EMEC Fall of Warness Tidal Test Site
Section 36 Consent Application
Environmental Statement: Non-technical summary

December 2014

EMEC ORKNEY
THE EUROPEAN MARINE ENERGY CENTRE LTD

European Marine Energy Centre (EMEC) Fall of Warness Tidal Energy Test Site, Orkney

Application for Section 36 Consent under the Electricity Act 1989

ENVIRONMENTAL STATEMENT: NON-TECHNICAL SUMMARY

December 2014

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1 INTRODUCTION

This document provides a Non-technical Summary (NTS) of the Environmental Statement (ES) produced in support of an application for consent under Section 36 of the Electricity Act 1989 (Section 36 consent) by the European Marine Energy Centre Ltd (EMEC) to operate a tidal energy test centre at the Fall Warness, Orkney. The ES is the formal report of an Environmental Impact Assessment (EIA) which was undertaken to consider the potential impacts during installation, operation and eventual decommissioning of the project.

1.1 Background

The EMEC grid-connected tidal energy test site at the Fall of Warness, Orkney, was established in 2005. At that time an EIA was undertaken to support EMEC's application for licences/consents to develop the site. This EIA process led to the production of an ES (the 2005 ES), which included a Navigational Risk Assessment (NRA) for the site.

Although EMEC was granted the licences/consents necessary for establishing the test site infrastructure, individual developers wishing to test devices at the site are required to apply for and obtain all licences/consents necessary to install their devices. These licences/consents include a Marine Licence under Section 25 of the Marine (Scotland) Act 2010, appropriate licences to disturb European Protected Species/basking shark and, for projects with a rated power output of >1MW, consent under Section 36 of the Electricity Act 1989. This requires each individual developer to provide appropriate supporting information to assess the potential impact of deploying, operating and decommissioning their devices on key natural heritage features and navigational safety.

In 20013/14 a review of the environmental documentation and other data available for the Fall of Warness tidal energy test site was undertaken by Scottish Natural Heritage (SNH) to assist EMEC and the Regulator, Marine Scotland, in reviewing the environmental assessment required to inform the consenting process for the test site. This led to the undertaking of an environmental appraisal, the outputs of which can be used in pre-appraising potential projects at the test site using a 'project envelope' approach (see Section 1.6 below). This project envelope describes the types and characteristics of marine energy convertor systems likely to be deployed for testing at the Fall of Warness tidal test site. It also describes the types of marine operations and activities likely to be associated with the installation, operation and maintenance of these devices. Any proposal falling within this project envelope (as assessed by the Regulator) will be considered pre-appraised and will not require any

further environmental appraisal by Marine Scotland when determining any associated Marine Licence application.

As confidence in the consenting process at EMEC has grown and in order to streamline the consenting process further, EMEC is keen to establish a single site-wide Section 36 consent to apply to the Fall of Warness tidal energy test site as a whole. Under this proposal, EMEC will be granted a generic site-wide Section 36 consent to generate electricity up to a maximum output of 10MW from the site. Individual developers will still be required to apply for and obtain their own project-specific Marine Licence and any other applicable project-specific licences and permissions, in order to deploy devices at the test site.

The primary driver for this application is one of efficiency, related to the wish to minimise repeated and unnecessary calls on Regulators' and Stakeholders' time and effort. With developers now beginning to test second generation machines, there is now a high risk that multiple developers will wish to test devices with nominal rating above the current exemption level of 1MW. If this were to occur, then there would foreseeably be several Section 36 Consent applications progressing in parallel, with most of the documentation being the common to all applications.

The proposal that EMEC hold a site-wide Section 36 consent enables the collective risks of site activity from a range of typical devices to be addressed once, in this single application, with stakeholder input thereafter being directed at the project-specific Marine Licence applications.

1.2 The European Marine Energy Centre Ltd.

Established in 2003, EMEC is the first and only centre of its kind in the world, providing developers of both wave and tidal energy systems with purpose-built, United Kingdom Accreditation Service accredited open-sea testing facilities.

Orkney, with its excellent oceanic wave regime, strong tidal currents, grid connection and sheltered harbour facilities, is an ideal base for EMEC. Orkney also boasts significant renewable, maritime and environmental expertise within its local community, all of which play a key role in supporting activities at EMEC.

With 14 full-scale test berths (8 tidal energy and 6 wave energy) across two sites, there have been more grid-connected marine energy devices deployed at EMEC than at any other single site in the world. Developers are attracted from around the globe to use the facilities to prove what is achievable in some of the harshest marine environments, whilst in close proximity to Orkney's sheltered harbours. EMEC also operates two non-grid-connected test sites where developers can test smaller scale devices, or those at an earlier stage in their development, gaining real sea

experience in less challenging conditions than those experienced at the grid-connected wave and tidal test sites.

Beyond device testing, EMEC provides independently-verified performance assessments and a wide range of consultancy and research services, as well as providing consenting support to developer clients.

1.3 The EMEC Fall of Warness Tidal Test Site

The EMEC grid-connected tidal energy test site is located at the Fall of Warness, just west of the island of Eday in the Orkney Islands. The site sits in a narrow channel between the Westray Firth and Stronsay Firth where tidal flow accelerates as water flows through the inter-island constriction on its way from the North Atlantic Ocean to the North Sea. The site was chosen for its high velocity marine currents which can reach almost 4m/sec (7.8 knots) at spring tides. The location of the EMEC tidal energy test site at Fall of Warness is shown in Figure 1 below.

