Magallanes ATIR 2.0

Project Information Summary

August 2025




Document History

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6.2	17/09/2025	Draft for resubmission	AM	DL	

Disclaimer

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1 Introduction

1.1 Company background

Magallanes FOW1 Limited is a leading developer of tidal energy technology. We are the UK branch of Magallanes Renovables and have been set up specifically to commercialise the Magallanes technology, leveraging the unparalleled expertise of the UK supply chain to do so. Magallanes FOW1 Limited is registered in Scotland.

Founded in 2007 Magallanes Renovables was created with the sole purpose of developing and commercialising a cost-effective tidal technology, overcoming the hurdles that have historically held the sector back. Our philosophy is simplicity and cost-effectiveness, which has led us to develop breakthrough systems, solving the many challenges encountered with innovative and cost-effective solutions.

Our technology is centered around a simple and reliable surface floating platform that leverages existing technology from the mature wind and naval industries, minimising technology risk. Our platforms deliver high output with low installation and maintenance costs.

We are a highly experienced multidisciplinary team with innovation, sustainability and quality as our core values. We have deployed and tested a full-scale platform in the unforgiving environment of the Orkney Islands. Previously we developed and tested 2 scale models to inform the full-scale design.

Key team experience

Our multidisciplinary and highly skilled team has been the main driver of our success, each individual is in charge of one of the working areas for technology development. Important decisions are taken in quorum and teamwork is part of our open working structure.

In addition, Magallanes Renovables has collaborated very closely with skilled partners in different business and technology areas needed to develop a ground-breaking system in tidal energy generation.

Since its inception, the company has been involved in multiple R&D projects focused on developing floating tidal turbines:

- 2007 to 2011 – concept development and evaluation including partial systems tests at small scale – e.g., 1:30 turbine and rotor
- 2011 to 2012 - 1:10 scale model constructed to evaluate and validate the concept. Prototype tested in Bay of Vigo and Scotland with positive results.
- 2013 to 2015 – Design of full-scale platform and systems.
- 2016 to 2017 – Construction of full scale, 1.5MW platform in Spain
- 2018 to 2018 - Sea-trials of full-scale platform around Vigo.
- 2019 - 2024 - Platform installed and grid-connected at EMEC, Scotland in early 2019.
- 2020 – upgrades to key systems on the full scale platform
- 2024 – Decommissioning of prototype platform

The accumulated project experience in areas of structural design, marine operations, control systems, energy production, mooring systems, etc. has allowed us to achieve the goal of having a demonstrated and validated floating platform.

1.2 Technology background

Magallanes was established to investigate and develop new methods of extracting electrical power from tidal currents.

Magallanes Renovables has had a full scale (1.5MW) prototype at the EMEC facility from early 2019 until mid 2023. We have accumulated thousands of hours of operational experience and demonstrated, proven and verified the performance and advantages of the technology, as well as learned from associated challenges.

Previously we developed and tested 2 scale models to inform this prototype.

Figure 1. Evolution of the Magallanes Technology

The platform has been on station and generating on most tides, apart from periods of downtime due to maintenance, upgrades, trials of new and improved systems as well as grid outages (including an outage for over 7 months due to damage to the subsea interconnector serving the island of Eday where the EMEC tidal facility is located and an extended leadtime waiting for a replacement dynamic cable).

Figure 2. Launch of the Prototype ATIR platform

Testing and demonstration activities with the full scale prototype over the last 7 years can be summarised as follows:

Activities	Year	Site	Scope	Result
Launch	2017	Vigo	Assembly & launch from quayside	• Assembly in 4 months. • Launched with cranes in Vigo Harbour. • Tow tests (not grid connected) in the bay of Vigo.
Towing Tests	2018	Vigo	Towing Test, including generation	• Towing test 500kW output
Generation	2019 - 2023	FoW (Orkney)	• Generation Test with 1 rotor • 2 rotor, low power • 2 rotor, rated power	• 1 rotor 400kW output • 2 rotors 3 months generation • 2 rotor 1.47MW. • Coeff > 48% peaks
Major maintenance	2022	Leith	Horizontal heeling and major maintenance	• Platform horizontal in dry dock • O&M works
O&M	2019 - 2023	FoW (Orkney)	O&M Works in FoW Cable and mooring options	• O&M works • New cable options • Mooring O&M
Environ-mental	2019 - 2023	FoW (Orkney)	Environmental tests and resource assessment	• Radar/Sonar • Mammal collision assessment • Birds • ADCP
H&S	2019 - 2023	FoW (Orkney)	Safe operations	• Platform visited more than 200 times • Zero incidents

Table 1. Test campaigns with the full-scale prototype

Generation and operations with the prototype platform over the last 7 years have proven the concept and validated the technology.

Work on the design of the commercial (ATIR 2.0) platform is now complete and has taken lessons learned from the ATIR 1.0 prototype and working with trusted consultants and supply chain partners. The design has been certified by Bureau Veritas - Design Approval (Design Assessment Statement received in January 2024), with full Type Certification expected mid 2025 following construction and deployment of the commercial demonstrator.

