



Northern Ireland  
Assembly

Committee for Enterprise, Trade and  
Investment

# OFFICIAL REPORT (Hansard)

Shale Gas Exploration: Geological Survey of  
Northern Ireland

21 June 2012

# NORTHERN IRELAND ASSEMBLY

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Shale Gas Exploration: Geological Survey of Northern Ireland

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**Members present for all or part of the proceedings:**

Mr Alban Maginness (Chairperson)  
Mr Daithí McKay (Deputy Chairperson)  
Mr Steven Agnew  
Mr Gordon Dunne  
Mr Phil Flanagan  
Mr Paul Frew  
Mr Stephen Moutray  
Mr Robin Newton  
Mrs Sandra Overend

**Witnesses:**

Mr Mike Thompson	Department of Enterprise, Trade and Investment
Mr Derek Reay	Geological Survey of Northern Ireland
Mr Mike Young	Geological Survey of Northern Ireland

**The Chairperson:** I inform colleagues that briefing the Committee today are Mr Mike Young, director of the Geological Survey of Northern Ireland (GSNI); Mr Derek Reay, senior scientific officer; and Mr Mike Thompson, head of the tourism, telecoms and geological survey policy division in the Department of Enterprise, Trade and Investment (DETI). You are very welcome to the Committee, gentlemen. We received your paper, which has helped our understanding of the issues involved. Please make an opening statement, and then we can get into questions and answers.

**Mr Mike Thompson (Department of Enterprise, Trade and Investment):** Chair and Committee members, thank you very much for the invitation to speak today about this very important issue. I will introduce the team. Mike Young, director of the Geological Survey of Northern Ireland, is a geophysicist. Derek Reay, senior scientific officer in the Geological Survey of Northern Ireland, is a geologist. I am neither, but I am well looked after with these experts on either side of me.

Mike runs a small unit of only 15 people, but it benefits from the expert advice and support of the wider British Geological Survey, which has many specialised fields. The Tamboran petroleum licence, which we are here to talk about in particular, was one of four that was awarded in Northern Ireland in April last year. Mike will say a few words about where we are with the licence, what the licence actually means and what the time frames are.

**Mr Mike Young (Geological Survey of Northern Ireland):** Chair and members of the Committee, thank you for the opportunity to talk about this matter. As you know, the matter is giving us considerable concern. We are always glad of the opportunity to exchange ideas, and we look forward to hearing your advice and guidance on it. In the briefing, we have described the process of issuing

the licence to Tamboran and looked at some of the wider issues regarding shale gas exploration. We were asked to produce a brief about plans by Tamboran for hydraulic fracturing for shale gas, so our briefing and what I have to say touches mostly on that specific topic rather than on shale gas in general.

As Mike said, four licences were awarded in a licensing round in April 2011, one of which was awarded to Tamboran Resources of Australia for a large area of County Fermanagh. The licence application was well founded, well put together and very competent scientifically. The company is Australian and has extensive licences for shale gas exploration elsewhere in the world, particularly in Australia and Botswana. The director who made the application, Dr David Falvey, is well known to us. He was the director of the British Geological Survey for many years, from 1998 to 2006, and he is a very distinguished Australian scientist.

I will not get into the details of fracking or hydraulic fracturing for shale gas. I am sure that there is plenty of information in the briefing. To summarise, shale gas is what we call an unconventional oil and gas target. The technology that has emerged in the past 20 years or so now allows us to exploit this very difficult reserve of gas in a shale. A shale is a very tight and impermeable geological formation, and gas is locked up into it in the pores. Therefore, it does not flow, as oil and gas does, from a conventional oil and gas reservoir, which is almost always in porous sandstones with a porosity typically of around 20%. To extract the gas from the shale, a method has been developed called hydraulic fracturing. It involves drilling a vertical borehole from the surface into the middle of the formation, diverting that hole at right angles to drill horizontally along the middle of it and lining the hole with steel casing and cementing that casing firmly in place so that no gases or liquids can escape up the hole between the casing and the rock. Once all of that is in place, the horizontal section of this well is perforated, usually with explosive charges. Then, the fracturing process takes place. It takes place over about eight hours only and involves pumping at high pressure a slurry of liquid, usually water and sand, into the perforations in the well casing. This process opens up micro fractures; that is, small fractures that are 1 millimetre or 2 millimetres wide. The sand that is in the slurry holds these fractures open. After this process of pressurising, at least some of the water is withdrawn. With these fractures now open, the way is then open for gas to flow into the fractures, back into the well and then up to the surface, from where it is exported. That is the process put simply, but, as you can understand, it is a very complex engineering process.

Fracturing is a process that has been applied in the oil industry for many, many decades in conventional vertical oil wells to increase the flow of oil and gas, so the general principle of opening up rock with fracturing is nothing new. During this fracturing process, we monitor the development of these fractures using a network of seismometers — a seismometer array. These seismometers are installed in boreholes or on the surface, and, with computer modelling, the movement and the development of this network of fractures can be modelled. So, we know the extent of these fractures. Your meeting pack includes a report sponsored by the Department of Energy and Climate Change (DECC) on the recent process of hydraulic fracking at Preese Hall in Lancashire. The earthquakes that arose from that process have been investigated independently and reported on, and that report has resulted in some very useful guidelines on how the process can be operated more safely in future.

**The Chairperson:** May I just stop you there? What report are you talking about? Is it the Preese Hall report?

**Mr Young:** Preese Hall, yes. I think that it is at appendix D in your pack.

As regards Tamboran's target, it is a formation called the Bundoran shale, which is extensive over County Fermanagh and County Leitrim. The top of it is believed to be at a depth of about 800 metres in the middle of what we call the north-west Carboniferous basin; it is also typically called the Lough Allen basin. It is expected to be about 500 metres thick. No one knows for sure, because not enough work has been done. That would be the point of the first exploratory drilling.

At appendix C, you will find geological maps and a simple map of the cross section of the geology in that location. You will see that it is what we call a layer-cake model. It is a pile of sandstones and shales. The Bundoran shale underlies a very tight sandstone, which was the target of the drilling about 10 years ago. It also underlies a shale called the Benbulbin shale, and it, too, is very impermeable. So, the target is overlain by very impermeable rocks.

The licence that has been issued gives the licensee exclusive rights over the ground. Only that company can go in and prospect for hydrocarbons over that ground. It gives companies very limited rights otherwise. They are broadly restricted to undertaking surface geological and geophysical work

and the general right to undertake what we call stratigraphic drilling, which is drilling relatively shallow boreholes to take rock samples for analysis. Even that process is subject to further consents. A company cannot go in and drill the stratigraphic test borehole until it has received our consent to do so.

To go to the next stage of the exploration drilling, hydraulic fracturing and all the other engineering work that goes with that requires the undertaking of a full planning application, which has to be informed by a detailed environmental impact statement. The environmental impact statement, which will be done by the company to specifications agreed by the regulators, will take a full 12 months. It will monitor a whole range of physical, ecological, environmental and chemical parameters. The results of that will ultimately inform the planning application, if and when it is made. So, the planning application is still a long way away.