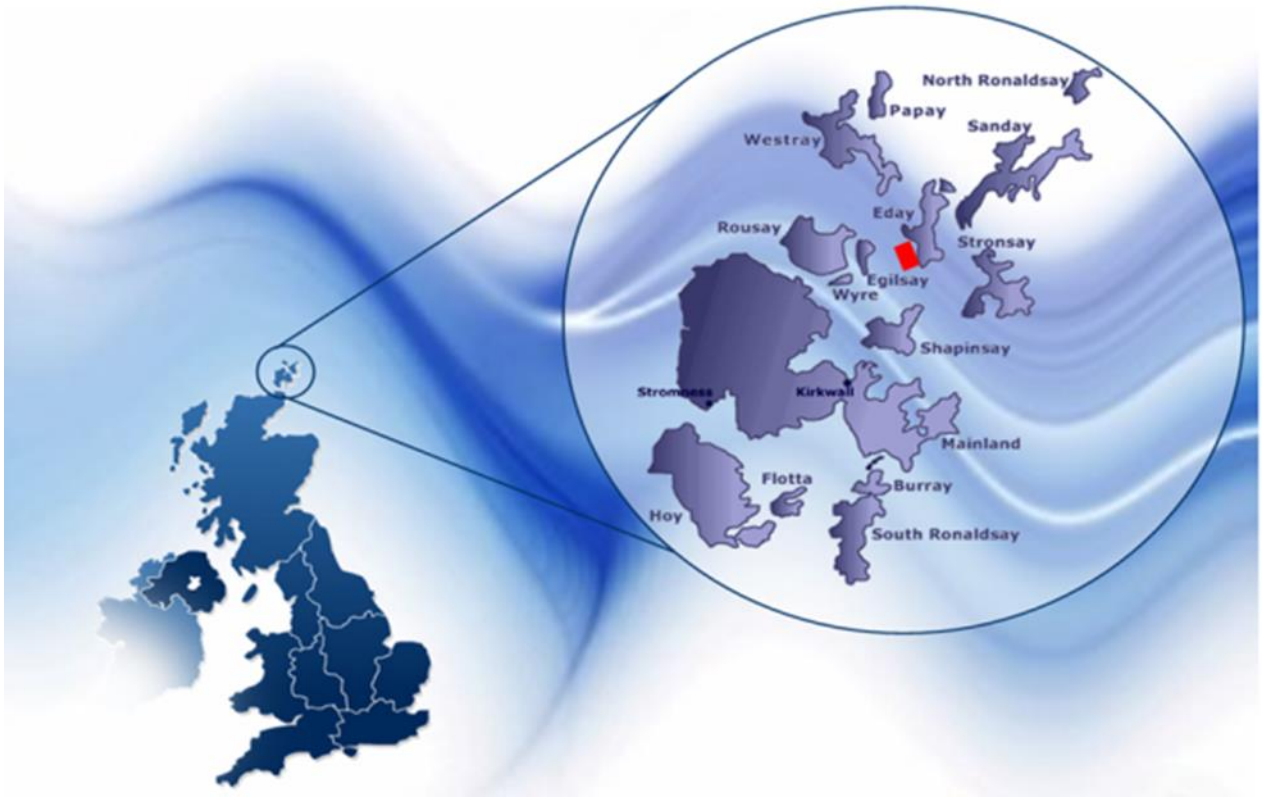


Figure 1: Location of the EMEC tidal energy test site at Fall of Warness, Orkney (red box).

The test site currently provides eight tidal test berths at depths ranging from 12m to 50m in an area 2km across and approximately 4km in length (see Figure 2 below). The 11kV sub-sea electricity cables extend to the middle of the tidal stream from an electricity sub-station on the island of Eday which houses the main switchgear, backup generator and communications room. The substation controls the supply from each tidal energy device and provides connection to the National Grid. An adjacent laydown area provides developers with space to place their power conditioning equipment, required to convert electricity from the level at which it is generated to grid-compliant electricity. EMEC sells generated electricity on behalf of the developers, who receive a return. In addition to transporting electricity, the sub-sea cables also contain a fibre-optic core which allows developers to communicate with their devices and transmit data back to the EMEC data centre and office facilities in Stromness.

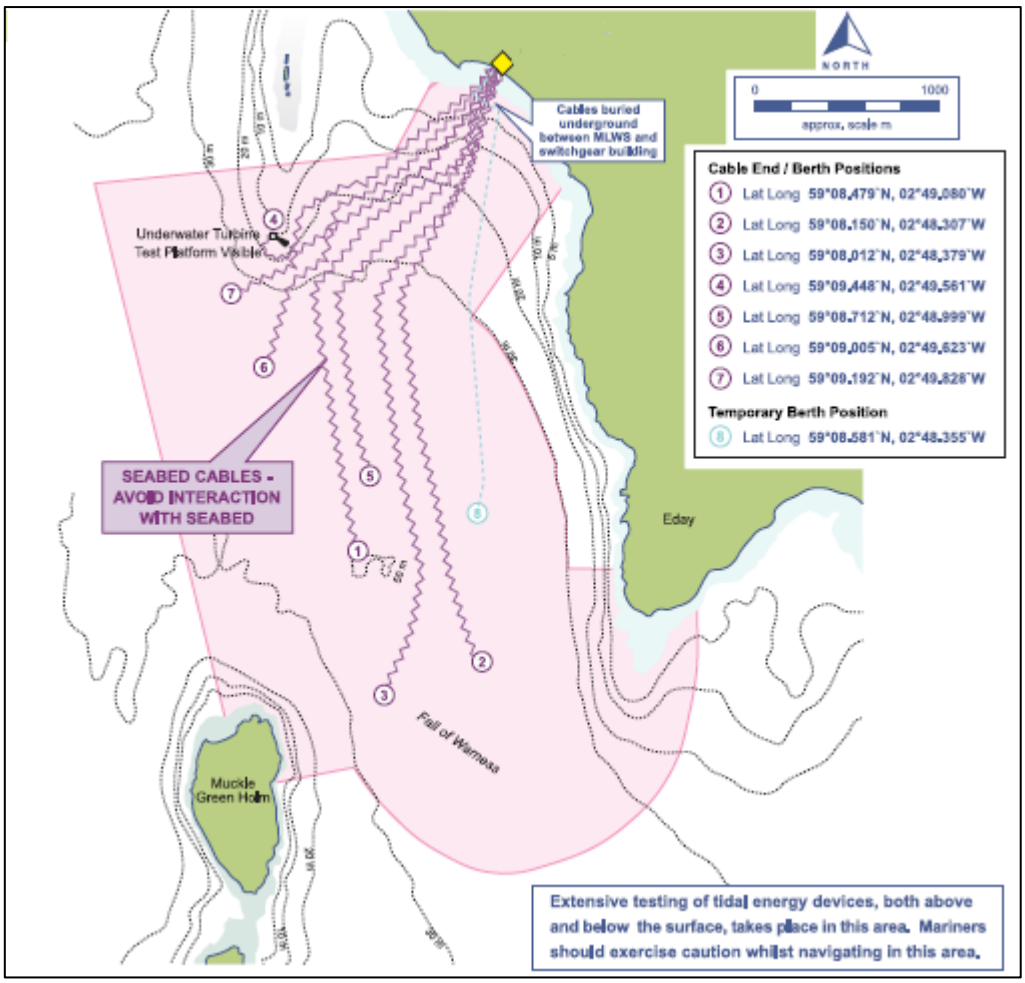


Figure 2: Area of the EMEC tidal energy test site at Fall of Warness.

1.4 Alternative Sites Considered

When EMEC was formed in 2004, Highlands and Islands Enterprise (HIE) commissioned a study to determine the optimum site for a tidal test centre. A preliminary desktop study identified the following eight potential sites for initial screening:

- Yell Sound, Shetland Isles
- Blue Mull Sound, Shetland Isles
- Fall of Warness, Orkney Isles
- Pentland Firth
- Sound of Harris, Western Isles
- Sound of Barra, Western Isles
- The Sound of Islay (between Islay & Jura)
- Kyle Rhea, Skye

The three most favourable sites of the eight listed above, selected primarily on physical resource and distance from EMEC, were (ranked in order of preference):

1. Fall of Warness, Orkney
2. Yell Sound, Shetland
3. Pentland Firth, Orkney

Discussions with potential developers highlighted reservations about the Pentland Firth as a tidal test site due to relatively high wave exposure. The relatively long distance of Yell Sound from the existing location of EMEC was seen as a problem. The Fall of Warness was therefore selected as the most suitable option for establishing the tidal test site.

1.5 Project Details

As mentioned above, the EMEC tidal test site was established at the Fall of Warness in 2005, and has since seen a number of developers' devices deployed for testing. All of these devices to date have had a peak generating output of less than or equal to 1MW, and therefore Section 36 consent has not been required. As progress is made in the testing of devices, developers are likely to need to test larger devices with peak generating output greater than 1MW, requiring Section 36 consent.