1.3 Project background

The first full scale prototype ATIR device has been deployed and operated at EMECs Fall of Warness tidal test site, which has enabled us to assess its performance in real sea conditions over multiple years. This testing has allowed us to progress the ATIR design towards commercial viability.

This proposed project will see a new platform based on the commercial design of the technology (the ATIR 2.0), deployed for up to 10 years at the EMEC Fall of Warness site (Berth 1), beginning in 2025. It will replace the previous ATIR1.0 prototype that was deployed at the same berth from 2019 until 2023.

The project aims are as follows:

- Verify and validate the commercial version of the technology, including with an independent electrical power performance assessment.
- Gain experience installing and operating the new platform long term.
- Demonstrate the long-term operational performance and reliability of the technology in a real, open sea environment.
- Learn and trial appropriate maintenance operations for long term deployments.
- Develop a business and marketing strategy to assist identification of potential customers.
- Develop the supply chain for further, commercial projects.

Data obtained from this period of testing will be crucial for future projects as it provides valuable information regarding long term operations and maintenance as well as validation of the power performance.

Existing funds have come from two separate funding sources: European Grants and the equity investment from the founder of Magallanes Renovables. These sources will secure the continuous development of Magallanes Renovables technology until its commercialisation, as well as the process of securing future projects.

2 Technology

2.1 Device description

The full scale floating tidal device to be deployed at EMEC under this proposed project consists of a surface floating platform (upper block), with a nacelle and rotors directly below it (lower block) and a 'mast' (vertical block) connecting the two.

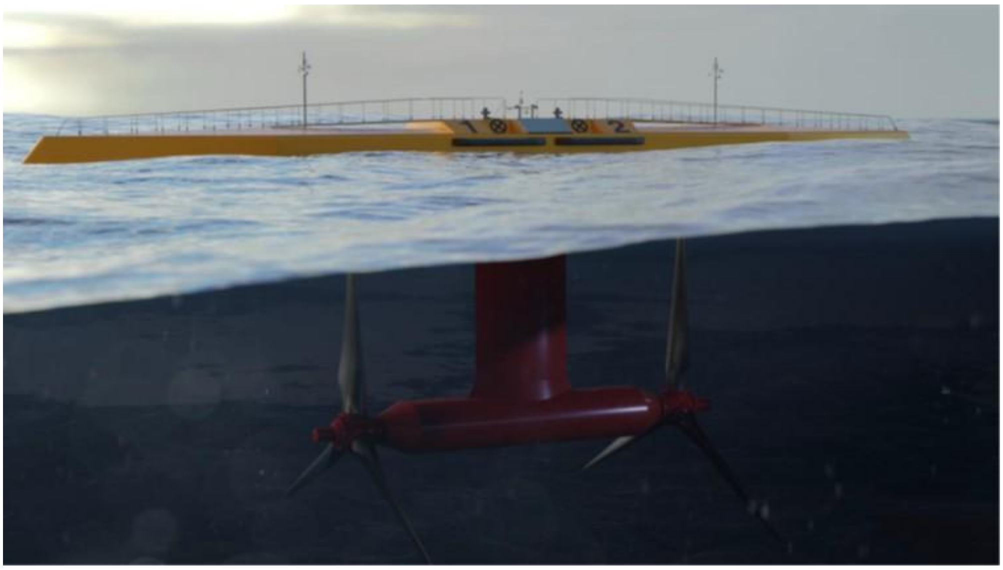

Figure 3. ATIR platform showing 'blocks'

This floating tidal energy converter has a total length of 53.6m, 7m of beam, a minimum draft of 15m without blades and 24m with blades. Its maximum weight with ballast is approximately 600tons. See Table 2 and Figure 4 below.

Item	Specification
Scale of the device	Full-scale
Overall length	53.6 m
Extreme moulded breadth	7 m
Operational draught	24 m
Maximum output power	Peak power of 1.7MW (however, nominal power limited to 1.5MW)
Number of rotors	2 – with 3 blades each
Type of rotor	3 bladed horizontal axis, pitch controlled
Rotor diameter	21 m
Rotor depth	15m (to rotor nacelle)
Blade/rotor design	Blades with counter-rotating mechanism

