

ENVIRONMENTAL EFFECTS METADATA SURVEY FORM

Name

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Project name: MeyGen Tidal Energy Project

Planned In Operation Completed

Project description:

Project Developer: MeyGen

Technology Developer: Hammerfest Strøm AS

Technology type: Horizontal axis turbine mounted on a tripod (Atlantis Resources and Andritz-Hydro)

Resource (wave, tidal): Tidal

Project scale (test site, prototype, array, commercial): Commercial Array

Installed capacity (MW): 86 MW

Project Website: <http://www.mygen.com/>

Launch Date: Planned 2015

Additional Description: MeyGen are planning to install bladed horizontal axis turbines at the Inner Sound site. The technologies selected are:

- Atlantis Resources Corporation: AR1000 - The AR1000 features a single rotor set with fixed pitch blades. The AR1000 can be rotated in the slack period between tides using a yaw drive, and then fixed in place for the optimal heading for the next tide. The AR1000 is designed to produce 1MW in water flows of 2.65m/s and above¹.
- Andritz Hydro Hammerfest: HS1000 - The HS1000 consists of a horizontal axis rotor, pitched blades and yaw feeding a variable speed conventional generator via a gearbox. Automatic control software governing a sensor-driven monitoring system adjusts the leading edge to capture optimum output from a given tidal environment. It is designed to handle flows between 1 and well above 4 m/s, in water depths down to 100m².

Within the project Environmental Statement, it is stated that turbines at the site will have a rated power between 1.0 and 2.4MW. It is also stated that the turbines will have 2 or 3 blades.

¹ Atlantis Resources Ltd., AR1000. Available online: <http://atlantisresourcesltd.com/technology/ar-series/ar1000.html>

² Andritz Hydro Hammerfest, Tidal current turbines. Available online: <http://www.andritz.com/hydro/hy-others-andritz-hydro/hy-tidal-current-turbine.htm>

A number of options are being considered with regards to the support structure(s) for the turbines, including:

- Gravity based structure (tripod)
- Drilled pin pile tripod
- Monopile

Export Cables: It is stated in the ES that each turbine will require its own cable to shore but that an option to use specifically manufactured cables with multiple circuits that allow power from more than one turbine to be exported through a single cable may be possible. It is anticipated that each cable will be brought to shore via horizontal directional drilled (HDD) bores through the bedrock and terminate in a Power Conversion Centre (PCC).

Onshore Infrastructure: MeyGen will require an onshore PCC, cable landfall and cable routes from the PCC to the grid connection location. At the PCC, the electricity will be transformed up to higher voltages for export to the national transmission grid. A further connection to the high voltage transmission network with Scottish Hydro Electric Transmission Ltd. has been secured, providing enough capacity to cover a large proportion of the remainder of the Project.

Vessel Spread: It is proposed that the following vessels will be required during construction and operation:

Vessel type	Activity	Comment
DP installation vessel	Installation of turbine support structures	Smaller vessels may be present for support services.
	Installation of export cables	
DP installation vessel (or tug)	Install turbines onto support structures	During year 1 and 2 of installation, only one DP vessel will be onsite at any one time. During year 3, two DP vessels may be on site during support structure installation.

Location: Inner Sound, Pentland Firth, Scotland

Coordinates: 58.6565, -3.13

Process status: MeyGen secured an Agreement for Lease (AfL) from the Crown Estate for the Inner Sound tidal development site in 2010. This AfL was for a tidal stream development with an installed capacity of up to 398 megawatts. MeyGen planned to consent the project in two phases and complete construction of Phase 2 by 2020. In 2013, MeyGen were awarded consent from the Scottish Government for the installation and operation of Phase 1 (up to 86 megawatts) and plan to commence construction in 2014. It is proposed to construct the necessary onshore infrastructure, including a project substation, in Caitness on the Scottish Mainland and to connect into the national electricity transmission grid from there.

Phase 2 will take place after a two year 'deploy and monitor strategy' on phase 1 turbines and will see the build out of the remainder of the project subject to a separate consent application³.