When the EMEC test site was established, it was not deemed possible to grant generic site licences and consents which could be applied to all devices that might in future be deployed at the test site. This was due primarily to the fact that little was known about the range of types of devices and details of their features, together with the requirement under EU and national legislation to fully consider detailed risks to the environment, with particular emphasis on marine fauna. In that context the Regulator and SNH were unable to adequately assess the extent of any risk to marine species of the tidal energy structures operating in sea areas used by potentially sensitive species.

Developments since 2006 mean that it now becomes feasible for the Regulator to consider awarding consent for technology-agnostic projects, as long as the key features of the future devices are characterised and assessed. These developments over the last decade include: (1) a much more detailed knowledge of the types of devices and structures that are likely to be used to capture energy from tidal streams; (2) the development by SNH and Marine Scotland of the 'Plan, Deploy and Monitor' approach to mitigation of environmental risk, once all possible other mitigation measures have been applied to a project; and (3) experience, gained largely at EMEC, of the different types of monitoring that can to be done in order to gather the data essential to addressing the remaining environmental concerns.

As described in Section 1.1 above, it has now been possible to conduct a more detailed environmental appraisal, and this was carried out for the test site in 2013/14. The availability of this environmental appraisal documentation does not remove the requirement for each developer to apply for an individual Marine Licence. Rather, it is provided to help inform the assessment process for each project. Consequently, the anticipated range of potential impacts that could arise from the installation, operation and maintenance of tidal turbine devices at the test site have been appraised and conclusions reached, provided that the proposed project fits within an agreed range of features and activities (referred to as the 'project envelope' – see Section 1.6 below).

The environmental appraisal includes comprehensive receptor appraisals that satisfy the requirements of legislation relating to designated sites and protected species. Because the appraisal was conducted in relation to the total anticipated range of devices and operations envisaged at the site, the appraisal itself is based on a full assessment of environmental risk from a cumulative perspective.

The appraisal also identifies mitigation and/or monitoring requirements, to be used by developers to produce a Project-specific Environmental Monitoring Programme (PEMP).

Given the increased knowledge of the environmental receptors that is now available (through almost ten years of wildlife monitoring at the site by EMEC) and the detailed environmental appraisal recently carried out, together with the agreement of a maximum project envelope for device types and operations (based on a decade of experience), it now makes sense for a more streamlined and efficient consenting arrangement to be put in place at the Fall of Warness.

This streamlined appraisal process removes the need for developers whose projects fall within the project envelope (as assessed by Marine Scotland) to produce extensive supporting environmental documentation (as these projects will in effect have been pre-appraised). The site-wide Environmental Appraisal and Navigational Risk Assessment can now form the basis of each developer's risk assessment, leaving the developers to concentrate on addressing any of their individual project-specific risks from both environmental and navigational perspectives.

These project-specific risk assessments, together with any project-specific mitigation and monitoring, will be addressed by the developers' individual Marine Licences. In this context, it is most efficient for EMEC to hold a generic site-wide Section 36 consent for the test site, which enables the generation of electricity to an agreed maximum of 10MW, without introducing developer-specific individual project limits of 1MW. This will introduce further efficiencies into the consenting process at EMEC and reduce the burden on the Regulator and its statutory and non-statutory consultees.

1.6 The Project Envelope

In 2013/14, EMEC produced a summary of the types and characteristics of tidal energy converter devices likely to be deployed for testing at the Fall of Warness test site. This summary was used as the basis for developing a 'project envelope' against which the potential environmental impacts of installation, operation and maintenance of devices under test could be appraised by the Regulator.

The project envelope is based on detailed knowledge of parameters relating to devices that have been deployed at EMEC, together with those emerging elsewhere in the UK. The project envelope therefore reflects the anticipated range of devices, and features thereof, and is an expression of the maximum anticipated likely usage of the site. In this context, it represents an expression of the cumulative presence of device features anticipated at the site, and therefore is a good basis for the assessment of cumulative environmental risk. Consequently, the environmental appraisal undertaken for the site is valid for all activities described in the project envelope, to the agreed levels described in the envelope.

Where a developer's project fits within the project envelope, no further environmental appraisal by Marine Scotland will be required in determining a Marine Licence application. Any proposals for deploying devices at the test site which are deemed by Marine Scotland to be out-with the project envelope will require further consultation and assessment/appraisal.

The project envelope for the Fall of Warness test site includes the following activities:

- Installation of new sub-sea cable and associated cable protection systems (mattresses, armour) where required and potential recovery and replacement on the seabed of existing cabling from berths to shore, and repair/maintenance to existing cables or cable protection systems.
- A maximum of 9 berths, accommodating up to 12 tidal energy devices at any one time, thereby supporting the testing of small arrays or additional non-grid-connected devices.
- Deployment of scientific instrumentation and associated cabling.
- Testing of buoys (maximum of two simultaneous tests).
- Testing of mooring arrangements (e.g. tripod support structures) or individual stand-alone components of devices.
- Potential for simultaneous operations, i.e. installation or maintenance activities, at more than one berth at the same time.

The following activities are ***not*** covered by the project envelope and would require further consultation and assessment/appraisal:

- Seabed preparation (e.g. seaweed clearance, rock grinding/blasting)

- Geotechnical and geophysical surveys (these are considered and, where necessary, licensed through the Notification of Site Survey procedures).
- Use of acoustic deterrent devices.
- Deployment and operational activities outside the parameters defined in this document.

Devices included in the project envelope may feature the following blade/rotor designs:

- Blades with exposed tips (may include multiple rotors, on single or multiple axles)
- Blades with enclosed tips (may include multiple rotors, on single or multiple axles), including 'annular' and 'venturi' style devices.
- Blades with contra-rotating mechanism (may include multiple rotors, on single or multiple axles)
- Single or multiple Archimedes rotors

Examples of technologies within the project envelope typically deployed for testing at the EMEC site are described below.

Venturi Effect

Figure 3 below illustrates this type of device. Venturi effect devices house the turbine within a duct which concentrates the tidal flow passing through the turbine. The funnel-like collecting device sits submerged in the tidal current. The flow of water can drive a turbine directly, or the induced pressure differential in the system can drive an air-turbine. Figure 7(a) below shows an example of a device that uses a small venturi effect installed at EMEC.

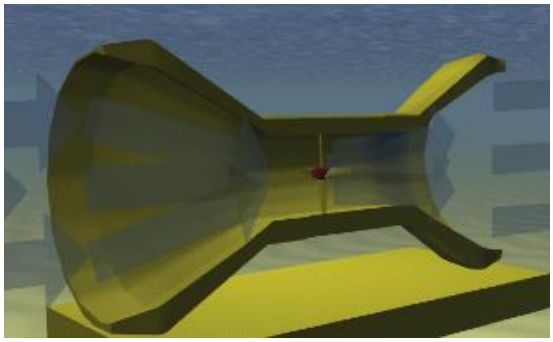


Figure 3: Illustration of venturi effect technology.

Horizontal Axis Turbine

This is the most common technology deployed at the test site to date, consisting of a two or three-bladed turbine, fixed to the seabed in some way. A graphic illustration of such a device is shown in Figure 4 below. Horizontal axis turbines (HAT) extract energy from moving water in much the same way as wind turbines extract energy from moving air. The tidal stream causes the rotors to rotate around the horizontal axis and generate power.

