UPDATE ON THE SEAGEN PROJECT AND INFORMATION ON SIMILAR PROJECTS AROUND THE WORLD

Introduction

The following paper provides an update of the SeaGen Strangford Lough tidal energy project, and an overview other projects in the Northern Ireland and the Republic of Ireland, and throughout the world.

The term ocean energy is used in distinction to wave energy, as the former term incorporates both wave and tidal energy. These two latter terms are defined respectively as:

- **Wave Energy** – the exploitation of wave motion for the purposes of energy generation; and

- **Tidal Energy** – the utilisation of tidal movement for the purposes of energy generation.[i]

Tidal power, relying as it does on regular tidal movements (linked to phases of the moon), is deemed to be more reliable than wave energy[ii], which has a load factor of 25% (meaning it will only produce approximately 25% of theoretical capacity).[iii]

Seagen Pilot Project at Strangford Lough – Update

The Strangford Lough SeaGen project was officially plugged into the gird on July 17 2008, making the first commercial-scale underwater to feed into an electricity network. During this initial trial of the technology the stated aim of the project was to deliver a generating capacity of 150kw with plans to increase this to (300kw by the end of summer 2008). The technology has the potential to generate an output of 1.2mw, which could power around 1,000 households.[iv] Power produced at the Strangford site will be purchased by ESB Independent Energy and sold to customers in Northern Ireland and the Republic of Ireland.[v]

Marine Current Turbines (MCT), a Bristol based firm, were responsible for the design and construction of the SeaGen technology, although the final piecing together of the device was undertaken by Harland and Wolff. Estimates place the cost of the project at

£12m.[vi] MCT received a BERR grant of £5.2m and £500,000 of financial assistance from Northern Ireland Electricity.[vii]

The project ran into difficulties during its first day of operation when two blades on one of its turbines suffered damage resulting from a computer fault. This has since been rectified and the technology generated at maximum capacity for the first time during December 2008. The next step will be to move towards full-operating mode, during which the system will generate at full capacity for 24 hours each day, this is expected to be achieved by February 09.[viii]

Project Expansion and similar projects

MCT's licence for the Strangford Lough project has a five-year term. Despite the technology used in the pilot project having a 20-year life span, no firm plans exist to extend the project beyond five-years. MCT state that, given the area's environmental importance, they are of the opinion that removal at the end of the current license term is the most appropriate course of action.[ix]

MCT currently has no plans to embark on similar projects in either Northern Ireland or the Republic of Ireland. Its next project will be the "Skerries" in Anglesey, North Wales (outlined below).

Rathlin Island has been identified as a future area of tidal energy development. Scottish Power announced plans to develop the site as part of wider project incorporating two other sites, Pentland Firth and the Sound of Islay, on September 29, 2008. The overall project, which has the potential to be the largest of its kind in the world, will involve the installation of between five and twenty turbines at each site, with a combined generation capacity of 60mw (equivalent to providing 40,000 homes with energy). Planning applications are expected to be submitted to the Scottish Government and Northern Irish Assembly in summer 2009.[x] In addition, Thetis Energy a consortium incorporating Larne-based B9 Energy Offshore Developments, Deepblue Renewables and Statkraft UK, have recently announced plans to site a £300m tidal power plant near Torr Head, Co Antrim.[xi]

A 2006 study by Sustainable Energy Ireland (SEI) found that there was a theoretical 525 terrawatt hours of un-harnessed wave energy in Irish water's(see appendix one for details of potential sites). In the same year the Republic of Ireland's electricity requirement was 27.8TWh.[xii] A report into tidal energy by the same body found a theoretical tidal resource of 230TWh, equivalent to 500% of electricity consumption based on 2010 estimates (see appendix two for details of potential sites). A number of projects, in various stages development, have been funded by SEI in the Republic of Ireland.

