

Dear Pro-Tide Environmental Aspects Group Members,

April has been an exciting month for tidal energy, with recent events providing a more positive outlook across the sector. This month we have also included a section highlighting the most relevant research on tidal energy released in Q1 2015. You can find this attached at the end of this newsletter.



MCT SeaGen tidal energy device in Strangford Lough, NI. ("SeaGen installed" by Fundy (Fundy) - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons)

### Stop press! A phoenix rises in tidal energy

On the 29th of April Atlantis Resources Ltd. announced their acquisition of Marine Current Turbines Limited from Siemens AG. The acquisition includes the MCT Ltd. turbines, seabed rights, existing projects, staff and IP, and extends Atlantis' business developments in to Wales, Northern Ireland, and Southern England. The deal gives Atlantis access to MCT's 15 years of project experience and sound demonstration of the survey, deploy, and monitor approach to environmental impact management. The MCT/SeaGen environmental monitoring protocols have been widely recognized as industry-leading.

### Dutch BlueTEC tidal energy platform unveiled

This month Bluewater unveiled its first BlueTEC tidal energy platform. The demonstration platform, which will be positioned near the island of Texel, will provide a test-bed for different turbines while supplying clean electricity to the Dutch grid. Eventually, Bluewater aims to deploy the tidal energy platform in remote, off-grid locations worldwide, reducing the need for diesel generators. Development of a second, higher capacity platform to be deployed in large farms is also planned.

### UK Marine Renewable Energy Programme wraps up



Marine Renewable Energy Knowledge Exchange Programme

The UK's Natural Environment Research Council (NERC) Marine Renewable Energy Research and Knowledge Exchange Programmes wrapped up this month at a ½ day workshop held in Southampton as part of the Ocean Business Event. The outcomes of four projects were presented, focussing both on the physical environment and environmental impacts at renewable energy developments. The four projects, FLOWBEC, RESPONSE, EBAO, and QBEX, are profiled in the research review which follows this newsletter. Recordings of project presentations given at the Ocean Business workshop can be found at: <http://tethys.pnnl.gov/events/update-technology-and-tools-de-risk-and-streamline-development-special-session-marine>.

#### Investing in Opportunities



This project has received European Regional Development Funding through INTERREG IV B.



INTERREG IVB

## Energy Island builds on cross-sectoral partnerships for energy R&D

The Anglesey Energy Island Programme is a programme building on public-private partnerships to bring the Anglesey and North Wales region to the forefront of energy R&D. It is expected that the energy island programme could contribute nearly £12 billion to the regional economy, and could be a boost for employment and development opportunities.

While the programme focusses on a wide range of energy streams, tidal energy is expected to play a substantial part in the programme, which aims make connections beyond the energy industry, and into all aspects of Anglesey and North Wales communities. The Skerries Tidal Array Project off the Anglesey coastline would have been Wales' first commercial tidal energy project, but was suspended in September 2014 by developer Siemens AG. More information can be found at [www.anglesey.gov.uk/business/energy-island](http://www.anglesey.gov.uk/business/energy-island).



The Skerries and West Mouse form Hen Borth, Anglesey. (Ian Warburton [CC BY-SA 2.0 (<http://creativecommons.org/licenses/by-sa/2.0>)], via Wikimedia Commons)

### Upcoming Events

May 6th-7th, 2015	All Energy Conference, Glasgow, UK. Ilse Deurwaarder, from Provincie Zeeland will be presenting the Pro-Tide Project at this event on May 7th.
May 20th -21st 2015	THETIS EMR Conference, Nantes, France, <a href="http://www.thetis-emr.com">www.thetis-emr.com</a>
May 27th – 28th 2015	Pro-Tide Project Partner Meeting and Knowledge Alliance Workshop, Middelburg, Netherlands
June 30th 2015	Pro-Tide Environmental Aspects Evaluation Workshop, Cowes, Isle of Wight

A tentative agenda for the Environmental Aspects Evaluation Workshop will be circulated imminently – we hope to see you there!

Best wishes,

Dr. Raeanne Miller  
Pro-Tide Environmental Investigator

This month we endeavour to summarise the most recent research outputs in tidal energy, focussing on environmental science. While these are brief summaries of each study or project, further information can be found using the associated links. Happy reading!

