Welcome to **Fair Head Tidal Information Day**

Fair Head Tidal (FHT) was awarded an Agreement for Lease from The Crown Estate in 2012 which grants it exclusive rights to carry out surveys on the site and, subject to securing the necessary consents, apply for a long term lease to use the site for the construction and operation of a tidal array with an installed capacity of up to 100MW. This exhibition outlines some of the work being undertaken to support a formal planning application to the Department of the Environment, to seek consent to build and operate the project.

Who we are

FAIRHEAD TIDAL

Fair Head Tidal Project is the joint venture between two independent offshore renewable energy specialists, DP Marine Energy (DPME, a subsidiary of DP Energy Group) and DBE (a subsidiary of DEME).

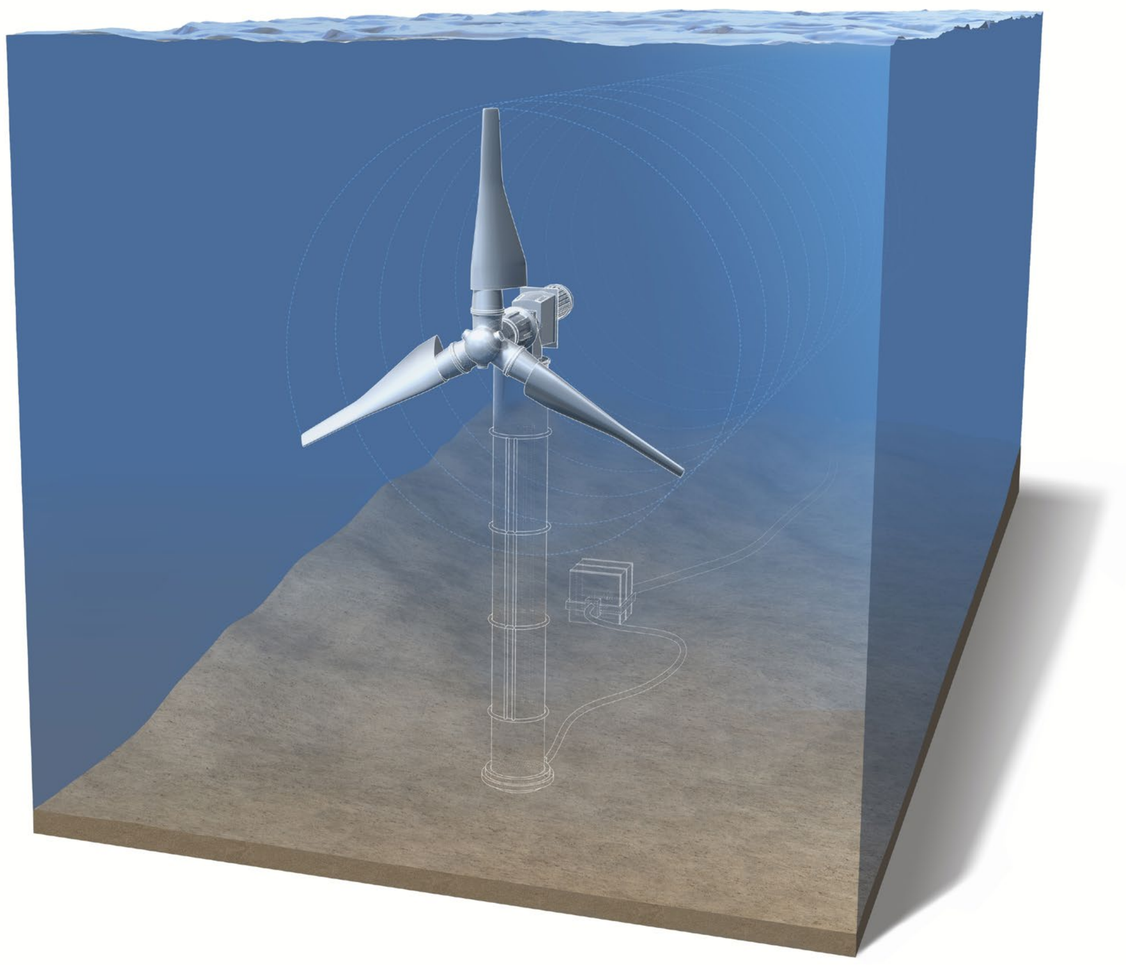
DP ENERGY

Cork-based DP Energy has been pioneering renewable energy projects for over 20 years. DPME specisalises in the marine renewable sector.

DBE
Wave & Tidal Solutions

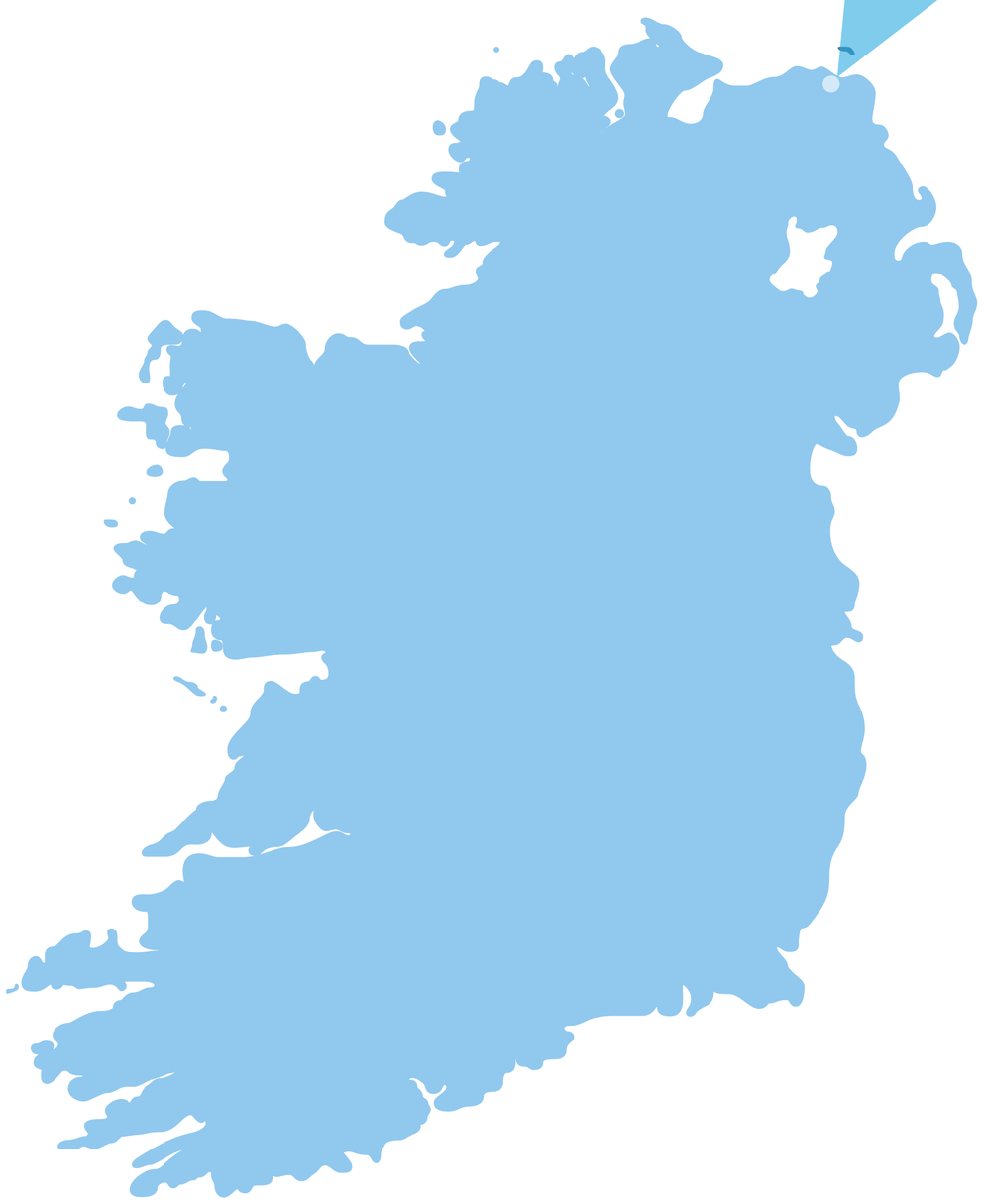
Belgium-based DEME is a Flemish marine construction group with 150 years of pedigree. It is one of the world's leading contractors in this field. DEME installed the SeaGen device in Strangford Lough, the first commercial tidal generation scheme in operation.