Wave Bob, Galway – a quarter scale prototype installed off the coast of Galway in 2006. The technology was the first to be installed in a test site of the coast of Spiddal. The prototype is designed to gauge the generation potential of the area. [xiii]

Ocean Energy Buoy, Galway – incorporating different technology than the Wave Bob prototype, the Ocean Energy Buoy is again a quarter scale test piece installed off the Coast of Galway in December 2006.[xiv]

Open Hydro – Open Hydro are a Republic of Ireland based marine turbine business funded by SEI. To date they have installed a 250kwh turbine off the coast of the Orkney Islands.[xv]

Aqua Buoy – Aqua Buoy is a wave energy technology firm owned by Finavera Renewables Ltd. The technology utilizes a hydraulic pump mechanism to generate energy.[xvi] Large scale trials of the technology began in 2008; the firm's website indicates that none of these trials took place in the Republic of Ireland.[xvii]

McCabe Wave Pump – The McCabe Wave Pump is a technology under development by a company called Hydam. Large scale trials of the technology took place in the Shannon Estuary in 2004.[xviii]

Global Projects

Globally, the following, notable, projects are being developed (a brief outline of notable projects is provided along with an indication of what sort of technology, tidal or wave, they utilise). From the array of projects in existence it is evident that Denmark and Portugal are emerging as world leaders in the deployment of ocean energy technology.

MCT the Skerries, Anglesey, North Wales – a 10.5mw tidal energy farm, consisting of seven 1.5mw SeaGen turbines at a location, which benefits from its proximity to gird connection. The project will see collaboration between MCT and Npower. Subject to granting of planning permission and financing the project is expected to be commissioned by 2011.[xix]

MCT Canada - MCT has plans to launch two projects off the East and West coasts of Canada. The firm has reached agreement with Canada's Maritime Tidal Energy Corporation to harness "enormous currents" found near the Bay of Fundy, on the Canadian East coast. The technical details of this project have yet to be released. A further West Coast project will involve installation of at least three 1.2mw turbines in Vancouver's Campbell River by 2009. The project, in collaboration with BC Tidal Energy Corporation, is viewed as the initial stages of a wider project to tap the 4000mw tidal energy potential of the region.[xx]

Pelamis Wave Power Ltd, Portugal – Scottish firm, Pelamis Wave Power Ltd[xxi], launched the world's first commercial-scale wave-power station, three miles off the north coast of Aguçadoura, Portugal, September 23 2008. The Pelamis system utilizes different technology than the SeaGen model. The system incorporates three "snake-like", cylindrical wave energy converters.[xxii]Wave motion causes the cylinders to bob up and down; an internal hydraulic system then powers an electricity generator.[xxiii] At present, the project has a peak capacity 2.25mw, enough power to provide the annual electricity needs of 1,500 households. The current set-up is only the first phase of the

project, plans exist to expand generation capacity to 21mw (equivalent to a CO2 reduction of 60,000) with the introduction of a further 25 machines. The first phase of the Aguçadoura project cost €9m, the Portuguese government will pay the company a feed in tariff of 25c per KWh. The project also received a €1.25m grant from Portuguese Agência de Inovação (Portugal's innovation agency). Commenting on the project, Greenpeace UK stated:[xxiv]

"Wave technology invented in Scotland is powering Portuguese homes and making money for Portuguese suppliers, because our government has consistently neglected the renewables industry here in the UK."[xxv]

Wave Dragon, Denmark, Wales and Portugal – the Wave Dragon project usesa "wave reflectors" to direct waves towards a ramp. A reservoir is situated behind the ramp to store the water before directing it towards hydro-turbines.[xxvi] An initial prototype of the technology was launched in 2003 off the northern coast of Denmark. An improved prototype model was introduced in 2006. A 7mw version of the project was launched of the coast of Wales in 2006 for a test period of three to five years. A full scale 50mw wave farm employing this technology is planned for Portugal. The initial Danish prototype was developed in collaboration between Nissum Brending, the Danish Energy Authority (contributing €1.5m), the European Commission (€1.5m) and Elkraft Systems (€0.25m).[xxvii]

Poseidon's Organ, Denmark – launched in August 2008 Poseidon's Organ is a "floating power plant" off the coast of southern Denmark. Not yet built to full scale, the current project is a 37 metre combined technology energy generating system. The system employs both wave energy (through a hydraulic pump system) and wind energy (by installing windmills on the deck of the floating station).[xxviii] When fully constructed the 230 metre plant has the potential to power 12,500 households. Once again, there are plans to introduce similar technology in the waters off Portugal.[xxix]