When it comes to the planning stage, the environmental impact statement will be assessed in the context of a number of what we call baseline studies of many of the parameters that we and other regulators are about to undertake. Those parameters are on, for example, the seismic activity in the area and the present physical, chemical and ecological conditions pertaining in that area. GSNI would expect to be involved in some of those things, particularly the seismicity. However, many of those activities will be carried out by other regulators, particularly the Department of the Environment (DOE), which has responsibility for groundwater, air and a range of other environmental issues that are outside GSNI's remit.

There are many risks attached to this process. That is, of course, why we are all concerned about it at the moment. You will hear more about those risks later, but we have listed them in the briefing. There are engineering risks, hydrological risks, chemical risks and ecological risks of all sorts. Those all need to be looked at in detail. We would say that much of the debate and discussion about those issues has emanated from experience in the United States and Canada, where, it is true, there have been many unfortunate experiences. However, we believe that on geological and particularly on planning grounds, there are very great differences between the situation in the United States and that in Northern Ireland. In the United States there has, typically, been a very fragmented approach to planning, whereas in Northern Ireland, I am glad to say, the approach to planning is very coherent. We have a much more co-ordinated approach than that which was the case in the United States where many of these conditions were experienced.

**Mr Flanagan:** Can I just interrupt Mr Young?

**The Chairperson:** No. I am sorry, you are out of order. It is not appropriate at this point.

**Mr Young:** To address those issues, the various regulators, of whom there are many — I mentioned the DOE but the issues also concern the Health and Safety Executive, NI Water and other bodies — formed an informal forum to share our experiences and what we know and to decide how to go forward in our proposals and scoping for regulating this activity. This forum has met a couple of times informally but, very recently, Minister Foster and Minister Attwood authorised us to formalise this forum and we are in the process of drawing up the terms of reference for it. That forum is already allowing us to collate our experiences, review the existing research, review what regulations and legislation are already in place and identify any gaps that need dealing with.

In summary, the situation for us at the moment is that a petroleum licence has been issued and we are managing it in DETI according to existing regulation and law. I believe that you will hear more from Tamboran next week, but, so far as we know, the status is that it is trying to purchase land in the area where it will then apply to drill its first stratigraphic well. When that is done, Tamboran will propose to us the specifications and scoping of its environmental studies. That will be considered by the forum together and thus result in the environmental study that will cover all the issues that are of concern to everybody.

We acknowledge that there are genuine concerns about this process of hydraulic fracking. We have received a lot of correspondence and we monitor the press reports. However, our stance at the moment is that we are following the recommendations of the House of Commons Select Committee on Energy and Climate Change inquiry into shale gas, which reported last year. That report is in members' packs. The Committee took evidence from many distinguished and eminent scientists and came to the conclusion that most of the environmental problems that had been experienced previously were due to poor engineering practices and poor regulation of those practices, and that those can be managed. That has also been the general finding of the more recent study produced by the University

of Aberdeen for the Environmental Protection Agency (EPA) of Ireland, which is also in members' packs. It is another independent study done for the Irish EPA which concluded much the same: there are issues but, in principle, they can be managed with good engineering practice. Those were also the findings of the most recent report by the International Energy Agency — the "Golden Rules" report, which is also in members' packs. It has also concluded that there are issues but they can be managed properly. It needs proper regulation and consultation with all stakeholders. That is the way that we recommend that we go forward.

While we are waiting for the planning application, we are collating all the existing research that is going on. We are taking extensive advice from DECC in London. We have monthly telephone calls with it and the Environment Agency, which has also established a forum for the exchange of ideas. Through them, we have access to an EU group which is also looking at these issues. So, we are very well in touch with the best advice that we can get on the topic. At the same time, as I said, we are preparing to undertake these baseline studies with our various other departmental partners. Over the 15- to 18-month period that we expect it will take before a planning application is issued, we have adequate time, we think, to assess all of these research papers and come up with a reasonable stance for when the application is submitted.

In summary, we feel that we are progressing in a rational way according to the law and taking into account all of the existing scientific evidence that is being presented. The key point to remember is that no permit has been issued for any deep, intrusive engineering work in the form of exploration drilling and hydraulic fracturing, and we do not expect that to happen for at least 15 months. Our feeling is that we should have confidence in the scientific process. The United Kingdom has world-class experience in developing hydrocarbons reserves. Our prosperity for the past few decades, to a large extent, perhaps, is a result of UK technology in exploiting North Sea oil reserves. The UK has extensive experience, which we can draw on in Northern Ireland, in managing the development of difficult hydrocarbons reserves. We have a co-ordinated and coherent approach to managing these risks, and that is the way that we will go forward with our partner regulators. Thank you very much for listening to all that. As I said at the start, we are very glad to have this opportunity and to receive any advice and guidance that you can give us.

**The Chairperson:** Thank you very much. I understand that none of your colleagues wishes to comment at this point but they are willing to answer questions. In summary, you are saying that there is a very long process to be gone through. What is the timescale from the point of the licence having been issued in April 2011 to the point where it may be that the green light is given for actually carrying out work and undertaking this process?

**Mr Young:** As I said, we are waiting for the company to present its proposals for the environmental impact study that it has to do. When we receive those, there will be a consultation process, which might take two or three months. That work will then start, and that will take a minimum of 12 months. So there is, say, 14 or 15 months before that process is finished. Only then can the planning application be made, so we have at least 15 months from now to when the planning application is made. Then, there is the planning process and probably appeal and inquiry before engineering work can start.

**The Chairperson:** So, you are talking about maybe three years.

**Mr Young:** It could well be that.

**The Chairperson:** That is the minimum amount of time. Over that period, if the environmental impact report was negative about what Tamboran is applying to do, would that end its plans completely?

**Mr Young:** Without wishing to pass the buck, that is a planning matter. We are just dealing with the geological issue.

**The Chairperson:** Assuming that the planning authorities were to find fault with the report, would that end the company's plans?

**Mr Thompson:** The planners have to take account of environmental and economic factors and a wide range of factors. If serious issues were to emerge from the environmental impact assessments and work, they would have to factor those into their decision.

**The Chairperson:** What would happen if the environmental impact assessment was positive as far as Tamboran was concerned? Would you then go into the full planning process?

**Mr Thompson:** Yes.

**The Chairperson:** Would that require a public inquiry?

**Mr Thompson:** That is a decision for the Planning Service. Considering the nature of the issue and the fact that there is a considerable amount of public interest in it, I would be surprised if colleagues in the Planning Service did not go down that route, but it is a decision for them and their Minister.

**The Chairperson:** Obviously, there will be consultation with stakeholders and the public at large during the course of that. Is there any consultation prior to that?

**Mr Thompson:** There is none proposed at the minute, but we in the Department are keen to speak with people. We very much welcome being here today. We are open to speaking with bodies as necessary.

**The Chairperson:** Before I go to the rest of the Committee, I want to ask you about the Shale Gas Forum. That is a regulators' forum, so it involves all the different agencies right across DETI and the DOE. What is the purpose of the forum? Is it informal? It is a non-statutory forum, obviously.

