EnFAIT

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ENFAIT
ENABLING FUTURE ARRAYS IN TIDAL

Initial Decommissioning Plan

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1.0	Final	31/05/18	First release	Gavin McPherson	Nova Innovation

Contents

1 The Project

1.1 Introduction

A Funding Grant was awarded from the European Union's Horizon 2020 research and innovation programme in January 2017 to demonstrate a grid-connected tidal energy array at a real-world tidal energy site, propelling tidal energy towards competing on a commercial basis with alternative renewable sources of energy generation – Enabling Future Arrays in Tidal (EnFAIT). This was in response to the call *LCE-15-2016: Scaling up in the ocean energy sector to arrays* to generate significant learning through demonstration of cost-effective tidal arrays.

This document is produced as the initial decommissioning plan for the Shetland Tidal Array developed following consultation with stakeholders and review of best practice. It is to be submitted to satisfy deliverable D7.2 of the EnFAIT project and to be also made available for public dissemination.

2 Scope of the Initial Decommissioning Plan

Decommissioning is defined as the removal of the tidal energy equipment and infrastructure at the end of the life of the Development. This Initial Decommissioning Plan (DP) is a working document which will evolve through the life of the Development. The plan presented here is based on the Decommissioning Programme submitted by Nova Innovation and consulted on as per the conditions of the original Marine Licence for the Shetland Tidal Array. A new Marine Licence has been awarded to cover the activity to be undertaken in the EnFAIT project; this DP will form the basis of the Decommission Programme for the new Marine Licence.

The information provided in this DP is based on the best available information at this time. However, the DP is a working document, and will be updated as the project progresses to incorporate new information such as: advancements in technology; updates to designs and methodologies; and changes to regulations.

2.1 Policy, Legislative Framework and Statutory Requirements

This section of the document provides an overview of the existing policies in place and legislative framework for developing decommissioning plans.

Sections 105-114 of the Energy Act 2004 (and subsequent updated versions) require a developer to submit to the Secretary of State at the Department of Business, Energy, & Industrial Strategy a draft Decommissioning Programme for the decommissioning of any relevant objects. The decommissioning of the Development will be undertaken in accordance with the legislation and guidance at the time of the works commencing, including but not limited to:

- United Nations Convention on the Law of the Sea ("UNCLOS"), 1982;
- International Maritime Organisation ("IMO") Standards;
- OSPAR Convention for the protection of the Marine Environment of the North East Atlantic;
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended);
- The Pollution Prevention and Control (Scotland) Regulations 2012;
- The Special Waste Regulations 1996 (as amended);
- Health and Safety at Work etc. Act 1974; and
- Construction (Design and Management) ("CDM") Regulations 2015.

This DP is written in accordance with legislation and guidance as it stands today. However, the decommissioning of the turbines will be undertaken in accordance with the legislation and guidance at the time of the works commencing.

2.2 Proposed Scope of Decommissioning

Decommissioning of the Shetland Tidal Array will involve complete removal of all cables, turbines, foundation and associated array equipment from the seabed.

2.3 Key Assumptions

I. Surveys will be undertaken with underwater video camera to verify the removal of all works and restoration of the site;

II. All material and equipment removed will be disposed of responsibly, using local recycling facilities in Shetland as far as possible;

III. This DP will be reviewed in advance of decommissioning. The review will draw upon:

   a. Environmental monitoring conducted to date and during the lifetime of the project;
   b. Stakeholder consultation to be conducted in advance of decommissioning as part of the Marine Licence required for decommissioning;
   c. Legislation and regulation in force at the time;

IV. All equipment can be removed using standard offshore workboats, as used for device and cable deployment. The vessels to be used will be determined at the time of decommissioning based on those available at the time.

V. All material is designed to be deployed and recovered without divers. Devices and cables can be recovered using pop-up buoys or, should this fail, by surface activated grab. However, considerations will be made to ensure all operations can be safely conducted by divers, should the need arise.

VI. One lift will be required for each turbine nacelle; one for each cable; and one additional lift will be required for each foundation.

VII. The gravity foundation can be lifted in its entirety from the seabed without the need for offshore cutting or any other operations.

2.4 Consultation

This Decommissioning Plan is based on consultations undertaken by Nova Innovation. The following organisations were consulted:

- Marine Scotland
- Maritime and Coastguard Agency
- Shetland Ports and Harbours
- Scottish National Heritage
- Northern Lighthouse Board
- Shetland Fishermen’s Association

- Shetland Shellfish Management Organisation
- Shetland Coastguard Operations Centre
- UK Hydrographic Office
- Shetland Islands Council
- Recreational Boating Associations
- Recreational Angling Associations
- Scottish Environment Protection Agency (SEPA)
- Joint Nature Conservation Committee (JNCC)
- Crown Estate Scotland