### PUBLICATIONS

#### **Social and ecological impacts of marine energy development**

While the marine renewable energy developments are faced with key ecological challenges, the social acceptance of renewable energy generally remains high. Even so, the success rate of planning applications for renewable energy developments remains low. To reduce costs and expedite development progress, developers should not only try to iteratively incorporate environmental and device monitoring results into future project design, but should also adopt fair and inclusive decision-making processes which gain the trust and confidence of local communities.

Bonar, P.A.J., Bryden, I.G., and Borthwick, A.G.L. (2015). Social and ecological impacts of marine energy development. *Renewable and Sustainable Reviews* 47, 486-495.

<http://www.sciencedirect.com/science/article/pii/S136403211500221X>

#### **Modelled cumulative impacts on sediment transport could be less than expected for Pentland Firth tidal energy developments**

Researchers at Swansea University suggest that impacts on seabed sediments and morphology from planned tidal energy arrays in the Pentland Firth may not be as significant as initially expected. Non-linear cumulative impacts on sediment dynamics have previously been assumed for multiple tidal energy projects in a single system, but the results of this study suggest that this is not the case for the Pentland Firth. The outputs of coupled hydrodynamic and sediment transport models indicated that the cumulative impact of proposed arrays in the area was linear: equal to the sum of the impacts of the individual arrays. This suggests that costly cumulative impact assessments for sediment transport processes may not be a necessary burden on developers.

Fairley, I., Masters, I., and Karunarathna, H. (2015). The cumulative impact of tidal stream turbine arrays on sediment transport in the Pentland Firth. *Renewable Energy* 80, 755-769. <http://www.sciencedirect.com/science/article/pii/S096014811500186X>

#### **An environmental risk evaluation system for coastal and estuarine renewable energy developments**

The Environmental Risk Evaluation System (ERES) developed by researchers at the Pacific Northwest National Laboratory, USA, provides a new template for assessing the environmental risk factors associated with renewable energy developments. The ERES aims to address the difficulties in environmental impact assessment linked to the lack of robust environmental datasets available for development sites, as well as to provide a framework for including new datasets in future assessments.

Copping, A., Hanna, L., Van Cleve, B., Blake, K., and Anderson, R.M. (2015). Environmental risk evaluation system – an approach to ranking risk of ocean energy development on coastal and estuarine environments. *Estuaries and Coasts* 38:1 supp, 287-302. <http://link.springer.com/article/10.1007/s12237-014-9816-3>

### **Impacts on water quality could depend on the level of tidal power extractions**

To better understand the effects of tidal energy extraction on water quality, the authors assessed the outcomes of two different tidal energy development scenarios in a generic estuarine system. Where energy extraction approaches the maximum capacity of the system, conditions associated with poor water quality were more likely to develop than at lower levels of development. Impacts on water quality were mediated by decreased flushing rates in the modelled system. While the North American study was based on a simplified model system, the findings could be of significance to the European industry in the context of the EU Marine Strategy Framework Directive.

Wang, T., Zhaoqing, Y., and Copping, A. (2015). A modeling study of the potential water quality impacts from in-stream tidal energy extraction. *Estuaries and Coasts* 38:1 supp, 173-186. <http://link.springer.com/article/10.1007/s12237-013-9718-9/fulltext.html>

### **Juvenile salmon and adult shad safely pass through vertical axis turbine**

In a laboratory study, salmon smolts and adult American shad passed through an operating tidal turbine in an experimental flume system injury-free and without follow-on effects on mortality rates. With the blades of the New Energy Corp., Inc., turbine rotating at 60 rpm, the experimental flume was configured so that fish could voluntarily approach the turbine, and pass through it. While the preliminary results from this study are encouraging, the authors stress that studies need to be carried out on greater numbers of fish (to increase experimental power) to concretely demonstrate low mortality rates, alongside complementary field studies.

Castro-Santos, T., and Haro, A. (2015). Survival and behavioral effects of exposure to a hydrokinetic turbine on juvenile Atlantic salmon and adult American shad. *Estuaries and Coasts* 38:1 supp, 203-214. <http://link.springer.com/article/10.1007/s12237-013-9680-6>

### **Streamlining the renewable energy consenting process in EU Member States**

The licensing and consenting processes are still seen as a substantial bottleneck to the marine renewable energy industry, but following a pan-European review of consenting processes, the authors suggest that integrated marine spatial planning, strategic environmental assessments, and revision of administrative and EIA procedures could help to streamline the process and promote development. Furthermore, improved stakeholder consultation from the beginning of project development and throughout its lifecycle could help developers identify and address problems before they stall proceedings further on in

the consenting process. More generally, the authors highlight the necessity of making data available and sharing of expertise and experience, in order to feed back into the policy cycle and to help regulators and policy makers make better informed decisions.

