

## ENVIRONMENTAL EFFECTS METADATA SURVEY FORM

Name

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Project name: Argyll Tidal Demonstrator Project

Project description:

*Project Developer:* Argyll Tidal Limited (ATL)

*Technology type:* Nautricity's CoRMaT

*Resource (wave, tidal):* Tidal

*Project scale (test site, prototype, array, commercial):* Prototype

*Installed capacity (MW):* 500kW (Planned)

*Project Website:* <http://www.nautricity.com/>

*Launch Date:* TBC

*Additional Description:* In October 2011, Argyll Tidal Limited (ATL) received an Agreement for Lease (AfL) with the Crown Estate under Section 3 of the Crown Estate Act 1961. This agreement initiated the investigation of the potential for development of a demonstration tidal energy array of up to 3 MW in the North Channel off the western coast of the Mull of Kintyre, Argyll and Bute, Scotland. ATL is working with Nautricity Limited (NL), a Scottish tidal energy technology developer.

It was originally proposed that up to 6 of these devices would be deployed at the development site subject to the appropriate consents and licences being granted.

During the feasibility and design stages of the development ATL sought a grid connection offer from the local distribution network operator (DNO) Scottish Hydro Electric Power Distribution (SHEPD). Due to Transmission Network constraints in the wider Argyll and Bute region and the limited capacity of the Local Distribution Network, for technical reasons it became clear that without construction of extensive and costly new grid infrastructure it would not be possible to connect more than a single CoRMaT device to the existing electricity network. ATL therefore abandoned plans for a multi-device array and refocused the development to a single 500kW demonstration device. As the capacity of the development was now less than 1MW, Marine Scotland Licencing Operations Team (MS-LOT) confirmed that the Development would only require a Marine License only. MS-LOT also confirmed that consent application would require robust supporting environmental information but not a formal Environmental Statement (ES) under the Environmental Impact Assessment (EIA) Regulations.

As the development would also include onshore elements to facilitate the connection of the device to the existing grid connection, an onshore planning application to the local planning authority (Argyll and Bute Council) was also be required.

From a technology suitability perspective, the Development Site near Kintyre was chosen for its water depths and resource levels which are well matched to the moored Nautricity device and are less compatible with fixed bottom solutions. Additional factors contributing to the suitability of the Argyll Tidal Demonstration Project Development Site include an absence of environmental designations on the site or in the immediate vicinity and the proximity of the site to the demand centre in Scotland (central belt). It is expected that the device will operate on site for up to 7 years.

Technology: The CoRMaT device comprises a neutrally buoyant cylindrical nacelle with contra-rotating rotors (upstream – 3 blades, downstream – 4 blades) in close proximity around a common axis of rotation. This arrangement encourages stability during operation and eliminates the requirement for a rigid support structure to transmit operational loads to the seabed. CoRMaT generates at variable speed via a submersible, contra-rotating permanent magnet generator with the rotor and stator driven directly by the upstream and downstream rotors respectively. For the demonstration deployment at the Mull of Kintyre, a minimum clearance of 10m below chart datum will be maintained above the hydrobuoy to allow safe passage of vessels and to distance the buoy from wave action, the loading from which is most severe close to the surface. The lower tips of the rotors will be at least 7m from the seabed in order to operate above the highly sheared, lower resource region of the turbulent bottom boundary layer. A rigid ‘stinger’ with float surround connects the nacelle to the yaw limiter. The nacelle is approximately 2.5m in diameter and 9.5m in length. Initially, 10m diameter rotor blades will be fitted with scope for future upgrade to a maximum of 14m diameter. The overall system design will allow the nacelle to self-align with the predominant flow direction following periods of slack water. Power generation will be governed by site-specific flow conditions.

The device has a cut-in speed of 1 m/s, a rated output in flows greater than 2.5m/s and a maximum rotational speed (for each rotor) of 12 rpm.

