Call for Expression of Interest from Marine Energy Technology Developers

for deployment at the AMETS Test Site, Offshore Belmullet, Co Mayo, Ireland

August 2021

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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The Sustainable Energy Authority of Ireland (SEAI) has been developing the Atlantic Marine Energy Test Site (AMETS) off Annagh Head, west of Belmullet in County Mayo since 2009. AMETS was initially envisaged as a grid connected test site for precommercial wave technologies. However, Wave Energy Conversion (WEC) technology has had slower than expected development over the last 10 years. Given the location of the test site in one of the world's most energetic environments, and the depths on site AMETS has been identified as being suitable for also testing Floating Offshore Wind (FOW) devices.

AMETS forms part of a national suite of infrastructural facilities set up to enable technology development and progression towards commercial viability. A small-scale site includes the deepwater basin and test tanks at LIR national Ocean Test facility in Cork, with an intermediate scale site at SmartBay Marine and Renewable Energy Test Site in Galway Bay. It is intended that full scale Marine Energy devices could be tested at their final stages of pre-commercial development at AMETS, *Figure 1*.

Figure 1. Ireland Marine Technology Test Facilities

To date no testing activity has commenced on site. Work on the project has primarily focussed on data acquisition and getting relevant consents and planning applications in place, the current status of which are as follows:

- Foreshore consent (lease) for the offshore element of AMETS was awarded in January 2015, which allows deployment of WEC devices, subject to the necessary pre-approvals. During this phase an Environmental Impact Assessment Report (EIS) was completed and formal consultation with statutory consultees and public consultation took place. Documentation related to this lease (including the EIS) is available at : Sustainable Energy Authority of Ireland (SEAI) | Department of Housing, Planning and Local Government

- Planning permission for the substation was awarded by An Bord Plenala in April 2017. The onshore element of the site comprises a small substation with office space for developers which will be constructed in the vicinity of Belderra Strand.

- The grid connection agreement is in place with ESBN since 2011. A grid connection route has been designed and submitted as part of the substation planning permission application. The connection agreement offers up to 10MW of generating capacity.

In summary, the site holds a lease for the deployment of WEC technology and work is progressing to seek a licence to deploy FOW technologies.

Figure 2. Atlantic Marine Energy Test Site (AMETS) location, Belmullet, Co. Mayo, Ireland.

2 About SEAI

The Sustainable Energy Authority of Ireland (SEAI) is Ireland's national sustainable energy authority. SEAI was established by Government under the Sustainable Energy Act 2002 and has a mission to transform Ireland into a society based on sustainable energy structures, technologies and practices. SEAI's key objectives are:

- implementing strong energy efficiency actions.
- accelerating the development and adoption of technologies to utilise renewable energy sources.
- supporting innovation and enterprise for our low-carbon future.
- and supporting evidence-based responses that engage all actors.

3 AMETS Introduction

The AMETS site is located on the Belmullet peninsula, offshore Co. Mayo (Figure 1). AMETS covers Test Site A which is in 100 m water depth, located ~16 km from landfall at Belderra Strand. The site under lease covers 6.99 km^2. Test Site B is in 50 m water depth, 6 km from Belderra Strand and is 1.52 km^2 in area, *Figure 3*.

