MARINE LICENCE VETTING COMMITTEE:
Re: DECLG file ref FS006566 Foreshore Application by Marine Institute in respect of the testing of prototype wind, wave and tidal energy devices at the Galway Bay Marine and Renewable Energy Test site, Spiddal, Co. Galway.

Request for observations from Mr. Patrick O' Neill (DECLG) dated 10.3.2016 and revised 6.4.2016

This application is for a Foreshore Lease for an upgrade at the Marine and Renewable Energy Test Site off the coast at Spiddal.

Documentation supplied states that:
"*The site is located at the existing test site offshore of Spiddal, Co. Galway and will provide developers and researchers with a cabled and a leased area in which to test and demonstrate their prototype ocean energy converters and related technologies. The application provides for an upgrade of infrastructure to improve the service offered to end-users. The following list details the proposed long term deployments at the site:*

- *Upgraded cardinal marks to allow for safer navigation;*
- *A databuoy to provide wave measurements;*
- *Buoys for testing marine technologies and scientific sensors;*
- *A 'SeaStation' which will provide power to, and dissipate power from, ocean energy devices as well as provide data communications to shore;*
- *An acoustic array for monitoring underwater sound;*
- *Interlocking modular gravity base(s);*
- *A variety of scientific sensors and instruments;*
- *Cables which will connect the instruments, sensors and ocean energy devices;*

The proposed upgrade of the site will enable periodic deployments of up to three individual devices, of the following types, for test and evaluation purposes for a maximum period of 18 months:

- *Surface ocean energy converters;*
- *Sub-surface ocean energy converters;*
- *Seabed ocean energy converters;*
- *Prototype floating wind turbines;*
- *Novel marine technologies and scientific sensors.*

It is proposed that the upgraded test site will operate for up to 35 years, with devices on site intermittently throughout the year. The test site has been structured into three berths, designed to only allow a maximum of 3 prototype ocean energy convertors to be deployed and tested at any one time. The fourth berth will be for the Cabled Observatory and related projects.
The deployment of wave energy converters, tidal turbines, floating devices and other innovation projects will take place in accordance with the strict conditions described in the Galway Bay Test and Demonstration Site Manual.

Devices will most likely be deployed at the test site during the months of April to September for periods of testing ranging from weeks to months."

The application seeks permission to install and test scaled prototypes of a variety of wind/wave energy convertors.

The application refers to 'upgrade' at the site – this does not involve construction but rather the deployment of a range of infrastructure.

No construction work is included in this application.

Maximum height (above sea level) of temporary structures to be installed is estimated at 35 m for turbine blade tips and 5 m for wave energy convertors.

The application indicates an anticipated maximum sound generation of 100 dB on typical operational wind farms and that the sound outputs from the proposed structures to be tested would be more likely to be in the 50 dB range. The application indicates that *"A hydrophone and acoustic array will facilitate the measurement of sound generated from experimental devices and will facilitate the recording of cetacean vocalisations allowing the Marine Institute to assess the impact on an ongoing basis. This monitoring will add to current scientific knowledge on noise impacts and it will add to the industries knowledge of potential impacts using scaled prototype devices in the test site."*

The application indicates that *""devices will most likely be deployed at the test site during the months of April to September for periods of testing ranging from weeks to months. The maximum duration of testing for any one device at the test site will be 18 months."*

The application identifies that the test area is essentially an exclusion zone for local commercial fisheries. This exclusion has been largely adhered to over the last period of years. The application further notes that *"its effective exclusion on fishing activity, may result in the development of nursery areas which could enhance fish and shellfish stock. Mooring systems may also create artificial reef structures which could also lead to enhanced fish and shellfish stock in the area. Such nursery areas may lead to increased catch in future, enhancing fishermen's income on a sustainable basis."*

IFI Queries:
The documentation refers to 'interlocking modular gravity foundations'. These are described in p. 59 of the Environmental Report provided. It is indicated that these would create a footprint of 56 m^2 on the seabed, at any location within the test site.
IFI presumes that these foundations are for mooring/anchoring purposes?
If so, how many such mooring areas of 56 m^2 are to be installed during the project lifetime?
Are new moorings erquired each time a new prototype is to be installed?

Are these to be left *in situ* on completion of the life span of the test site?