View North Across Murlough Bay Towards Fair Head



Artists Impression of SeaGen SU Turbine (copyright Siemens 2014)

Siemens MCT Seagen S tidal turbine in Strangford Lough



Fair Head **Tidal Project**

The island of Ireland shares a single energy market which means we are interdependent. Power stations fired by imported coal, oil and gas north and south of the border still generate the majority of the island's needs. But both administrations have now pledged to reduce our reliance on imported fossil fuels.

The island of Ireland is blessed with some of the best wind and tidal resources in Europe. Following on the success of MCT's SeaGen tidal generator in Strangford Lough in County Down, the NI government is now encouraging the development of more sustainable energy sources.

The Fair Head Tidal Energy project will be delivered in two phases. The first, up to 10MW demonstration array is proposed to connect into the existing grid system at Ballycastle. This would be one of the first tidal arrays in the world. The second stage would complete the proposed 100MW array of tidal turbines that would be capable of powering some 70,000 homes.

NI
ASPIRATION

Northern Ireland will seek to achieve 40% of its electricity consumption from renewable sources by 2020.

Energy Minister Arlene Foster says offshore renewable energy offers NI a great opportunity to develop.

“Offshore renewable energy provides security and diversity of supply, climate change mitigation and contributes to the Executive’s 2020 targets. It brings significant business supply chain opportunities for local companies.”

“I recently welcomed the signing of agreements for 200MW of tidal developments in Northern Ireland’s first offshore renewable energy Leasing Round. It is important now to ensure that the appropriate regimes are in place to facilitate the timely and sustainable development of these projects.”

A joint venture partnership between Open Hydro and Bord Gais called “Tidal Ventures Ltd” is developing a similar sized tidal energy project adjacent to Fair Head off Torr Head.

Assembly and loading of SeaGen S at Harland and Wolf Shipyard in Belfast (copyright Harland and Wolf)

Heavy Lift Barge “Rambiz” installing SeaGen S foundation in Strangford Lough

Crew access SeaGen S turbine for routine maintenance

“Offshore renewable energy provides security and diversity of supply, climate change mitigation and contributes to the Executive’s 2020 targets.”

Arlene Foster
MLA Minister of Enterprise, Trade and Investment

Development **Approach**

Our approach to the development of Fair Head is based on a number of fundamental principles, including:

Stakeholder Engagement – we are committed to sharing our proposals for the project widely and openly. We welcome feedback from all project stakeholders including the local community.

Delivering a Buildable Project – the tidal industry is still developing and Fair Head will be one of the first tidal arrays in the world. It is important that we recognise this when presenting our plans to the relevant authorities for permission to build the project. This includes taking a "technology neutral" approach by describing a range of different designs and configurations, for both the tidal turbines that may be deployed and also the plant and equipment used to install and connect them to the electricity grid.

Phased Development – at present the tidal industry is testing individual turbines such as the Seagen device in Strangford Lough. The next step for the industry is the demonstration of small arrays and for Fair Head we propose to build an initial array of up to 10MW connected into the existing onshore electricity network before building out a larger array of up to 100MW, which will require new onshore grid infrastructure. Each phase will be subject to separate consent applications.

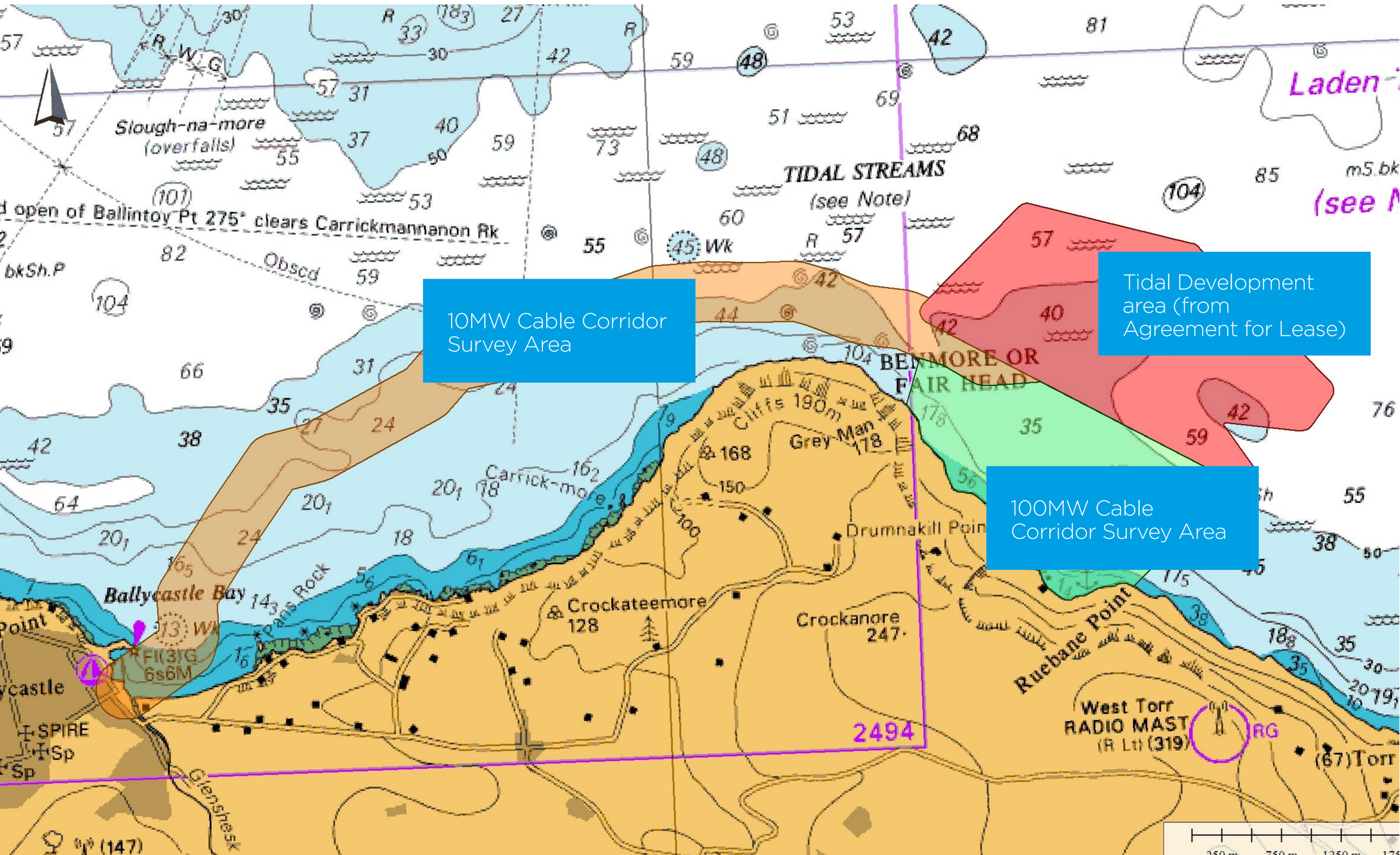
Whole Project – as far as possible we will design a project that considers all components from the tidal turbine offshore through to the connection into the electricity network onshore. This also includes considering all project phases from the current development stage, through construction and operation, to decommissioning.