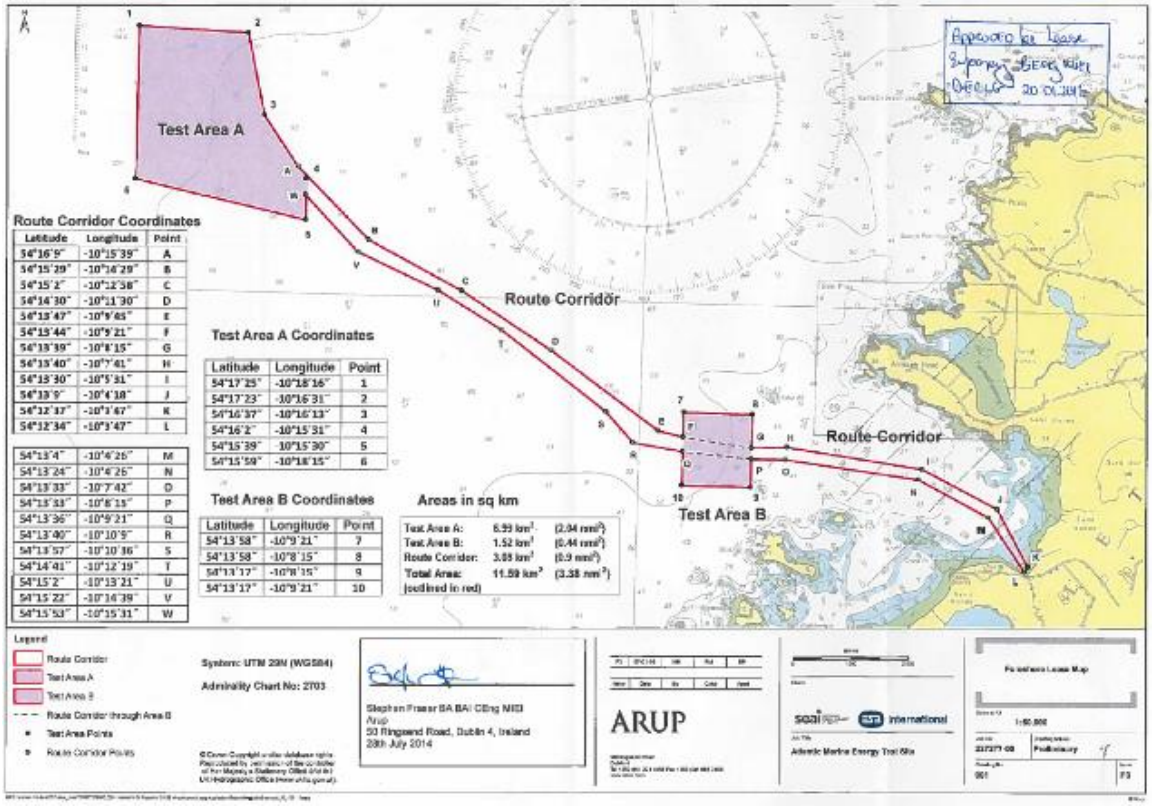


Figure 3. AMETS Test Areas A and B, and cable route corridor

AMETS was selected as an ideal test site due to its energetic wave climate (Wave H_S 16.7 m, average wind speed 8.8 m/s, max wind 35.1 m/s), it being deep water (50-100m) and close to shore, with a sandy seabed suitable for cable and moorings.

4 Grid connection and Substation

The test site will be connected to the grid, via an offshore electrical cable, which will make land at Belderra Strand. The current agreement with the grid operator has a total generating capacity of 10MW for both AMETS A and B test sites. Both the cable route and shore station have already received planning permission.

The current offshore lease allows for 4x10Kv cables (2 from site A and 2 from site B) from the site to the shore. At present, it is proposed to have at least two export subsea power cables from test site A and B to the onshore substation. Each cable will be buried for protection at least one meter in depth where feasible, with alternative protection methods eg. mattressing in rocky locations. Each connection point will accommodate the testing and validation of either a single or multi technology devices. The generated electricity will travel to the local grid from the substation via conventional 20 kv overhead and underground transmission lines similar to those already in use in the area.

The approximate length of the cable from test site A to the onshore junction box in Belderra strand is about 16 Km, while the length of the cable from test site B to the onshore junction box is about 6km. There will be an onshore export cable(s) from the onshore junction box in Belderra strand to the onshore substation which is around 700 m away from the beach as indicated in Figure 5 below.

Each export subsea cable will be connected to an offshore connector to facilitate the connection of the technology dynamic cable to the static export cable.

Figure 4 below illustrates the export subsea cables arrangement.

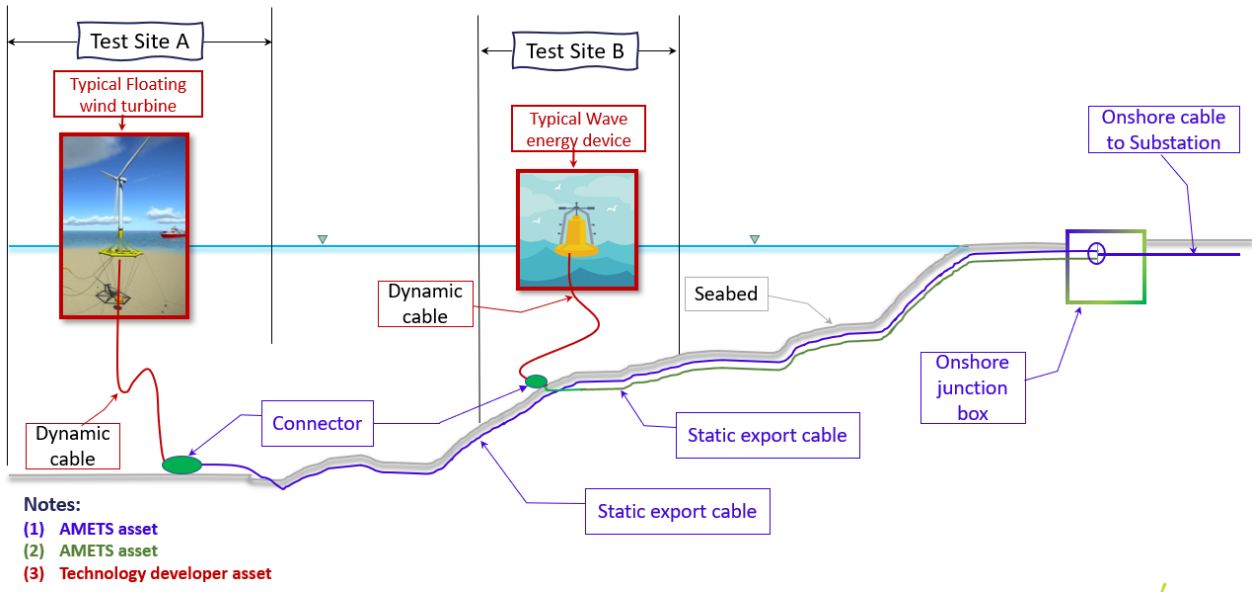


Figure 4. *Export Subsea Power Cable Layout*

Figure 5. *Google Earth Image Belderra Strand (SW beach) showing substation location*