Wave Star, Denmark – still in its prototype stage the "Wave Star" cuts at a right angle into the wave motion, with floats partially submerged in the water. When a wave rolls in, the floats are lifted up one by one until the wave subsides. The rising float drives a piston which in turn powers a hydraulic motor connected to a generator".[xxx] The advantage of the technology is its cost, comparable to wind turbines. The project's developers Erhervs Bladet and Wave Energy plan to increase the generating capacity of the plant to 3mw.[xxxi]

Aidan Stennett
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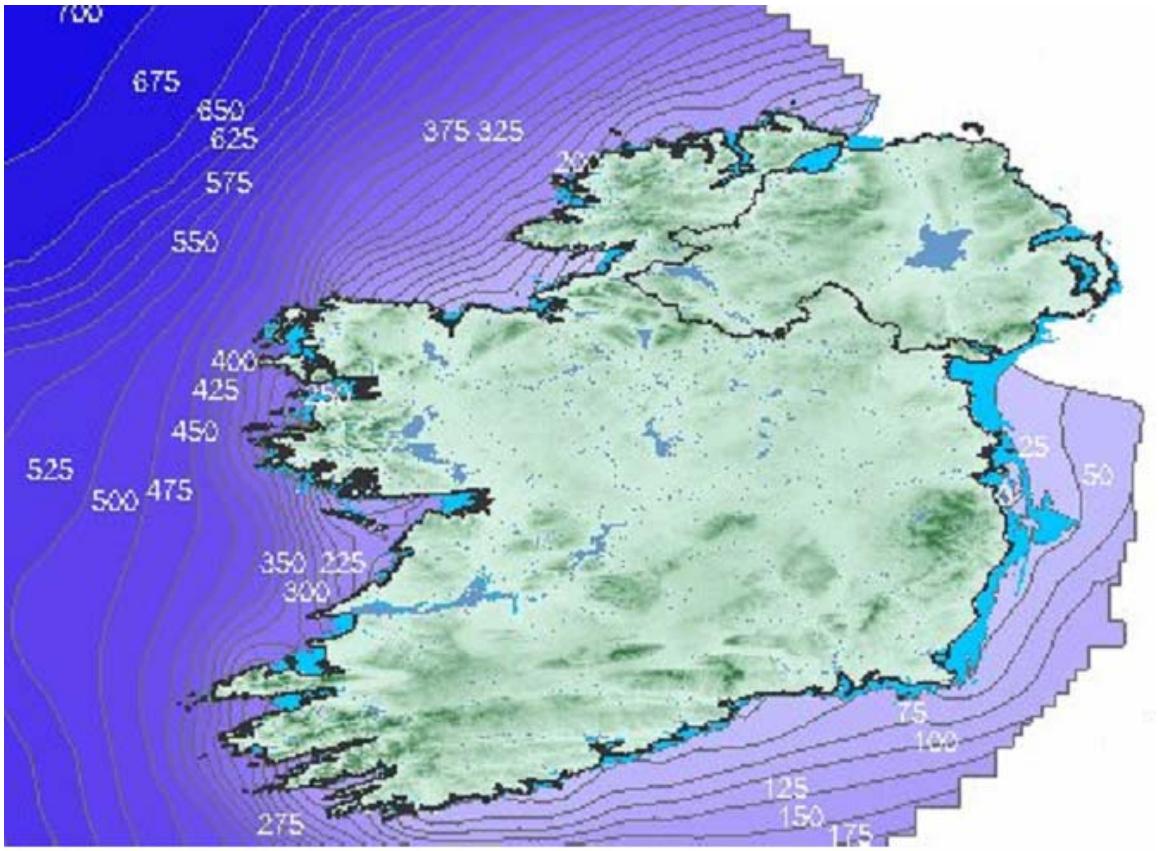
APPENDIX ONE

Viable wave energy resource[xxxii]



APPENDIX TWO

Viable tidal energy resource[xxxiii]

