Dear Member of the Ocean Energy Community:

I would like to request your assistance in gathering information on current research efforts that investigate environmental effects of ocean energy projects (principally tidal, wave, and ocean current energy). This US-led data collection process, known as Annex IV, consists of collecting information on site-specific project and experiments that investigate potential environmental effects of ocean energy devices, mooring systems, anchors, and power cables on marine animals, habitats, and ecosystem processes. Annex IV has two main goals; to produce a publically accessible database to house project information on the potential environmental impacts of ocean energy development, and to use the database to analyze the current status of environmental issues important to marine renewable energy development worldwide.

We are interested in collecting information from both completed research studies and project sites currently in progress (e.g. without final results) that pertain to potential environmental effects of ocean energy technologies. The attached form seeks metadata about **ocean energy project sites**, that is, information regarding the types of environmental studies you are engaging in and a brief summary of the methodology, results, and status of these studies.

By choosing to participate in the Annex IV information collection process, you will assist the ocean energy industry, government agencies, and stakeholders by contributing to the compilation of environmental effects information in a single location to allow for:

• **Increased awareness** amongst developers and regulators (consenters) about new and current research efforts, which may inform new investments into monitoring methods and mitigation strategies;

• **Increased efficiency** of the permitting (consenting) process by precluding studies/evaluations shown to yield few results (under certain conditions), allowing for shorter and less costly processes;

• **Reduced uncertainty** for targeted investments of environmental effects by government agencies and other funding sources, further clarifying the permitting (consenting) process; and

• **Value added interpretation and knowledge** through the examination of key research findings in conjunction with project monitoring data, informing optimal siting and permitting.

Please provide information about your research or other information associated with environmental effects of marine and hydrokinetic devices.

An example form is provided demonstrating the types of information requested. Thank you in advance for your consideration and contribution to this valuable effort!

Please email the form and any associated files to:

Dr. Andrea Copping

Pacific Northwest National Laboratory

Andrea.copping@pnnl.gov

Any questions should also be directed to Dr. Copping.

#  **Project Site metadatA survey form**

Name of person updating the form Date submitted

Project Name:

[ ]  Planned [ ]  In-Operation [ ] Completed [ ] Canceled

Project Description:

*Project Developer:*

*Technology Developer:*

*Technology* *Type:*

*Resource (wave, tidal):*

*Project Scale (test site, prototype, array, commercial):*

*Installed Capacity (MW):*

*Project Website:*

*Launch Date:*

*End Date (if applicable):*

*Additional Description:*

Location:

*Provide Ocean/Water body, depth, closest city, country, etc.*

*Coordinates (please use Mercator – decimal degrees):*

Process Status:

*Current status of the project implementation and future developments*

*Expected operation date (if project is under way please indicate the start date)*

Licensing Information:

*Please provide a brief description listing the organizations involved,* *licenses needed and duration of consent process. One paragraph should suffice.*

Key Environmental Issues: *brief description* *on the most important environmental issues raised by the project (e.g. Sensitive species/habitats/areas that were of particular concern and/or received special protection) and how they were addressed.*

Environmental Webpage: *link to project official environmental webpage (if available)*

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| **Baseline Assessment:**  |
| **General description** |  |
| **Receptor** | **Study description including question and/or objective** (several can be listed per receptor) | **Design and methods** | **Results** | **Status**(planned, underway, completed, with dates) |
| Physical environment |  |  |  |  |
| Benthos |  |  |  |  |
| Fish and fisheries |  |  |  |  |
| Large vertebrates |  |  |  |  |
| Birds |  |  |  |  |
| Marine uses / users |  |  |  |  |
| Other\* (can be named) |  |  |  |  |
| **Reports or Papers** | (Key papers on the areas addressed should be listed here; when possible the files themselves can be made available in downloadable PDF format, alternatively links to the files or project website can be provided when available) |
| **Research Projects** | (past or on-going environmental research projects at the site) |

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| **Post-Installation Monitoring:**  |
| **General description** |  |
| **Receptor** | **Monitoring program description including question and/or objective** (several can be listed per receptor)  | **Design and methods** | **Results** | **Status**(planned, underway, completed, with dates) |
| Physical environment |  |  |  |  |
| Benthos |  |  |  |  |
| Fish and fisheries |  |  |  |  |
| Large vertebrates |  |  |  |  |
| Birds |  |  |  |  |
| Marine uses/ users |  |  |  |  |
| Other\* (can be named) |  |  |  |  |
| **Reports or Papers** | (Key papers on the areas addressed should be listed here; when possible the files themselves can be made available in downloadable PDF format, alternatively links to the files or project website can be provided when available) |
| **Research Projects** | (past or on-going environmental research projects at the site) |