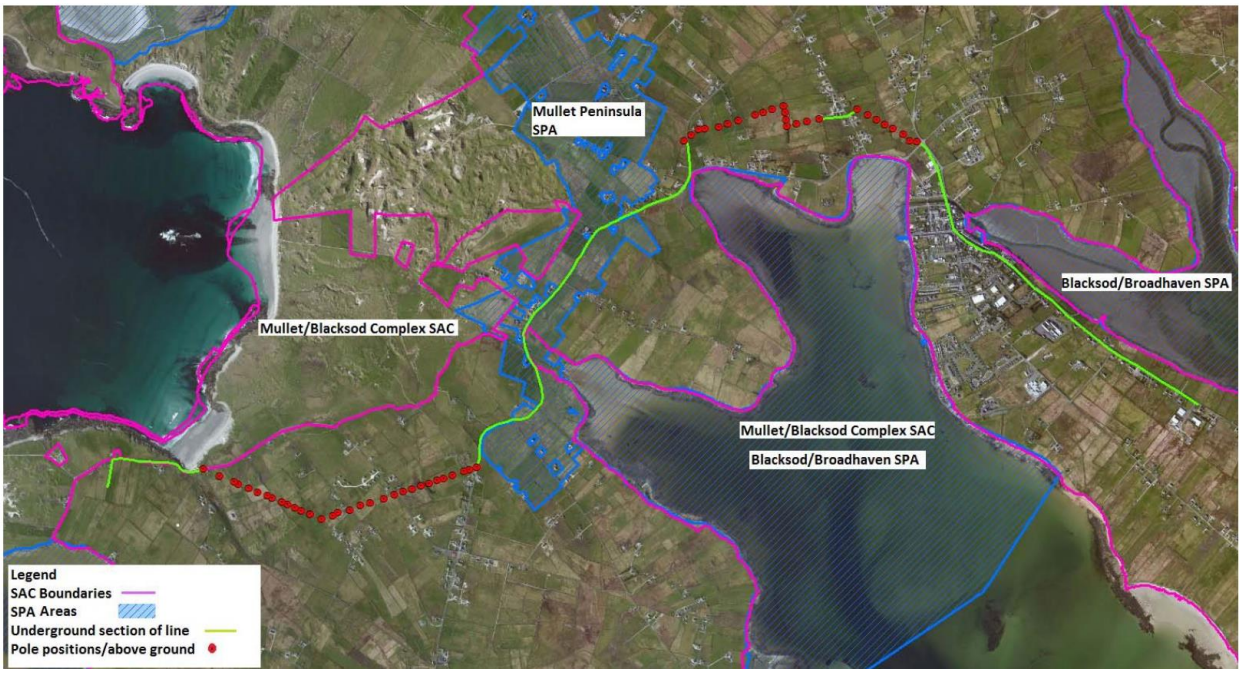


Figure 6. *Planned Onshore Cable Route (Pole and Underground Locations)*

5 Wave climate

Wave monitoring at AMETS consists of a directional Waverider buoy located at both Test Area A and B. The Waveriders have been installed at, and collecting data at Test Site A since May 2012, and at Test Site B since Dec 2009. The data can be accessed in near real-time at the following webpage (in CSV, JSON, KML format):

https://www.oceanenergyireland.com/Observation/Download.html

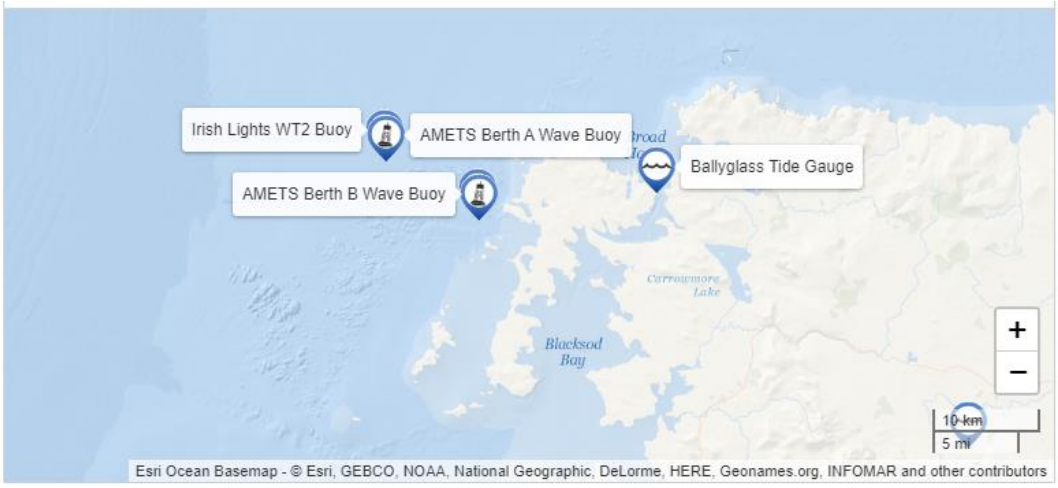


Figure 7. Location of monitoring devices in the AMETS area

This wave data has facilitated the development of a well validated wave model for the sites which has been used to provide accurate wave energy maps for the area. These maps are available at http://atlas.marine.ie/OceanEnergy.html#?c=53.9108:-15.9082:6

The table below outlines the measured wave parameters at Sites A and B.