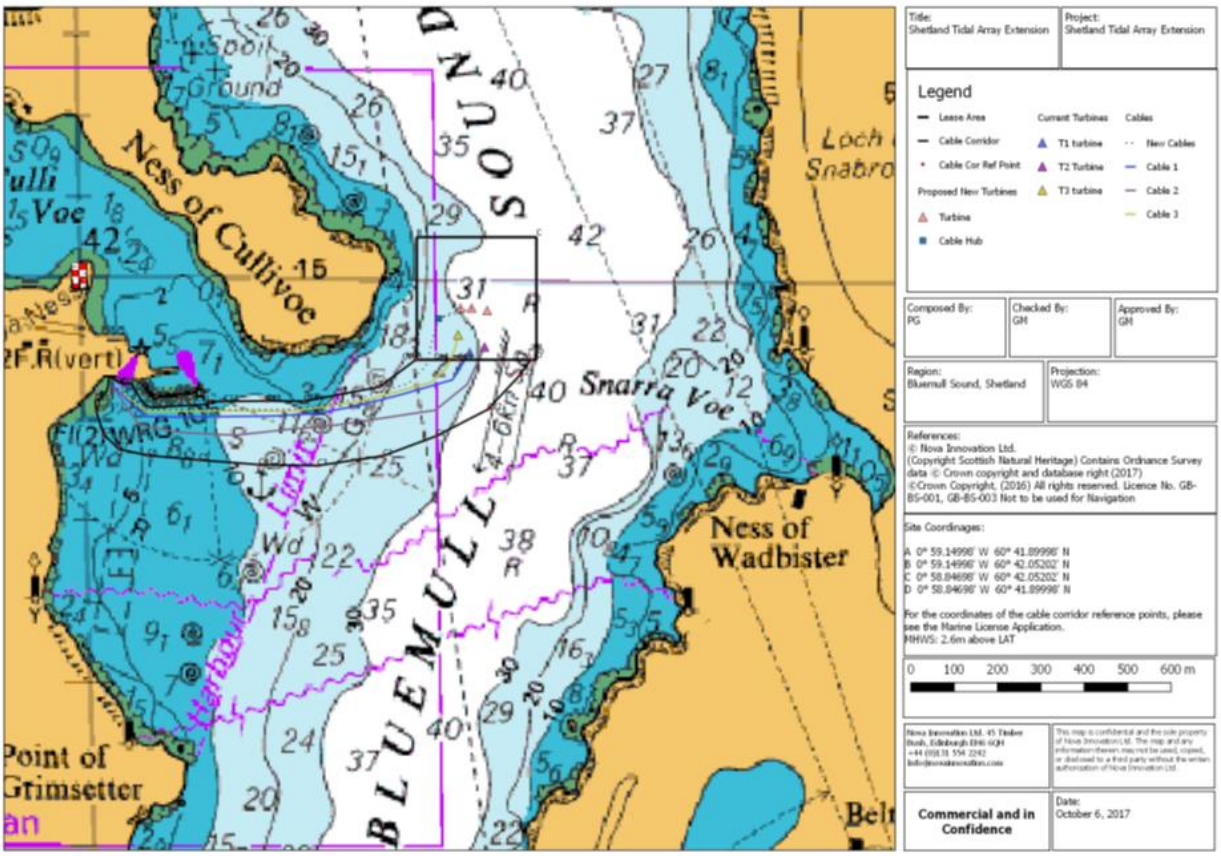
3 Background Information

3.1 Layout of the Facilities to be Decommissioned

The tidal array will consist of six 100 kW tidal turbines. Three of these turbines export electricity to the shore via a dedicated sub-sea cable (one for each turbine), three other turbines are connected to a subsea hub with a single export cable connecting the subsea hub to the shore.

The array is located in the Bluemull Sound, situated between the Shetland Islands of Yell and Unst. The array site is east of the Ness of Cullivoe. Figure 3.1 shows the location and proposed layout of the array.

Figure 3.1 Shetland Tidal Array Location



The Sound is approximately 800m wide and up to 40m deep in the central channel. The seabed in the channel consists largely of shattered rock and occasional boulders on a substrate of solid rock, with sandy sediment in shallow waters close to shore.

3.2 Other Infrastructure

A number of subsea cables run across the Bluemull Sound at a distance of at least 400m south of the array site (purple wavy lines in Figure 3.1)

3.3 Information on Prevailing Weather

Currents at the site can reach 6-8 knots during spring tides. Regarding wave conditions, the Bluemull Sound is classified by the MCA[1] as Category D, meaning "Tidal rivers and estuaries where the significant wave height could not be expected to exceed 2.0 metres at any time". Wind data for Lerwick is shown in Figure 3.7.

3.4 Traffic Survey

A marine traffic survey was conducted drawing on the following information sources:

- Automatic Identification System (AIS) receiver located on Cullivoe Pier by Nova.
- Fishing activity data from the NAFC Marine Centre (NAFC).
- Consultation with the Shetland Fishermen's Association and the Shetland Shellfish Management Organisation.

3.4.1 Shetland Isles Overview

Shipping passes around the islands and several ferry routes and regular dry cargo trades run from the mainland and between the individual Islands in the Shetlands. The oil terminal at Sullom Voe generates calls by tankers in excess of 250 metres in length together with oil rig and other support services. Construction work at Sullom Voe and at surrounding oil fields and development projects also generate vessel traffic. Shallow water and restricted navigation means that these larger vessels avoid the Bluemull Sound.

3.4.2 Cullivoe Pier

The Harbour at Cullivoe has an ice house used by the fishing industry. The pier is primarily used by fishing and service vessels although there is also some leisure traffic.