Table 2. Main specifications of the ATIR 2.0 platform

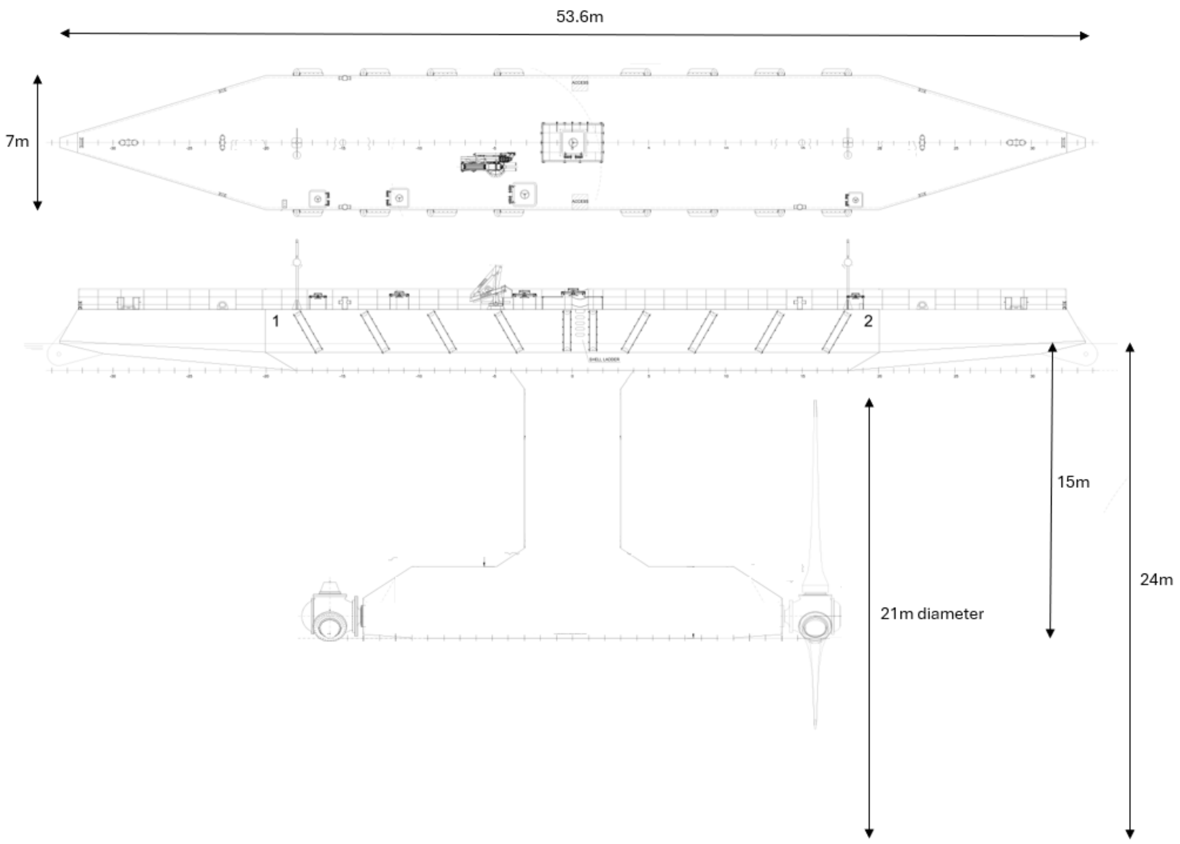

Figure 4: Key Dimensions of the ATIR 2.0

Figure 5. ATIR from above

It has two counter-rotating horizontal axis turbines in series, one behind the other, so that it counteracts the efforts of one turbine with those of the other to avoid list and yaw. Each rotor consists of 3 blades with a rotor diameter of 21m.

Each rotor is equipped with a generator of 850kW of nominal power, and an associated frequency converter; allowing for a peak power of up to 1.7MW; however, the nominal power is limited to 1.5MW. It's moored to the seabed through four mooring lines, two at each end. The device is able to orient itself to different directions of current in a passive way and to generate energy efficiently on both the ebb and flood currents.