Simas, T., O'Hagan, A.M., O-Callaghan, J., Hamawi, S., Magagna, D., Bailey, I., Greaves, D., Saulnier, J.-B., Marina, D., Bald, J., Huertas, C., and Sundberg, J. (2015). Review of the consenting processes for ocean energy in selected European Union Member states. *International Journal of Marine Energy* 9, 41-59.

<http://www.sciencedirect.com/science/article/pii/S221416691400037X>

## **UK NATURAL ENVIRONMENT RESEARCH COUNCIL (NERC) AND DEPARTMENT FOR ENVIRONMENT, FOOD, AND RURAL AFFAIRS (DEFRA) RENEWABLE ENERGY PROJECTS**

Following the NERC Special Session on Marine Renewable Energy at the Ocean Business event on April 16th, 2015, recorded presentations summarising the outputs of these projects can be found at: <http://tethys.pnnl.gov/events/update-technology-and-tools-de-risk-and-streamline-development-special-session-marine>

### **QBEX – Quantifying benefits and impacts of fishing exclusion zones around marine renewable energy installations**

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A cross-disciplinary project, QBEX aimed to assess the extent to which biological 'spillover' enhanced adjacent areas as a consequence of the de-facto protected area status of marine renewable energy developments. The project team focussed on the spatial movements of fish and shellfish across space and time, to understand how animals use space in response to environmental changes over time, and also addressed the social and economic costs of renewable energy developments in relation to fisheries. The latest results from the project can be found at: <http://www.mba.ac.uk/simslab/qbex/>.

### **EBAO – Optimising Array Form for Energy Extraction and Environmental Benefit**

The EBAO project was designed to establish a methodology which allows future large-scale marine energy developments to maximise their economic potential while respecting ecological and social constraints on development. Researchers focussed on establishing and quantifying environmental and social impacts of large renewable energy arrays, and processes by which such knowledge could be fed into technology and project design. Such an approach would be beneficial both to the natural environment and to the financial outcomes of development. Details of publications and project outcomes can be found at: <http://gtr.rcuk.ac.uk/project/7CF567CB-74AB-4E15-B199-9114A1538555>.

## **FLOWBEC – FLOW, Water column & Benthic Ecology 4D**

This NERC and DEFRA funded project aimed to develop high-resolution physical modelling techniques and cutting-edge observations systems in order to identify the physical conditions which influence seabed biology and the behaviour of fish and their predators at three renewable energy test sites. Highlights from this project include the use of X-band radar to track current flow patterns in real-time at tidal energy sites and the development of the FLOWBEC monitoring frame which enables simultaneous monitoring of plankton, zooplankton, and fish, as well as information on seabird and marine mammal foraging behaviours. More information about this project, and latest outputs can be found at: <http://noc.ac.uk/project/flowbec>.

## **RESPONSE – Understanding how marine renewable device operations influence fine scale habitat use and behaviour of marine vertebrates.**

The RESPONSE project aimed to identify and quantify the risk of negative consequences of interactions between marine mammals and renewable energy devices, in order to decrease uncertainty in both industry and natural environment contexts. By bringing together a wide group of stakeholders, researchers first assessed the perception of risk to the renewable energy industry and the environment posed by interactions with marine wildlife. Following on, state-of-the-art techniques were used to gather information on the habitat useage of marine mammals, seabirds, and fish at sites characterised by high levels of tidal and wave energy. Sound outputs from renewable energy devices were then used in controlled exposure trials in captivity and in the wild to understand how animals respond to renewable energy device noise. Preliminary analyses of these trials suggests that reactions to sound were minor, and transient. Researchers also observed surprising patterns of use of tidal rapids by large concentrations of harbour seals, with clear implications for planned tidal energy developments. More information about this project and latest outputs can be found at: <http://qtr.rcuk.ac.uk/project/14EFAB51-1335-4924-9966-92B3AFA025EF>