Most of our current activities are focused on preparing a planning application for the first (up to 10MW) phase, which will be supported by two important documents, an Environmental Statement and a Navigational Safety Risk Assessment. To prepare these documents we undertake a number of site surveys and assessments in the following three areas:

- Physical Environment
- Biological Environment
- Human Environment

Over the next few months we expect to undertake further surveys and assessments in these three areas, as outlined below.

- Physical environment: (coastal processes)
- Biological Environment: (Mammals, Birds, Reptiles, Basking Sharks, Natural Fish, Benthic, Intertidal and Otter),
- Human environment: (commercial fishing, archaeology, landscape and seascape visual, traffic and transport, inc vessel movements, recreation and amenity, socio-economic)



Development
Proposed Timeline

Phase 1

2014

Scoping, Pre-application Consultation. Open days

Baseline surveys. Environmental Impact Assessment. Open days

Concept design. Project description. Assemble environmental statement

2015

Submit planning application. Continue communication

Expected decision on 10MW consent application

2016

Geotechnical survey

Detailed design and construction methods

2017

Commence construction of 10MW project

Phase 2

The balance of 100MW is expected to follow between one and two years behind phase 1 with a similar process and will be timed to coincide with onshore grid upgrades

Scoping, pre-application consultation, open days
A scoping opinion is sought from the relevant authorities and consultation undertaken with statutory and non-statutory consultees and members of the public to help define the scope of the Environmental Impact Assessment (EIA). FHT is committed to effectively engaging the public and local communities at an early stage in the development.

Baseline Surveys
This is the collection of data which will form the baseline for the EIA. This involves carrying out various surveys and site investigations including geophysical, benthic, bird and marine mammal data collection. This data will then be assessed to determine the impacts that the proposed development may have upon the baseline characteristics.

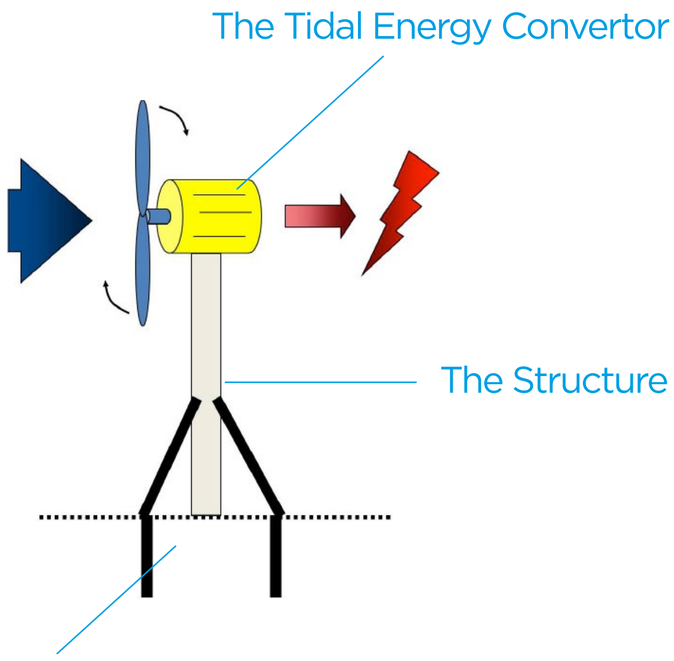
Concept Design and Project Description
This is a continual refinement of the layout which takes account of any environmental information and which seeks to find the best fit layout for the site at the same time as avoiding any significant impacts where possible.

Preparation of Environmental Statement (ES)
The findings of the EIA in terms of the phyical, biological and human environments are presented in an ES which is a publicly available document that will be submitted to Department of the Environment (DOE), Marine Division (MD) and the Department of Enterprise, Trade and Investment (DETI) at the time of seeking consent for the development.

Submission of Application
The application with accompanying ES will be submitted to DOE MD and DETI for approval

Review of Application
The submitted application is reviewed by DOE MD, DETI and statutory consultees. The parties reviewing the document can request additional information. The developer is thereafter required to provide this.

Evaluation of Proposal
Once DOE MD, DETI and all statutory consultees are happy that they have received and reviewed all of the information, they will assess the proposal against local planning and energy policy and decide whether consent should be granted.



Tidal Energy **Technology**

Tidal technology (often rerfered to as Tidal Energy Converter or TEC) works in a similar way to wind turbines. The water flows over the hydrofoil sections (the 'blades') and creates 'lift' like an aeroplane wing. The blades then rotate driving an electrical generator.

We are working with a number of leading tidal technology developers and are taking a "technology neutral" approach to consenting the site.

It is expected that the consent application will therefore describe a range of different designs and configurations based on the features explained and illustrated below.

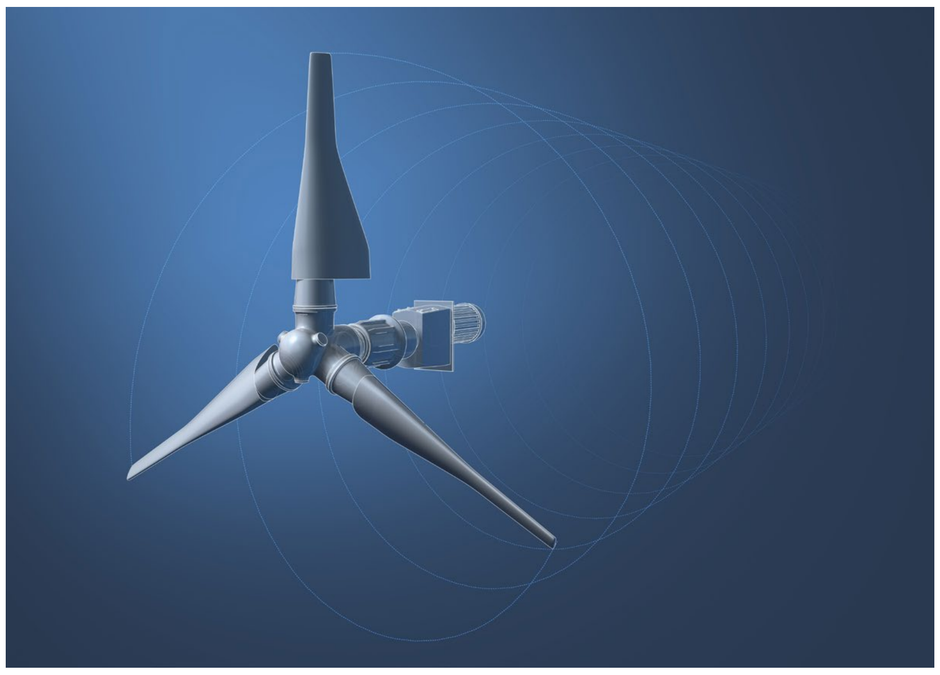
Technology
Most devices comprise of the following main components:

1. The Fixings/Base
The Fixings/Base holds the structure in the required location so that it can counteract the forces of the sea and TEC acting on it. The fixings for Fair Head are likely to be based on drilling into the seabed by multiple smaller holes for pin-piles. Alternatively, a gravity base with sufficient mass to counteract the overturning forces on the TEC may be considered.

