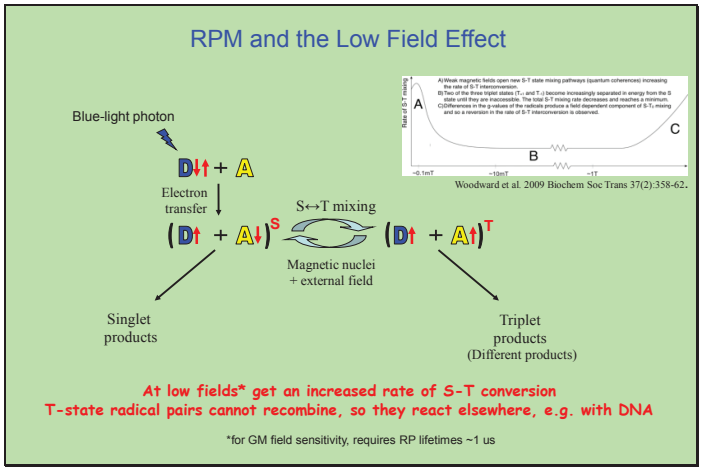
Figure 4 Schematic illustration of electron hole transfer and electron spin dynamics in the FADH cofactor and tryptophan chain.

From Solov'yov et al. (2007) Biophys J 92:2711-2726.

I've slipped this slide in here to point out models of the actual RP pathways in cryptochrome

FAD = flavin-adenine dinucleotide

Slide 68



Low fields open up new S-T mixing pathways increasing thee rate of S-T conversion

Examples of RPM in chemical systems:

Scaiano et al 1997: Photoreduction of benzophenone by 1,4-cyclohexadiene;
Mohtat et al 1998: Radical pair derived from hydrogen abstraction of triplet benzophenone;
Streiner & Ulrich 1989: Table 6 (Molecular crystals): e.g. Naphthalene, 1,4-dibromonaphthalen, anthracene; Table 5: e.g.s of photochemical reactions in the gas phase
Brocklehurst & McLauchlan 1996: benzaldehyde (PhCHO, Ph = C6H5) in tetrachloromethane; RPs created from UV irradiation of the condensed ring aromatic hydrocarbon pyrene (Py) in solution with 1,3-dicyanobenzene (DCB)
Vink & Woodward (2004): Radical recombination reaction occurring after the photodecomposition of 2-hydroxy-4¢-(2-hydroxyethoxy)-2-methylpropiophenone (R-HP)
Woodward et al 2002: Pyrene with isomers of dicyanobenzene

References:

Steiner UE, Ulrich T. 1989, Magnetic field effects in chemical reactions and related phenomena. Chemical Reviews, 89:51-147.
Brocklehurst R, McLauchlan KA 1996. Free radical mechanism for the effects of environmental electromagnetic fields on biological systems. International Journal of Radiation Biology 69:3-34.

Timmel CR, Till U, Brocklehurst B, Mclauchlan KA, Hore PJ 1998. Effects of weak magnetic fields on free radical recombination reactions. Molecular Physics 95:71-89.
Woodward JR 2002. Radical pairs in solution. Progress in Reaction Kinetics and Mechanism, 27:165-207.
Timmel CR, Henbest KB 2004. A study of spin chemistry in weak magnetic fields. Philosophical Transactions of the Royal Society of London A 362:2573-2589.
Rodgers CT 2009. Magnetic field effects in chemical systems, Pure and Applied Chemistry 81:19-43.
Rodgers CT, Hore PJ, 2009. Chemical magnetoreception in birds: The radical pair mechanism. Proceedings of the National Academy of Sciences of the USA 106:353-360.

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