3.4.3 Ferry Services

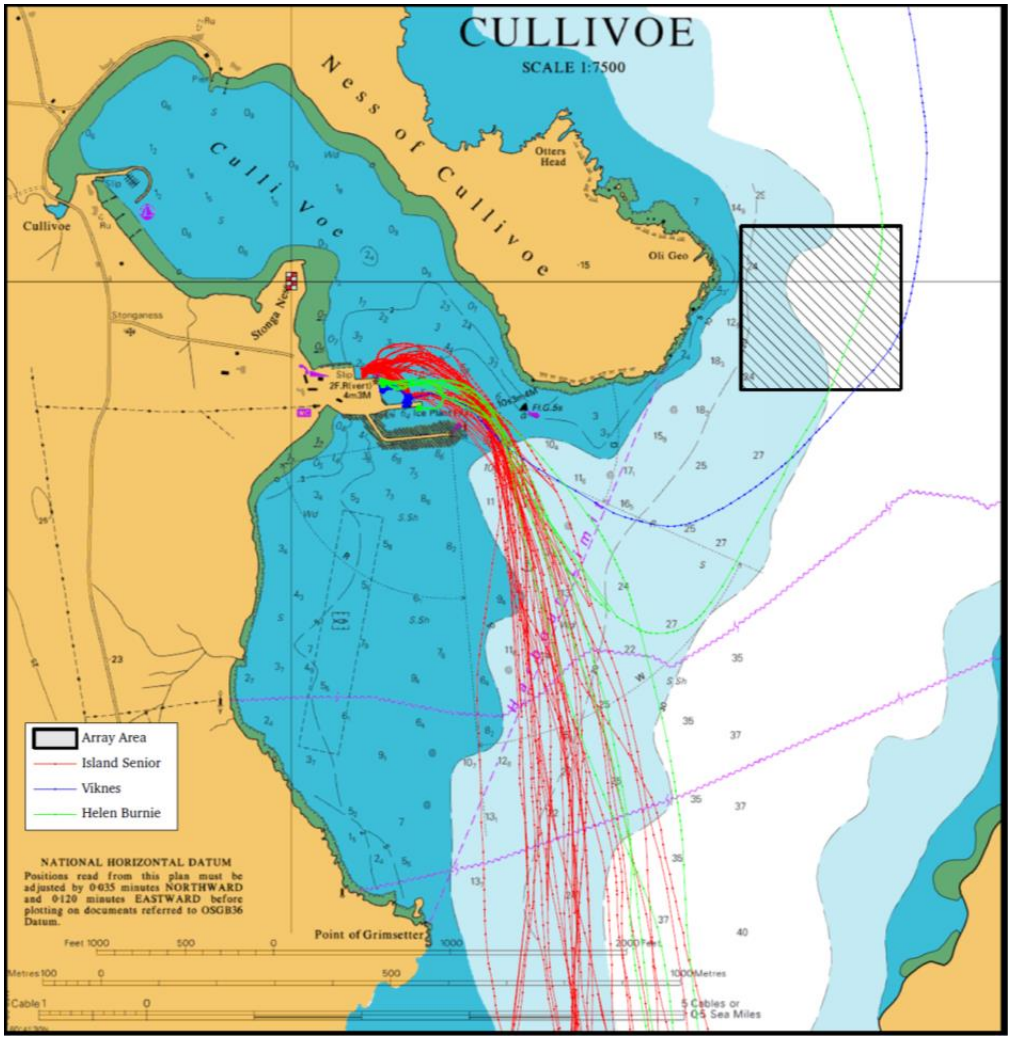
To the South of the Bluemull Sound, approximately 2 km from the array site, ferries run between Gutcher, Belmont and Hamars Ness. The ferry occasionally berths at Cullivoe Pier in poor weather or to refuel.

[1] Merchant shipping note MSN 1837 (M), Categorisation of Waters

3.4.4 AIS Traffic Survey

AIS data was collected over two 2-week periods, one in Summer (2nd to 15th of July 2014) and one in Winter (1st to 14th of February 2015). The results are shown in Figure 3.2 and Figure 3.3. The maps below will be updated to incorporate results from an additional AIS survey, which is underway.

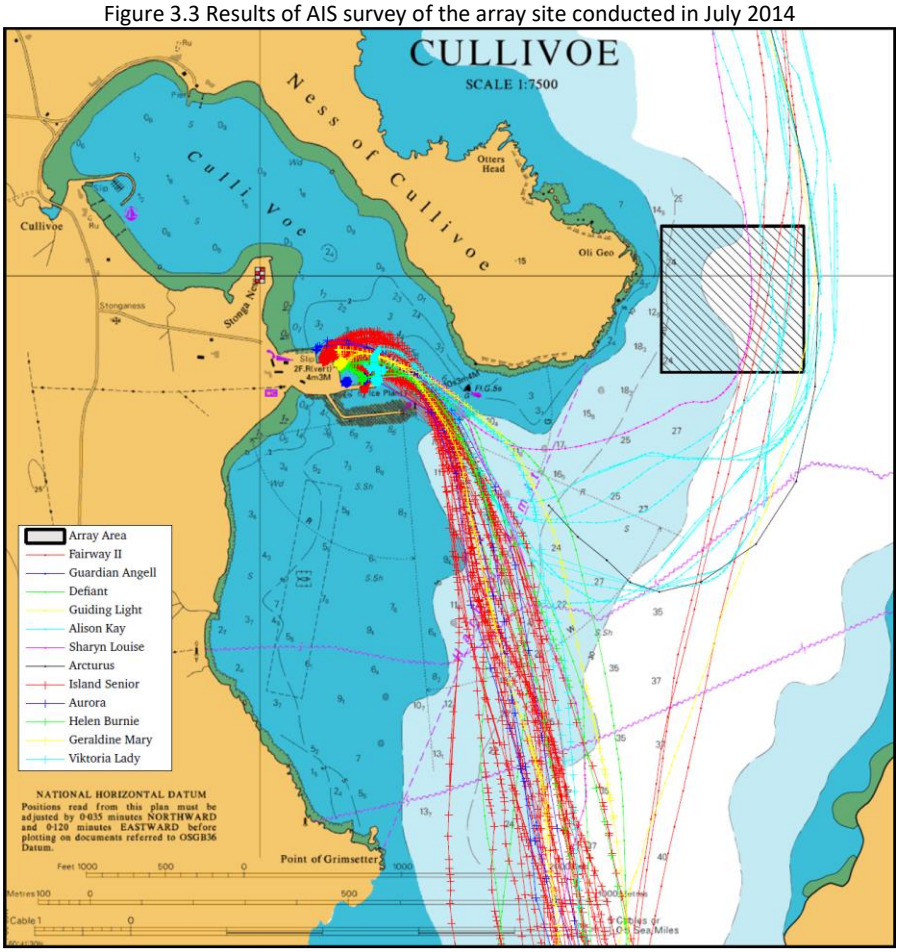
Figure 3.2 Results of AIS survey of the array site conducted in February 2015



Source: Copyright Nova Innovation 2018 ©

During the winter AIS survey only two vessels were observed passing over the array site (one traverse per week). Both vessels were travelling to or from Cullivoe Pier and crossed the deep water (30 m+) area to the East of the array site.