2. The Tidal Energy Convertor
The Tidal Energy Convertor (TEC) converts the kinetic energy in the flowing water to electricity. We expect the devices to be 3-bladed open rotors driving an electrical generator either directly or using a gearbox to increase the speed of generator rotation to make it more suitable for electricity generation. The rotor is expected to be around 18m to 24m diameter, rotating around once every six seconds.

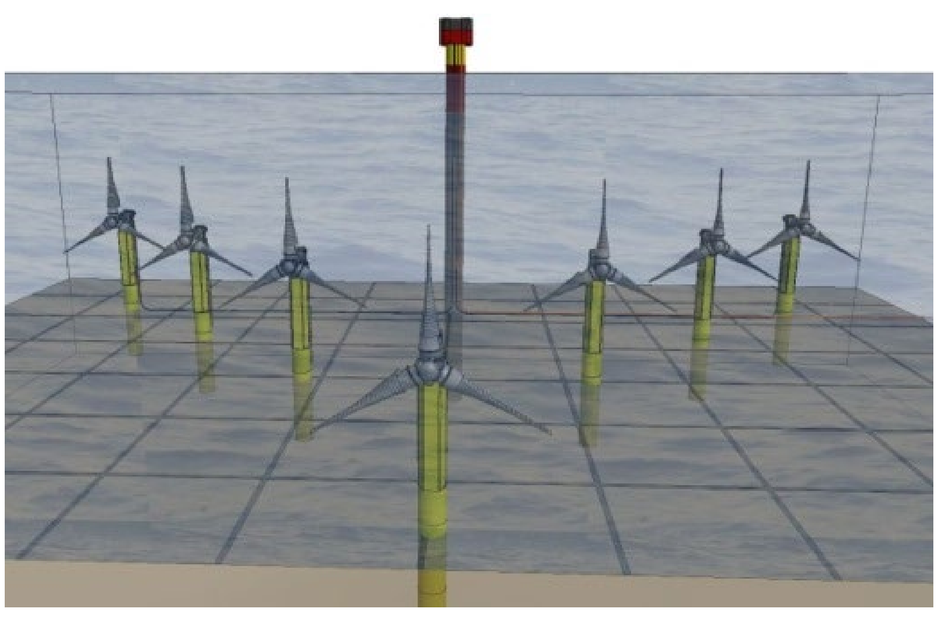
3. The Structure
The Structure supports one or more TEC's and is expected to be based on a tripod or monopile configuration. Depending on the site resource conditions and expected variability in tidal flow, this structure may allow the TEC to rotate and align with the tidal flow for efficient operation.

The following images show some of the above features on devices being developed by some of the leading industrials in the sector:



Artists Impression of SeaGen SU Rotor (copyright Siemens 2014)

Alstom 3 bladed TEC on quayside at Hatston, Orkney, prior to testing at EMEC (copyright Alstom 2014)



An artist impression of an array of turbines connected into a single surface piercing structure

Single TEC, capable of rotating to face flow, on a tripod structure, pin piled into the seabed (copyright Alstom 2014)

Tidal Energy
Resource

Understanding the nature of the tidal energy on the site is very important when calculating the potential amount of electrical energy (MegaWatt-hours). This knowledge informs the design of the devices ensuring they are built to withstand the various loads during operation and including extreme events.

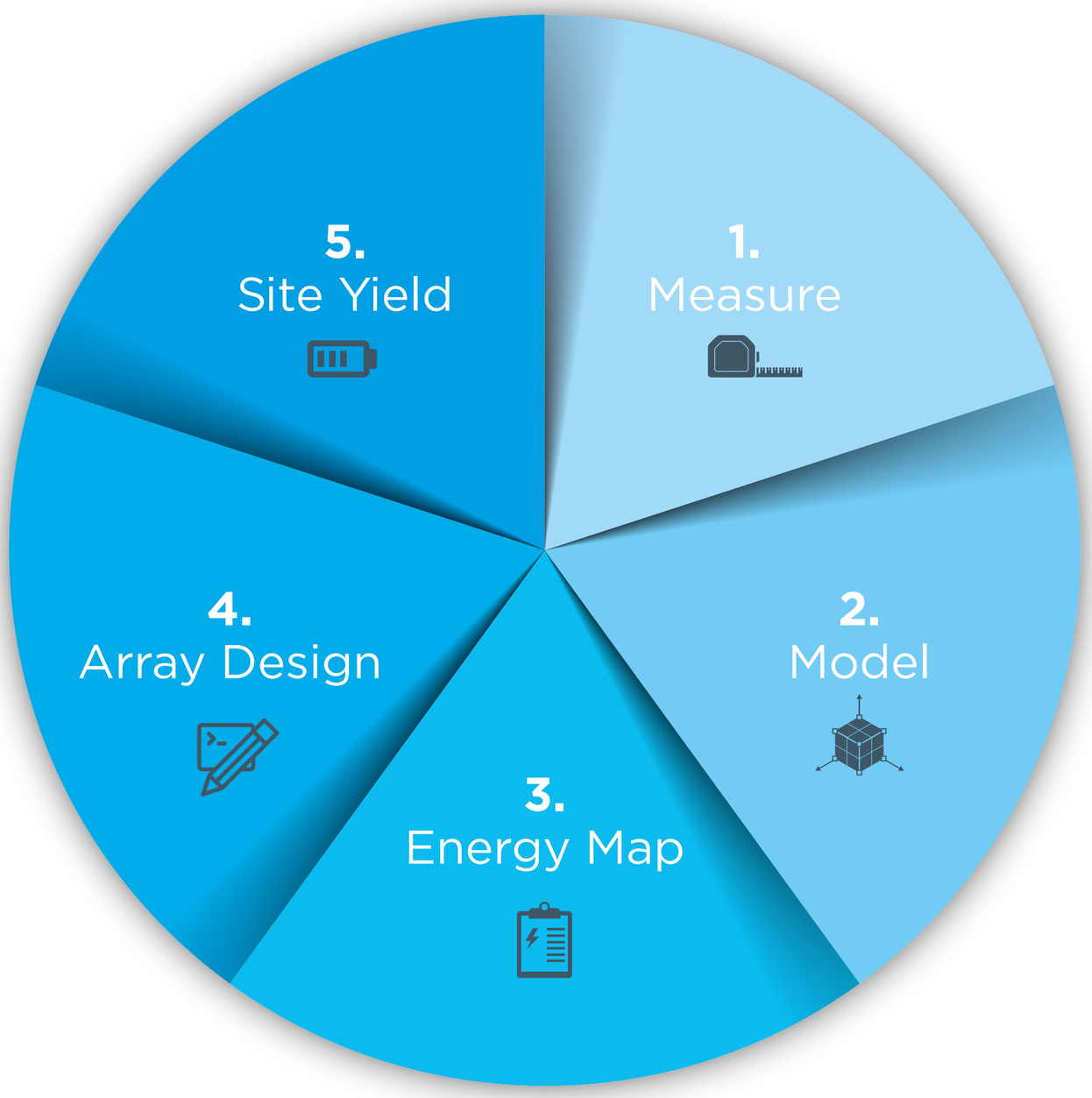
Step 1 - Measure
Tidal measurements on site: Acoustic Doppler Current Profilers (ADCPs) have been placed on the seabed at various locations across the Fair Head site. They measure current speed and direction throughout the water column at predefined intervals. They are typically deployed for a minimum period of 28 days in order to acquire data over a full tidal cycle.