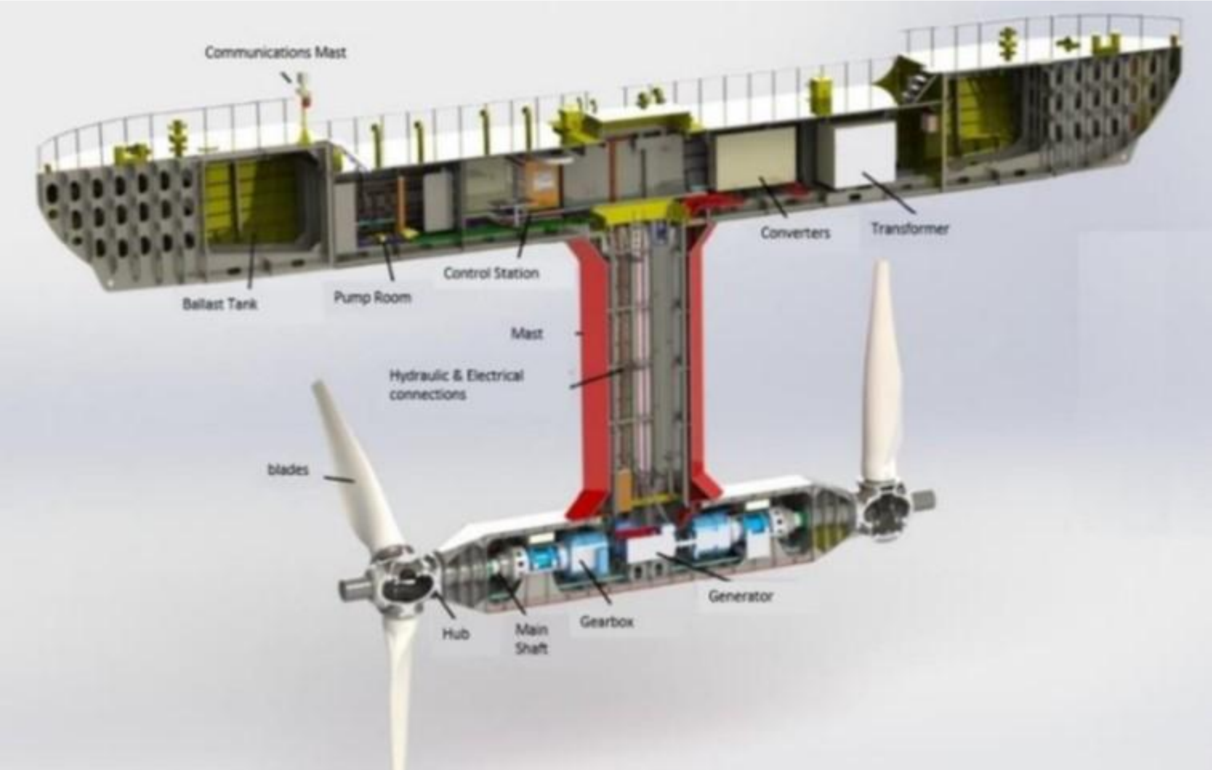

Figure 6. Main components of the ATIR platform

The floating platform (upper block) is the visible part of the device. It has an upper deck, where the entrance hatches are located. It also has 2 inaccessible compartments on both ends of the block, which are part of the variable ballast system. The accessible part of this block is composed of 3 main rooms, the first of them houses pumps and emergency systems, the other 2 have been designed to accommodate transformers, frequency converters, electric panels and other auxiliary electrical or electronic systems.

The mast (vertical block) fixes the nacelle (lower block) to the platform (upper block). It is a hollow space through which the communication and low-voltage cables connect the equipment housed in the nacelle with the parts of the electrical systems within the upper block. Rigid pipes for environmental acceptable lubricant supply and draining, among others, are also installed in the mast. It also allows access to the lower block for inspection and maintenance.

The nacelle (lower block) is significantly smaller than the upper block and is dedicated to the mechanical PTO systems. This block is where the main shafts, gearboxes and generators are located. As the platform is equipped with two counter-rotating rotors, all the components for the PTO system are duplicated (one for each rotor).

The device has electronic power converters onboard the platform that adapts the energy output to the frequency and phase of the network, in addition, it will also have a step-up transformer that will establish the output voltage of the platform at 11kV - the connection voltage).

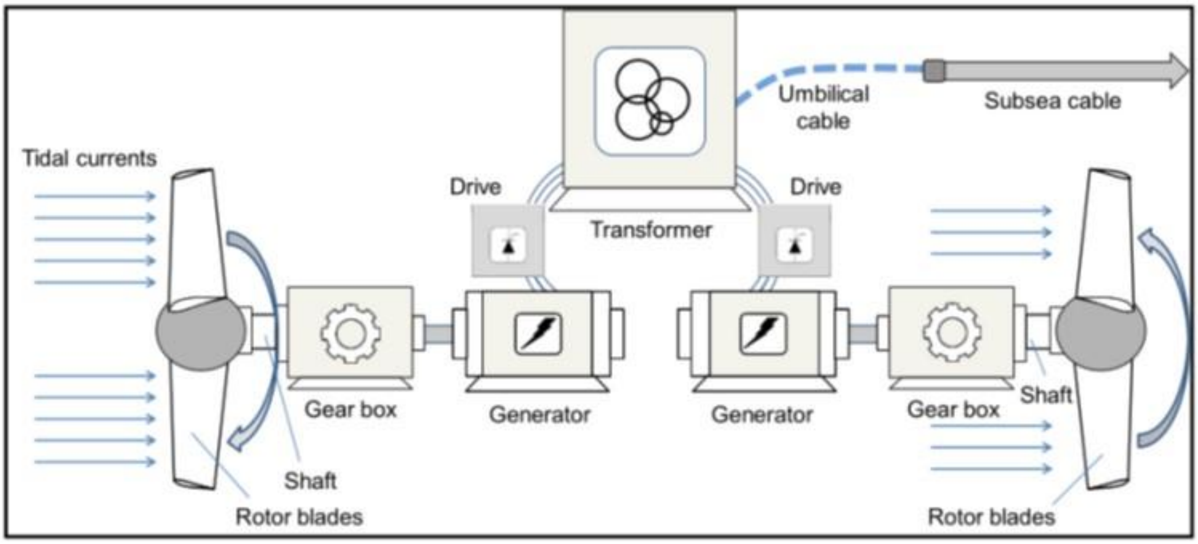

Figure 7. Diagram of electrical power generation from tidal currents

The platform will be connected to the existing EMEC export cable via a dynamic umbilical cable.

2.2 Mooring system

The ATIR 2.0 device will utilise the mooring system which currently exists on site and was used for the previously licensed ATIR device. The mooring system consists of 4 mooring lines, 2 at each end fixed to the platform, the mooring lines are redundantly dimensioned so that even if a line breaks, the other line on that side is capable of holding the platform on station.

The following parameters are currently estimated for the site, based on preliminary engineering analysis and modelling undertaken:

- Hull Attachment - A single padeye at the bow and stern, to which a single shackle is connected and from which two mooring lines are attached.
- The total length of chain per leg (including excursion limiters): approximately 290m of 76mm studlink chain.
- Mooring footprint diameter = approximately 500m (250m radius).