# **Examples of metadata entered into the form**

# **WAVE EXAMPLE**

Project Name: Strangford Lough – MCT (SeaGen)

[ ]  Planned [x]  In-Operation [ ] Completed [ ] Canceled

Project Description:

*Project Developer:* Sea Generation Ltd

*Technology Developer:* Marine Current Turbines Ltd

*Technology* *Type:* Twin turbine system

*Resource (wave, tidal):* Tidal

*Project Scale (test site, prototype, array, commercial):* Single device

*Installed Capacity (MW):* 1.2 MW

*Project Website:* [www.marineturbines.com](http://www.marineturbines.com)

*Launch Date:* December 2008

*End Date (if applicable):* N/A

*Additional Description:* Seagen is a twin turbine system with a mobile cross arm on a single supporting pile 3m in diameter and 9m above the average sea level. The twin rotors have an 8m radius and will begin to generate electricity once the tide runs faster than 1m/s. At maximum speed, the tips move at around 12m/s, approximately 1/3 of the average wind turbine speed.

Location: Strangford Lough, Northern Ireland, at 24 meters water depth.

*Coordinates (please use Mercator):* 54.364119°, -5.543969°

Process Status: Royal Haskoning Ltd was appointed in early 2004 to provide support to the EIA process. The scoping consultation was completed in mid-2004, and the EIA commenced late 2004. The final EIA was submitted in July 2005, with the initial FEPA license being granted in December 2006. These were revised to accommodate necessary changes in installation methodology in February 2007, and again in February 2008.

Installation of the moorings for anchoring the SeaGen deployment vessel commenced in February 2008 and was completed in March 2008. The SeaGen structure was positioned on the seabed on April 2 2008 by the crane barge Rambiz. Drilling for the pin piles, grouting and completion of assembly was achieved using the crane barge Missing Link, which was on location from mid-April to late May 2008.

Commissioning of SeaGen commenced in July 2008, culminating in full 1.2MW power generation to the grid in December 2008. Operation is continuing within the constraints of the FEPA license with the environmental monitoring programme results contributing to an adaptive management strategy where findings are periodically reviewed and improvements to the application of the FEPA restrictions are proposed.

Licensing Information: The final Environmental Impact Study was submitted to the regulatory authority, the Environment and Heritage Service (EHS) in Northern Ireland in June 2005. The FEPA license for the temporary installation for the SeaGen system for a five year duration was first issued in December 2005, revised in February 2007 and again in February 2008. Pre-installation environmental monitoring commenced in May 2004. A baseline report has been completed and was submitted to EHS in August 2006. The environmental impact of SeaGen will be continuously monitored by independent science team throughout the licensed 5 year installation period. The existing FEPA license covers the initial 5-year lease granted by the Crown Estate, which will result in SeaGen being decommissioned and removed in 2013.

Key Environmental Issues: Strangford Lough has been identified as a site which supports internationally important examples of particular marine and coastal habitat and species features and has accordingly been given the dual status of a European Special Area of Conservation (SAC) and a European Special Protected Area (SPA). Three of the site features have been identified as potentially vulnerable to activities and impacts associated with the installation of the SeaGen turbine.

Environmental webpage: [www.seageneration.co.uk/environmental-aspects.asp](http://www.seageneration.co.uk/environmental-aspects.asp)