Figure 3.3 Results of AIS survey of the array site conducted in July 2014



Source: Copyright Nova Innovation 2018 ©

During the Summer AIS monitoring there was an increase in traffic compared to the winter survey: the site was traversed eight times by four different vessels during the survey period (approximately one traverse every two days): four times by vessels travelling to/from Cullivoe Pier; four times by vessels passing through the Sound. The observed seasonal variation in activity was confirmed in consultation with local seafarers, and through observation during operations undertaken by Nova at the site.

3.4.5 Non AIS Traffic

Much of the traffic using the Bluemull Sound consists of smaller vessels which will not necessarily be fitted with AIS (mandatory for ships over 300 gross tonnes). This will include fishing vessels, service boats and leisure boats. Many of these vessels use Bluemull Sound as a transit route. The local harbour at Cullivoe also attracts vessels to the area along with a small marina for leisure boats.

To better understand the local traffic and site-specific issues, the position and size of the deployment area was discussed and agreed in consultation with Shetland Ports and Harbours, the Shetland Fishermen's Association and Shetland Shellfish Management Organisation. The position of the devices was selected to avoid any area used for safe anchorage and to minimise any risk to shipping in the area. It was agreed that 15 metres would be adequate draft clearance for the deployment area selected. It was also agreed that the site would not be permanently marked by a buoy (or similar device) as this could create a hazard to shipping.

3.4.6 Fishing activity

Consultation with local professional fishing and recreational angling bodies confirmed that that the array site is not used for commercial or recreational fishing activities.

3.5 Nature Designations

3.5.1 Habitats Regulation Appraisal

The Shetland Tidal Array is located near multiple Natura sites. Natura sites are either Special Areas of Conservation (SACs) or Special Protection Areas (SPAs). These sites are designated under two pieces of European legislation relating to nature conservation, the Habitats Directive and Birds Directive.[2]

The Birds Directive provides EU member states with the power and responsibility to classify Special Protection Areas (SPAs) to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors. The Habitats Directive complements and amends the Birds Directive by protecting natural habitats and other species of wild plants and animals, as well as establishing the Natura sites.

The Habitats Directive was transposed into domestic law in Scotland by the 'Conservation (Natural Habitats, &c.) Regulations 1994' which came into force on 30 October 1994. These regulations are commonly referred to as the Habitats Regulations.[3]

Regulation 48 of the Habitats Regulations requires Marine Scotland to undertake a Habitats Regulations Appraisal (HRA) if activities have the potential to affect Natura sites. A Habitats Regulations Appraisal (HRA) allows Marine Scotland to:

- Determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not,
- Determine whether the proposal is likely to have a significant effect on the site either individually or in combination with other plans or projects; and, if so, then
- Make an Appropriate Assessment of the implications (of the proposal) for the site in view of that site's conservation objectives.

3.5.2 Natura Sites

Consultation with SNH, and the Appropriate Assessment conducted as part of the Marine Licence application, allowed Nova to identify Natura Sites that could potentially be impacted by the decommissioning process. This list is informed by the foraging range of breeding seabirds. Seabirds that are a qualifying feature of a SPA are protected both within and outside the area of the SPA.[4]

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[2] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, available at: http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32009L0147 Accessed on 14/08/2017

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043 Accessed on 14/08/2017

[3] The Conservation (Natural Habitats, &c.) Regulations 1994, available at: http://www.legislation.gov.uk/uksi/1994/2716/contents/made Accessed on 14/08/2014

[4] The assessment of foraging ranges of birds is based on the following sources: Christ Eastham, Scottish National Heritage, The use of breeding seabird foraging ranges for assessing impacts to Special Protection Areas (SPAs) from wave and tidal renewable energy proposals; Thaxter et Al, Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas, Biological Conservation, December 2012

The following breeding seabirds were considered when making the selection:

- Herring Gull
- Arctic Tern
- Atlantic Puffin
- European Shag
- Red Throated Diver
- Northern Gannet

SNH has advised that an Appropriate Assessment is unlikely to be required for the decommissioning process. SNH reached this view due to the temporary and extremely short duration of decommissioning activity and lack of any particularly noisy marine works.

3.5.3 Potential Impacts of the Decommissioning Process

The Scottish Government has developed an online tool called IMPACT that allows developers to assess the impact of tidal and wave energy development on Scotland's marine ecological environment. The tool provides developers with an overview of:

- The key issues affecting the wildlife;
- Preliminary desk-based studies that can be undertaken to further assess the site-specific impact;
- Further Baseline characterisation surveys;
- Further desk-based studies; and
- Options for monitoring during and post installation.

The IMPACT tool allows Nova to identify the following potential impacts of the decommissioning process.