**Mr Thompson:** The forum has met twice already. To date, it has been informal. Minister Attwood and Minister Foster met recently, and they felt that it was important and that they wanted it to be more formalised. We are currently working up the terms of reference to address those issues. The key issue is that it cuts across a number of Departments and agencies. We want to get it right; we do not want anything to fall between the stools. We want to understand each other's needs and requirements. We want to work smart together; that is its purpose. Obviously, we will bring the terms of reference to you in due course.

**The Chairperson:** So, the purpose of the forum is to inform government at different levels so that government are in a position to make a judgement? That is not confined to DETI and DOE but, rather, refers to the Executive at large.

**Mr Thompson:** Yes.

**The Chairperson:** Is there any one person who will head up the forum?

**Mr Thompson:** At the minute, it lies between us and DOE. That decision has to get —

**The Chairperson:** So, as yet, no one person has responsibility for leading the forum?

**Mr Thompson:** No, not yet. We are running the forum at present. Those decisions will be taken in due course.

**The Chairperson:** This is a matter as much of geology and geography as anything else. It involves the island of Ireland. The areas included are Leitrim and parts of Sligo and Cavan as well as Fermanagh. Are you working with the Irish Government in relation to this issue? What is the position?

**Mr Thompson:** There are two points. Obviously, the geology does not stop at the border; the basin transcends the border. The licence that has been given is within Northern Ireland; anything that happens will be in Northern Ireland only. My colleagues here have very good and regular contacts with our colleagues down in Dublin. Perhaps Mike and Derek will mention —

**The Chairperson:** I want to make one point before you answer that. It would seem rather bizarre if, for example, the Northern Ireland Executive were to give the green light to the proposition and the Government in the Republic were to say no. To get this right, it seems that there needs to be a co-ordinated effort, not just an informal exchange of views, between the two Administrations. That is the context in which I ask the question.

**Mr Young:** Some of the regulators have had one informal meeting with colleagues from the petroleum affairs division and the Irish EPA to share experiences and views of the legislation and regulation, particularly the EU regulations that are relevant. That is as far as it has gone at the moment. Derek, would you like to say more about our interaction with the Irish?

**Mr Derek Reay (Geological Survey of Northern Ireland):** We have been dealing with them on a number of issues. We have been exploring things like seismic monitoring, which is one of the aspects of earthquake risk. Yes, we would welcome a more formal level of co-operation. If it gets to the stage of planning process, part of the environmental impact assessment takes into account transnational impacts, so it would be dealt with at that stage, but, ahead of that, we want to be working closely with the Departments and agencies in the Republic to make sure that we are looking at those trans-border aspects.

**The Chairperson:** The point I am making — I am probably not making it clearly enough — is that if, for example, there is a negative impact on the landscape and water in Fermanagh, and there is a knock-on effect into the various counties of the Republic right down towards the Shannon, you could have an environmental problem that is much more extensive. So it seems to me that you cannot just take Fermanagh or Leitrim; you have to look at the thing all together. Both Governments should be looking at this on a formal and co-ordinated basis; that is my point.

**Mr Thompson:** As Mr Reay explained, the transnational issues are taken account of in the assessment. Nature does not stick to borders and there could well be, as you say, impacts elsewhere, and they have to be factored into the decision-making process. That is a given. As to formal structures with colleagues in the South, I understand the point that you make, but that is something that I must take back to the Department and seek guidance on.

**The Chairperson:** I suppose it is a more general political point but, just by way of information, is the EPA in the South an independent organisation or is it a part of government?

**Mr Reay:** It is an independent agency. It is unlike the Northern Ireland Environment Agency, which is a part of the Department of the Environment.

**Mr Young:** If I may have a final word, once the forum is formalised, it will make it easier for us to structure communication with the South more easily.

**The Chairperson:** My understanding is that the Lough Allen basin is very important in the whole geography of that part of Ireland. It feeds into the Shannon and so forth. It is crucially important.

**Mr McKay:** Thank you for your presentation. Obviously, this issue has caused some controversy, particularly in Fermanagh. What strikes me about it is the lack of public awareness generally as to what fracking is and what risks are involved with the particular process. In my area, the north coast, awareness of the issue has been raised recently, although only in certain quarters. That is concerning, because you have outlined the process over the next year or year and a half. There is an environmental impact assessment, and then it goes to the Planning Service. At that stage, you have the public inquiry. Given the experiences that you talked about in the US and Canada and what I see as bad examples of fracking there, are you not putting the cart before the horse? Is it not appropriate that we have some sort of public inquiry or something along those lines before we go through the process? By the time we get to planning and the later stages, I think it will be too late. We need to bring in the public and increase public awareness of this much earlier.

**Mr Thompson:** The issue of public awareness and public knowledge is hugely important. The next set of witnesses before the Committee represent the Fermanagh Fracking Awareness Network, and I think that is a really excellent name. We are 100% behind the concept of trying to get much greater awareness and debate around this issue for the very reasons that you said.

You mentioned a public inquiry. I doubt that we will go down that route, but we are keen to have much greater engagement with interested parties in lots of different ways. We are keen to learn from your experience and your guidance as to how best to do that. Colleagues have attended meetings. The meetings were held by Tamboran, but unfortunately those meetings were quite confrontational. They could not really have a proper, quality debate, with different points of view being expressed and people listening as much as they were talking. That is where we are really keen to get to, and we are very open to suggestions in that regard.

**Mr McKay:** Would a public inquiry or something along those lines not address those concerns?

**Mr Thompson:** The problem with having a public inquiry at this stage is that we are right at the start of the process. All that Tamboran has is a licence to go and have a look to see what is down there. That is the stage that we are at. We do not even know where it will do its test drill yet. We are at a very early stage to have a public inquiry.

**Mr McKay:** You are talking about a planning application being introduced in the next year and a half, so it is not really that long away.

**Mr Thompson:** The planning process gives plenty of opportunity for people to be involved. Our job is probably —

**Mr McKay:** From the point of view of Tamboran and those who are more in favour of fracking, surely it would be better to engage the public in a meaningful way at an early stage as opposed to leaving it to a later stage, when views will be more fixed.

**Mr Thompson:** I totally agree.

**Mr Young:** To give Tamboran its due, it held several meetings in the area. Derek and I were at one of those meetings, but it was so hostile that it was not a useful exchange.

**Mr Thompson:** The idea of getting the public more aware —

**Mr McKay:** Surely a public inquiry would be a better way to approach it than Tamboran holding the meeting itself.

**Mr Thompson:** I 100% support the idea of greater public awareness before any planning application may be lodged, although I reserve judgement as to the method. I am not sure whether a public inquiry would be the best way of doing it. I support the principle of greater public awareness and debate around the topic because that means that we get better decisions.

**Mr McKay:** What sort of analysis has been done of the tourism sector in the areas proposed? Fermanagh and the area around the Rathlin basin are two of our greatest areas of natural beauty and tourism. Consider the Executive's tourism figure targets. We have already discussed this morning the need to grow infrastructure and the tourism product. Obviously, there is the potential that fracking and how the proposals roll out will impact that adversely.