	SITE A	SITE B
ANNUAL MEAN OMNIDIRECTIONAL WAVE POWER FLUX KW/M	60-70	60-70
ANNUAL MEAN SIGNIFICANT WAVE HEIGHT (M)	3	2.9-3
MAX WAVE HEIGHT (1:50 YEAR RETURN PERIOD) (M)	16.7	-
ANNUAL WAVE DIRECTION (°)	270	-
MAX. CURRENT SPEED (10YR MAX) (M/SEC)	2.46 Free surface 0.28 Seabed	-

In addition to the data gathered from waveriders, current data has also been gathered from ADCP devices over the following periods:

- June-July 2011 – ADCP Data from Berth A and Berth B
- July- September 2016 – ADCP Data from Berth A and Berth B
- October 2019- April 2020- ADCP Data from Berth A
- April- August 2020 ADCP Data from Berth A and Berth B

Should a developer be expressly interested in using the AMETS site, ADCP data is available on request.

6 Wind climate

Ireland's Marine Renewable Energy Atlas provides an overview of the wind resource and can be found at http://atlas.marine.ie/OceanEnergy.html#?c=53.9108:-15.9082:6 (taken from the Irish national onshore and offshore wind atlas 2003 and 2013). The 2003 wind atlas reports on the mapping of mean wind speeds and power at heights of 50m, 75m and 100m above MSL on a 200m grid spacing onshore, and on a 400m grid offshore up to 20km. The 2013 atlas is a remodelling of these inputs.

The table below shows the mean and average wind speeds measured at Site A.

	SITE A	SITE B
MEAN WIND SPEED @ SEA LEVEL (M/SEC)	8.8	-
MAX WIND SPEED @ SEA LEVEL (M/SEC)	35.1	-

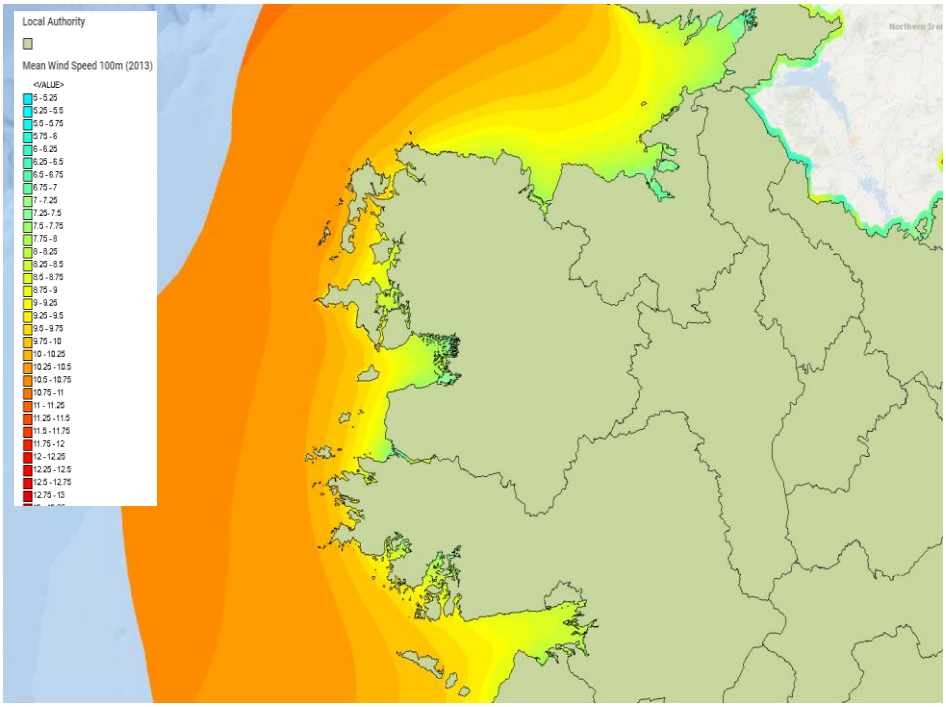


Figure 8. Mean Wind Speed 100m above MSL for Mayo area (source atlas.marine.ie)

Wind data for Europe, including Ireland can also be accessed at New European Wind Atlas (https://map.neweuropeanwindatlas.eu/).

7 Mooring conditions

Surveys to date have indicated that both test site A and B have a seabed composed of sand or glacial till which would be suitable for conventional drag or suction anchors, *Figure 10*.

Historically six Infomar (Marine Institute and GSI) geophysical campaigns have extensively surveyed the area (CV07, 08, 10, 11, 14, 16), however not all were be-spoke AMETS site assessment surveys, *Figure 9*. The collected dataset comprises sub bottom profile data (SBP), multibeam bathymetry (MBES) and some surveys side scan sonar (SSS). The data is available to download at https://jetstream.gsi.ie/iwdds/map.jsp

The deeper water area outside the 10m depth contour is well covered by good quality MBES data (Figure 1 & 2 and Marine Institute, 2008). In general, the multibeam data is a good indicator of, and nicely locates the hard bedrock which outcrops at seabed (Pre-Cambrian quartzo-feldspathic gneiss, most of which is likely the Annagh Division (Marine Institute, 2008)).

Where the surveys were part of a wider national campaign (CV 07, 10, 16) the vessel speed was not optimised to obtain good quality SBP data. Where a more bespoke survey was shot (CV08, CV11) survey speed was optimised to get good data, however data quality was impacted by poor weather conditions on both surveys – but to a lesser extent on the CV08 campaign, where some data highlights the top bedrock nicely (*Figure 11*).

A good geotechnical database exists comprising 96 vibrocores across the area (*Figure 10*). A cursory interpretation shows that where bedrock is close to / or at seabed the facies is a gravel, with sandier facies being found further from the bedrock.