Table 3.1 Potential Impact of the Decommissioning Process for Marine Mammals and Basking Sharks

Risk	Impact	Comments
Barrier to Movement	No likely significant effect	The decommissioning is unlikely to have a significant impact on qualifying interests of the SACs and SPAs. This is due to: • the temporary and extremely short duration of the decommissioning activities, • the lack of any particularly noisy marine works, • The use of multicat vessels which are common in the area.
Displacement of Essential Activities	No likely significant effect	
Collision	No likely significant effect	
Underwater Noise	No likely significant effect	
Noise above the surface	No likely significant effect	

Table 3.2 Potential Impacts of the Decommissioning Process for Birds

Risk	Impact	Comments
Displacement of Essential Activities	No likely significant effect	The decommissioning is unlikely to have a significant impact on qualifying interests of the SACs and SPAs. This is due to: • the temporary and extremely short duration of the decommissioning activities, • the lack of any particularly noisy marine works • The use of multicat vessels which are common in the area.
Collision	No likely significant effect	
Underwater Noise and Vibration	No likely significant effect	
Changes in Turbulence	No likely significant effect	

3.5.4 European Protected Species and Basking Sharks

The Habitats Regulations further provide protection to European protected species (EPS) of animals and plants. This means that for certain activities that have the potential to disturb European Protected Species,

a licence is required. These Regulations apply across the terrestrial environment and to Scottish inshore waters (up to 12 nautical miles from the shore).

The Basking Shark has had full legal protection since 1998 under the Wildlife & Countryside Act 1981 (as amended by the Nature Conservation (Scotland) Act 2004).[5] Basking sharks are protected against any intentional or reckless disturbance or harassment. As with the EPS, a licence can be granted for certain activities that risk disturbing or endangering basking sharks.

Because of the temporary nature of the work and the extremely short duration, as well as the lack of any particularly noisy marine work, it is very unlikely that the decommissioning process will impact or disturb an EPS or basking sharks. Nova will further mitigate the risk by ensuring that all personnel adheres to the Scottish Marine Wildlife Watching Code (SMWWC).

SNH have confirmed that, because of the temporary and extremely short duration of the work, and the lack of any particularly noisy marine work, an EPS licence or a licence to disturb basking sharks will not be required for decommissioning, as long as personnel will adhere to the guidelines associated with the SMWWC.

3.6 Seabed and Physical Conditions

Site surveys have been undertaken using underwater cameras to establish the nature of the seabed. The sea bottom at the site consists of relatively flat shattered rock and small boulders that form a stable seabed.

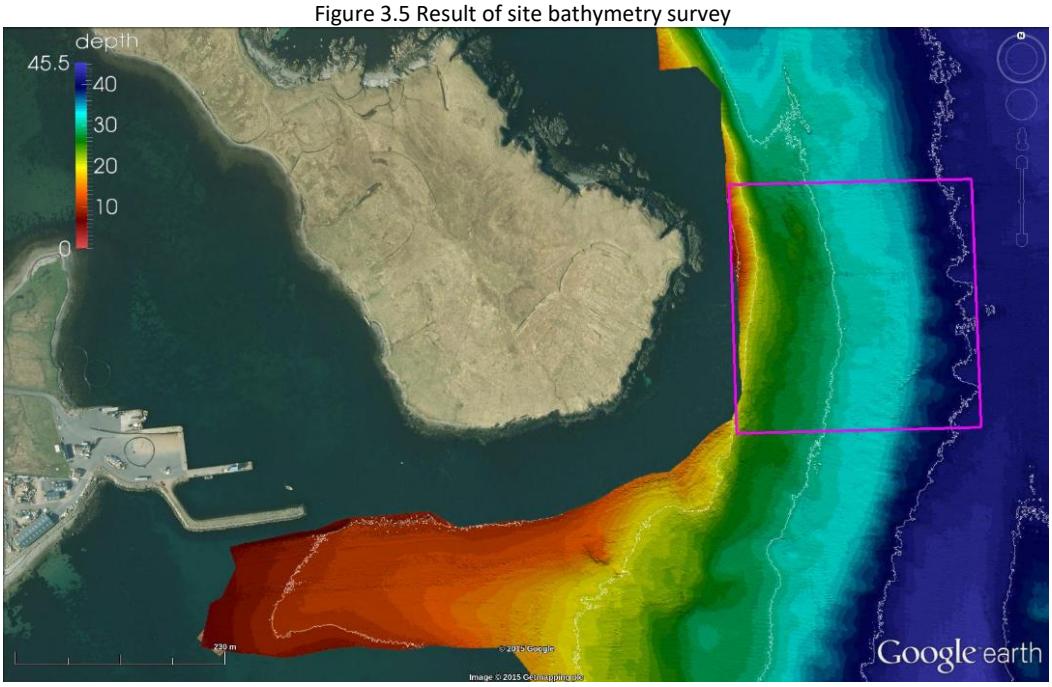
Figure 3.4 Still picture from ROV footage on the array site

Source: Copyright Nova Innovation 2018 ©

[5]Wildlife and Countryside Act 1981, available at: http://www.legislation.gov.uk/ukpga/1981/69, Accessed on 15/08/2017

Nature Conservation (Scotland) Act 2004, Available at: http://www.legislation.gov.uk/asp/2004/6/contents, Accessed on 15/08/2017