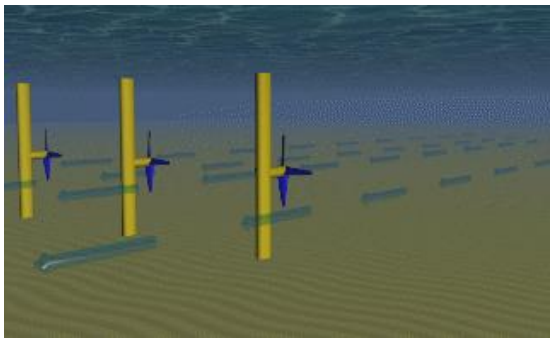


Figure 4: Illustration of horizontal axis technology.

A HAT can be located at the right point in the water column by sitting on the seabed, or being attached to one or more piles that are embedded in the seabed. Horizontal axis turbines can also be deployed by 'suspending' them from a floating platform device. Figure 7 (b) – (f) shows examples of horizontal axis devices deployed at EMEC.

Vertical Axis Turbine

Vertical axis turbines extract energy from the tides in a similar manner to that for horizontal axis turbines, however in this case the turbine is mounted on a vertical axis. The tidal stream causes the rotors to rotate around the vertical axis and generate power. Vertical axis turbines are illustrated in Figure 5 below.

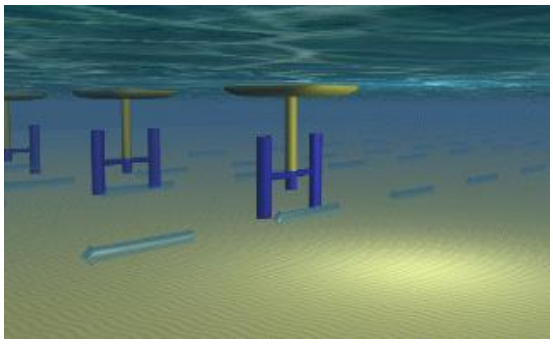


Figure 5: Illustration of vertical axis technology.

Archimedes Rotors

The Archimedes Rotor is a helical corkscrew-shaped device (a helical surface surrounding a central cylindrical shaft). The device draws power from the tidal stream as the water moves up/through the spiral turning the turbines. Figure 6 below illustrates a typical Archimedes rotor type device.

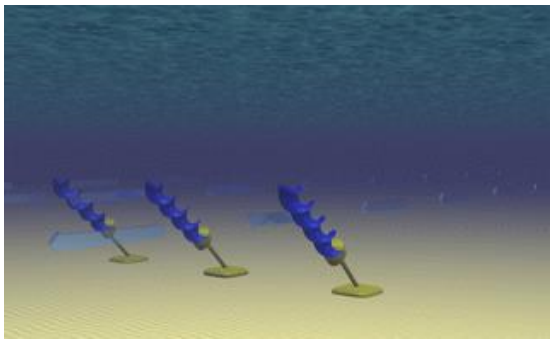


Figure 6: Illustration of Archimedes rotor technology.

To date, a wide variety of devices incorporating some of the technologies described above have been deployed for testing at the EMEC site at Fall of Warness, as can be seen in Figure 7 below.

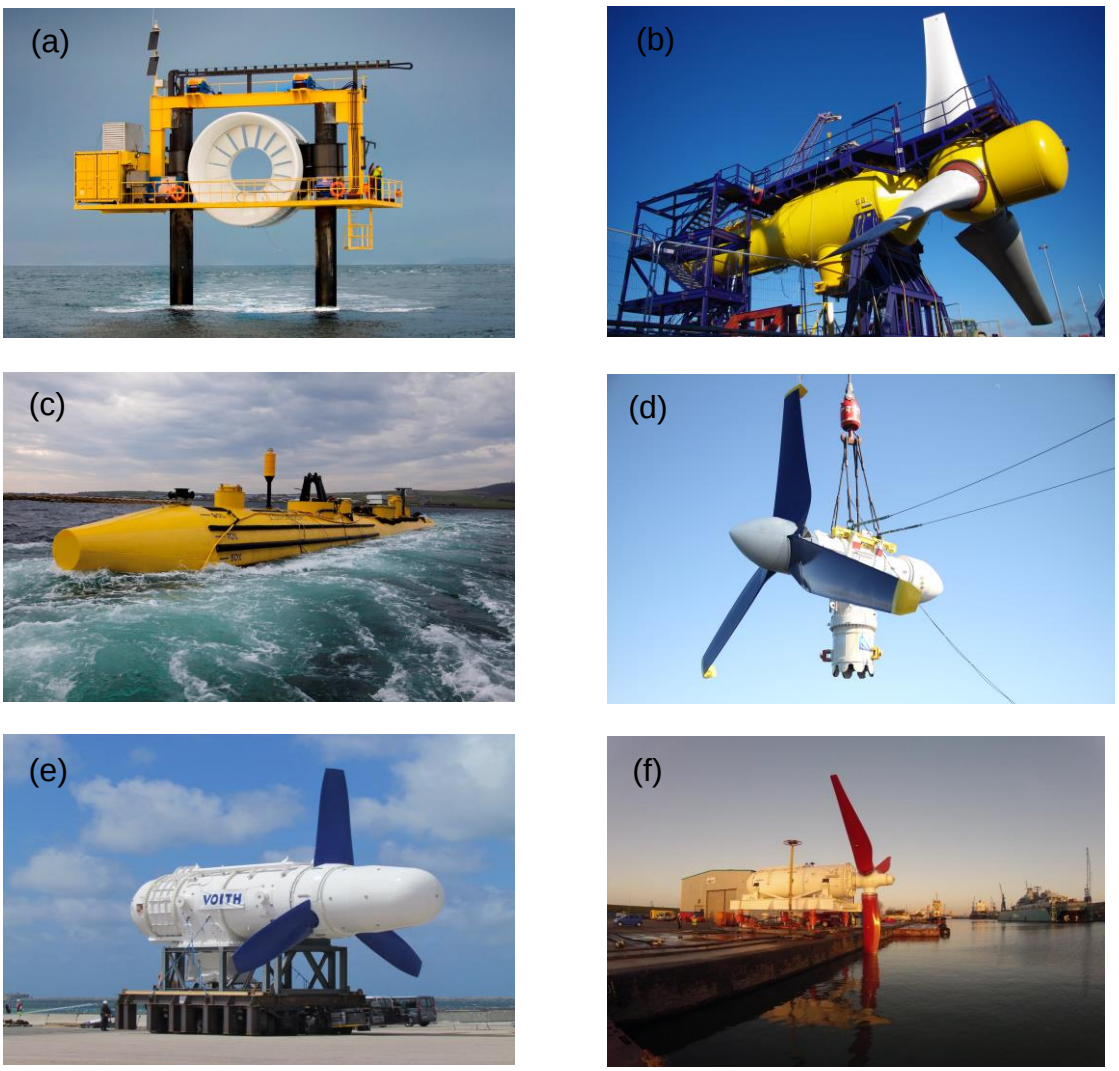


Figure 7: Devices deployed at the EMEC Fall of Warness tidal test site to date. (a) Open Hydro open-centred turbine; (b) TGL 1MW turbine; (c) Scotrenewables SR250 twin-rotor floating device; (d) Atlantic Resource Corp. 1MW turbine; (e) Voith Hydro Hytide 1MW turbine; (f) Andritz Hydro Hammerfest HS1000 turbine.