**Mr Thompson:** It is interesting that the geology of Northern Ireland, particularly the geology of Fermanagh with the Marble Arch caves and suchlike, attracts people who are interested in geology because of how unique and special it is. We are at an early stage, and all that we are doing is issuing the licence to see what is down there. The wider issues of tourism, agriculture and society generally are taken into account through the planning process.

**Mr McKay:** But surely the Department has an interest in tourism and should not leave it to the DOE. Obviously it goes to the planning process but, if there are concerns about the impact on tourism now, surely DETI should be taking the lead in engaging with the tourism stakeholders it is supposed to act on behalf of.

**Mr Thompson:** Again, we feel that it is too early for that process. At this stage, all that we are doing is giving a licence to a company to have a look to see what is down there. All those issues —

**Mr McKay:** There could be a planning application within 18 months.

**Mr Thompson:** All those issues are of huge importance.

**Mr McKay:** Yet you are not doing that much about them by the sounds of it.



**Mr Thompson:** All those issues are of huge importance. We fully recognise how important they are, but the proper and correct forum for them to be addressed is the planning process. The planning process takes account of all the issues, including the economic, tourism and environmental issues, rather than looking at one or two issues in isolation. That is the right way of approaching this. Good systems are in place here, and we are not in the business of trying to create new systems to second-guess the good government systems that exist.

**Mr McKay:** It is important that we mitigate any potential impact. That is why I say that we seem to be putting the cart before the horse in this instance. You also have to look at the issue of water and the risk to the water table, and you have seen the experience of NI Water and the infractions there. What risk is there in terms of the water framework directive? Do you believe that there is justification for using a sizeable amount of local water as the fluid for the process, and what do you do with it after it goes through the process?

**Mr Thompson:** I turn to my specialist colleagues to answer that.

**Mr Reay:** We are looking at exploration in the first instance. Water use for exploration for a single hole would be looked at on a case-by-case basis. You were talking about the planning application. That planning application is for a single exploration, which is rather different from looking at the impact on tourism. You are looking at a development that is a long way into the future.

The Northern Ireland Environment Agency has responsibility for the implementation of the water framework directive, and it regulates through abstraction licensing and discharge licensing. The Environment Agency regulates the use, storage and disposal of any water, and it carries out a risk analysis of whether there is any potential risk to the shallow aquifer from the fracking operations.

In the States, there have been examples of problems associated with shale gas operations, but that has to be taken in the context of a case where you have had perhaps half a million fracking operations. There are shale gas operations in over 20 states in the US, accounting for nearly 30% of its domestic shale production. In various areas of the States, it has been shown that it can be carried out safely and without any detriment to the environment. However, if it is not done properly, there are certain substantial risks. Some of this will depend on the individual circumstances and the geology. It will certainly depend on the methodology that is used. It is very important that that methodology is right. We talked about the construction of the well with successive steel piping — casing, as it is called — and about that being cemented. In various areas of the States, the design of that is such that there is only one surface casing or production casing. That surface casing does not necessarily go down below the base of where the groundwater is, and, in that case, there is a potential risk of contamination. In some places, they have not tested the integrity of the cement that keeps it in place and whether the cement job has been carried out properly. You can run logs that will test that, but that has not always been done in the States in certain areas. Again, they have not always waited a sufficient length of time between putting that cement down and starting the fracturing job. With the proper methods and design, those risks can be mitigated and reduced. However, that risk analysis has to be carried out on a case-by-case basis and will depend on the particular location and geology. That is the approach that would be taken for any proposal to drill a test exploration borehole where test fracking was going to take place.

You say that we are putting the cart before the horse. As regards trying to look at the potential future impacts of the development at this stage; at the moment, the assessment of the resource has been done on desk studies and a limited knowledge of that shale — it has not been explored before for shale gas. The first step would be for the company to drill a stratigraphic hole. It drills down using conventional mining exploration slim boreholes and collects core material that it tests to see whether it has the potential to generate the gas sufficiently to what it predicts. It may not live up to expectations, but it could exceed expectations of the richness there. The resource might not be as great as it thinks, or it might be greater. At this stage, we do not know. That is the first stage.

If the drilling is approved and the results are positive, the company would submit a planning application, supported by its environmental baseline studies, to drill a full exploration hole where it intends to carry out hydraulic fracking. That is the subject of the planning application. It is completely separate from going on to any development of any multiple well pads or anything of that sort. If permission is given for that borehole, the results from that would inform how that shale produces gas and how much volume you could get out of it. That feeds back into what the raw source is, whether it can be developed and how many wells you would need to develop it to make it economic. The company would then, over a number of years, develop a development plan, which it would have to

submit to DETI and for a planning application. That would be a major stage further. At that stage, it would be a longer-term impact because you are talking about operations going on for a much greater duration. Therefore, it would have much wider impacts. The impact on tourism and agriculture, as well as the environmental and the health and safety aspects, would be taken into account at that stage.

So, at the moment, we are talking about initial stages of exploration, prior to the company applying to drill a well and proposing to fracture that well.

**Mr McKay:** High-volume fracking on that scale has been carried out in places like the US only since about 2005, so it is difficult to make a full assessment of what the impact will be over the medium and longer term. There are very bad examples, and there is, of course, the discussion around what is in the film 'Gasland', etc. I have heard very few references to good examples of fracking that has been carried out over a considerable period. Is there anything that you could refer the Committee to so that members could look at it further?

**Mr Reay:** Obviously, hydraulic fracking has been used for many decades, but, as you said, high-volume hydraulic fracking of shale gas has only really been done in the past 10 to 15 years. Take, for example, the Barnett shale experience in the Fort Worth area of Texas. Over 10,000 wells have been drilled in that large metropolitan area, which has a population of over 6 million people, including within the city limits. Now, that area takes a large amount of its water supplies from those groundwater aquifers. Drilling goes through to a much deeper shale horizon. That water is tested regularly, and there is no evidence there of contamination.

**Mr McKay:** How long has that been in place?

**Mr Reay:** Since the 90s. You are right. If you are talking about geological timescales, that evidence is not —

**The Chairperson:** It is a microsecond.

**Mr Newton:** I thank the delegation for coming today. I am looking for reassurance, and I think that I am getting that reassurance from the steps that Minister Foster and Minister Attwood have taken. There is a very competent and professional approach, and there is a recognition that, although this may be a huge opportunity for the economy in Northern Ireland, there are concerns from the Fermanagh community in particular and from the wider community. I welcome the steps that both Ministers are taking. I suspect that community confidence will be achieved only when awareness levels rise. I have to say that when I first heard the term "fracking", I thought it was something out of 'Father Ted'. This fracking needs to have the confidence of the public. It seems to me that both Ministers are trying to put in place infrastructure that will give people that confidence.

My question is simple and leads on, in part, from what Mr McKay has asked. I am seeking an assurance that there is a history of managing the impacts on the atmosphere and groundwater. Obviously, the Programme for Government has established figures on atmospheric pollution, and so on. We want to be certain that they will be taken into consideration as part of all the investigations. I would say that, although in geological terms it is a microsecond, certainly the timescale of the approach and the professionalism of the approach are to be welcomed.