Figure 3.5 Result of site bathymetry survey

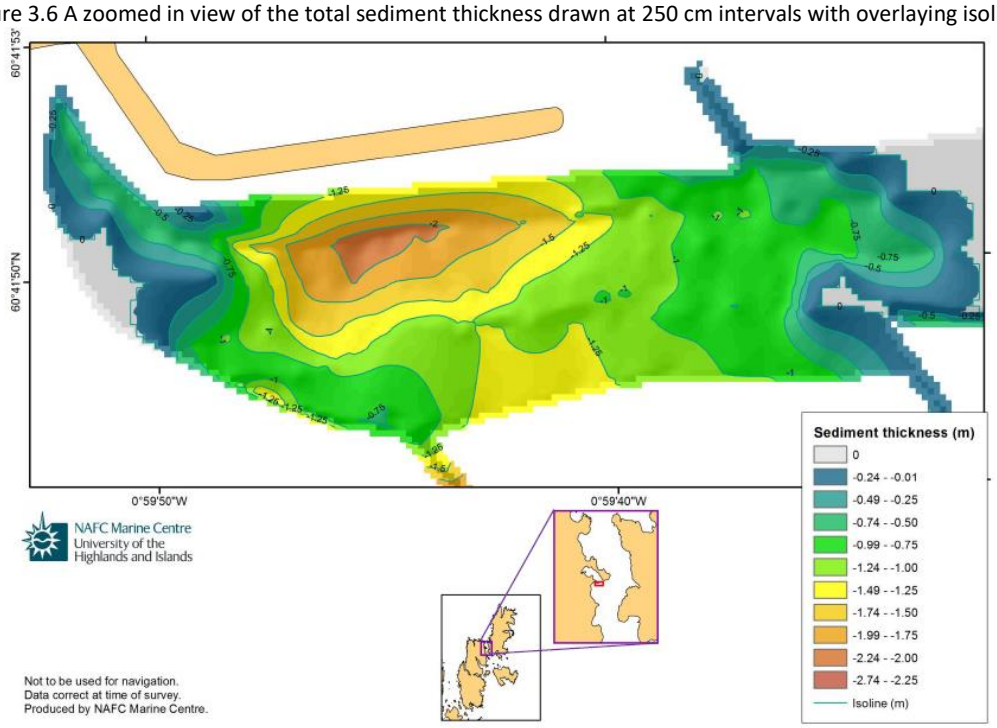


Source: Copyright Nova Innovation 2018 ©, Google earth

Figure 3.5 shows the results of the bathymetry survey, which indicates that the depth in the array area varies relatively smoothly from 10 m depth at the west of the site to 40 m depth at the east.

A sub-bottom survey has been conducted, with the results shown in Figure 3.6. The survey found no soft sediment in the array area or along the majority of the cable route. Soft sediment was located along the cable route from the entrance to the harbour and along the south side of the harbour breakwater. The deepest sediment was found to be 2.2 m thick and located to the south of the breakwater.

Figure 3.6 A zoomed in view of the total sediment thickness drawn at 250 cm intervals with overlaying isolines

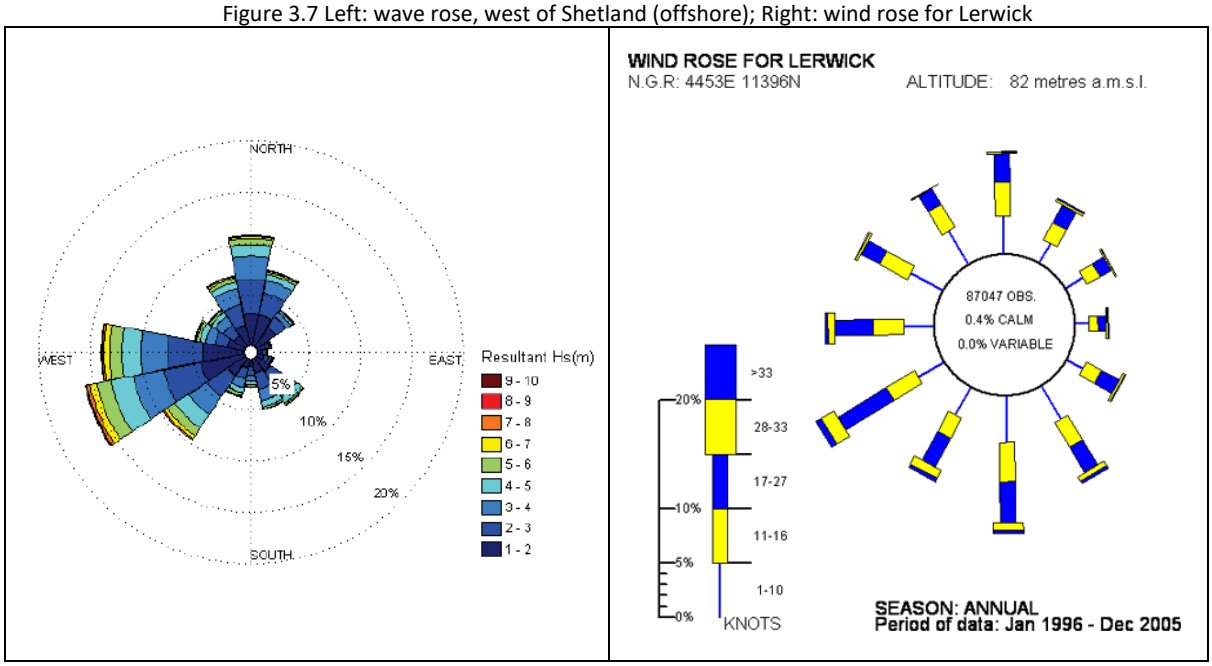


Source: NAFC Marine Centre. Copyright © Nova Innovation 2018

3.7 Metocean Conditions and Weather Conditions

Wave and wind data for Shetland are shown in Figure 3.7.

Figure 3.7 Left: wave rose, west of Shetland (offshore); Right: wind rose for Lerwick



Source: Shetland Island Council, Shetland Marine Resource Study 2011, Met Office

Sea state at the turbine location was estimated with reference to the Shetland Tidal Resource Study[6]. This found that the wave regime to the west of Shetland was relatively stable throughout the year, with waves incident predominantly from the West, a mean wave height 2-4 m, a period of 7-8 seconds, and an extreme annual significant wave height[7] of 8 m.