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| **Baseline Assessment: Strangford Lough – MCT (Seagen)** |  |
| **General description** |  |
| **Receptor** | **Study description** | **Design and methods** | **Results** | **Status** |
| Physical Environment  | Alterations to Hydrodynamics  | Desk based study, modelling and video footage.  | The installation and operation of the SeaGen turbine will not impede or modify the flow dynamics, scour patterns or turbulence character of the Narrows in such a way that will cause a change to benthic community structure.  | Completed  |
| Benthic Communities | Potential impacts to Benthic Communities  | Desk based study and diver surveys  | The installation and operation of the SeaGen turbine will have no significant impact on the abundance, diversity and integrity of the benthic communities within the Strangford Narrows.  | Completed  |
| Potential impact to Cetacean populations  | Desk based study and Aerial surveys  | The SeaGen turbine does not displace harbour porpoises from the Strangford Narrows and the adjacent Strangford Lough SAC. The SeaGen turbine does not present a barrier effect to the free passage of harbour porpoises through the Strangford Narrows. Cetaceans not excluded from important foraging habitat or social areas within the Strangford Narrows as a result of the installation and operation of the SeaGen turbine.  | Completed  |
| Large Vertebrates  | Potential impacts to marine mammals (General)  | Desk based study and Aerial surveys  | No marine mortalities occur consequence of interaction with the turbine rotors. The turbine operates in such a way as to stop when marine mammals are within 50m from the rotors. Relative abundance of marine mammals in Strangford Narrows is not significantly modified by the operation of the SeaGen turbine.  | Completed  |
| Harbour Seals  | Potential impact to Harbour Seals  | Ariel Surveys, visual surveys, desk based study  | The number of harbour seal adults and pups does not decrease significantly as a result of the installation and operation of the SeaGen turbine. The SeaGen turbine does not present a barrier effect to the free passage of harbour seals through the Strangford Narrows. Harbor seals are not excluded from mportant3 foraging habitat or social areas within the Strangford Narrows as a result of the installation and operation of the Seagen turbine.  | Completed  |
| Grey Seals  | Potential impact of Seagen to Grey Seal populations  | Ariel surveys, visual surveys and desk based studies  | The number of grey seal adults and pups does not decrease significantly as a result of the installation and operation of the SeaGen turbine. The SeaGen turbine does not cause a significant change in the use of important grey seal haul out sites within the Strangford Lough SAC. The SeaGen turbine does not present a barrier effect to the free passage of grey seals through the Strangford Narrows. Grey seals are not excluded from important foraging habitat or social areas within the Strangford Narrows as a result of the installation and operation of the SeaGen turbine.  | Completed |
| **Reports or Papers** | Royal Haskoning. (2010). SeaGen Biannual EMP update. EMP update (Jan 2010). (Access Online: http://www.seageneration.co.uk/downloads/SeaGen%20biannual%20report%20April%2 02010.PDF) |
| **Research Projects** | N/A |

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| **Post-Installation Monitoring: Strangford Lough – MCT (Seagen)** |  |
| **General description** |  |
| **Receptor** | **Monitoring program description** | **Design and methods** | **Results** | **Status** |
| Physical Environment  | Seagen effect on surrounding Hydrodynamics  | ADCP measurements and video surveys  | Vessel- or bottom mounted ADCP measurement, as appropriate, of upstream and downstream flow character and turbulence signature. Diver video survey for scours effects.  | Ongoing  |
| Benthic hard communities  | Potential impact of Seagen to Benthic communities  | Video Surveys and diver surveys  | Benthic species abundance at re- locatable video sample stations at a range of distance intervals from the turbine installation.  | Ongoing  |
| Marine Mammals  | Impact of Seagen on Marine Mammals (General)  | Observations, sonar operations, visual observations and seal telemetry studies  | Pile based marine mammal observations (ceased 21/08/09). Active sonar operations allowing targets to be observed moving passed the turbine during periods of operation. Land based visual observations pre- and post installation to examine any change in use of the area around the turbine.  | Ongoing  |
| Marine Mammals  | Impact of Seagen on Marine Mammals (General)  | Post Mortem  | Post mortem evaluation of carcass stranding and assessment of cause of death.  | Ongoing  |
| Harbor seals  | Impact of Seagen on Harbor Seals  | Ariel Surveys, Historical data, telemetry data and visual observations  | Population estimates derived from aerial survey and set within the context of historical data. Population distribution and haulout behaviour from telemetry data. (Number of harbour seals using the Lough based on boat counts from NIEA can also supplement these data)  | Ongoing  |
| Grey Seals  | Impact of Seagen on Grey Seals  | Aerial surveys, historical data and visual surveys  | Population estimates derived from aerial survey and set within the context of historical data. (Number of grey seals using the Lough based on boat counts from NIEA can also supplement these data). Haul out site seal numbers from aerial and boat-based survey. Sightings frequency over space and time (from Shore-based visual operation) in pre-operational and post- operational periods).  | Ongoing  |
| Birds  | Potential impact of Seagen to seabirds  | Visual observations  | Sightings frequency of diving birds from shore- based visual surveys. Sightings frequency/hour watched of diving and rafting birds within the pile- mounted observational grid area.  | Ongoing |
| **Reports or Papers** | Royal Haskoning. (2010). SeaGen Biannual EMP update. EMP update (Jan 2010). (Access Online: http://www.seageneration.co.uk/downloads/SeaGen%20biannual%20report%20April%2 02010.PDF) |
| **Research Projects** | N/A |