**Mr Thompson:** Thank you for the comments. They are appreciated. I think that my colleague Mr Reay has answered the question on the groundwater. The atmosphere is also a really important issue. There has been evidence of both good and bad practice, and we are constantly learning. We want to get to the good practice, and there are engineering processes that mitigate any atmospheric impact. All of that is very much downstream. Have you anything to add to that, Mr Reay?

**Mr Reay:** I can add to that. One of the major issues that have been identified with shale gas is the issue of fugitive emissions. That is where there is leakage of methane at various stages of the process. Methane is a very powerful greenhouse gas, much more so than carbon dioxide. It is an issue that must be considered carefully. Technological solutions are readily available at the moment to minimise those emissions considerably. Two positive steps have been taken recently. The Environmental Protection Agency in the States is introducing new measures and standards to reduce those emissions. From another aspect, the Scottish Widows Investment Partnership has just published a report in which it recommends that people looking at investing in energy companies

should look to make sure that the companies are committed to reducing those emissions. It lists the various methods they can use to do that. In Northern Ireland, our approach would be to ensure that, if shale gas production takes place, the best methods are mandatory for the reduction of any possible fugitive emissions. That would be the objective among the regulators. Obviously, the regulation of that does not come under DETI's remit. That is a matter for DOE and the local environmental health officers, but we will certainly take a keen interest in that, and we are looking at the technology that is available to achieve those objectives.

**Mrs Overend:** Thank you very much for your presentation. It was very interesting, and, as you said, we are just at the beginning of this. You have granted a licence to Tamboran, and you referred to differences between standards in Australia and standards in the United States. How have you set the Northern Ireland standards, regulatory controls and legal requirements? How did you get to that stage?

**Mr Reay:** Because there has not been any exploration for shale gas before, we are looking now at the detailed standards. Detailed standards do exist. If all the companies or states in the US had applied a lot of those standards, many of the incidents that have occurred would have been prevented. In the past two or three years, the American Petroleum Institute has introduced best practice guidelines and standards specifically dealing with hydraulic fracturing and protection of groundwater. Similarly, the UK Offshore Operators' Association has a set of regulations to do with best practice, well construction, segmentation of casing, etc. So, standards are available, and our approach will be to adopt those standards as appropriate. It is true to say that, as technology moves on, the standards that can be applied can be improved, as can the methods used in operations and monitoring, particularly when checking the validity of different methods that are adopted or introduced. That is why we are having continual dialogue on these issues with our counterparts in the Department of Energy and Climate Change, the Environment Agency and the Health and Safety Executive in Great Britain as well as with our counterparts in the South. We are also keeping abreast of EU developments and what is happening in the States. Various studies and reviews are being carried out in the States at the moment.

**Mr Thompson:** I will just come in in support of that. There have been significant reports and analysis on this issue, not only in the United Kingdom but elsewhere. We are benefiting from the House of Commons Select Committee's inquiry into shale gas, which made a number of excellent recommendations. The International Energy Agency has given us the golden rules of hydraulic fracturing, which is a great name for it. Colleagues here benefit from the expertise and knowledge of the British Geological Survey. It is hugely important that we get this right because we have seen what happens when it goes wrong in America. We are confident that we are plugged in to the right forums and the right information to make sure that, as best as possible, we get it right. That is the sort of approach that we are adopting.

**Mrs Overend:** At each stage of the process that you have outlined, it is important not just to stop there but to continue that monitoring. How are you going to do that?

**Mr Thompson:** Again, we monitor the licence that the company has at present very carefully. It has to give us annual reports, but, frankly, we are talking to it much more regularly than that, and rightly so. The licence sets out a number of things that it has to do, and we monitor against that. There is very regular, ongoing monitoring consistently throughout the process. I stress that we are really only at the first step in the process. The direction that the company will go in in the future very much depends on what it finds, but there is regular, ongoing monitoring. If it did move forward towards something more through a public inquiry, other regulatory agencies would then plug in their monitoring arrangements as well.

**Mrs Overend:** The monitoring and all the work that you are doing needs to be open and transparent. The people who live in that area feel that that is very important. That will include details of chemicals and suchlike as well.

**Mr Thompson:** Absolutely.

**Mr Flanagan:** Gentlemen, thank you for coming to the Committee, and I thank the Committee for taking an approach to fracking that will hear from both sides. I hope that we can continue to have a mature debate on it. The first thing I should do is declare an interest as someone whose family owns small amounts of land in the affected area. Mr Young referred to some of the efforts that Tamboran

has made to engage with the local community. I attended one of those meetings where you were on the platform beside Tamboran. You referred to some of the hostility in the room that night. My genuine opinion is that there was hostility going both ways. I hope that all that hostility and some of the emotion that always comes with a matter like this can be removed so that we can have a mature debate and look solely at facts.

Tamboran held a number of public meetings across the affected areas of Fermanagh and Leitrim in late August and early September last year, but it has since presented information to investors around the world and to various conferences across the island of Ireland. The information that it has been providing at those events has been seriously different from the information presented at the events in Fermanagh and Leitrim. It would be cynical of me to suggest that that is an attempt to overplay the benefits to investors to attract them and get them to come on board and to downplay the potential for the industrialisation of Fermanagh so that it will not really scare people.

What level of public consultation took place before the licence was actually awarded? It is my understanding that it was awarded during a period of purdah, but some sort of process took place before that. As someone who was a councillor on Fermanagh District Council at the time, I was not notified that that process was going to take place. You have referred to raising awareness and how you would support that. How can you justify or stand over the fact that 23 elected councillors of Fermanagh District Council were not aware that that was taking place and that nobody in the community knew that it was happening? To be honest, most people in Fermanagh did not become aware that the licence had been awarded until late June last year, when an earthquake took place in Blackpool, which alerted people to the fact that there was such a thing as hydraulic fracturing. People then started to look into it and realised that a licence has been issued in the South. Then, a few days later, they realised that a licence had been issued in the North. I find it disgraceful that, as an elected representative of Fermanagh District Council, neither I nor any of my colleagues were consulted about that process.

**Mr Young:** I was not director at that time, but I think that is covered in the briefing. We have listed the consultations that there were, the letters that were issued and the advertisements that were in the press, and there is a full list of the people who were consulted. Derek, you will have that at your fingertips, I think.

**Mr Reay:** The issuing of petroleum licences does not bring with it a statutory consultation. However, we follow a similar approach to the approach for mineral licences, where there is a statutory requirement. When the Department has received and assessed applications and decided that it intends to offer a licence to the company, it sends out notification of that intention to a variety of statutory consultees on mineral licensing. Those organisations include the local councils in those areas. That is sent out, and the Department also places advertisements in the local papers with an indication that it intends to offer licences. It asks for comments and feedback for a month after that.

**Mr Thompson:** Appendix A of the briefing note that is provided sets out the process that was undertaken.

**Mr Young:** There were several advertisements in the local press, and, in appendix A, there is a list of all of the organisations that were informed, including Fermanagh District Council.