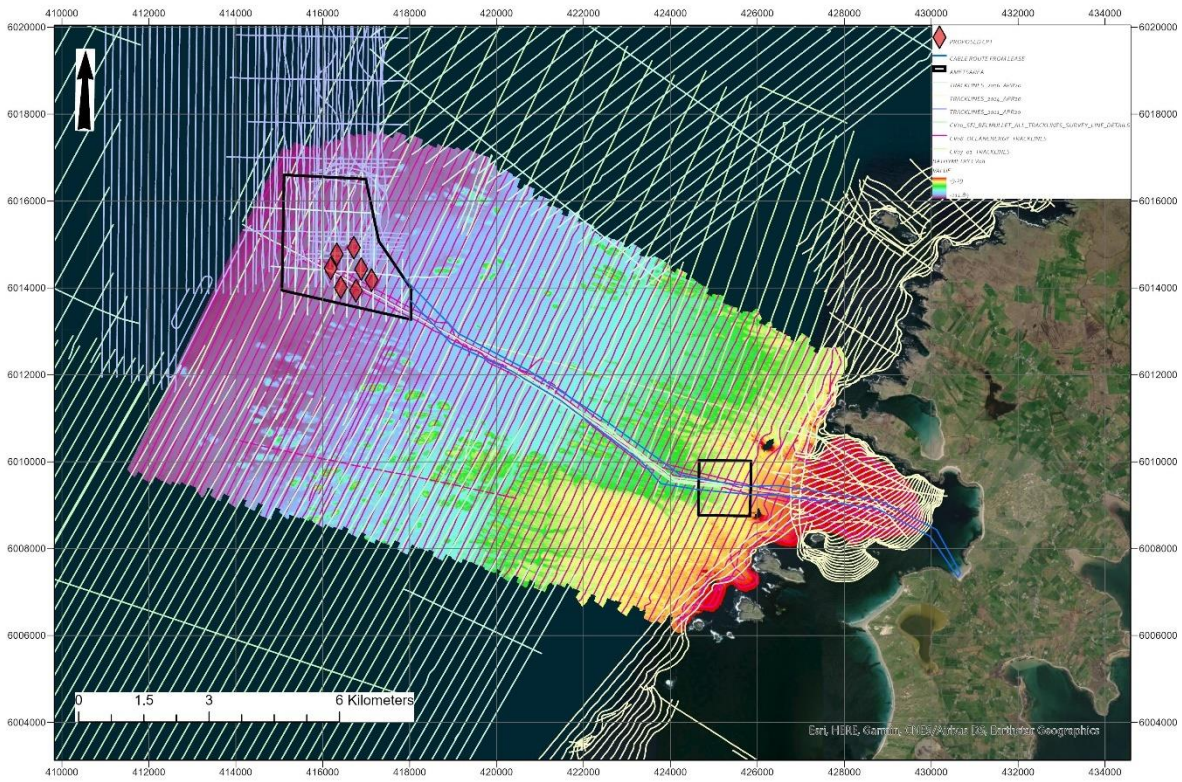


Figure 9. Infomar Survey Database

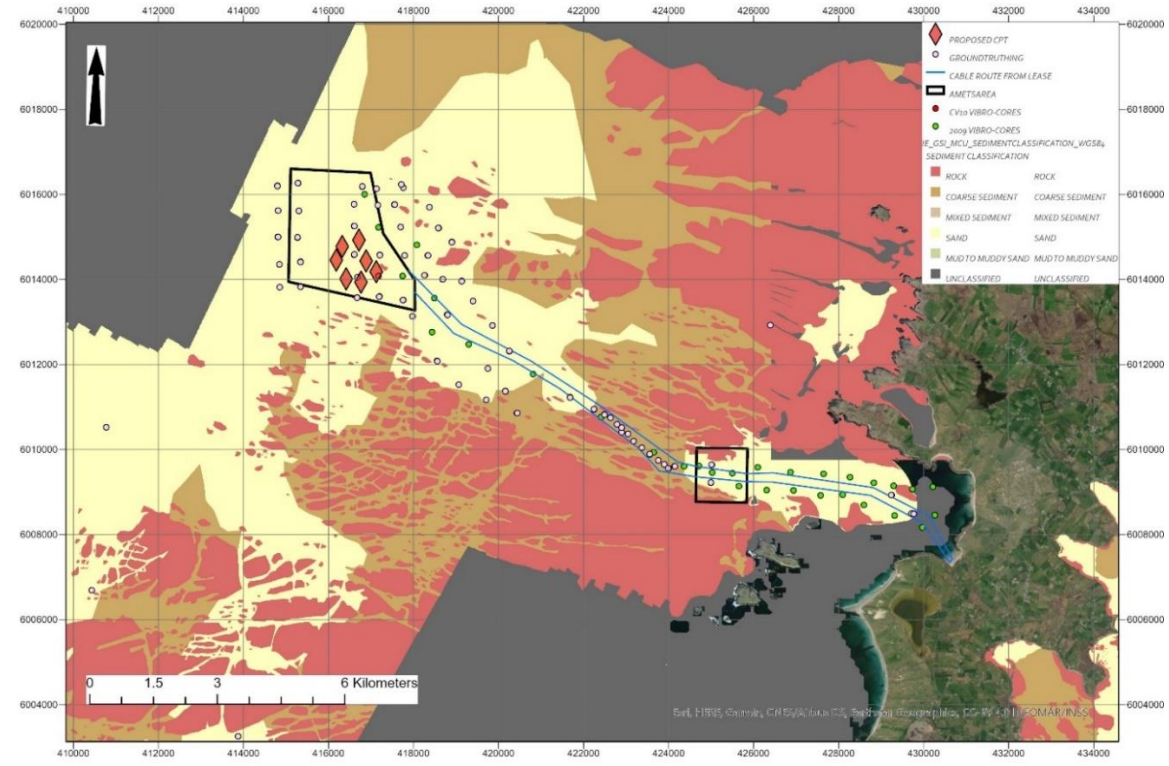


Figure 10. Sediment Classification map based on ground truthing (vibrocores) and backscatter data

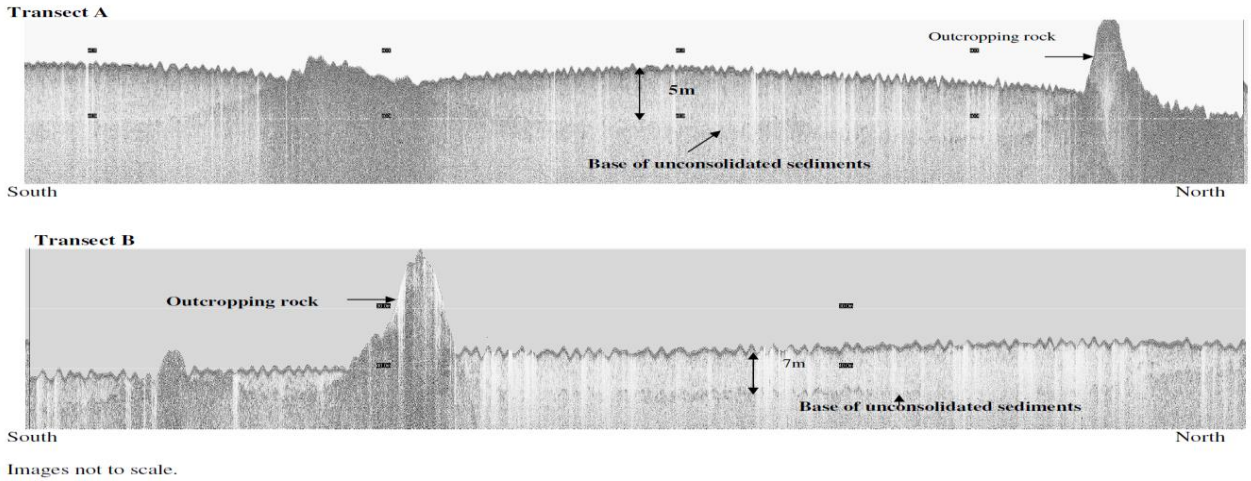


Figure 11. Good quality data where Top Bedrock can be mapped (thought to be 2008 data)

An upcoming site survey (2021/2022) is being planned to acquire additional MBES data and SSS as a seabed clearance survey and to further confirm the seabed facies and hopes to acquire better quality SBP to help define sediment thickness above bedrock primarily at Test Site A and B, but also along the cable route.
Currently, the project is awaiting a decision on an application for site investigation works, which was submitted as part of the AFLOWT (Accelerating market uptake of Floating Offshore Wind Technology) project. This application to acquire new geophysical and geotechnical data, as well as benthic samples is available at : https://www.gov.ie/en/foreshore-notice/f498c-seai-saipam-site-investigation-for-floating-offshore-wind-testing-at-amets-site-mayo/?referrer=http://www.gov.ie/en/publication/fd3d9-seai-saipam-site-investigation-for-floating-offshore-wind-testing-at-amets-site-mayo/

8 Ecological Data

SEAI will have fully completed a one-year data acquisition of environmental baseline data for marine mammals, benthos and birds in September 2021 (data collected over 2020/2021). Bird surveys consisted of 3 aerial, 12 boat surveys, 12 shore-based surveys and 2 nesting surveys for storm petrels. Marine mammal monitoring was done via the deployment of two CPODS, one at each test site, and boat surveys on location. Benthic data collection consists of drop down video footage, dive surveys and seabed grab sampling (the seabed sampling will be completed in early 2022).

Historical marine mammal data was collected at AMETS between 2009-2013, which included land (32 watches) and sea-based surveys (12 boat surveys, 3 with PAM) and static acoustic monitoring (31 months). Benthic data was acquired for the area between 2010-2012, additional useful data is shown in *Figure 12* below. Historical bird boat survey data is shown in *Figure 13*.

All the above historical data was acquired for input into the EIS (Foreshore Lease Consultation | Ocean Energy Test Sites | SEAI chapter 6 : Flora and Fauna) provided in the Foreshore Lease application for wave devices.