EMEC does not generally provide mooring or foundation infrastructure at its grid-connected test site. Devices deployed at the site are generally installed utilising developers' own custom-made foundation/moorings. The following methods are included within the project envelope:

- Mono/twin-pile(s) fixed into the seabed (non-percussive drilling only)
- Tripod structure, pinned to the seabed (non-percussive drilling only)
- Tripod structure held on seabed by gravity
- Other mooring structure pinned to (non-percussive drilling only) or held on the seabed by gravity
- Gravity-based anchor(s) with mooring line(s) attached
- Embedment anchor(s) with mooring lines attached

Full device details including design, structure, materials and weights, and any device-specific mooring arrangement and foundation materials will be specified by the developer in the project-specific supporting documentation submitted to Marine Scotland as part of the Marine Licence application documentation.

In addition to the features of different devices described above, the project envelope also describes a range of marine works associated with the installation, operation and maintenance of these devices. It describes the range of different types of vessels and activities that are typically used throughout the whole testing lifecycle of deployments at the test site.

2 SITE CHARACTERISTICS AND KEY SENSITIVITIES

The Fall of Warness test site does not sit within or directly adjacent to any existing designated Special Areas of Conservation (SAC) or Special Protected Areas (SPA) sites. However, there are 2 designated SAC and 14 SPA within the local area. The key conservation areas and protected sites in proximity to the Fall of Warness test site are shown in Figure 8 below. A full environmental appraisal of the potential impact of the Fall of Warness test site on these sites was carried out by SNH in 2013/14.

The ES produced for the Fall of Warness test site in June 2005 (the 2005 ES) identified the environmental receptors that might be sensitive to the construction and installation of the proposed test site infrastructure, and recommended management controls and mitigation measures required to reduce any potential impacts to a tolerable level. Various preliminary studies were carried out to inform the 2005 ES, including a terrestrial habitat and vegetation survey, coastal habitats survey, coastal and seabed processes review, seabed surveys, and assessment of birds, cetaceans, sea mammals & coastal wildlife. Archaeological, visual & landscape, and navigational risk assessments were also undertaken.

The primary recommendation for further study which arose from the Regulator's consideration of the 2005 ES was for a land-based visual surface wildlife observation programme to be undertaken. This programme commenced at the Fall of Warness test site in July 2005.

SNH identified key site sensitivities to aid developers in addressing potential interactions between tidal energy converter devices and species found within the local environment. The main sensitivities identified at the test site were harbour seals, which haul out and pup on rocks to the north of the site; European Protected Species such as cetaceans and otters; basking sharks; and diving birds.

2.1 Environmental Monitoring

EMEC has undertaken a variety of environmental monitoring projects at the Fall of Warness test site, with the principal objectives of providing a targeted benefit to developers through provision of supporting data thus reducing the monitoring obligations placed on them individually, and reducing the inefficiencies associated with multiple data gathering initiatives all aimed at the same goal.

The results of these site-wide environmental monitoring projects can aid the Regulator and its statutory advisors to gain a more comprehensive understanding of the environmental sensitivities of the sites. This information can also be used to undertake environmental appraisals and to inform recommendations for specific

monitoring requirements that form part of individual developers' device-specific monitoring plans.

A site-wide Section 36 consent will enable the Regulator to form a view on the appropriateness of encouraging a site-wide approach to environmental monitoring that would build on the lessons already learnt from the data gathered to date.

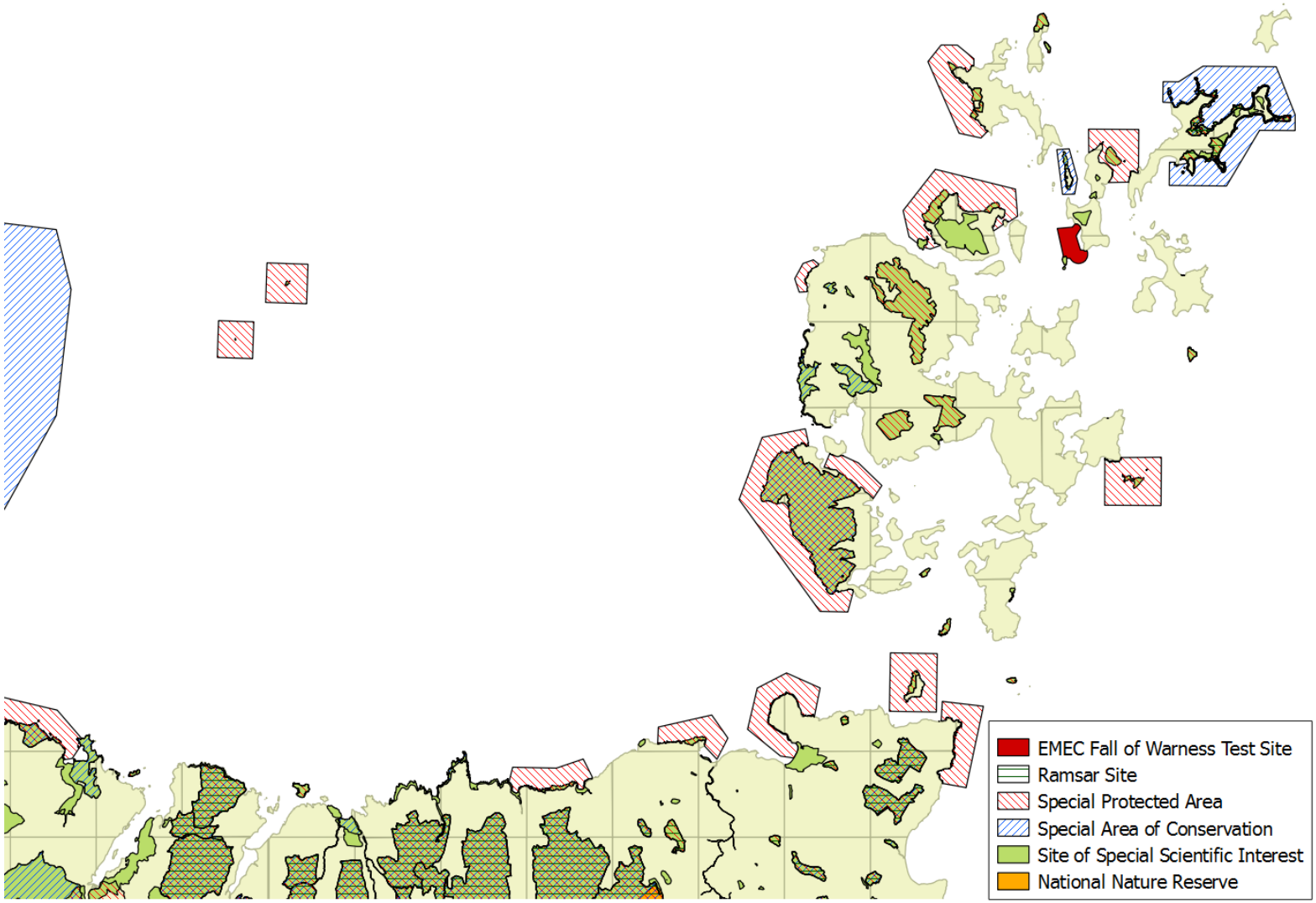


Figure 8: Conservation and protected sites adjacent to the EMEC Fall of Warness test site.