**The Chairperson:** What page is that on?

**Mr Young:** It is in appendix A of the briefing, at the bottom of the second page.

**Mr Thompson:** It is under section e, which is on the consultation process.

**The Chairperson:** Thank you very much.

**Mr Flanagan:** The papers that you have provided set out the departmental position on hydraulic fracturing and this process. Is that the Minister's position, or is the licensing process completely independent of ministerial interference? The licence was awarded during purdah and was not signed off by the Minister. Was the decision taken by officials and experts, or is it a ministerial decision?

**Mr Young:** It is an established process of the Department, which includes the process of consultation, following which there was a departmental committee, chaired by the deputy secretary, to consider the application and the consultation. In this case, it awarded the licence.

**Mr Thompson:** The Minister did not have a role in this.

**Mr Flanagan:** That is fine. Mike, you referenced the work that groups such as the Fermanagh Fracking Awareness Network do and how you would support a debate around fracking and an increased level of public awareness of the issue. Do you support your Minister's assessment of the debate that took place in Belfast, where the film 'Gasland' was shown, and her criticism of the Co-operative for showing that film and the debate that took place afterwards? Do you stand over her assertion that it was a bad decision by that organisation to try to facilitate a debate, albeit by showing a film that is one-sided because the other side would not take part in the filming. Does her stance not reinforce the one-sidedness of the argument? Would it not have been better for the Minister or one of her officials to have attended the event and put forward the other side of the argument?

**Mr Thompson:** Mr Flanagan, the Minister is very keen to have good, open debate on the issue. I understand that there are factual inaccuracies in the film 'Gasland', and she did not feel that that set the right framework for a good, open debate. That was the decision that she took.

**Mr Flanagan:** Do you agree with that decision?

**Mr Thompson:** Yes. Mr Flanagan, you would not expect me to say anything else.

**Mr Flanagan:** You have moved about jobs recently; you might like another new one.

Mr Young, in your comments and as part of your paper, you have listed some of the risks that some people feel fracking poses. One of your opening comments was that your organisation has considerable concern and that you look forward to getting our advice. Your paper contains two paragraphs under the heading, "Potential Problems and Publicly Expressed Areas of Concern". The paper is freely available, so I will not read those paragraphs out. You list 12 or 13 potential risks as issues that have been raised "by those concerned". You also said that you have considerable concern, so which of those risks are you concerned about? Can you go into more detail about what your actual concerns about those are?

**Mr Young:** In general, we are concerned if anyone has a concern, without being pedantic about it.

**Mr Flanagan:** So, you are concerned about the concern and not the process?

**Mr Young:** We are anxious to address any possible risk. This is about engineering risk, as far as we are concerned. Of course, there are economic and social risks, but we are concerned here with engineering risks. On the basis of the evidence that is available to us, which, for example, was considered by the House of Commons Select Committee which received advice from many eminent scientists, we believe that, so far as we know, those risks can be controlled, and all these engineering risks are risks that are being considered by the industry at the moment.

Derek has explained some of the engineering standards that are emerging, for example, from the American Petroleum Institute, which calls the shots in the area of engineering. We are concerned about all these risks and that we get the right process to monitor them.

**Mr Flanagan:** Are you satisfied that the right process can be put in place with the right amount of regulation so that none of these risks could possibly happen, and not just as far as you know?

**Mr Young:** That is what we are assessing, and that is what will be put to the planning authorities for them to decide.

**Mr Thompson:** We are in a great position, in that we know about these risks now. It is much better to know about them now and go into this properly with our eyes open, than to find out about risks halfway through it when it is too late. We also know, because a lot of knowledge and expertise has been built up, how these risks have been addressed elsewhere.

Really, however, the issue is how these risks would be addressed if something were to happen in Fermanagh. Again, we are at the early stage where we do not really know what the particular unique aspects of Fermanagh are, nor do we yet know which of these risks may be more or less important. However, we know that these are the things to look for. That puts us in a good position, but all these are hugely important and we need to be aware of them. We need to look for them and we need to see how they are addressed. We need to apply the existing knowledge now to the particular nature of Fermanagh.

**Mr Flanagan:** Finally, one of Mr Young's other comments was that fractures can be monitored using the latest technology. You can monitor them all you want, but they cannot be controlled. It has been proven that putting water into the ground at a high pressure is likely to cause earth tremors. They might be very small tremors, and you might not feel them on the ground, but you cannot predict the potential damage that that could do to the well casing. You cannot control what is going to happen in that instance. Therefore, you cannot give a guarantee that there will not be some potential contamination.

You are the people with the engineering and geological backgrounds, so I do not understand how you cannot identify that. Is there a clear link, in your opinion, between putting water in at high pressures and earth tremors and damage to well casings, which may lead to potential contamination of groundwater, or can you categorically say that that will not happen?

**Mr Young:** This issue is dealt with at great length in the recent DECC report on the Preese Hall earthquake. There were earthquakes, which were not caused so much by the fracturing of the rock but by existing geological faults being lubricated by the water that was pumped in; there is a difference there. That report set out very clear recommendations about a traffic light system for monitoring the seismicity that is associated with the process. It is a very conservative system, which recommends that the process be stopped once the level of seismicity reaches 0.5, which is a very small level.

**Mr Flanagan:** So, once it reaches 0.5 and you turn off the water, is that the end of it?

**Mr Young:** That is what will emerge from the recommendations and the regulations that will be worked out between now and the process. The latest research that we have is the Preese Hall report, which has considered this very question and has come up with recommendations that we will follow.

**Mr Flanagan:** Your answer takes us back to Mr Reay's final comments to Mr McKay. The evidence is just not there. If that is the case, why are we rushing into this? That gas has been there for thousands of years and it is not going anywhere. Why are we rushing?

**Mr Young:** We are not rushing into this.

**Mr Flanagan:** You are telling me that a planning application will be submitted in 15 months' time: that is rushing.

**Mr Young:** And then these issues will be considered in the context of the existing science. If the existing science does not give satisfactory answers, I am sure the application will be refused.

**Mr Flanagan:** Surely those issues should have been considered before a licence was given?

**Mr Young:** It is not a licence for fracking. We keep saying that. It is a licence to explore.

**Mr Thompson:** All we are doing at present is having a look to see what is down there. There is no licence to frack.

**Mr Flanagan:** Mr Thompson, if you are having a look to see what is down there, how come Tamboran has published figures telling us exactly what is down there, the economic benefit of it —

**Mr Young:** They have not done —

**Mr Flanagan:** — how many jobs it will create, and how long it will give us security of supply? If we do not know what is down there, how can they publish those figures and how come you have not come out saying that those figures are not right?

**Mr Young:** That is the whole point of exploration. Tamboran has made estimates based on geological knowledge that we have, which is limited to a few boreholes and some seismic data. That is the point of the first phase of the exploration programme: for Tamboran to collect the information that it needs to make that assessment.