Date	Reference	Data description
20010/2012.	Sustainable Energy Authority of Ireland (2011). Atlantic Marine Energy Test Site Environmental Impact Statement. Appendix 3: Ecological assessment	Raw data, results and discussion for the 2010 to 2012 baseline surveys and associated monitoring of the AMETS area.
2010	Dropdown video files for the benthic habitats of the AMETS	Drop down video files for the 2010 to 2012 baseline surveys and associated monitoring of the AMETS area.
2019	EUSeaMap (2019) Broad-Scale Predictive Habitat Map	This data layer provides broad-scale mapping for the area of the AMETS detailing the Marine Strategy Framework Directive (MSFD) broad habitat type
2014	NPWS (2014) Conservation Objectives: Mullet/Blacksod Bay Complex SAC 000470. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Site specific conservation objectives for all habitats, including benthic habitats of Mullet/Blacksod Bay Complex SAC.
2014	Mullet/Blacksod Bay Complex SAC (site code 470) Conservation objectives supporting document-coastal habitats. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	Marine supporting document for the benthic habitats of Mullet/Blacksod Bay Complex SAC.
2014	Conservation objectives: Marine Community Types for all Ireland	Marine community mapping for Benthic habitats of Mullet/Blacksod Bay Complex SAC.
2018	Scally, L., Pfeiffer, N. and Hewitt, E. (In prep). Appendices. The monitoring and assessment of six EU Habitats Directive Annex I Marine Habitats.	Intertidal reef surveys of Belderra Strand
	Irish Wildlife Manuals, No. 118. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.	

Figure 12. Benthic Data available for the AMETS area

Year	January	February	March	April	May	June	July	August	September	October	November	December
2009												
2010												
2011												
2012												
2013												

Figure 13. Boat based transect surveys at AMETS prior to the 2020-2021 campaign

Should a developer be expressly interested in using the AMETS site, the ecological data is available on request.

9 Supply Chain

There are a number of relevant supply chain companies in Ireland to service the offshore renewable industry. The majority of which are registered on the Marine Ireland Industry Network website: https://marine-ireland.ie/directory

The AMETS test areas and substation are located adjacent to and on the Mullet Peninsula, Co Mayo. With a broad industrial base, direct air (Knock), sea and rail freight access and a quality communications infrastraucture it is an attractive location for business. The small town of Belmullet (~1000 people) is the nearest population centre to AMETS, being ~10km away from the substation. The principle towns in Mayo are Castlebar, Balllina and Westport.

The Corrib gas project onshore processing facilities are also located nearby on the Belmullet peninsula at Bellanaboy, with the gas pipeline offshore located ~ 5.5 km north of AMETS Test Site A, coming ashore at Dooncarton in Broadhaven Bay.

From a regional perspective, the Mullet Peninsula has the potential to become a hub for renewable energy testing, given the fact that recent planning permission was awarded for the RWE Airborne Wind Energy test site which is also located in the region.

9.1 Piers/landing facilities

In the vicinity of AMETS there are two small piers which may be useful for AMETS customers: Frenchport pier and Ballyglass Pier. The nearest deep-water port (12nm at MLWS) is Killybegs Harbour in Co Donegal, approximately 118km from AMETS site.

Frenchport pier can accommodate the launch and retrieval of RIBs (Rigid-hull Inflatable Boats) and has been significantly upgraded by Mayo County Council, with support from SEAI, to accommodate the berthing of smaller workboats which will be used for servicing the wave energy converters undergoing testing.

Larger workboats can also berth 25 kilometres away at Ballyglass pier in Broadhaven Bay. Ballyglass pier is the principle local facility for boats servicing the Corrib Gas project. It has about 2m of water at MLWS and 6m at MHWS. The nearest deep-water pier (12m at MLWS) is at Killybegs, Co Donegal, about 6 hours steaming (130 km) from the proposed AMETS test areas.

Figure 14. Piers / landing facilities

Pier-side depth	2 new quays, 12m and 9m CD respectively
Quay length	300m and 150m respectively
Lay-down area	70,000 m² & covered space available
Slipway, Dry-dock or synchro-lift	Synchro-lift with capacity for vessels 37m long and 580 tonne weight. Slipway in inner harbour.
Crane(s)	Mobile cranes available locally
Fabrication and engineering services	An assortment of Services for the Fishing Industry including companies specializing in marine electronics, hydraulics and marine engineering. Mooney Boats is a long established small ship building company with multiple skills in marine engineering.
Sea distance from AMETS facility	64 nmi (118 km)

Figure 15. Killybegs Harbour

Pier-side depth	2m at MLWS
Quay length	83m long, 14m wide
Lay-down area	Small area at inner end of pier. There is also a laydown area just 50m north west of the pier access which has been used by services to the Corrib Gas project. It may be possible to rent this.
Slipway, Dry-dock or synchro-lift	Small private slipway close-by used by RNLI lifeboat facility.
Crane(s)	Crane on pier (Spec = 2.5tonne at 8m) Mobile cranes available locally. See paragraph re Crane Hire
Fabrication and engineering services	Nearest is Cathal Shevlin Engineering in Belmullet town. See paragraph re Manufacturing and Engineering
Sea distance from AMETS facility	12 nmi

Figure 16. Ballyglass Pier

Pier-side depth	1m at MLWS
Quay length	60m long, 4.6m wide
Lay-down area	There is a parking area just south of the inner end of the pier which is intended for temporary use by road vehicles and trailers. A portion of this could be available for short term lay-down.
Slipway, Dry-dock or synchro-lift	6m wide, 1:7 slope slipway.
Crane(s)	Mobile cranes available locally. See paragraph re Crane Hire
Fabrication and engineering services	Nearest is Cathal Shevlin Engineering in Belmullet town. See paragraph re Manufacturing and Engineering
Sea distance from AMETS facility	4.5 nmi and 6.5 nmi from the inner and outer test areas respectively.