The issue of moorings and anchoring systems is reported in p 74 *et seq* of the Environmental Report. It is not clear, as stated above, whether each new device to be tested will have a new set of moorings / anchorings. Is it the case that anchoring systems will start to 'accumulate' on the seabed within the area of the test site, over the site's lifespan?
Further information is provided in the Environmental report p. 114 dealing with habitat loss. A 'worst-case' scenario, with three test devices deployed simultaneously, would lead to loss of 460m^2 of seabed habitat in its present form. The Environmental report concludes that this is an extremely small area, relative to the extent of the test site as a whole.
However, the Environmental report does not extrapolate to a situation where new anchorings etc. might be required for each new device to be tested. If such occurs then the amount of seabed habitat, in its present form, to be lost would increase substantially over the envisaged 35 year lifespan of the project. The Environmental report does identify that a rapid rate of invertebrate re-colonisation is anticipated, based on literature cited.

The current application is in respect of infrastructure installation at the test site. Will the installation of each and every subsequent 'device' to be tested require a foreshore licence (in view of anchoring etc. needed for each device to be deployed for testing)?

The Environmental Report examines potential impacts under a series of headings – including habitat loss, noise and electro-magnetic fields (e.m.f.) – of specific interest to IFI.

The impact of **noise** (6.5.3.3 of Environmental Report) in displacing species or in impeding their normal biological capacities within or adjacent to the test area is identified:
"Noise from these devices could potentially disrupt prey location and underwater navigation in marine birds and prey location, navigation and social interaction in marine mammals or even result in temporary or permanent hearing damage. This noise also has the potential to affect fish, species in the immediate vicinity of the devices. The operational noise generated from these devices will be considerably lower than that generated by vessel noise; however it could result in avoidance behaviour and exclusion from an area. This may result in limiting access to feeding areas which could ultimately affect feeding and breeding success."
The IMPACT ASSESSMENT indicates that noise should have a 'low' impact.

The issue of **E.M.F. or electro-magnetic fields** is also raised (6.5.3.4) and the potential of such fields to impact on sensitive species. The fields can be associated with the wave energy machinery and also with the cables carrying electricity to /

from the prototypes under test. The sensitive species include bottom-living species that might come in closest contact with cabling e.g. elasmobranchs (sharks, skates and rays). The report indicates that *"These EMFs can affect migration and prey detection in certain electro-sensitive fish species such as elasmobranchs (sharks, skates and rays), lamprey, some bony fish such as Atlantic salmon and eel and some cetaceans (whales and dolphins)."*

The IMPACT ASSESSMENT summarises issues and mitigations

I*t is anticipated that there could be up to 3 cables connecting scaled test devices to the SeaStation and a 4thcable connecting the SeaStation to the CEE. These cables will be free floating between the devices. The CEE will provide 400V DC (3.5kW) power supply to the sensors, SeaStation, test devices and HDTV cameras through a standard 25mm single conductor telecommunications type cable which was laid between the CEE and the shore in April 2015. This cable was fitted with 12 fibres and the single power conductor will require the use of seawater as a return path from the CEE. This cable was double armoured and buried to a depth of 700mm where substrata allowed or laid directly on the seabed and protected with either cast iron protection or concrete bags.*

Shielded electric transmission cables do not directly emit electric fields, but are surrounded by magnetic fields that can cause induced electric fields in moving water (Gill et al., 2012). EMF could also disturb fish migration patterns by interfering with their capacity to orientate in relation to the geomagnetic field, as indicated by empirical studies on eel (Westerberg & Begout-Anras, 2000; Westerberg & Lagenfelt 2008; Gill et al., 2012). The extent of EMF can potentially be mitigated by adequate cable design. Only few studies have addressed electroreception in marine mammals (Czech-Damal et al., 2012) or invertebrates (Karlsen & Aristharkhov, 1985; Aristharkhov et al.,1988, Bochert & Zettler 2004) and no significant effects have been shown to date. Probable negative impact from electromagnetic fields (EMF) is generally rated as low (Bergstrom et al.,2014). In addition, Olsen & Larsson (2009) conducted an extensive review of the impacts of electromagnetic fields from sub-sea power cables on marine organisms and concluded that research to date has found that sub-sea power cables pose no threat to the marine environment due to EMF. Additional work commissioned in the UK on behalf of the Collaborative Offshore Wind Energy Research into the Environment (COWRIE) concluded that there was no solid evidence to suggest that EMF associated with high voltage cables have either positive or negative effects on cetaceans, fish or elasmobranches.

At 3.5kW and 400V the power and voltage of the proposed cables are a fraction of those found in high power undersea cables. For instance the East West interconnector which was recently laid in the Irish Sea connecting the Irish and UK electrical grids can transmit up to 500,000kW at up to 200,000V (Marine Institute, 2013). The low power levels in the proposed cables mean that the magnetic field and induced electric field from the proposed cables will not have any significant impact on marine species in the area. The likelihood of an impact occurring is unlikely and the consequence would be negligible.