Step 2 – Model
Preparing a computer model to predict 'whole site' tidal characteristics: the model is used to build a 2-dimensional flow model across the whole site. The data from the ADCPs is used to validate the flow model.

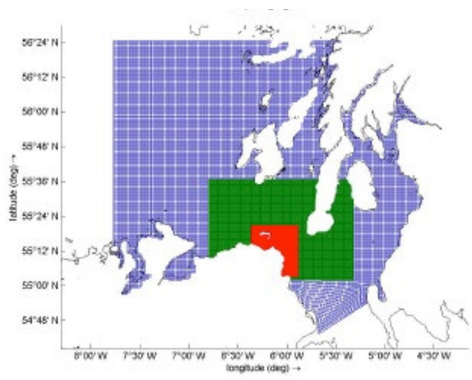
Step 3 – Energy Map
From the model, we create an "energy map" by estimating the amount of raw marine energy across the whole site. The raw kinetic energy in the water is calculated across the whole site to identify the areas of greatest resource interest. This kinetic energy is directly proportional to the cube of the flow (velocity) which explains why high velocity sites have significantly more energy than low velocity sites.

Step 4 – Array Design
Preparing a layout of tidal energy devices across the site – an array design. The level of knowledge on designs of tidal arrays is still evolving, and the experience gained from initial demonstrator projects will provide important learning points.

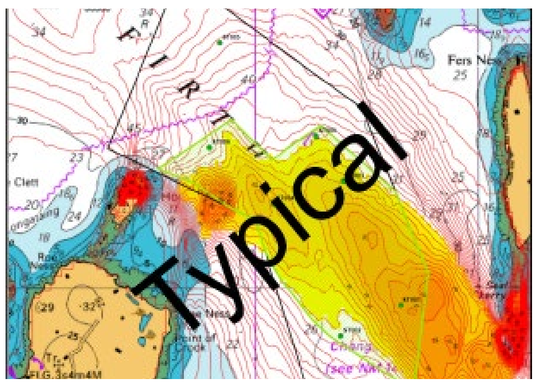
Step 5 – Site Yield
Calculating energy production by combining energy map, array design and technology data. Once an energy map has been produced and an initial array design selected, the information will be used with tidal device performance data to calculate the amount of electrical energy produced by each device on an annual basis. The energy output for each of the devices is then aggregated to arrive at a total annual energy production for the site.