Figure 17. Frenchport Pier

10 Future of AMETS/Call to action

In 2019 the AMETS site, as part of the Interreg AFLOWT project received funding to further progress development of the site. AFLOWT aims to demonstrate the survivability and cost-competitiveness of a floating offshore wind technology. Funding for the project is sourced from Interreg Northwest Europe. The five-year project is led by EMEC (European Marine Energy Centre) who were initially working with technology partner SAIPEM and test site owner SEAI, along with MARIN (Maritime Research Institute Netherlands), UCC (University College Cork), ESB (Electricity Supply Board), Fraunhofer IWES (Institute for Wind Energy Systems) and CaLiCyA (Cable Life Cycle Assurance). A project change was confirmed in early 2021, which saw the technology providers SAIPEM move the technology demonstration to a test site in France. This has prompted this call for expression of interest for a new developer to occupy the site. Further information on the AFLOWT project can be found at https://www.nweurope.eu/projects/project-search/aflowt-accelerating-market-uptake-of-floating-offshore-wind-technology/.

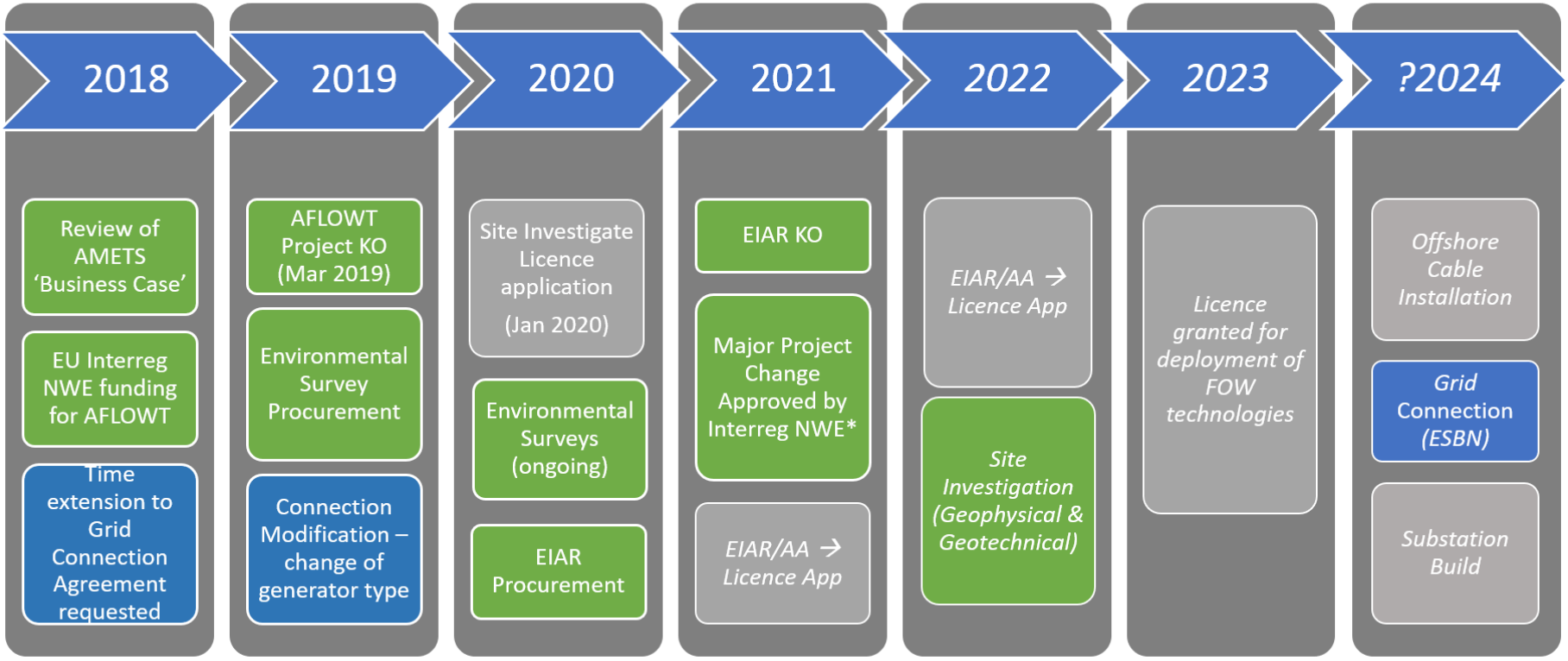
As part of the AFLOWT project SEAI and its project partners have a requirement to complete an Environmental Impact Assessment Report (EIAR), prior to applying for a foreshore lease/licence for floating wind technologies to be tested at AMETS. The EIAR will accompany the lease/licence application due to be submitted in 2022, under the new MAP (Maritime Area Planning) bill.

The lease/licence application will use a project design envelope (PDE) approach which would in principle enable a range of floating offshore wind technologies to be installed. To allow for a multitude of technologies to be included in the EIAR a range of technology specifications will be screened. If you wish your technology to be included in the EIAR, please indicate this by detailing the relevant specifications in the accompanying questionnaire.

11 Timeline

AMETS & AFLOWT Timeline

AFLOWT Project | ESBN Grid Connection | On/Offshore Infrastructure



*Project change indicates the Saipem technology moving to France (Mistral)

12 Questionnaire

https://www.surveymonkey.com/r/AMETSsurvey