Licensing Information: Consent was granted by the Scottish Ministers under section 36 of the Electricity Act for the construction and operation of the development, consisting of 61 turbines with a permitted capacity of up to 86 megawatts. This consent is conditional upon the Company deploying the turbines in stages with Stage One of the development being limited to a maximum of 6 turbines and will all subsequent stages of the development being subject to the prior written approval of the Scottish Ministers.

Licence	Competent Authority	Reference	Date issued	Expiry date
Section 36 (Electricity Act) Consent	Scottish Ministers	TBC	2013	TBC
Marine Licence (Marine (Scotland) Act) Consent	Marine Scotland	04577/14/0	31 January 2014	31 December 2020
Licence to Disturb Marine Species	Marine Scotland	TBC	TBC	TBC
Licence to Disturb Basking Shark	Marine Scotland	TBC	TBC	TBC
Controlled Activities Regulations (CAR) Licence	Scottish Environment Protection Agency	TBC	TBC	TBC
Planning permission (onshore)	Highland Council	TBC	TBC	TBC

Key Environmental issues:

Environmental webpage:

Baseline studies and project effects studies: MeyGen Tidal Energy Project				
General description		The following field surveys were undertaken (or commissioned by) the developer to inform the baseline characterisation of the Inner Sound		
Receptor	Study description	Design and methods (brief description)	Results (brief description)	Status (planned, underway, completed, with dates)
Physical Environment and Sediment Dynamics	Conducted by Atlantis	300kHz Acoustic Doppler Current Profiler (ADCP and moving vessel current transects to measure Current speed and direction at 1m bins throughout the water column.		Underway
	Conducted by Atlantis	Multi-beam echo sounder, side scan sonar, pinger sub-bottom profiler,		Underway

³ MeyGen, The project. Available online: <http://www.meygen.com/the-project/> Accessed 31/01/14

		magnetometer to determine water depths, seabed composition, bedform profiles, depth of seabed sediment and presence of anomalies.		
	Conducted by Atlantis	Coastal geology field survey.		Underway
	Conducted by ERI	Vessel mounted 300 kHz RDI ADCP to measure Current speed and direction along transects.		Underway
	Conducted by ERI	Vessel mounted starfish 450F sidescan sonar survey.		Underway
	Conducted by MeyGen	Bottom mounted RDI 1200 kHz, ADCP, bottom mounted Acoustic Wave and current (AWAC) 600 kHz ADCP to measure current speed and direction throughout water column and provide some quantification of turbulence and wave heights.		Underway
	Conducted by MeyGen	Deployment of; Helley-Smith bedload sampler, Petersen grab sampler, Niskin bottle, video and still photography to determine sediment bedload, sediment particle size distribution and suspended sediment.		Underway
Benthic habitats and ecology	Conducted by iXSurvey Limited	Geophysical site survey to provide an indication of the seabed substratum present in the area.		Underway
	Conducted by Aquatic Survey and Monitoring Ltd	Drop down video and photographic survey to note seabed type and biotopes present		Underway
	Conducted by Aquatic Survey and Monitoring Ltd	Grab survey to sample the infaunal community types in any sediment that exists in the area and to determine baseline sediment particle size distribution. Additional grabs taken to collect sediment for analysis of radioactivity.		Underway
	Conducted by Aquatic Survey and Monitoring Ltd	Qualitative pipe-dredge survey in predicted 'gravel bed' areas to sample any epifauna and interstitial fauna present.		Underway
	Conducted by Aquatic Survey and Monitoring Ltd	Collection of sediment bedload samples (along with water samples).		Underway
Marine	Conducted by	Boat based surveys (2 years) – transect		Underway