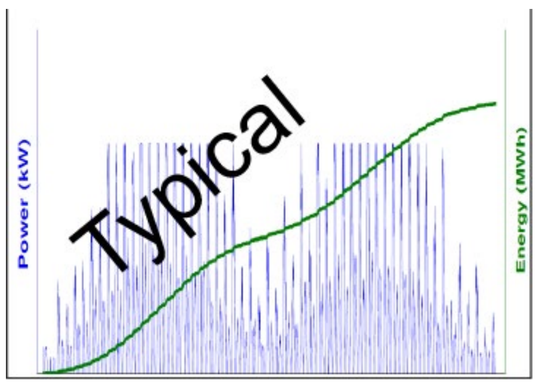
ADCP`s Being Deployed



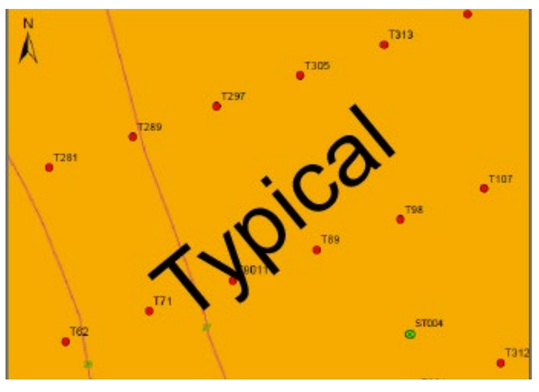
Model



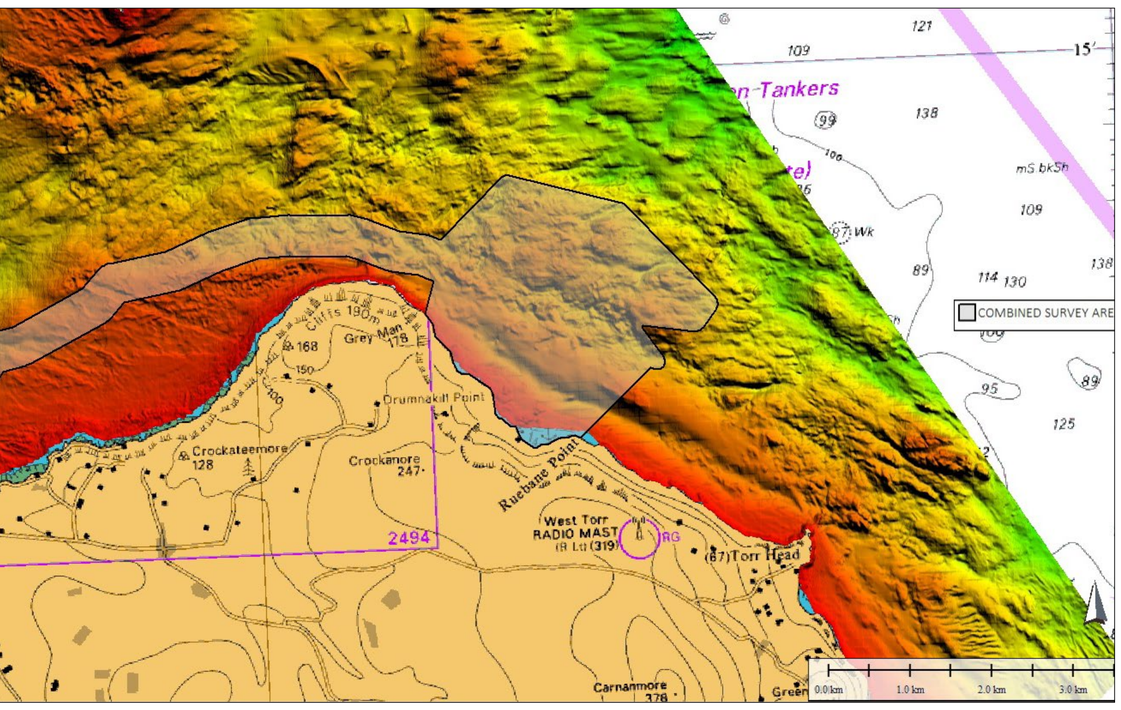
Energy Map



Site Yield

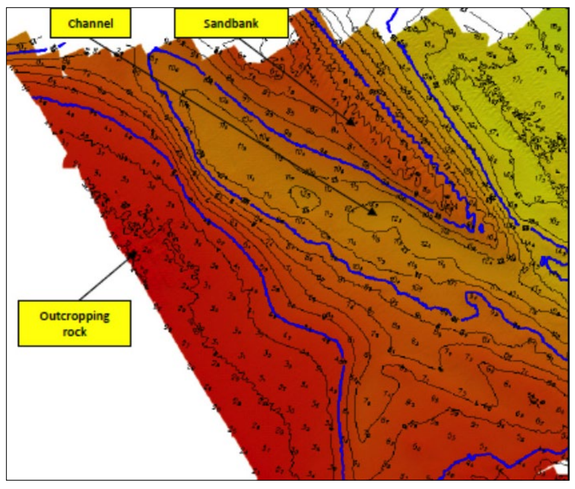


Array Design

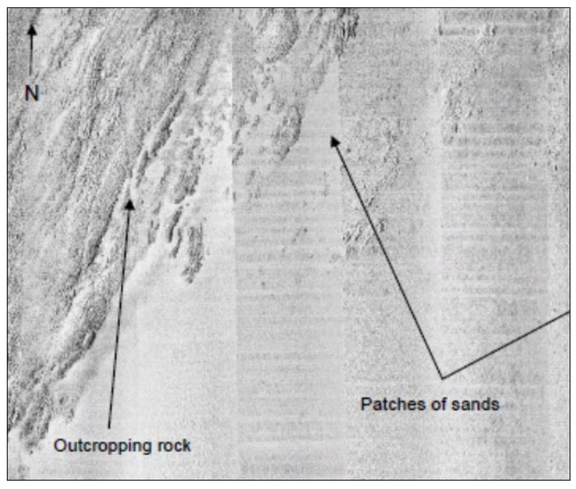


Sea bed off Fair Head

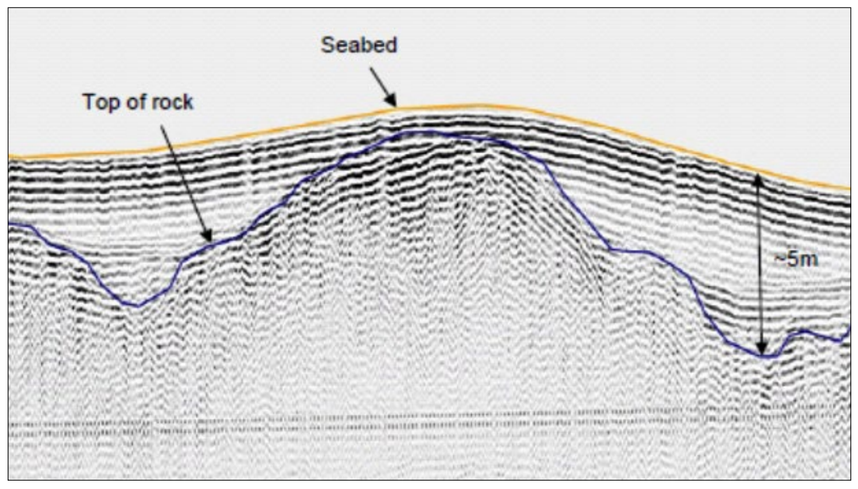
Corystes vessel used for the geophyisical survey on the Fair Head site



1.



2.



3.

Physical **Environment**

Physical Environment
The physical environment survey results provide data that is critical to identify areas where it is technically feasible to place tidal turbines and other infrastructure. This includes tidal resource measurement. Information on this is presented on a separate display.

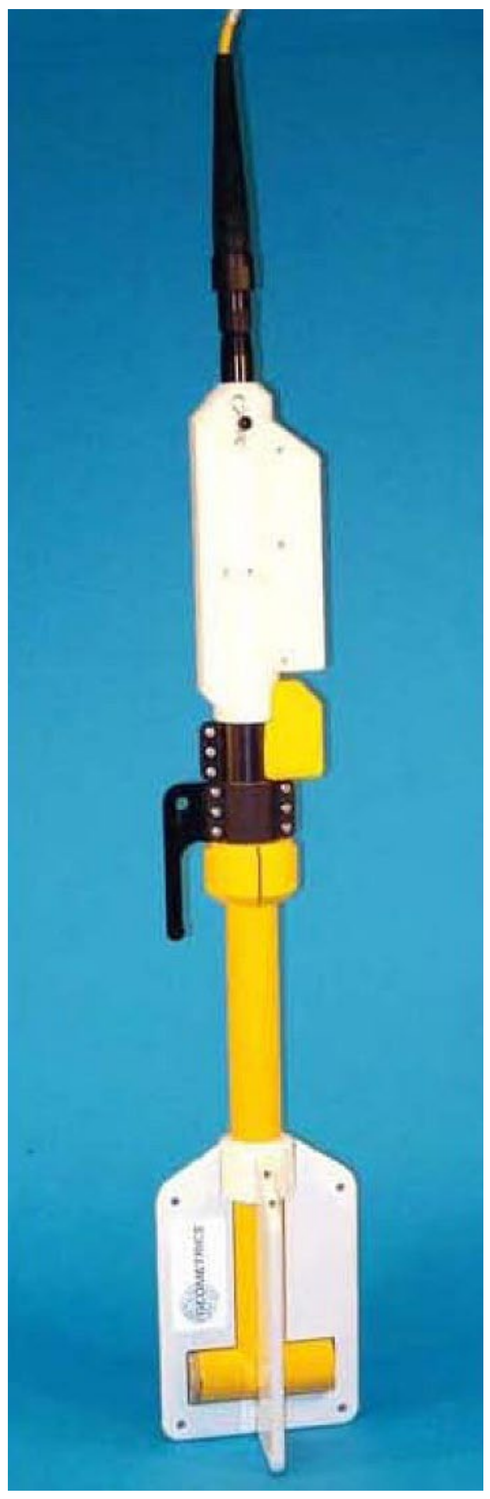
GEOPHYSICAL SURVEY

1. Bathymetry
This provides detailed information about water depth. The data can also be manipulated to provide information about seabed slopes, features and habitat types.

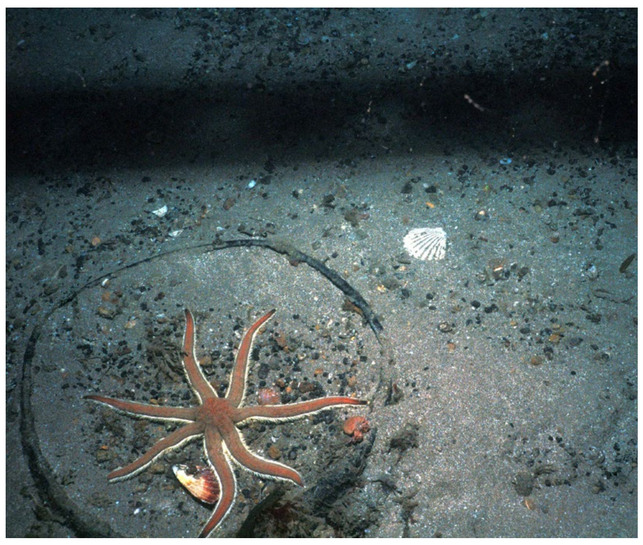
2. Side Scan Sonar
Sonar pulses are sent out from a 'fish' towed by the survey vessel which is 'flown' 10-15m above the seabed. The length of shadow cast by seabed features enables their size to be determined. This defines different benthic communities and to assist in locating sunken vessels, pipelines or debris.