Likelihood = Unlikely;

Consequence = Negligible;

***Impact = Low**"*

Mitigation measures:
Section 6.7 of Environmental Report presents a series of mitigation measures/recommendations. IFI would broadly support these. Many are highly pertinent to protection of fish and the fish habitat. Some are specific – and refer to specific target species – and in some cases the mitigation for the named species may be contrary to best interests of specific fish species. IFI has inserted comments in BOLD where its interests are concerned in the list below:

Proposed Measures
A number of mitigation / best practice measures are recommended to ensure minimal impact of the Galway Bay Marine and Renewable Energy Test Site.

•Site specific geophysical and geotechnical surveys to establish a baseline and identify suitable locations for infrastructure
IFI – such surveys have been undertaken already in context of overall project. These surveys can generate disturbance, particularly through sound emission with high dB levels
•Carry out pre installation baseline seabed surveys (sediment and faunal) for comparison with post installation surveys to document any changes. Control sites must be included.
•Use installation methods that minimise disturbance of sediments
•Deploy all objects on to the seabed as slowly and controlled as possible to minimise sediment disturbance on the seabed
•Carry out work in appropriate tidal conditions to minimise effect
•Carry out potentially hazardous operations under appropriate weather/tide conditions
•Avoid sensitive time periods for local receptors
IFI – salmon smolt out-migration during the period March – June from the adjacent Lough Corrib SAC. Considered likely that smolts hug the north shoreline of Galway Bay on out-migration. Installation timing should be done in advance, in each relevant case, with IFI.
•Risk assessment for contingency planning
•Use low toxicity and biodegradable materials
•Use minimum quantities
•Design infrastructure for minimum maintenance
•Design devices to minimise risk of leakage of pollutants
•Risk assessment for contingency planning
•Implementation of Shipboard Oil Pollution Emergency Plan (SOPEP)
•Presence of a trained experienced Marine Mammal Observer (MMO) to implement the NPWS best practice guidelines when all work is taking place and to implement appropriate buffer zones in good sea-state.
•If bow thrusters are required on installation vessels they should be covered to prevent collision with marine mammals
•Target work to take place when porpoise presence is at its lowest e.g. during the

spring or early summer
IFI – salmon smolt out-migration during the period March – June from the adjacent Lough Corrib SAC. Considered likely that smolts hug the north shoreline of Galway Bay on out-migration. Installation timing should be done in advance, in each relevant case, with IFI.
•*Only carry out observations (and therefore work) during daylight hours (this will also minimise risk of bird and mammal collision with vessels)*
•*Carry out SAM at the site during and after installation works to assess if avoidance behaviour is recorded and if so for how long it lasts.*
•*Design devices for minimal impact of collision risk*
•*Plan operations efficiently to minimise the number of trips that the service vessel must make.*
•*Leave any long-term devices, which have become established as functional artificial reefs and are beneficial to the area in place.*

IFI would recommend that these mitigation measures, along with IFI alterations, be incorporated into licence conditions for this application.

The Appropriate Assessment document provided with the application provided a detailed review of potential impacts of the installation proposals on two qualifying interest species from the Lough Corrib SAC – Atlantic salmon and sea lamprey. The review covered the disturbance during installation of anchorage, noise / blade strike etc. of generation equipment *in situ* and electro-magnetic field issues associated with cabling. The overall conclusion of the Screening was one of no significant impact on the two fish species.

James J. King (IFI R&D) Inland Fisheries Ireland
13.5.2016

CC Terry Mc Mahon MLVC;

Pat,
Sorry for delay – was on annual leave till Monday 13th.

The clarifications etc. of Marine Institute in regard to IFI's queries the above are most helpful.

No further comment at this stage.

Jimmy King

Dr. James King
Senior Research Officer

Iascach Intíre Éireann
Inland Fisheries Ireland

Tel +353 (0)1 8842600
Mob +353 (0) 87 6468608
Fax +353 (0)1 8360060
Email jimmy.king@fisheriesireland.ie
Web www.fisheriesireland.ie
3044 Lake Drive, Citywest Business Campus, Dublin 24, IRELAND.

From: Pat O'Neill - (DECLG) [mailto:Pat.ONeill@environ.ie]
Sent: 02 June 2016 12:36
To: Jimmy King; Foreshore EPA Marine
Subject: Marine Institute - File ref. FS 006566

Jimmy/DAU,

Please find attached a soft copy of the MI's responses to your recent observations.

Please let me have your updated observations as soon as possible, as the public consultation period ends on 17/06/2016, and we wish to progress the case as quickly as possible to MLVC Assessment with a view to making an early submission to the Minister.

Regards
Pat