Gravity anchors (as detailed lower down) will be used. A basic scheme of the mooring system to be used is illustrated below in Figure 8. Gravity anchors used will be multiple chain clump weights (up to 12 per leg) with a total capacity (wet weight) varying between 90 and 165Te per leg. Anchor sizes will vary due to the statistically derived environmental loading and the larger environmental forces from the North.

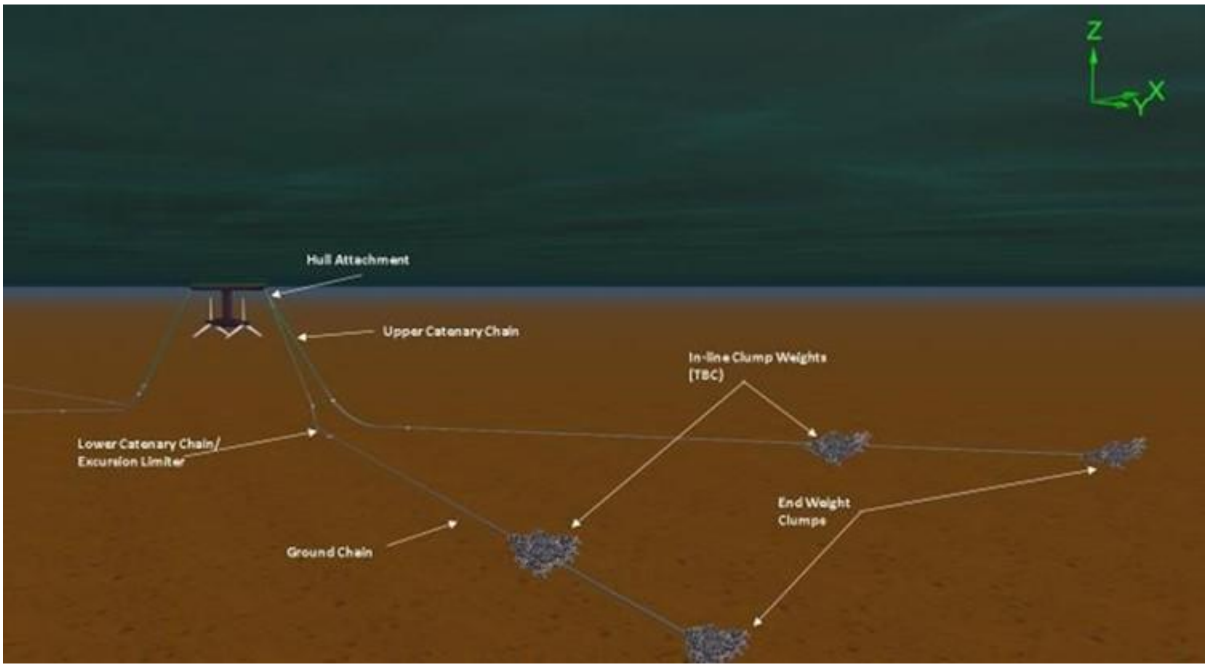

Figure 8. Scheme of mooring system with clump weights

2.3 Materials used

Materials which are already *in situ* within the Fall of Warness test site are highlighted within Table 3. These will be reused for the ATIR 2.0 device coming onto site. The components which will be newly coming onto site with the ATIR 2.0 device are listed in Table 4. Please note that around a 20% contingency has been added to the new deposit quantities, and it is expected that the final amounts will be less than those indicated in the table below. If a licence is granted, a FEP5 form will be completed after installation to confirm the quantities installed.

Fall of Warness				
Components on site	**Type of deposit***	**Nature of deposit (P=Permanent, T= Temporary)**	**Deposit quantity (tones, m3 etc.)**	**Contingency allowance**
Anchors and Mooring lines	Steel	P	700 tonnes	5%

Table 3. Components currently on site following the first ATIR device deployment and removal

Fall of Warness				
Components	**Type of deposit***	**Nature of deposit (P=Permanent, T= Temporary)**	**Deposit quantity (tones, m^3 etc.)**	**Contingency allowance**
Platform Structures	Steel	P	230 tonnes	20%

Turbine drivetrains	Steel	P	150 tonnes	20%
Rotor blades	Composite	P	18 tonnes	20%
Electrical motor & control cabinets	Copper, steel and plastics	P	30 tonnes	20%
Cable	Copper, Steel, & plastics	P	250m	20%
Cable stability	Steel	P	4 tonnes	20%
Lubricants	Environmental acceptable lubricant, fulfilling ISO 15380 requirements	P	20 tonnes	20%
Diesel (for emergency power generator)	Diesel	P	2 tonnes	20%

Table 4. Overview of component deposits coming onto site with the ATIR 2.0 device

*Types of deposits to consider: Steel/Iron; Timber; Plastic/Synthetic; Composite; GRP; Concrete; Silt; Sand; Stone/Rock/Gravel; Concrete Bags/Mattresses; and, Cable.