The following environmental monitoring projects have been undertaken by EMEC at the Fall of Warness test site:

- Land-based visual observations of surface wildlife
- Acoustic characterisation of underwater ambient noise
- Integrated environmental monitoring project:
    - Active Acoustic - utilising a custom-made sonar system
    - Passive Acoustic - using both drifting hydrophones and fixed hydrophones
    - Physical Environment - real-time long-term measurement of wave and tidal resource and conductivity, temperature, depth, and turbidity (CTD/Tu) of sea water; surface wave and current data gathered using marine X-band radar to build a spatial map of variation in wave and tidal resource at the test site
    - Benthic Surveys - assessment of benthos in and around an operating tidal generator based on comparison of pre-and post-device installation ROV data surveys; sampling of test and control areas

The integrated environmental monitoring project is aimed at undertaking monitoring of marine mammals and diving birds in the close vicinity of an operating tidal turbine in order to assess the close-range behaviour and the potential risk of harm to marine species due to potential collision with devices. This is still a high priority issue of concern to the Regulator in Scotland during the licensing of marine devices.

In addition to the monitoring undertaken by EMEC at the site, developers have undertaken their own monitoring using a range of methods, which includes underwater video and drop-camera as well as using strain gauges to identify potential collision events. These methods show different degrees of success, and are currently being reviewed. Lessons learnt from this review will be shared via the Marine Scotland Interactive website[1].

[1] http://www.scotland.gov.uk/Topics/marine/science/MSInteractive

3 POTENTIAL IMPACTS

This section describes the potential impacts of the test centre on the various receptors and summarises the conclusions drawn from the environmental appraisal carried out in 2013/14 in relation to these.

3.1 Benthic Environment

The environmental appraisal concludes that, while the development footprint includes some rocky reef habitat, any potential impacts on the physical integrity of sedimentary substrates and of rock, boulder and cobble substrates are not regarded as important at the scale of the development and in the context of the wider environment.

Any potential impacts on the biogenic habitats and sessile and low-mobility benthic species are considered as not of ecological importance.

3.2 Fish and Shellfish

The most likely potential impacts on fish and shellfish would occur during installation as a result of drilling operations. Drilling will create noise which has potential to cause mild behavioural changes in some fish species; however, this impact will be localised and temporary.

While there have been anecdotal observations of fish and shellfish made during benthic surveys and seabed investigations, there have been no site-wide targeted surveys of fish and shellfish at the Fall of Warness test site. Some developer–specific studies have been undertaken, for example the study of Pollack (*P. pollachius*) by OpenHydro. This study indicated that Pollack seemed to exhibit an abundance response with a deployed tidal turbine. Aggregations appeared to be influenced by turbine velocity, with higher velocity rates reducing the number of fish observations, and the suggestion that the device was acting as a refuge or feeding site.

It is possible however to make reasonable assumptions as to the species likely to be present, based primarily upon the habitats and physical conditions at the site. The environmental appraisal concludes that no potential impacts of relevance to fish and shellfish ecology are expected from developments at the Fall of Warness EMEC test facility.

3.3 Marine Mammals and Basking Shark

The key potential impacts to be considered for marine mammals and basking sharks are collision with operational devices, collision/interaction with installation vessels, and disturbance/displacement due to underwater noise and/or physical presence of devices.

Sightings of marine mammals and basking shark at the Fall of Warness tidal test site have been recorded under the EMEC land-based visual wildlife observation programme since July 2005. This data provides a valuable source of information that has been used to characterise the existing environment and assess the potential impacts of the use of the area as a marine energy test site on these species.

Harbour porpoise is the most frequently sighted cetacean at the test site, with other frequently spotted species being minke and killer whales, and white beaked and Risso's dolphin. Although other cetacean species could occur at the site, due to their higher occurrence, these five species can be regarded as appropriate species to consider in relation to the potential risks to other cetacean species as well. For this reason, it is these five species that have been the subject of specific appraisal. The appraisals carried out show that the potential impacts of the tidal energy test site will *not* be detrimental to the maintenance of the population of these species at Favourable Conservation Status in their natural range.

EMEC wildlife observations and other existing data show that the Fall of Warness test site area is used by both grey seals and harbour seals, with a higher number of grey seals in comparison to harbour seals.

Harbour seals are present in the Fall of Warness during the pupping season (June and July) and during August when adult seals haul out to moult. Tagging studies show that individual seals are transiting through the Fall of Warness and it is likely that they are also using this area when foraging. There is a strong possibility that those harbour seals transiting through the test site, or utilising any of the nearby haul outs, could be associated with the Sanday Special Areas of Conservation (SAC). However, the distance between Fall of Warness and the Sanday SAC, plus the presence of other (albeit smaller) harbour seal haul-outs in the vicinity of the Fall of Warness and wider Orkney sea area, make it highly likely that a large proportion of the harbour seals present are not associated with the Sanday SAC.

The location of the Faray and Holm of Faray SAC together with the Muckle and Little Green Holm Site of Special Scientific Interest, and other non-designated nearby haul outs frequented by grey seals (e.g. Seal Skerry), might explain the higher number of grey seals observed using the test site area. Again, these seals are present during both the breeding season (October to December) and moulting period. There is a strong possibility that some of the grey seals using the Fall of Warness are part of

the population from Faray and Holm of Faray SAC. However, there are several other grey seal haul outs in the vicinity and in Orkney generally, including some with even greater proximity to the Fall of Warness test site (e.g. Muckle Green Holm and Little Green Holm, and Seal Skerry). Consequently, it is highly likely that a large proportion of the grey seals present in the Fall of Warness are *not* associated with the Faray and Holm of Faray SAC.

The appraisals carried out for seals show that the tidal energy test site will not adversely affect the integrity of any of these protected sites.

Coastal surveys in the vicinity of Fall of Warness, including a survey conducted in 2010 at the site of the EMEC cable landfall, indicate that otters use the area. There are signs of foraging and rest areas present along the south-west coast of Eday, and on Faray and Holm of Faray to the north of the test site. Interaction between otters and operational tidal turbines leading to injury or death is considered unlikely. Otters may be impacted by onshore aspects of development activities, and therefore installation or maintenance of cabling will require project-specific appraisal and appropriate consultation to determine any mitigation requirements and any need for a licence to disturb otters.

Basking sharks have been recorded at the Fall of Warness test site between June and October, with peak sightings in July and August. The environmental appraisal concludes that it is considered that the potential impacts from the tidal test site will not have any negative implications for the conservation status of basking sharks.

3.4 Birds

The EMEC wildlife observation programme has shown that a variety of bird species use the area of the Fall of Warness tidal energy test site. These include sea-ducks, divers, petrels, gannets, cormorants & shag, skuas, gulls & terns, and auks.

There are no Sites of Special Scientific Interest (SSSI) in the immediate vicinity of the Fall of Warness which have any bird species as notified features. While some other coastal SSSI in the wider area of Stronsay Firth and Westray Firth do have birds as notified features, and could conceivably be adjacent to transit routes for some vessels in use at the Fall of Warness test site, these areas already support a moderate amount of vessel activity, including creel boats likely to work in relatively shallow waters. The environmental appraisal therefore concludes that any additional vessel traffic associated with the Fall of Warness test site is unlikely to add significantly to any disturbance impact or have any adverse impact on the notified bird features of these SSSI.