Mammals and Basking Sharks	RPS	surveys based on modified ESAS methods to collect distributional data and stationary surveys at fixed locations to collect behavioural data.		
	Conducted by RPS	Land-based vantage point surveys (2 years) – from three locations during 2-3 visits each month over the period as the boat based surveys. And shore-based surveys aimed at determining marine mammal distribution, abundance, seasonality and behaviour within the Inner Sound.		Underway
	Conducted by Ecologic UK	Acoustic survey across the Inner Sound to trial the performance of PAM systems in the site conditions. Outputs used to qualitatively assess the likelt efficiency of the visual surveys for harbour porpoise detection. PAM was deployed on the final 3 marine mammal surveys.		Underway
Marine Cultural Heritage	Conducted by iXSurvey Limited	Geophysical site survey was undertaken using; multibeam echosounder, hull-mounted sub-bottom profiler and a side-scan sonar interfaced with a magnetometer.		Underway
Ornithology	Conducted by RPS	Boat based surveys (2 years) using modified ESAS methods based on those developed for offshore windfarms but modified to account for the smaller scale of the area. Data on dive duration for diving seabirds was also collected at four locations within the Inner Sound.		Underway
	Conducted by RPS	Vantage point surveys (2 years) from 3 locations on the mainland.		Underway
Shipping and Navigation	Conducted by MeyGen	42 days of data from an existing radar scanner at Sandy Hill South Ronaldsay was gathered and analysed (along with other data sources such as AIS). Visual logs of small vessel activity were kept during other offshore and onshore projects surveys.		Underway
Reports or papers	<ul style="list-style-type: none"> • MeyGen Tidal Energy Project – Phase 1: Environmental Statement 			
Research projects				

Monitoring and adaptive management: MeyGen Tidal Energy Project

General description	The following mitigation and monitoring measures are proposed within the project ES. The project team, along with Marine Scotland and other key stakeholders are currently preparing a Preliminary Environmental Monitoring Plan (PEMP) which will outline the proposed monitoring strategy in more detail.			
Receptor	Monitoring program description	Design and methods (brief description)	Results (brief description)	Status (planned, underway, completed, with dates)
Fish	Mitigation - Effect of electromagnetic fields induced by subsea cables	Where cables are not within boreholes they will be laid where possible within natural crevices and cracks within the seabed ensuring that the majority of the cable is below the seabed.		Planned
		The length of the drilled boreholes for the cable will be (as far as technically and commercially possible) to increase the length of cable under the seabed.		Planned
		Cables will be bundled into groups of 3 minimising the magnetic field by placing the cables close together, allowing the field vectors to cancel each other out.		Planned
		Ongoing research by Marine Scotland and their advisors will be monitored for further indications of successful mitigation strategies.		Planned
Marine Mammals and Basking Sharks	Mitigation - Ship strike (installation vessels) and ducted propellers	MeyGen commit to undertaking frequent reviews of the literature regarding spiral injuries in seals and ducted propellers and to regularly discuss advances in understanding of this topic with relevant regulatory and advisory bodies. MeyGen will apply appropriate mitigation, as deemed necessary in consultation with Marine Scotland and SNH, should vessels with ducted propellers be used, to avoid any significant impacts.		Planned

Marine Cultural Heritage	<p>Mitigation - Geophysical anomalies were identified in the overall survey area; some have uncertain potential of being cultural remains. There may be impacts on geophysical anomalies within the turbine deployment area and cable deployment area.</p>	<p>If avoidance of potential cultural heritage features is not possible, it is recommended that geophysical anomalies of high and medium potential within 100m of the development are investigated by ROV methods in an appropriate manner by specialists in marine archaeology so they can be positively identified. This will be done before offshore construction commences.</p>		Planned
Shipping and Navigation	<p>Mitigation - Traffic re-routing due to work vessels and associated safety zones.</p> <p>Mitigation - Working vessel gets into difficulty.</p>	<p>Further consultation will be carried out on the safety zone dimensions with Marine Scotland, the MCA, Department Energy and Climate Change (DECC), the appointed contractor and local stakeholders prior to the application being made to DECC.</p>		Planned
		<p>Safety zones will be established on a 'rolling' basis, covering only the area of the site in which activity is taking place at a given time. Once that activity has been completed in that specific location, the safety zone will then 'roll on' to cover the next specific location (not the whole Project area).</p>		Planned
		<p>Work vessels will indicate their status on Automatic Identification System (AIS) and using appropriate marks/lights, e.g., if restricted in maneuverability. This will signify to passing traffic whether a Safety Zones is in place or not.</p>		Planned
		<p>Working vessels are selected and audited based on suitability for the job and the conditions in the Pentland Firth.</p> <p>Marine operating procedures are developed specifying allowable wave, tide and weather criteria.</p> <p>Procedures specify that work vessels should seek shelter (or return to base) when not working at the site.</p> <p>Working personnel are trained in offshore survival and have suitable Personal Protective Equipment (PPE).</p>		Planned Planned Planned Planned