In contrast, because the Bluemull Sound is a narrow channel sheltered from the prevailing winds, the mean wave height in the Sound was found to be less than 0.6 m. Assuming the ratio of maximum to mean wave height is the same in the Sound as offshore, the maximum significant wave height experienced in one year would be less than 2 m. This is consistent with the classification of the Bluemull Sound by the MCA[8] as Category D, meaning "Tidal rivers and estuaries where the significant wave height could not be expected to exceed 2.0 metres at any time". This assessment is also consistent with sea conditions observed during offshore operations conducted by Nova at the site since 2014.

4 Description of Items to be Decommissioned

4.1 Layout of the Facilities and Site Location

The proposed layout of the facilities is provided in Section 3.1; this will be updated to reflect the final layout once all devices and cables have been deployed.

[6] Shetland Islands Wave and Tidal Resource, Shetland Island Council 2011.

[7] Significant wave height is defined as the mean height (trough to crest) of the highest third of waves.

[8] Merchant shipping note MSN 1837 (M), Categorisation of Waters

4.2 Development Elements

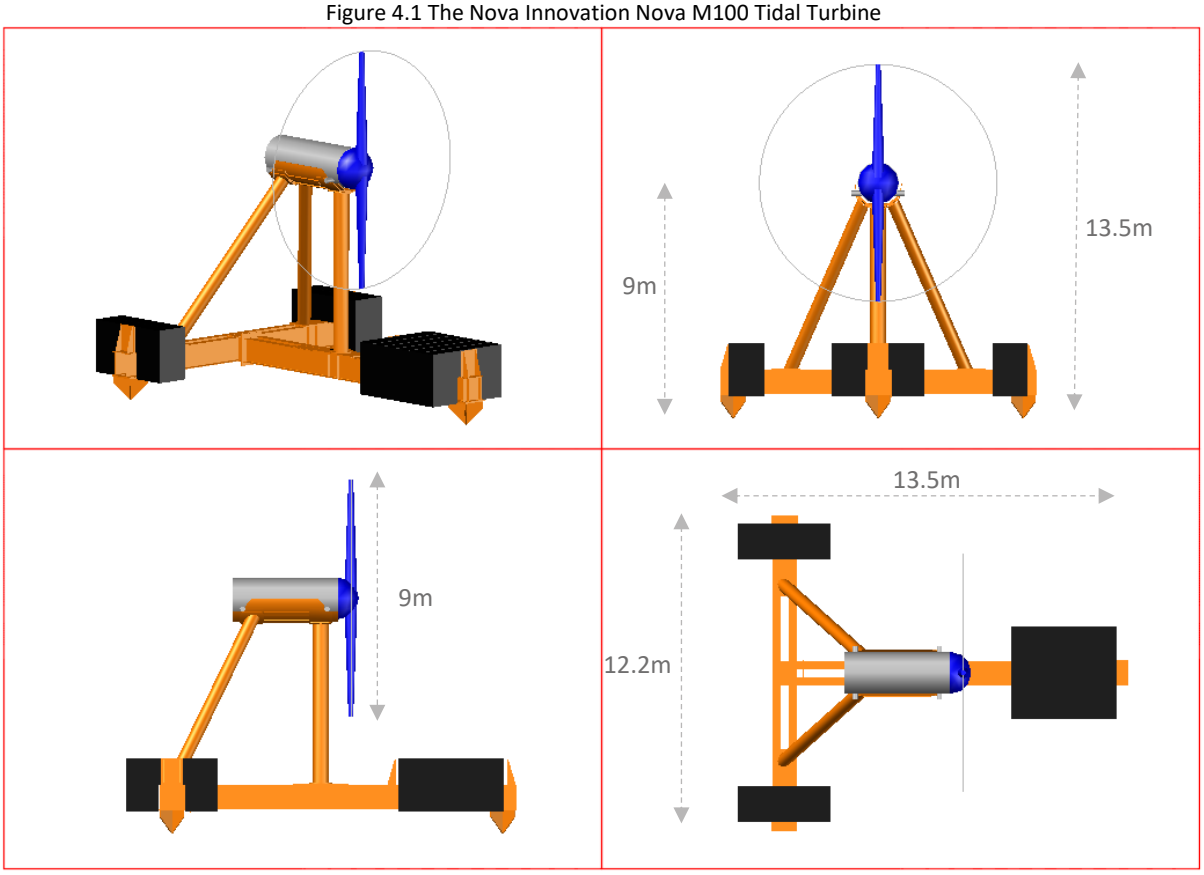
The development consists of the following elements:

- Six 100 kW Nova M100 turbines
- Individual cables from three turbines to shore (T1, T2, T3)
- A sub-sea hub, connected to shore by a single export cable, and to three turbines (T4, T5, T6) by array cables
- Onshore housings for power electronic and control equipment

4.3 Turbine Description

A representative image of the Nova Innovation 100 kW (Nova M100) device is shown in Figure 4.1. Each tidal turbine assembly comprises a cylindrical nacelle unit, rotor and gravity base foundation (made up of a steel frame and concrete ballast) to secure it to the sea bed. No seabed drilling, cutting or additional site works are required for removal. The negatively buoyant nacelle is connected to the foundation by means of secure mating system.

Figure 4.1 The Nova Innovation Nova M100 Tidal Turbine



Source: Copyright Nova Innovation 2018 ©

For the existing devices (T1, T2 and T3), the turbine has a rotor diameter of 9 m, and a hub height of 9 m, making the maximum height 13.5 m from the bottom of the feet to the tip of the blades. In the Shetland Tidal Array the devices will be installed in water depths greater than 30 m, so clearance will be more than 15 m below mean tide. The footprint of the device is 13.5 x 12.2 m, and the weight in air of the entire structure (steel foundation, concrete ballast, nacelle and turbine) is 145 tonnes. Minor modifications will be made to this design for T4, T5 and T6, but the overall device footprint will be similar.