Moorings: The device and mooring system will be attached to 3 cylindrical can foundations anchored to the seabed via drilled and grouted pins. The can dimensions are not expected to exceed 1.4m in height and 0.8m in diameter. The spread and relative orientation of the foundation locations to the tidal flow will be determined by a number of design factors including deployment depth, the morphology and bathymetry at the deployment location and local resource variations. Drilling depths are not expected to be greater than 12m and the diameter of holes is likely to be in the 140 – 250mm range. Cuttings - rock fragments - will be flushed away. The anchors will be solid cylindrical steel pins of diameter in the range 75-150mm. A non-shrink, high strength grout will secure the anchor pins. All grouting operations will be sealed to prevent loss of grout to the environment.

The mooring system will be comprised of a ‘platform’ of 3 steel wire lines. A single line will be connected to each of the foundation cans and these will meet approximately mid-water column and connect to the yaw limiter. The ‘platform’ mooring line inclinations will be dependent on design factors including deployment depth, foundation specification and local resource level. Operational tilt resulting from thrust and drag loading will be up to 30 degrees

from the upright position. The mechanical yaw limiter acts as the connection point for the CoRMaT system via a rigid 'stinger'. Its operational function is 2-fold:

- To allow alignment with prevailing tidal flow direction; and
- To prevent coiling of the electrical and control cable passing through its centre.

The hydro buoy will be foam-filled, constructed from steel with suitable corrosion and anti-fouling protection and be tethered to the upper plate of the yaw limiter using steel mooring lines. To avoid disturbance to the flow upstream of the rotor swept area, the lower surface of the hydro buoy will be located above rotor tip height in the water column. The hydrofoil profile has been selected to offer stable performance through a wide range of angles of attack. It is expected that the maximum dimensions of the hydro buoy will be a 6.5m chord length and an 8m span. As with the final specification of the mooring system and foundations, the design of this element will be determined in light of detailed information on the local flow environment.

Export cable: Power will be delivered to shore via an electrical export cable (3 phase, 3.3kV) protected in a single 4" to 6" diameter drill pipe run. Also enclosed within the drill pipe will be a 230V electrical supply cable and fibre bundle for the CoRMaT control and braking systems. The connection for electrical export, electrical supply and communications cabling will most likely be dry-mate – the final configuration and location of this connection is still to be determined. Detailed design activity may conclude that additional means of securing the pipeline to the seabed are required at exposed sections of the route e.g. use of subsea cable mattress.

The subsea export cable landing j-tube bounds the offshore and onshore elements of the project. Landward of this point, a short tail of the subsea cable-in-pipe (approximately 25-50m in length) will protrude from the wider diameter j-tube following a winched installation. It is anticipated that conduits will be buried in a trench of up to 1m depth along this section. An isolator / earth switch will interface the onshore electrical equipment within the container compound from the generator. It is expected that the isolator will be containerised and located within the compound. The container compound will house both project and Distribution Network Operator (Scottish Hydro Electric Power Distribution) equipment. Project-side equipment will include:

- An isolator / earth switch bridging onshore electrical equipment and the generator
- Converters, transformers and switchgear housed in a number (provisionally 3) of compact containers

The DNO equipment comprises switchgear on a concrete plinth housed within a GRP enclosure. The detailed specification of the containers, final layout and orientation of the compound will be confirmed pre-construction.

Vessel spread:

Vessel type	Activity	Comment
2x Multicat	Installation (Pipeline)	Used to tow and position pipeline
Rigid hull inshore craft	Installation (Pipeline)	To monitor float out of pipeline
Guard vessel	Installation (Pipeline)	To ensure safe transit of the pipeline
Barge	Installation (Mooring)	Approximately 30m in length with drilling rig. Install mooring pins and device mooring.
Workboat	Installation (Mooring and device)	Approximately 20m in length. Aid in the instalment of mooring pins and mooring. Also used to tow device to site.

Location: North Channel off the western coast of the Mull of Kintyre, Argyll and Bute, Scotland.

Coordinates: The AfL is located within the following four corners:

- 55° 20.001'N 005° 54.537'W
- 55° 20.001'N 005° 51.146'W
- 55° 17.280'N 005° 48.346'W
- 55° 17.281'N 005° 51.147'W

Process status: An Environmental Appraisal has been prepared by the Developer. Determination is expected in the coming months.