The environmental appraisal concludes that, for all seabirds, any potential impacts are not regarded as important at a Scottish population level.

3.5 Marine Water Quality

Marine water bodies within the vicinity of the test site are all considered by the Scottish Environment Protection Agency (SEPA) to be in good condition.

Pollution from the normal activity of vessels is strictly controlled by regulations that implement the International Convention for the Prevention of Pollution from Ships (MARPOL) and its various annexes and protocols. All vessel masters are required to adhere to MARPOL regulations and vessels are audited for safety by the Maritime and Coastguard Agency (MCA).

The site NRA outlines mitigation to reduce the risk of accidental vessel collision and reduce the risk of oil spills. There may be small amounts of hydraulic oil in devices themselves. In the unlikely event that this oil accidentally enters the environment, the volume is likely to be low and it is expected that the high energy site will disperse and dilute contaminants rapidly.

The anticipated impact of any potential pollution arising accidental emissions from vessels carrying out activities at the test site, or from devices operating at the site, is considered to be of minor significance due to the limited potential for contaminants to enter the marine environment.

3.6 Hydrology, Geology, and Surface Water

The potential impacts on the onshore hydrology, geology and surface water relate to activities associated with construction of the onshore electricity sub-station and installation of the sub-sea electricity cables. Potential impacts include changes to surface water or groundwater flow patterns, potential releases of polluting materials, and the potential for flooding.

Construction of the onshore electricity sub-station was completed in 2007, and due to the small scale of any future additional onshore works together with adherence to best practice on site, these impacts will be of negligible significance.

3.7 Seascape and Landscape

The Fall of Warness tidal test site is visible from some remote residences and minor roads: however any visual impact on the site is primarily due to vessels in transit

through the Stronsay and Westray Firths, including passenger ferries and some cruise ships.

The area is subject to moderate intensity use by a variety of other vessels, including those from the fishing, aquaculture and shipping sectors, which themselves contribute to the baseline visual environment. The presence of installation/support vessels associated with EMEC activities at the site is considered to have minimal impact, even where visually obtrusive, as all such activities are temporary and reversible, and will not be in-situ long enough to alter the seascape, coastal character or visual amenity.

While most tidal energy convertor devices do not include any surface-piercing or surface-buoyant aspects, there is a presence of surface-piercing and surface-buoyant devices already in existence at the Fall of Warness test site (namely the supporting infrastructure for the OpenHydro tidal turbine currently under test at the site, and the intermittent deployment of the ScotRenewables floating tidal energy conversion device). There is potential for more surface-buoyant devices to be installed at the site in the future.

The environmental appraisal concludes that for all aspects of the seascape, landscape and visual amenity all potential impacts are regarded as unimportant.

3.8 Commercial Fisheries

The main species fished in the area of the test site are brown, green and velvet crab, and lobsters. In the region of 12 creel fishing boats from Mainland Orkney and 2 from Westray regularly fish on the SW coast of Eday within the Fall of Warness, with the catch amounting to upwards of 30% of their total catch throughout Orkney. Individual vessels may have a greater reliance on the fishing stocks in the area, estimated as up to 50% in some cases (Orkney Fishermen's Association). Whilst scallop diving does take place in the Fall of Warness, it is understood that this activity is limited by safety constraints due to the high tidal flow at the site.

At its inception in 2004, EMEC identified consultation with local fishermen over development of the Fall of Warness tidal test site as a high priority. EMEC is keen to gain feedback from fishermen about proposed deployments at the site, and holds regular consultations and update meetings with Orkney Fisheries Association and Orkney Fishermen's Society in order to keep them informed of developments at the test site and seek their views on upcoming proposed deployments. Input from local fishermen proved invaluable when establishing the extent of the test site, with the boundary with the west coast of Eday amended to follow the 30 metre water depth contour line, and agreement that fishing activity could continue in the shallower waters out-with this boundary where there is no device testing or cable presence.

3.9 Shipping and Navigation

The Fall of Warness is within an International Maritime Organisation (IMO) adopted "Area To Be Avoided" which requires all vessels over 5,000 tonnes carrying oil or other hazardous cargo to avoid the area designated. The inherent nature of the channel makes it hazardous for small craft (leisure sailing/diving boats), although it is used by larger vessels. Cruise ships and pelagic fishing vessels use the channel for passage, creel fishermen operate in the area, and the inter-island ferries use a number of routes through the channel in response to poor weather and associated sea conditions.

A NRA for the test site has been undertaken with the following recommendations:

- All sea users will be informed of any intended works via a Notice to Mariners.
- All works will take place in conditions of calm weather and good visibility
- All vessel associated with works at the test site will have marking and lighting in accordance with COLREGS

The risk mitigation measures proposed in the NRA are deemed to reduce any risk to shipping and navigation to an acceptable level.

3.10 Traffic and Transport

The majority of materials and equipment associated with the test centre will be brought to the test site area by sea, therefore minimising disruption to road traffic.

3.11 Archaeology

An archaeological study, commissioned as part of the EIA for establishing the test site, comprised a desk-based assessment followed by a walkover survey at the following sites:

- Cauldale: the sub-station building site and access road
- Greentoft Bay possible navigational marker site: the marker site with associated construction area and access
- Muckle Green Holm possible navigational marker site: the marker site with associated construction area and access
- Little Green Holm possible navigational marker site: the marker site with associated construction area and access
- The offshore test site: comprising the offshore area within the limits of the test site, including the cable routes and cable end positions

This study identified several sites of archaeological interest, none of which would be impacted by the development and operation of the test centre. In addition, recent seabed surveys carried out have uncovered no evidence of any wreckage. It is therefore considered extremely unlikely that any archaeological remains will be located, and the potential impact from operation of the test centre is considered to be negligible.

3.12 Onshore Noise

Potential sources of onshore noise associated with the test centre include drilling during construction of the sub-station, noise generated by onshore vehicles, and noise generated by marine vessels. The electricity sub-station on Eday is now fully constructed and operational, and any noise generated by onshore vehicles will be minimal and of a temporary nature. No significant onshore noise is predicted during operation of the test centre.

3.13 Socio-economics

The development of the test centre has provided many socio-economic benefits to the local community. Approximately 300 local jobs have been created in around 40 different local companies, particularly to support the installation and on-going operation and maintenance of devices under test at the centre. In addition, there has been an increase in spend on local services, particularly during the device installation phase of developers' projects, from the influx of personnel to the area.

There is also on-going spend on local services associated with operation and maintenance of devices under test. It is estimated that developers testing at EMEC spend around £1million per device in the local economy, and EMEC's total local spend to the end of 2013 was £7.7 million (2005 - 2013).

3.14 Tourism and Recreation

Tourist activity on Eday tends to be dominated by bird and wildlife watching, with other activities such as visiting ancient monuments and archaeological sites.

It is an aim of EMEC that the presence of the tidal energy test centre should add to the local economy, without discouraging existing tourism. Information leaflets are provided to the local tourist information centre to encourage and inform visitors.