Third Party Verification (TPV)

With the aim of undertaking the Third Party Verification (TPV) it is proposed to engage the services of Orcades Marine Consultants Ltd, which provides marine project management, specialist marine risk management, innovative and practical consultancy advice, third party verification and marine warranty survey, independent auditing and assessment to the shipping and port industry, the marine renewable energy sector, and the offshore oil and gas industry. The Company is accredited to ISO 9001 and OHSAS 18001 for the provision of those services to the industry.

Orcades Marine Maritime Consultants has a wide experience in third party verification and marine warranty in the marine renewable sector. Some examples of relevant previous experience include the following works:

- TPV for a tidal floating system for marine licensing purposes for installation in Orkney
- Independent opinion as to the suitability of a grounding berth for securing a vessel safely alongside
- Marine and safety advisors for the installation of a tidal turbine in Singapore.

Some of their clients in the past have been Tocardo, Sustainable Marine Energy, Aquatera or Andritz Hammerfest.

For all the above, Magallanes FOW1 Limited believes that Orcades Marine Consultants is appropriate to conduct the verification of the platforms and their moorings. Such verification will certify the integrity of the structural design of the platform and its moorings for the conditions expected at the Fall of Warness site, and associated works.

3 Project Description

3.1 Location

The platform is to be deployed at the EMEC Fall of Warness test site, off the island of Eday, Orkney, in the allocated berth (berth1).

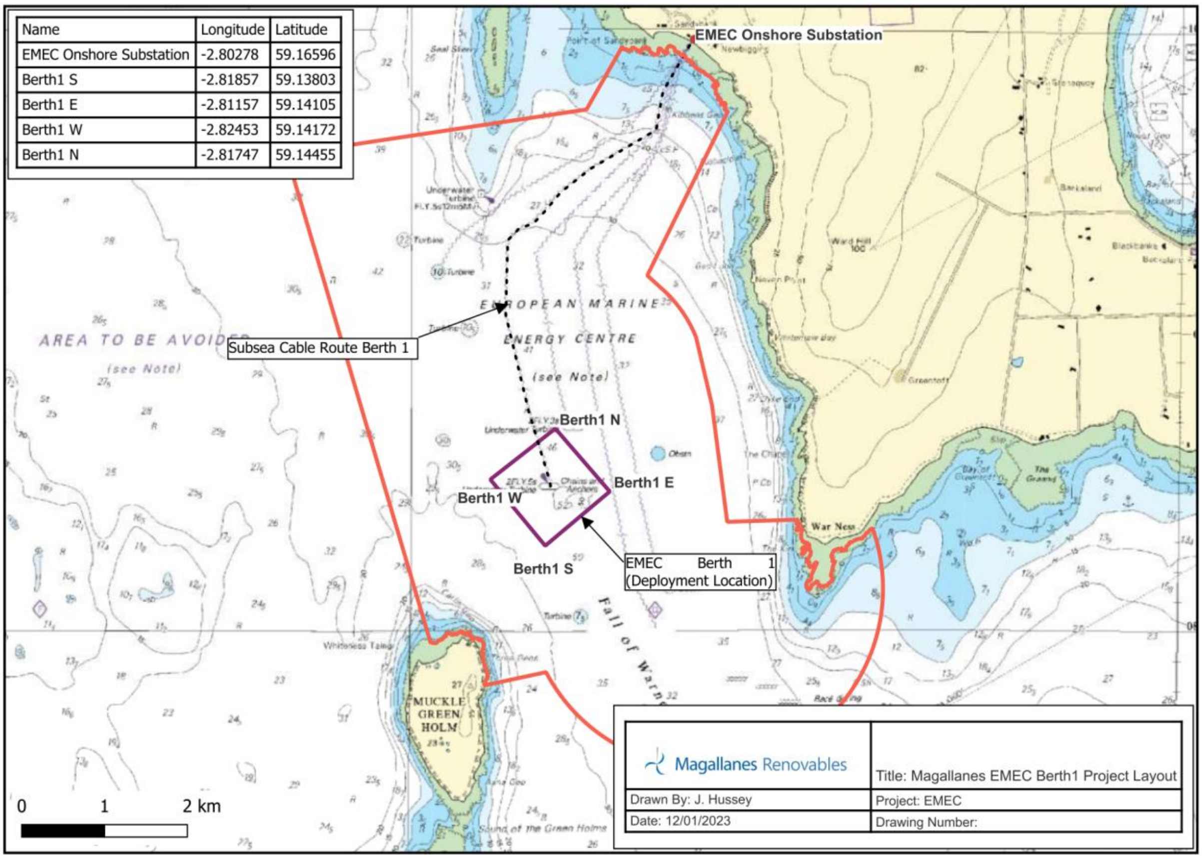

Figure 9. Chart showing the area of EMEC Fall of Warness test site. Magallanes Crown Estate lease outlined with solid purple line. Fall of Warness tidal test site Crown Estate lease shown as red line

The deployment will take place in the vicinity of the berth location and within the boundary coordinates provided in Table 4 and shown in Figure 10 above.