**Mr Flanagan:** So if that information is not correct, why bother to put it out?

**Mr Thompson:** That is a decision for the company. You and I understand why they are doing that.

**Mr Flanagan:** You are right and cynical too, Mike, are you?

**Mr Thompson:** We understand that there are commercial reasons why they suggest that. Tamboran is coming to give evidence next week and the Committee will have an opportunity to talk to the company then. We reckon that knowledge is limited. There is some knowledge about what is there, but it is limited and that is why the licence has been granted to do this exploratory work and find out, much more definitively, what is there, how much it is and whether it can be extracted. Those figures, which are guess-estimates by the company, would then start to be firmed up. At this stage, they can only be guess-estimates because the work has not been done.

**Mr Flanagan:** I am sorry, Chair; I know that I said I was finished. If we are relying on Tamboran —

**The Chairperson:** That is four questions. *[Laughter.]*

**Mr Flanagan:** If we are relying on Tamboran's guess-estimates as to what is there, which are designed to attract investors, how can we be sure that the information that it gives on the environmental impact of this is correct? They say that they will not use chemicals. How can we trust them on that? There will be no guarantee in any contract that they will not use chemicals.

**Mr Young:** That is neither here nor there. The issue will be what the planning authority decides. If the planning permission is given on the basis that Tamboran will not use chemicals, it will not do so.

**Mr Flanagan:** Can it be done without chemicals?

**Mr Young:** Derek will have more information about this, but I understand that, because we are talking about shallower depths, the pressures are much lower. Chemicals are needed where fracking is done at great depth and where chemical lubricants are required to facilitate the process. I understand that this is possible to do without chemicals. Tamboran has signed a declaration that it will not use chemicals. It is a hypothetical question because it will depend on what Tamboran proposes to do and what the planning authority authorises.

**Mr Flanagan:** You have said that it is possible to do it without chemicals. Where did you get that information? Is it from Tamboran's experts?

**Mr Reay:** There are examples where this has been carried out without chemicals in Canada, in shallower shale gas plays. I am sure that we can provide information on that.

**The Chairperson:** Thank you very much, Mr Flanagan. Mr Agnew, can I ask you to be —

**Mr Agnew:** No.

**Mr Flanagan:** You can ask all you want, Chair.

**The Chairperson:** The problem is that we want to hear from the Fermanagh group. I do not want to run out of time and I want to be fair.

**Mr Agnew:** I appreciate that, Chair, but I have considerable interest in this. I will be as brief as I can, but I hope I get the leeway that other members were given.

**The Chairperson:** I am trying to be as flexible as I can, but we have a serious time problem.

**Mr Agnew:** I appreciate that. Thank you.

Thank you for your answers until now. We talked about the lack of public awareness of fracking. It is very important that the information that is out there is as accurate as possible. So I would like to clarify a few things that you have either said today or stated in your briefing paper. There are some things that I believe may, unfortunately, perpetuate some of the myths that are out there. For example, Mr Young said earlier that vertical fracking has been around for decades. That is a very careful choice of words: vertical fracking has been around for decades. What has not been around for decades is horizontal directional drilling; multi-stage fracturing and slick water, which is characterised by high-frack fluid; multi-well pads; and cluster drilling. My understanding is that the earliest drilling of that type was done seven years ago. I hope that my source is correct about that. Ultimately, that is what we are talking about in Fermanagh, and I think that is what we should stick to talking about, rather than talking about fracking being around for decades. Vertical drilling is not what is proposed for Northern Ireland; it is horizontal drilling. I just want to nail that point down; we are talking about something that is seven years old.

As regards scientific data, the US Environmental Protection Agency has not yet had a single conclusive report. One draft report shows causal effect between fracking and water pollution, but that is only a draft. We mentioned that, in geological terms, we are talking about microseconds. We have had a very short time frame in which to gather scientific research and an evidence base for this process, and information is still being gathered. That is why the Assembly and I agreed that we should have a moratorium until that evidence is conclusive. That is my view, and I would say that it is a view shared by the majority in the Assembly.

Another thing that I think is being perpetuated —

**The Chairperson:** Do you want those questions to be answered? There were two questions there; one about the American Environmental Protection Agency and the other in relation to the method of fracking.

**Mr Agnew:** Mr Young was nodding at me.

**Mr Young:** Yes, I agree entirely with what you said.

**The Chairperson:** You accept what Mr Agnew is saying?

**Mr Young:** Yes, indeed. The point is that we know this; this is the point of the process that we are going through and, ultimately, these things will be decided at planning stage. It is up to the planning authorities to decide whether we know enough about it and whether the risks are too high. Again, it is all about risk — engineering risk. We believe that we are very good at managing and estimating risks, so the question will be answered at that stage.

**Mr Agnew:** Your submission made it clear that, if my motion were followed and the licences for fracking were withdrawn, the Department would be open to litigation. So, at this stage, as long as the licence-holder complies with his licence, the Department of Enterprise, Trade and Investment cannot stop fracking at this point: is it fair to say that?

**Mr Young:** It will not have anything to do with this Department; it will be up to the planning Department that runs the planning process.

**Mr Agnew:** So, this Department could not prevent —

**Mr Reay:** That is not correct. DETI also has to give consent for drilling.

**Mr Agnew:** Under what grounds could it refuse consent?

**Mr Reay:** To get that consent, the licensee has to have all of the necessary permissions, including planning permission.



**Mr Agnew:** So, if the licensee complies with his licence and gets those permissions from the other Department, this Department is powerless unless it wants to face litigation, because it has to follow through on the contract that it has with the licensee to allow it to frack should it comply with the —

**Mr Reay:** As long as that conforms to industry best practice standards.

**Mr Agnew:** So, we have issued a licence when we know very little about it, and the Department has very little scope to withdraw it. That is my assessment from my reading of the briefing. That seems to confirm that that is where we are.

Another thing that I think is a myth, and I am interested in your view, is that the Minister had no involvement in the issuing of these licences. I suppose it depends how we define "involvement", because while it was pointed out that the licences were issued during purdah, I have a letter that was sent to this Committee — before I was on it, I might say — from the Minister informing the Committee about three of the applications in relation to petroleum licences:

*"Three of the applications from new applicants were straightforward and the Department has offered licences in respect of these applications. The areas covered by these offers are Rathlin Island, an area in the Larne-Lough Neagh basin and an area in Fermanagh."*

I assume that that refers to the licence we are discussing today, that for Tamboran. So, the Minister was aware on 18 October 2010 that this licence was going to be issued. While she might not have signed the licence, put it in an envelope and sent it herself, she was certainly briefed on the issue and had committed to keeping this Committee and other Ministers briefed. How can we then say that the Minister — who, in legal terms, is inseparable from her Department; in legal terms they are one and the same — was not involved in the issuing of licences?

**Mr Thompson:** Because she was not.

**Mr Agnew:** Under what definition of "involvement"? If she is being briefed by her Department, ultimately those issuing the licence are in her employment. When my staff do something, I am involved in it.

**Mr Thompson:** Thanks for the question, Mr Agnew. I presume that that correspondence was in response to another piece of correspondence?