3.15 Military Activity

There are no military exercise areas immediately adjacent to the test site area and no indications of the area as being a transit route for anything other than surface vessels.

3.16 Cumulative Impacts

As discussed above, the environmental appraisal was based on a project envelope that describes maximum combined usage of the test site by multiple developers. The potential cumulative impact of the use of the Fall of Warness test site by multiple developers to deploy multiple devices has therefore been taken into account in the environmental appraisal.

The NRA, and developer annexes to it, collectively addresses cumulative navigational risks at the site, and mitigation measures are in place to ensure that such risks are minimised.

There are currently no other operational or consented marine renewable developments in the vicinity of the EMEC Fall of Warness tidal test site. There are two proposed tidal energy projects in the vicinity of the EMEC site: the Westray South Tidal Array (submission of consent application expected in 2015) is immediately adjacent and to the north of the site; and the Scotrenewables proposed Lashy Sound development off the east coast of Eday (currently at scoping stage).

Potential cumulative impacts (positive or negative) of these proposed developments in combination with the EMEC test site include:

- Impacts to commercial fisheries, including loss of access to fishing grounds, displacement to less profitable areas, increased steaming times, increased running costs and conflict between users of different gear.
- Impacts to marine mammals, through disturbance due to underwater noise, collision risk and displacement.
- Impacts to ornithology, through habitat loss, modification to migratory routes, collision risk and disruption to habitat function.
- Impacts to shipping and navigation, including constriction of shipping routes, increased navigational risk, increased travel and running costs.
- Impacts on local residents, including employment opportunities, improvements to local infrastructure, increased industrial activity and increased demand on social services during construction, with benefits to wider UK economy.
- Contributions to achieving Scottish and UK renewable energy targets and promotion of marine renewable energy technology.

- Benefits to emission reduction and climate and offset of traditional energy generation.

Given that the EMEC test site is well established and has been operating successfully for some years now, the potential cumulative impacts associated with the site are not considered to be significant and do not require any mitigation over and above that already in place.

Other proposed tidal energy projects in the Pentland Firth area are far enough away from the EMEC test site to not present any likely cumulative impacts.

Proposers of any new developments in the vicinity of the EMEC test site will be required to fully consider the potential cumulative impact of their proposal.

4 DECOMMISSIONING

In accordance with the Energy Act 2004, EMEC will establish a Decommissioning Programme (DP) for the site infrastructure only..

EMEC's seabed lease with The Crown Estate currently expires in 2022 and the DP will be developed in line with this timescale. Any requirements of the lease will be incorporated within the DP, and obligations will be passed on to site tenants via the EMEC client contract process as appropriate.

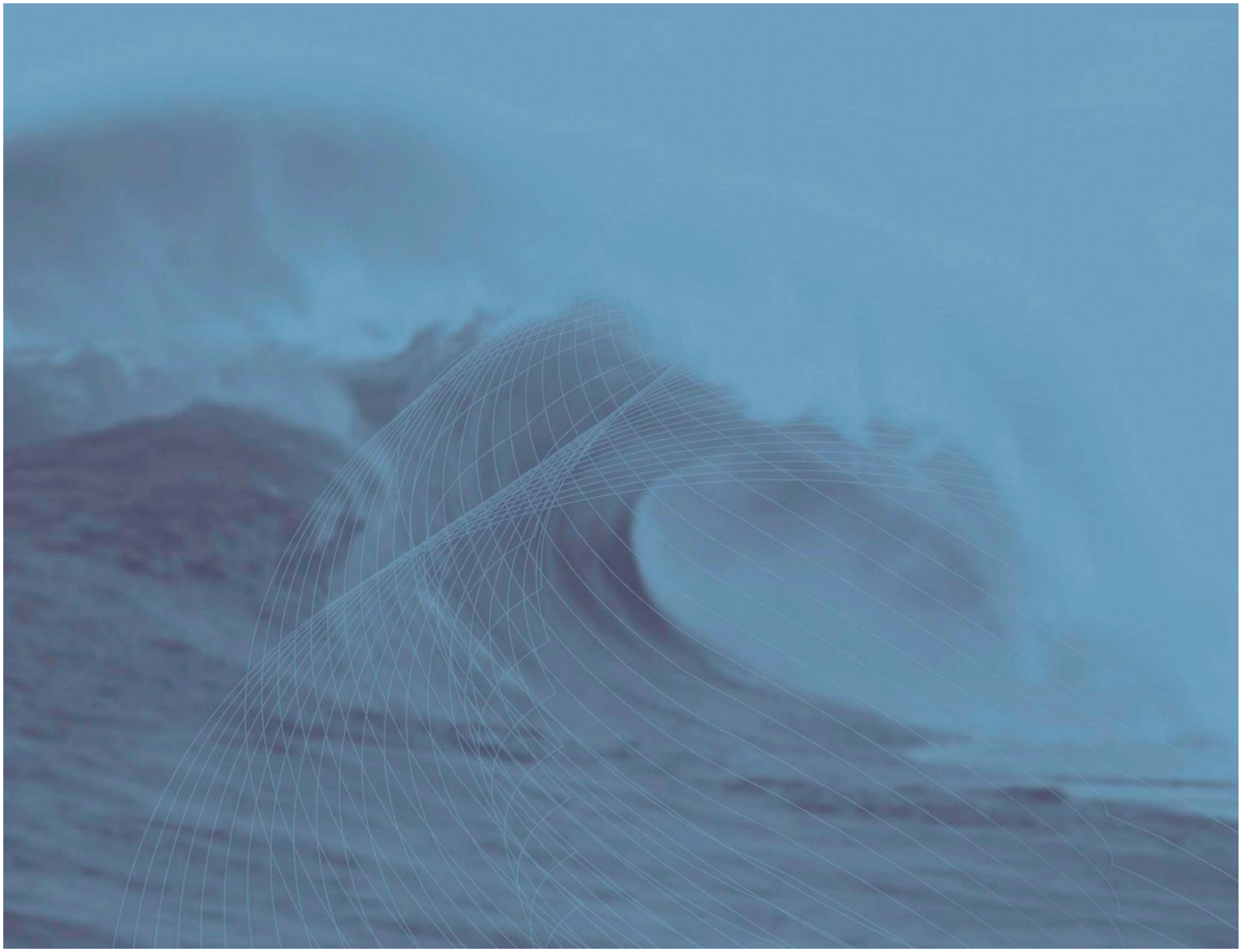
The DP will consider the latest technological developments, legislation and environmental requirements at the time that the work is due to be carried out.

It is anticipated that decommissioning of project-related structures will remain the responsibility of individual developers (enforced through condition of Marine Licence) although EMEC is currently (December 2014) progressing discussions with DECC on options for introducing efficiencies through streamlining of the decommissioning process.

5 THE CONSENTING PROCESS

An application for a generic, site-wide Section 36 consent under the Electricity Act 1989 was submitted to Marine Scotland in December 2014. Marine Scotland aims to make a recommendation with regards to the consenting of the project within approximately 9 months.

Electronic copies of the full ES and supporting documentation can be downloaded from the Marine Scotland Interactive website. Alternatively, the full documentation is available on request from EMEC at a cost of £15 for an electronic copy and £250 for a hard copy. Hard copies are also available to view in the Kirkwall and Stromness public libraries.



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