Licensing Information: The development has a capacity below 1MW therefore the Development does not require consent under Section 36 of the Electricity Act.

Licence	Competent Authority	Reference
Marine Licence (Marine (Scotland) Act) Consent	Marine Scotland	TBC
Licence to Disturb Marine Species	Marine Scotland	TBC
Licence to Disturb Basking Shark	Marine Scotland	TBC
Town and County Planning Permission	Argyll and Bute Council	TBC

Key Environmental issues: Several potential impacts were identified, however only the following was considered to be potentially significant:

- Risk to navigational safety from failing of the device/ mooring

Mitigation measures: In dealing with risk of device/mooring failure, the following measures are proposed

- The mooring system will be approved by an appropriate classification society; this is also a requirement of the Applicant's Agreement for Lease with The Crown Estate.

- Telemetry measures will be installed to continually monitor the device enabling the device to be switched off immediately in an emergency event.
- Regular inspections of the mooring system as part of the device operation and maintenance plan should be undertaken.
- The operator will develop appropriate contingency plans and emergency response procedures in the form of 'The Emergency Response Cooperation Plan (ERCoP)' in agreement with the relevant stakeholders.

Environmental webpage:

[http://www.nautricity.com/docs/014\\_036\\_argylltidal\\_environmentalappraisal\\_dec13\\_lores3\\_1392661149.pdf](http://www.nautricity.com/docs/014_036_argylltidal_environmentalappraisal_dec13_lores3_1392661149.pdf)

## Baseline studies and project effects studies: Nautricity- Mull of Kintyre

<b>General description</b> The following field surveys were undertaken (or commissioned by) the developer to inform baseline characterisation				
<b>Receptor</b>	<b>Study description</b>	<b>Design and methods</b> (brief description)	<b>Results</b> (brief description)	<b>Status</b> (planned, underway, completed, with dates)
<b>Physical environment</b>	Flow model conducted by RES Offshore	Regional numerical flow model of the North Channel area.	The south-eastern corner of the Development Site is the region of highest tidal resource with much of the northern and western areas being too benign for development. Maximum flow speeds are approaching 4 m/s in the highest resource areas with corresponding mean speeds of 1.8 m/s.	Completed (no date)
	Geological and bathymetric survey	A multi-beam survey of the development site region inshore of the 20m contour.	Not available	Completed (17/10/2013 and additional MBES survey on 24/11/2013)
<b>Benthic Ecology</b>	Habitat and species identification, by Precision Marine Survey Ltd.	Drop down video survey.	The area is characterised by variable, tide swept rocky substrata interspersed with, or influenced by, coarse mixed sediments.	Completed (14/10/2013)
<b>Marine mammals and Basking sharks</b>	Vantage Point surveys by MacArthur Green (2012) <sup>1</sup>	Visual survey.	Site used by only a small number of grey seals. Harbour porpoise and Common dolphin observed, no other cetacean species or basking sharks recorded.	Completed 2012 (survey carried out between June and October 2012)

<sup>1</sup> MacArthur Green 2012. Argyll Tidal Array Seabird Survey Methodology. Report to Marine Scotland and Scottish Natural Heritage.

<b>Marine Birds</b>	Vantage Point surveys by MacArthur Green (2012) <sup>2</sup>	Visual survey.	Multiple species were observed in the area. No Common or Arctic turns were recorded which may have been expected to occur. Some non-seabird species (peregrine, oystercatcher, curlew, swift, hooded crow and raven) were recorded but not considered in analysis because they do not enter the water, hence will not be vulnerable to effects of the development.	Completed 2012 (survey carried out between June and October 2012)
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<sup>2</sup> MacArthur Green 2012. Argyll Tidal Array Seabird Survey Methodology. Report to Marine Scotland and Scottish Natural Heritage.

**Monitoring and adaptive management: Nautricity- Mull of Kintyre**

**General description** Details of any Environmental Mitigation and Monitoring Plan (EMMP) are not yet available.

<b>Receptor</b>	<b>Monitoring program description</b>	<b>Design and methods</b> (brief description)	<b>Results</b> (brief description)	<b>Status</b> (planned, underway, completed, with dates)
	TBC			