**Mr Agnew:** It is correspondence from the Minister to Mr Maginness, the Chair of this Committee, in relation to the hydrocarbons licensing directive, and it states that three of the applications were straightforward and the Department had offered licences in respect of those applications.

**Mr Thompson:** I presume that it was a bit of correspondence from our Minister following a request for information from the Committee, which is perfectly normal. That always goes through the Minister and it is the perfectly normal process. That is quite separate and distinct from the actual process of issuing the licence.

**Mr Agnew:** OK. Would it be fair to say that she was well aware of the licence?

**Mr Thompson:** Obviously, if it is said in the correspondence that you have — I do not have it in front of me — she would have been aware of the process, but that is very separate and distinct from having an active involvement in it.

**Mr Agnew:** GSNI is within the Department and ultimately responsible to the Minister: is that correct?

**Mr Thompson:** It is an interesting appendage to the Department. Mike may have a better knowledge of the relationship. GSNI advises the Department; the Department has a three-year service-level agreement with the team in GSNI to give the Department that advice.

**Mr Agnew:** OK. Is it funded by the Department?

**Mr Thompson:** Yes.

**Mr Agnew:** Tony Bazley, the current director of environmental and community affairs at Tamboran, was previously employed by GSNI. In what role was he employed and when did his employment cease?

**Mr Young:** He was a long-term and distinguished member of the British Geological Survey. He was originally the chief geologist for Wales and ultimately became director of the Geological Survey of Northern Ireland, from which position he retired in or around 1999. It was quite a long time ago, anyway.

**Mr Agnew:** OK; I was just not sure of the timeline.

**Mr Young:** I am the third director since his time.

**Mr Agnew:** So it was a significant while ago. I genuinely was not aware of the time frame.

I will move on to the process of fracking and some of the research that is around. We can, of course, do things differently in Northern Ireland, but I do not think that we are so wonderful that we are somehow infallible and our engineers or regulations are exempt from mistakes. I am trying to get a sense of the level of risk. For example, Professor Ingraffea in Cornell University said that 5% of gas wells in this type of fracking leak within the first year, with 50% leaking in their lifetime.

I mentioned the US EPA study in Wyoming, and it is important to note that that was an example of shallow drilling, which is, I understand, what is proposed in Fermanagh. I am interested in your views on that for the purpose of clarification.

In one other piece of research, Professor Richard Davies, director of the Durham Energy Institute, said that there should be a 600 metre gap between an aquifer and a target area for fracking. Will you be recommending a minimum 600 metre gap, or what is your assessment of that research? I am particularly interested in your assessment of the US EPA study in Wyoming and how it relates to this proposal and the research by Professor Richard Davies.

**Mr Reay:** The Pavillion gas field in Wyoming is a shallow gas field, but it is not a shale gas production field. Fracturing has taken place, but it is a mixture of conventional gas and using fracturing to enhance the production. The producing formation is the same formation and extends to the surface and includes the shallow aquifer where the groundwater is taken from. That formation consists of an interbedded sequence of sandstones, which are porous, and shales. Therefore, you have ideal geological conditions to have pathways that can go from the area where the fracking takes place up towards the surface. Having said that, a lot of the evidence of the pollution in that area is from surface pits rather than anything else. Unlined or poorly lined surface pits were used for storage of produced water, which had fracking fluids in there as well. So, it is a perfect example of how not to do it and where it is inappropriate to use those techniques. Lessons can be learned from that, but it is not an analogy for the geology in Fermanagh. However, it is valid in this important study.

In relation to the 600 metre gap, Professor Davis has done this research as a basis of a statistical study on the published data from the States on fracture heights across thousands of wells there, and the 600 metre gap comes from the highest fracture measured in one of the formations, which was 578 metres or something of that sort. Therefore, he has suggested that 600 metre separations in an area where you have not fracked before would be reasonable. However, that highest fracture of 600 metres occurred down at depths of around 3-5 kilometres, where the company doing the fracturing would have used much higher pressures for the fracturing than would be required in the shallower depths of Fermanagh. However, that said, we will be in contact with Professor Davis to gain more information about the analysis that his group is carrying out, and that sort of information will be taken into account when deciding whether there is a specific height or thickness of buffer that should be allowed between a zone of fracturing and any aquifer. So, that would be considered. At the moment, I am not sure that taking an arbitrary figure is the right approach because what you really need to do is look at the detailed geology and what the factors are in respect of the fracture propagation. There are different geological factors, such as the stress regime and the pressuring of the reservoir, which will affect the height to which fractures propagate. Therefore, it is not just a simple approach, but there is a lot of published literature on fracture propagation and the risks involved.

**Mr Agnew:** I have one very brief question —

**The Chairperson:** One last question, because it is unfair to the Fermanagh group.

**Mr Agnew:** In relation to the geological properties in Fermanagh, the Bundoran shale has been identified as a potential target area for fracturing. What is the depth between it and the Ballyshannon limestone aquifer?

**Mr Reay:** The Ballyshannon limestone aquifer occurs beneath the Bundoran shale. However, the Ballyshannon aquifer is at shallower depths. The formation water in the centre of the Ballyshannon basin is saline water, which is not in connection with the aquifer water.

**Mr Agnew:** OK. Thank you very much, and thank you, Chair.

**The Chairperson:** Will you clarify one point for me? Who owns the gas?

**Mr Reay:** Petroleum is vested with DETI, under the Petroleum (Production) Act (Northern Ireland) 1964. That applies to most areas of Northern Ireland, with a few exceptions. Former owners of mineral rights prior to the passing of that legislation are entitled to compensation at a rate of 7.5% of the value of the oil or gas produced.

**The Chairperson:** If gas is produced, will the royalties belong to DETI?

**Mr Reay:** There are no royalties, as such, payable to DETI. There is a range of taxes in the UK to which any production would be subject, such as a ring-fenced corporation tax level of 32% that is applied to petroleum. The 7.5% goes initially to DETI, and if it is not claimed by any former owners, it may be retained by DETI or returned to the Treasury. I do not know the exact details. It has not happened before in Northern Ireland.

**The Chairperson:** Is it the case that landowners have to give their permission or can be put into a position in which they cannot resist?

**Mr Thompson:** I presume that it is up to the landowner to do a commercial deal with the explorer.

**The Chairperson:** Therefore, the landowner negotiates a deal with Tamboran, or whichever company may be doing the extraction.

**Mr Flanagan:** An important point to make is that the company can drill down and across, under someone's land, and that landowner does not have to give permission. Negotiation is only for the access needed.

**The Chairperson:** How many wells would be required to extract all the gas that is supposed to be there?

**Mr Young:** That will depend on Tamboran's plans. It has indicated that, in general, it will drill clusters of wells on what it calls pads and that those pads may be spaced between 2 kilometres and 4 kilometres apart across the landscape. As we said, that will have to be negotiated with the landowners, who, I am sure, will benefit handsomely.

**The Chairperson:** I am sure that they will. Thank you very much, gentlemen. It has been very interesting. I am sorry that things went on for so long, because we are running out of time. I am sure that we will hear from you again.