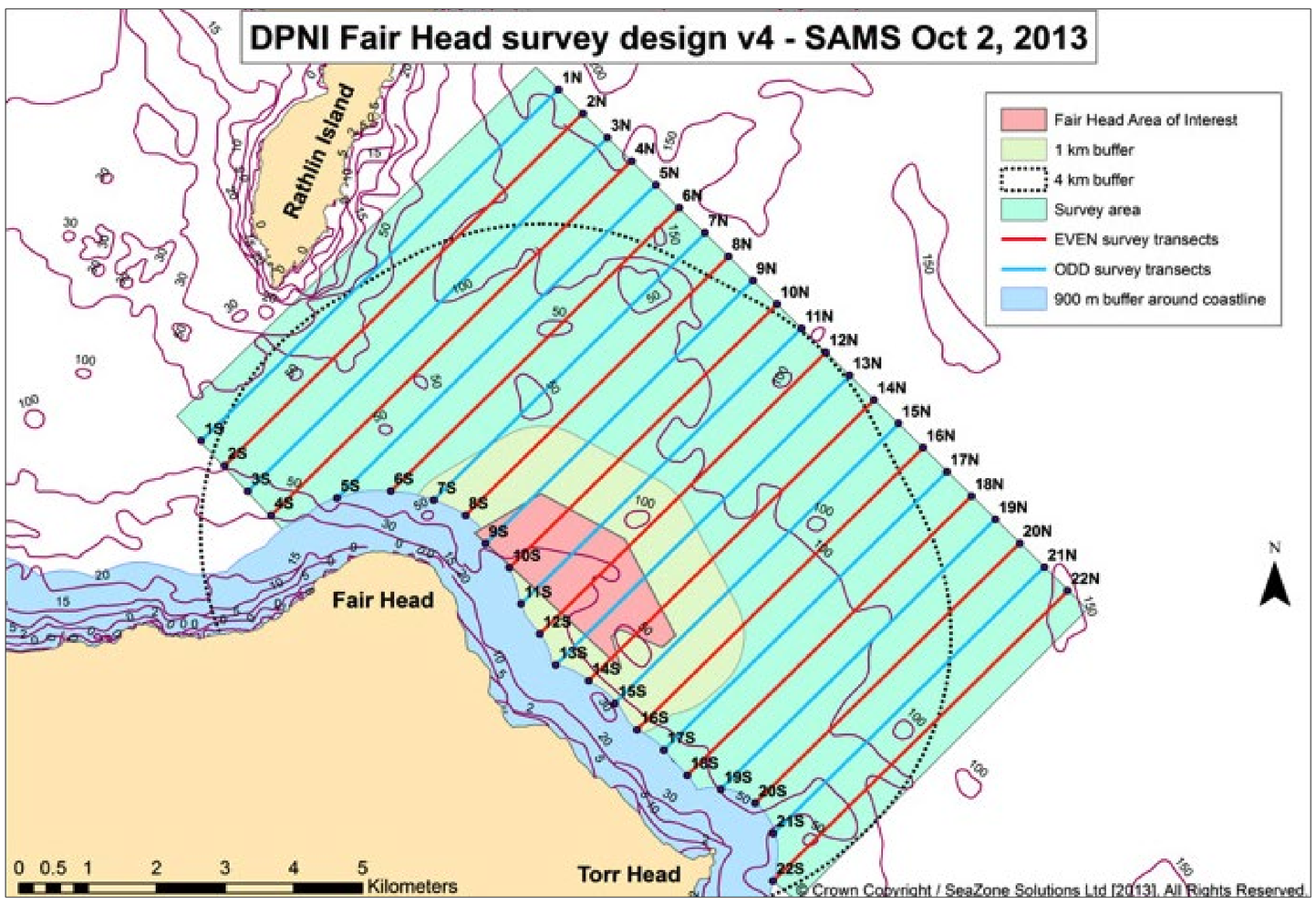
3. Sub-Bottom Profiler
Data on the depth of sediment, including identifying if there is any at all, is important when considering options for cable routing and also to inform assessment of potential effects the development might have on sediment movement.

4. Magnetometer
This piece of equipment is normally towed on a short cable from the side-scan sonar 'fish'. It detects metallic objects which may be wrecks, old anchors or other large ferrous objects.



4.





Biological **Environment**

Site investigation
Biological surveys provide baseline data about habitats and the species that use the proposed development areas. A key aim of the surveys is to determine if there are any species and/or habitats which may be sensitive to the type of development proposed.

Mammals, Birds, Basking Sharks and Reptiles
Since July 2013 birds and marine mammals have been surveyed visually along a series of transect lines from a boat at approximately monthly intervals. The survey covers the Agreement for Lease area and a buffer of up to 4km as shown on the map. The sightings for porpoise and dolphins are complemented by hydro-acoustic data collected simultaneously using towed hydrophone equipment setup to detect the distinctive clicking noises made by these species.

Benthic Ecology
Some indication of the benthic ecology can be gained through analysis of the geophysical data. However in order to ‘ground truth’ this it is necessary to take video or camera stills of the seabed. Where there is sediment some grab samples may also be taken.

Human **Environment**

Landscape and Visual Assessment

A detailed landscape and seascape assessment will be undertaken to assess the impact of any surface piercing structures and provide suitable mitigation measures.

Landscape effects derive from changes in the physical landscape which may give rise to changes in its character and how this is experienced.

Visual effects relate to changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes and to the overall effects with respect to visual amenity.

The aim of the landscape and visual assessment is to identify, predict and evaluate potential key effects arising from the proposed development.

Seascape Effects

Seascape effects will be assessed within a 15km radius study area. A seascape character assessment will establish the baseline conditions, and examine the sensitivity of the seascape and surrounding study area to change associated with the development of a tidal farm.

Visual effects will be assessed using a Zone of Theoretical Visual Influence (ZTVI) map and a viewpoint analysis. A draft ZTVI will be prepared to a 15km radius, which will indicate the theoretical visibility of the proposed tidal farm. The visibility from receptors will be described and a viewpoint assessment carried out to determine the effect of the tidal farm on specific receptors and viewpoints in the study area.

The ZTVI is a useful tool to enable potentially sensitive receptors (viewpoints, walks etc) to be defined.

Commercial Fishing

In order to assess the potential impacts on this area for the site and the wider interests where the proposed cable route will run, a commercial fishing assessment will be undertaken in conjunction with local fishing interests. This will be carried out in several steps.

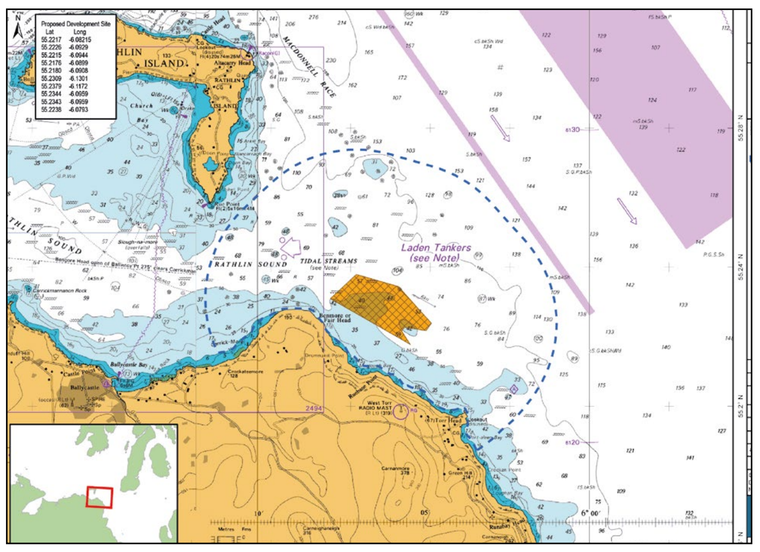
- Baseline assessment using historical data and fisheries statistics between the years 2001 and 2010.
- Satellite and surveillance tracking and description of vessels and gear;
- Operating patterns and practices; and
- Future predicted patterns.