4.4 Foundation Description

The foundation consists of a solid, painted steel structure, as shown in yellow in Figure 4.1. The foundation sits on three feet consisting of triangular steel plates; ballast consisting of reinforced concrete blocks sits on top of the three feet (the grey blocks in Figure 4.1).

4.5 Cable Connections at Turbines

The cables are connected via subsea electrical connectors. For removal, the turbine nacelle is lifted to the surface and secured to the recovery vessel; the cable can then be disconnected manually on the vessel.

4.6 Sub-Sea Cables

Four sub-sea cables run from the site to the shore, making landfall at the South of the breakwater at Cullivoe Pier. Three cables connect turbines T1, T2 and T3 to the shore, the fourth cable connects the sub-sea hub to the shore. The length of each cable is in the range 800 to 1200 m, depending on the location within the array. The cables include two armour layers and a hard, HDPE outer shell, bringing extra stability and robustness compared to alternative cable designs.

5 Decommissioning Process

This section outlines the proposed decommissioning processes for the array. Processes will be updated as the project progresses to reflect changes in (for example) industry best practice, national and local regulations, port facilities and vessel technology.

5.1 Overview of Decommissioning Process

Decommissioning involves removing the turbines, foundations, cables and associated equipment to shore for recycling or disposal and surveying the site to confirm all equipment has been removed. Decommissioning will occur using one vessel mobilisation and will incorporate the following stages:

1. Each turbine nacelle is physically unlatched, electrically isolated, and lifted by the vessel from the turbine foundation to the surface. The cable is then disconnected at the surface and wet-stowed on the seabed while the nacelle is recovered to shore.
2. A lifting beam is lowered from the vessel and attached to the base, which is lifted by the vessel and removed to shore.
3. The subsea hub is lifted from the seabed, detached from cables and removed to shore.
4. The cables are each recovered separately by the vessel, spooled onto a drum and taken to shore. Any cable protection is also removed with the cable.
5. For cables running to shore, the shore end of the cable is cut and pulled through the intertidal zone via the spool on the vessel.
6. Once onshore all components will be recycled or disposed of in accordance with relevant recycling and waste disposal procedures.
7. The offshore site is surveyed to ensure all equipment has been removed.

5.2 Port Options for Decommissioning

Decommissioning can use the same ports used during construction: Cullivoe (1km from the array site) and Belmont (3km from the site) on the Bluemull Sound. Recycling facilities at The Port of Lerwick (~80km distant) can also be used, with transport options available via vessel or road.

6 Vessels, Equipment and Facilities

The type of vessel to be used for decommissioning the turbine is the same as used in construction: a Multicat similar to that shown in Figure 6.1.

One cable reeler will be required for this vessel. A mobile crane and flat-bed trucks will be required for onshore decommissioning. Appropriate, certified lifting gear will be required for all lifts.

6.1 Vessels Used in Decommissioning

All offshore elements of the array will be removed using multicat vessels of similar specification to that shown in Figure 6.1. Because of the small size of the turbine, relatively small vessels can be utilised: at time of writing there are approximately 25 vessels of similar specification operating in UK waters.

Figure 6.1 Representative array installation vessel

Source: Delta Marine

7 Environmental Impact Assessment

A Marine Licence will be required from the Scottish Government prior to decommissioning. An Environmental Monitoring and Mitigation Plan (EMMP) will be developed at this stage to cover the decommissioning phase, including consultation with stakeholders on proposed monitoring and removal techniques. This process will begin at least a year in advance of the start of the Decommissioning

Programme. This array is under 1 MW in size and does not require a formal Environmental Impact Assessment: an appropriate level of assessment will be determined, proportionate to the scale of the facility, in consultation with Marine Scotland.

The EMMP will be informed by a visual survey of the array equipment and cable area conducted in advance of decommissioning. A further survey will be conducted following decommissioning to confirm the removal of all equipment.

The only offshore operation required is lifting of components by small work vessels. All offshore operations should be completed within two weeks.

8 Consultation with Interested Parties

The following parties will be consulted with as part of securing the Marine Licence for decommissioning:

- Marine Scotland
- Maritime and Coastguard Agency
- Shetland Ports and Harbours
- Scottish National Heritage
- Northern Lighthouse Board
- Shetland Fishermen's Association
- Shetland Shellfish Management Organisation
- Shetland Coastguard Operations Centre
- UK Hydrographic Office
- Shetland Islands Council
- Recreational Boating Associations
- Recreational Angling Associations
- Crown Estate Scotland
- Scottish Environment Protection Agency (SEPA)

Consultations will be conducted via telephone, face to face or email.

9 Waste Management

Any material that can be reused (e.g. mechanical or electrical components) will be transported from the site and stored by Nova Innovation for re-use. Material that can be recycled (such as steel and cables) will be recycled using facilities in Shetland.

The following are estimates of the maximum amount of material requiring recycling:

- Steel/iron, 300 tonnes
- Plastic/synthetic/mixed, 180 m^2
- Concrete, 300 m^3
- Cable, 6.6 km

10 Restoration and Seabed clearance

All components of the array will be removed from the water. Clearance of the site will be verified by a video survey following decommissioning.

11 Post-decommissioning Monitoring, Maintenance and Management of the Site

Since all components of the array will be removed from the water, as verified by a subsea survey, no post-decommissioning management of the site will be required.

12 References

DECC (2011) Decommissioning of offshore renewable energy installations under the Energy Act 2004: Guidance notes for industry. Department for Energy and Climate Change (January 2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/80786/orei_guide.pdf

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