[i] OECD Glossary of Statistical Terms http://stats.oecd.org/glossary/detail.asp?ID=4624
[ii] The Belfast Telegraph *Tidal power may solve energy need* (December 2008) http://www.belfasttelegraph.co.uk/business/business-news/tidal-power-may-solve-energy-need-14098352.html
[iii] British Wind Energy Association, *Can we rely on the wind?* http://www.bwea.com/energy/rely.html (accessed 13/01/09)
[iv] The Guardian, First tidal power turbine gets plugged in, July 17 2008
[v] The Irish News, NI Tidal power turbine blades damaged, July 22 2008
[vi] The Belfast Telegraph, World's first as £12m turbine installed in Strangford Lough, March 31 2008
[vii] The Irish News, NI Tidal power turbine blades damaged, July 22 2008
[viii] Marine Current Turbines press release *SeaGen tidal energy reaches full power* December 18 2008
[ix] Conversation with Taylor Keogh Communications, press office for MCT
[x] Scottish Power press release, Scottish Power Renewables Announce The Largest Tidal Stream Projects In The World, September 29 2008 http://www.scottishpower.com/PressReleases_1764.htm
[xi] The Belfast Telegraph *Tidal power may solve energy need* (December 2008) http://www.belfasttelegraph.co.uk/business/business-news/tidal-power-may-solve-energy-need-14098352.html
[xii] Sustainable Energy Ireland, Ireland's Wave Energy Resource http://www.sei.ie/index.asp?locID=1193&docID=-1
[xiii] Marine Institute Ireland, Ireland's first Wave-Energy generator arrives in Galway http://www.marine.ie/home/aboutus/newsroom/pressreleases/Wave-Energy+Generator+arrives+in+Galway.htm
[xiv] SEI, Ocean Energy Buoy http://www.sei.ie/index.asp?locID=1196&docID=-1
[xv] SEI, Open Hydro http://www.sei.ie/index.asp?locID=1197&docID=-1
[xvi] SEI Aqua Buoy
[xvii] Finavera, Wave Energy, The Future of Renewables http://www.finavera.com/en/wave
[xviii] SEI McCabe Wave Pump http://www.sei.ie/index.asp?locID=1199&docID=-1
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[xx] MCT Canada http://www.marineturbines.com/18/projects/22/canada/
[xxi] Formally Ocean Power Delivery Ltd
[xxii] The Guardian, 'Wave snakes' switch on to harness ocean's power, September 24 2008 http://www.guardian.co.uk/environment/2008/sep/24/renewable.wave.energy.portugal
[xxiii] Wave Power: Spotlight on Ocean Power Delivery Ltd http://www.treehugger.com/files/2006/10/wave_power_ocean.php
[xxiv] The Guardian, 'Wave snakes' switch on to harness ocean's power, September 24 2008 http://www.guardian.co.uk/environment/2008/sep/24/renewable.wave.energy.portugal
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[xxvi] Three Wacky Danish Wave Power Projects - http://www.treehugger.com/files/2008/10/3-wacky-danish-wave-projects.php
[xxvii] Wave Dragon, Prototype testing in Denmark http://www.wavedragon.net/index.php?option=com_content&task=view&id=12&Itemid=14
[xxviii]Floating Power Plant, Poseidon's Organ, How it works http://www.floatingpowerplant.com/default.asp?pageid=324
[xxix] Three Wacky Danish Wave Power Projects - http://www.treehugger.com/files/2008/10/3-wacky-danish-wave-projects.php
[xxx] Three Wacky Danish Wave Power Projects - http://www.treehugger.com/files/2008/10/3-wacky-danish-wave-projects.php
[xxxi] Three Wacky Danish Wave Power Projects - http://www.treehugger.com/files/2008/10/3-wacky-danish-wave-projects.php
[xxxii] Marine Institute Ireland, Wave Energy http://www.maps.marine.ie/wave/Default.aspx

[xxxiii] Sustainable Energy Ireland, Tidal and Current Energy Resource in Ireland www.sei.ie/getFile.asp?FC_ID=2296&docID=59