		The Construction company operates a Safety Management System.		Planned
		Passage plans are developed for vessels routing between the Project area and the onshore base.		Planned
		Work vessel movements are monitored from an onshore control centre, e.g., on AIS and VHF (Very High Frequency).		Planned
		An Emergency Response Cooperation Plan (ERCoP) will be prepared for the project following the template provided by the MCA in MGN 371. This will be submitted to the MCA for comment and approval.		Planned
Nearfield	Mitigation - Loss of station.	The turbines have been subjected to engineering design and third-party verification to ensure they are suitable for deployment in the Inner Sound.		Planned
		The Project will be using tried and tested equipment and techniques to minimise the risks associated with the high tidal flow environment.		Planned
		Most parts will be negatively buoyant.		Planned
		Turbine nacelle designs that use buoyancy as part of the installation and maintenance strategy have failsafe locking systems for the connection between the nacelle and the Turbine Support Structures (TSSs) to prevent accidental release.		Planned
		On-site monitoring via SCADA (Supervisory Control and Data Acquisition) will alert the 24-hour control room operations team of turbine failure or an object hitting the turbine.		Planned
		An Emergency Response Cooperation Plan (ERCoP) will be prepared for the Project following the template provided by the MCA in Marine Guidance Note (MGN) 371. This will be submitted to the MCA for comment and approval. Emergency response would include informing HM Coastguard, Royal National Lifeboat Institution (RNLI), Harbours and local users (e.g., Pentland Ferries) so that		Planned

		vessels in the area are alerted to the potential hazard.		
Physical environment and sediment morphology	Monitoring	Deploy 1 ADCP with the initial turbines to validate the hydrodynamic modelling undertaken to inform the EIA and to validate the erosion/deposition and bedload transport results.		Planned
Benthic habitats and ecology	Monitoring	Monitor the dispersion of drill cuttings from potential TTS pile installation and HDD bore breakthrough		Planned
		Undertaken surveys (post-installation and post decommissioning) to detect any significant changes in habitats due to the presence of the turbines		Planned
Commercial fisheries	Monitoring	Vessel traffic behaviour will be monitored on AIS during construction and operation to assess the effect the project has on passing traffic and the proportion of vessels that re-route within the Inner Sound or via the Outer Sound.		Planned
		Consultation with local fishermen will be maintained throughout the project to aid the assessment of any long term impacts and to inform the decommissioning phase.		Planned
Fish	Monitoring	Collision risk will be monitored by the installation of one or more active monitoring systems on one of more of the tidal devices.		Planned
		Collection of underwater noise measurements of candidate prototype tidal turbines. This data collected will be used to validate the underwater noise modelling completed to inform the impact assessment.		Planned
Marine mammals and Basking Sharks	Monitoring	Collection of underwater noise measurements of candidate prototype tidal turbines. This data collected will be used to validate the underwater noise modelling completed to inform the impact assessment.		Planned

	Monitoring	Targeted observation of marine mammals is proposed, as is acoustic monitoring of harbour porpoise using static loggers to with determining area use.		Planned
Marine Cultural Heritage	Monitoring	A reporting protocol will be put in place in the event of a discovery of previously unknown marine cultural heritage material.		Planned
Ornithology	Monitoring	Disturbance and displacement of birds at sea will be monitored from targeted land and boat based surveys to determine any behavioural changes. Collision risk will be monitored by the installation of one or more active monitoring systems on one of more of the tidal devices; this will assist in the understanding of near field bird interaction with devices. Birds will also be fitted with geo locators and dive loggers will provide information on any correlations between the site and breeding grounds.		Planned
Shipping and Navigation	Monitoring	Vessel traffic behaviour will be monitored on AIS during construction and operation to assess the effect the project has on passing traffic and the proportion of vessels that re-route within the Inner Sound or via the Outer Sound.		Planned
Reports or papers	<ul style="list-style-type: none"> • MeyGen Tidal Energy Project – Phase 1: Environmental Statement 			
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