Test berth	Latitude (WGS84)	Longitude (WGS84)
Points along platform deployment boundary	59º 08.673'N 59º 08.463'N 59º 08.282'N 59º 08.503'N	02º 49.048'W 02º 48.693'W 02º 49.113'W 02º 49.471'W

Table 5. Deployment location at EMEC's Fall of Warness test site

3.2 Installation method

The platform is to be deployed at Fall of Warness berth 1, The installation method is summarised below. A Construction Method Statement will be provided to MD-LOT closer to deployment.

3.3 Fall of Warness mooring works

The mooring systems in the deployment area at the Fall of Warness are described in Section 2.2 above. This mooring system is already in place and has been installed using the below methods:

The installation vessel used a 4-point mooring spread for the duration of all installation activities on site. Installation operations lasted for a period of up to 7 days, after which the installation vessel recovered its moorings and returned to shore.
During the installation and subsequent offshore commissioning period, there was also a daily requirement for a small workboat or RIB for return journeys between the site and Kirkwall Harbour, for transfer of personnel and equipment.

3.4 Platform installation

The platform will be towed from Hatson Pier and will be attached to the 4 anchor points by means of four chain catenary legs, two at the bow and two at the stern, as described in section 2.2 above.

- The installation multi-cat will set up on its mooring spread.
- The multi-cat, assisted by a workboat will recover the surface buoy of one chain leg and winch in the ground chain, then connect that leg to the padeye on one end of the platform.
- A second chain will then be connected to the same end of the platform in a similar way
- The remaining 2 moorings legs will then be connected to the other end of the platform in a similar manner to that described above.
- Finally, the platform will be connected to the EMEC export cable. The EMEC export cable will be lifted by deck crane from the seabed to the deck of the installation vessel and connected to the end of the dynamic umbilical cable (which will already be connected to the onboard switchgear in the platform).

Magallanes will work closely with local companies experienced in marine operations, with knowledge of the site and available equipment and vessels to develop detailed procedures for the various activities related to the installation of the platform. It is not known yet the vessels which will be involved for the installation of the platform, due to the characteristics and dimensions of the device, typical workboats or multicat workboats such as MV C-Odyssey, MV C-Salvor, MV C-Chariot, or similar, (with lengths no greater than 28m and draught up to 4m) rather than large installation or heavy lift vessels will be used. In addition, it may be necessary to utilise support vessels (such as MV Ocean Explorer, or similar) for some tasks during the installation of the platform.

3.5 Blade installation methodology

With the platform already being moored, a multicat workboat with a deck crane will load the blades from Hatson Pier to the designated marine license area. Depending on the deck area, one or more blades may be transported at once.

The vessel will be brought alongside the platform, by means of several slings and the deck crane, one blade will be lifted and lowered into the water until it is located below the upper block of the platform. Once there, with the help of a cable/sling guidance system, the blade will be attached to the underside of the upper block hull. The guidance system also ensures the blade is positioned vertically (with the top of the blade upwards and the root, downwards), just above the nacelle hub. Once the blade is vertical and above the nacelle hub, it will then be lowered using tackles or similar equipment, until the blade root fits in the nacelle hub. The blade will then be bolted to the nacelle hub. Finally, the guidance system will be disengaged from the installed blade, so that it can be used for the assembly of another blade.

Once the first blade is installed, the methodology for assembling the remaining five blades (three blades per rotor) would be the same.

3.6 Operations and Maintenance Works

Due to the nature of the platform, minimal human intervention is required, allowing the platform to stay on site for long periods of time. This is facilitated by the remotely operated control system and the communication system.

However, during the period the platform will be deployed, there will be surveillance and maintenance on site. Visits will take place at regular intervals, at least once per month, although during the first month of platform operation, visits may be more frequent.

The platform has been designed in such a way that there is enough inner space for having an accessible machine room, both in the upper block and the lower block. In addition, the lower block is accessible from the upper block through the vertical block. As a result, repairs can be done offshore with no need to take the platform to a shipyard for maintenance. It should be possible to carry out in situ all maintenance activities, dependant on weather and tidal conditions.

In general, the vessels to be used during maintenance works are support vessels (such as *MV Ocean Explorer*, or similar). In the event of maintenance tasks which require more extensive equipment (for dive support, for example, or major corrective actions), the multicat type vessels may be used. It is likely that these workboats will be assisted by support vessels.

3.7 Decommissioning / removal method

The removal method will essentially be the reverse of installation using the same multicat type vessels, supported by smaller workboats and a tugboat.

The platform umbilical cable will be disconnected from the EMEC export cable. The export cable end will be capped, buoyed off and lowered onto the seabed. The platform will then be detached from the mooring lines using a multicat workboat and towed by a tug vessel from Fall of Warness test site back to Hatson Pier.

For end-of-life decommissioning, the mooring systems will also be removed, using the crane of one of the vessels participating in the decommissioning operations. If required, a dive team may also help in the recovery of the mooring system. All remaining components which constitute the platform mooring system will be dismantled, on the condition that such removal doesn't entail further disturbance or impact on the environment.

A decommissioning programme will be produced in support of the marine license application, which will outline the decommissioning procedure and associated schedules.

Local companies with experience in marine operations (most probable the company that would have been involved with the installation of the platforms) will participate in removal and decommissioning.