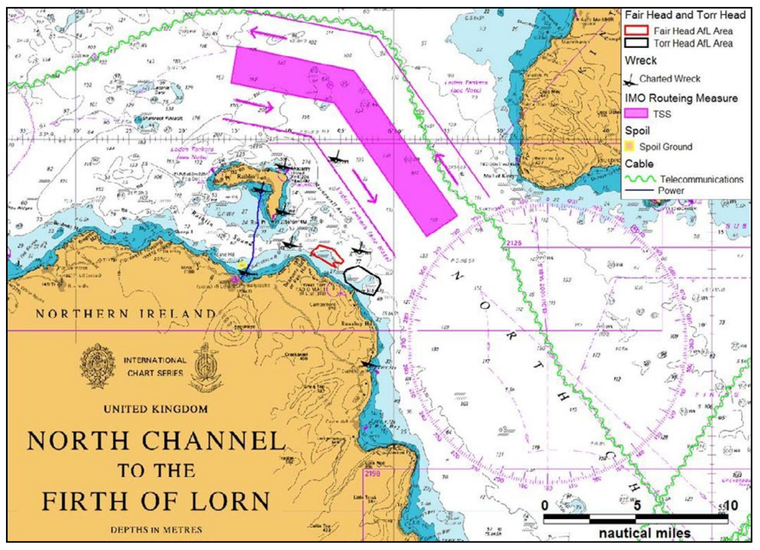
Consultation with fishing groups has already commenced.

Shipping and Navigation

A Navigational Safety Risk Assessment (NSRA) has already commenced to better understand the types of vessels transiting the site. This assessment will help to inform a risk assessment which will be undertaken to assess the safety implications of the purposed development on navigation.

View north across Murlough Bay towards Fair Head





North Channel Navigational Features

Typical 110kV Wooden Transmission Poles

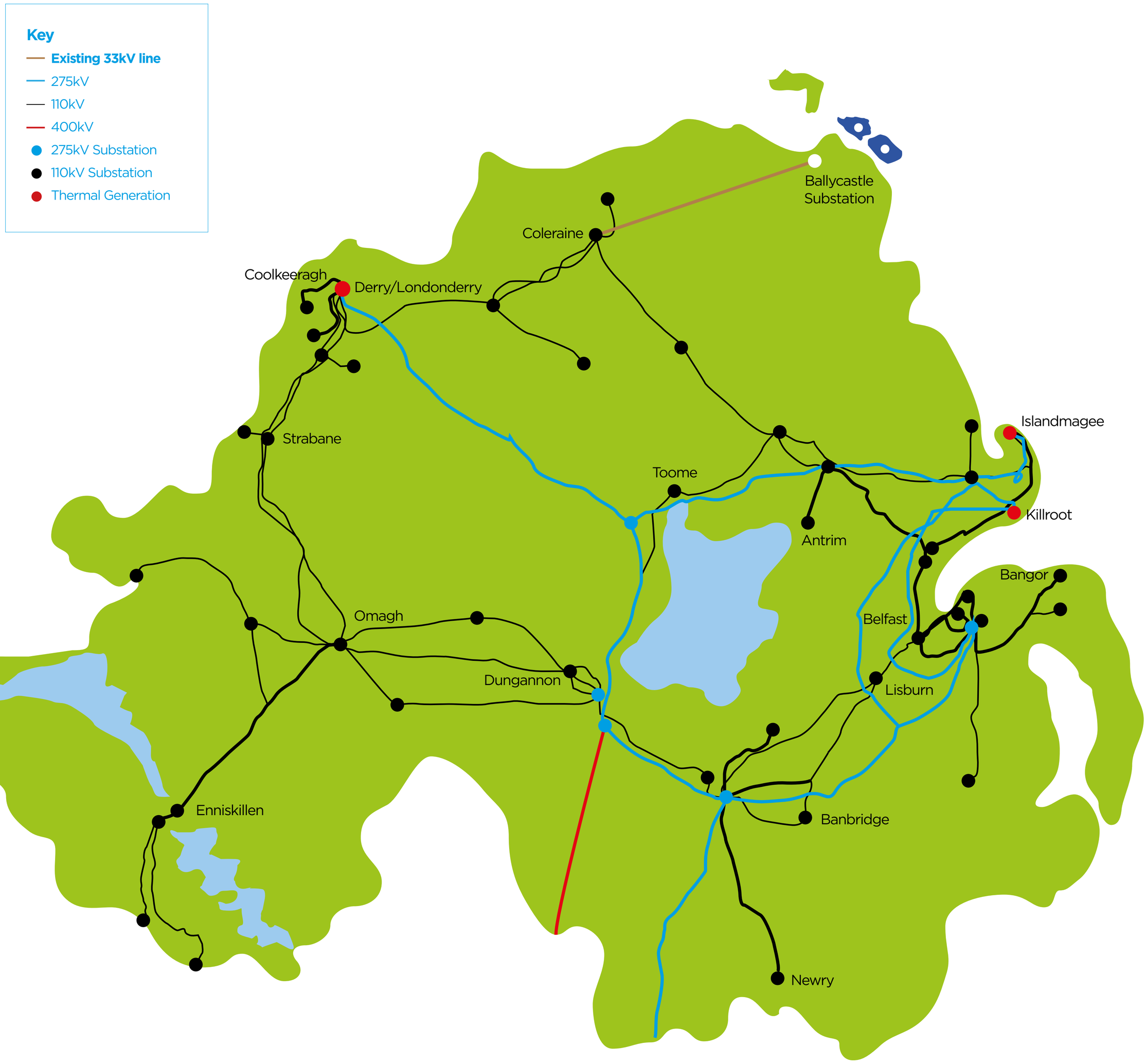
Onshore Grid **Connection**

FHT are working closely with the System Operator for Northern Ireland (SONI) and Northern Ireland Electricity (NIE) to develop the grid connection strategy for the project.

NIE is assessing feasibility for connection of the 10MW project at the Ballycastle 33kV substation. A feasible connection at Ballycastle will enable early delivery of the demonstration array.

Connection of the larger Phase 2 of the project will require new onshore infrastructure works. A new regional substation is expected to be required and it is very likely that this would be common infrastructure providing connections for both the Fair Head and neighbouring Torr Head project.

The new substation is expected to be joined to the existing network by a 110kV transmission wooden pole based overhead line connection. Options for the location of the connection into the existing NI transmission network are still under assessment, but include the Loguestown, Mid-Antrim and Kells substations.



What Happens **Next?**

The survey work will continue for the coming months, gathering data to further inform the EIA and ES which will be submitted in support of the Planning and Marine Licence Applications which we propose submitting in early 2015.

We will hold a further round of public exhibitions before we submit our applications to bring you the latest project information. These exhibitions will be widely advertised nearer the time.

Your Comments
We value your comments and would very much like to hear your thoughts about our proposals for the Fair Head Tidal Project. Your comments will help inform the development of the project. Please take the opportunity to speak to a member of staff today and complete a comments form. Copies of these exhibition boards, comments forms and other project information will be made available on the project website shortly after the events. The website address is: **www.fairheadtidal.com**

If there is an aspect of the project you would like to discuss further, please include your contact details in the questionnaire and a member of the project team will contact you. Your contact details will only be used by us in relation to this project.

Communication
Communication with communities and stakeholders is very important to us and we strive to provide information about our projects in as open and honest a way as possible. We hope that you have found the information provided here today both useful and interesting.

We will provide updates via the project website and via the project Twitter feed. Contact details include:

www.fairheadtidal.com
Twitter: @fairheadtidal

Project Manager:
Blair Marnie
M: +44 (0)77 7584 6039

Environment Manager:
Clodagh McGrath
M: +353 (0)87 737 5642

Press and PR
Joris Minne,
Tel: +44 (0)28 9076 0066
E: Joris.minne@jprni.com