3.8 Anticipated vessel traffic to site

Due to the installation, surveillance/maintenance and decommissioning of the platform, vessel traffic is expected at Fall of Warness site and its surroundings. Vessels expected to be used are workboats, multicat workboats and support vessels. Listed below are the most significant activities together with the anticipated frequency of vessel movements.

Activity	Anticipated movements frequency of vessel
Platform installation	
Preparation and installation of moorings at Fall of Warness	Already deployed so no vessel movements associated with moorings
Installation of the platform (including attachment to the mooring and subsea cable connection)	15-20 day trips (possibly over 2 x neap periods)
Operation and maintenance	
Operations and maintenance on site	Visits at regular intervals. 2 trips per month (1 day trip). During the first month of platform operation, visits might be more frequent.
Maintenance on site	Visits at regular intervals. 1 trip per month (1 day trip). During the first month of operation, and in the event of any major repairs required, visits might be more frequent.
Platform decommissioning	
Decommissioning of the platform (including unmooring and subsea cable disconnection)	15-20 day trips (possibly over 2 x neap periods)
Decommissioning of moorings at Fall of Warness	10-20 single day trips

Table 6. Operational activities and anticipated frequency of vessel movements

It should be noted that all schedules might vary since operations are subject to suitable weather and tidal conditions and, therefore, adverse weather may increase the forecasted duration of activities. Furthermore, it should also be noted that additional trips might be required due to unplanned maintenance. Notices to mariners will be issued prior to undertaking works onsite, specifying the type of works to be carried out and its duration, as well as the vessel(s) involved.

3.9 Device monitoring systems

The platform together with its subsystems is going to be monitored continuously in order to ensure that they operate properly and in order to be able to respond rapidly in case of an emergency. The most relevant device monitoring systems are outlined below.

System	Description
General monitoring systems	
General position system (GPS)	Records time and date continuously, provides the exact position of the platform at all times and transmits the information to shore. The platform will move on the sea surface within an area constrained by its compliant mooring system (based on ebb and flow, depth, length of mooring lines, etc.). In the event that the platform moves outside of its pre-established range, this may mean that there has been a failure in one of the mooring lines. In such case, GPS system will warn immediately about the abnormal position of a platform. This will help to provide a rapid response (with vessels, dive team, etc.) so as to return the platform to a safe and agreed location.
Inertial measurement unit (IMU)	Used for monitoring platform stability (pitch, roll and yaw degrees).
Weather station	Records outside temperature, atmospheric pressure, wind speed and wind direction, among others. It helps to anticipate rough weather conditions that may impact on platform behaviour.
Insulation monitoring device	Employed in order to monitor the insulation resistance of unearthed main circuits and to detect early deterioration in the insulation.
Current meter	Instrument for providing water velocity data and measurement of local flow conditions in real time.
Specific monitoring systems	
Variable pitch system	Allows the blades' configuration and pitch to change according to the current.
Shaft positioning system	Assures the proper orientation of the rotor blade shaft, so that loads are balanced. It is also intended for facilitating blade assembly and disassembly.
Emergency response systems	
Fire detection system	Set of devices for detecting fire or smoke in the platforms and raising the alarm so as to respond as soon as possible and minimise any damage caused.

Bilge pumping system	If unwanted water is present in the platform, the system is design to drain any watertight compartment, in order to prevent flooding and minimise risk of damage due to the presence of internal water.
Uninterruptible power supply system (UPS)	In the event of failure of the grid, this system will provide emergency power to electrical devices so that they can keep running temporarily.
Emergency braking system	If a critical fault takes place and such fault presents a risk to the integrity of the platform, the emergency braking system comes into operation in order to stop the mechanical system and, as a result, stop rotor blade rotation.

Table 7. Platform monitoring systems

Apart from the aforementioned monitoring and response systems, other variables such as temperature, humidity, pressure, voltage, power, etc. will be monitored within the platform. Furthermore, the main components such as generators, converters and gear boxes, among others, will also be monitored in order to ensure they work suitably. Two cameras might also be installed at the deck of the platform, one at the bow and one at the deck, for surveillance purposes.

Owing to the nature of the platform, which is conceived for minimising required human intervention, a remotely operated system is developed in order to display and store within the platform the most relevant parameters. Communication with the platform is established through the umbilical cable and EMEC's subsea cable. Nevertheless, in the event of loss communication, a satellite or radio communication system, which will behave as a redundant system, can be utilised. Both communication systems allow the transmission and operation of the control system variables remotely.

4 Project Schedule

The anticipated project schedule in presented below; however, this may be subject to change, depending on external project factors. Any survey works conducted that constitute a licensable activity will seek consent through their own separate individual marine licenses before being initiated.

Marine Directorate and relevant stakeholders will be informed, and a Notice to Mariners (NtM) issued before this new platform is deployed. The platform may be removed from site to a pier or shipyard during the lifetime of this licence for maintenance and repairs. If the device is removed, a NtM will be issued, and Marine Directorate and all consultees will be notified.

Key project dates are as follows:

- Site surveys: Q2 - Q3 2026
- Installation: Q3 / Q4 2026
- Commissioning Q4 2026
- Operations: 2026 - 2042
- Decommissioning or extension: 2043