PORTOS Project

Guidelines for Applicants Applying for the Testing of Marine Renewable Energy Devices and Technologies

CALL REMAINS OPEN UNTIL 31ST DECEMBER 2021
Contact the test facility manager immediately to show your interest.

Deep Ocean Basin at Lir National Ocean Test Facility

Project Details

Project Details	
Project Acronym	PORTOS
Project Title	Ports Towards Self-Sufficiency

Completed application forms should be returned to nathan.kirwan@ucc.ie with all necessary documentation before 31.12.'21

Introduction

Sea ports have high-energy requirements which are normally catered for by fossil fuels and are a source of air pollution, two environmental problems that can be minimised by using renewable energy. Considering the convergence of resources, infrastructures and facilities in ports, marine renewable energy (MRE) has the potential to be a promising alternative.

PORTOS aims to assess, develop and promote the integrated use of renewable energy resources in Atlantic Area ports and increase their energy efficiency, establishing a roadmap to a more competitive and sustainable sector. Although there are proven technologies to harness MRE, new concepts are continuously being invented by academic, non-academic and industry inventors and entrepreneurs, who may not have enough resources and expertise to develop their ideas further.

In that regard applicants are invited to submit an application for the testing of their MRE device or technology to an independent Selection Panel (SP) comprising of experts in this sector. The SP positively appreciates solutions that can be integrated into ports.

Successful applicants will have access to one of the following facilities for up to two weeks;

- Universidade do Porto – UPORTO (PT) multidirectional wave basin or wave-current flume;
- Universidade de Santiago de Compostela – USC (ES) wave/current flume;
- Ecole d'Ingenieurs en Genie des Systemes Industriels – EIGSI (FR) technical assessment of novel technologies;
- Universidad de Oviedo – UNIOVI (ES) – numerical modelling of novel technologies.

  Contact the test facility manager immediately to show your interest.

The institutions have various facilities. The maximum access that will be granted is two weeks. The researchers at each facility have vast experience and knowledge on MRE which will prove invaluable during the test. Applicants are required to contact the test facility prior to applying to ensure they can facilitate the campaign. Please read these Application Guidelines before applying.

Contents

Application Guidelines

Interreg Atlantic Area offers users free-of-charge access to the research and testing facilities of the PORTOS Project. The test facilities include multidirectional wave basin, wave/current flume, wave flume and wave basin, and a large wave flume laboratory facility. The range of facilities available provides potential users with the capability to test technology relating to offshore wind, tidal, and wave energy, as well as electrical and grid integration, and cross-cutting technologies. A detailed description of each facility is available on the PORTOS website.

Based on the response rate there will be up to two calls for access to the facilities over the lifespan of the PORTOS Project. Applicants are required to download and complete the PORTOS Application Form. Information is required regarding the affiliation of the user(s), the choice of infrastructure and proposed period of access (maximum two weeks). Detailed information is required regarding the proposed work, the test plan, the technical requirements and the anticipated outcomes. Discussions between the applicant and the facility manager are mandatory during the application phase to ensure the facility is suitable for the proposed testing and to fine-tune the application.

Each application will be evaluated by an independent Selection Panel who will consider the eligibility of the proposal and the technical feasibility. Successful applicants are notified and subsequently contacted by the facility managers to begin the process of organising the test campaign. Upon completion of testing, a short report is produced by the applicant, highlighting the scientific output of the access received.

INTERREG Atlantic Area projects supports transnational cooperation projects in five countries; France, Ireland, Portugal, Spain and UK. Therefore, only applications from these areas can be accepted. Priority will be given to transnational access and to people/organisations who have not tested their device before.

Application Preparation

Before preparing an application for access to a test facility, it is recommended that users familiarise themselves with typical testing procedures.

Preparation of a detailed and well thought out proposal is essential for a successful application. This section provides recommendations for the application phase to increase the likelihood of success of a proposal.

Facility Manager Consultation

As part of the initial application phase, the proposed user and the facility manager must communicate in advance of the application being finalised. This is important to ensure the following;

(a) There is allocation available at the user's facility of choice;

(b) The facility is appropriate to carry out the desired test program;

(c) Advice is received by the applicant on the proposed test program.

As experts in device testing, the facility managers have a wealth of experience and knowledge to offer those planning a testing campaign, particularly those embarking on such a campaign for the first time. Proposals will only be successful if they are technically feasible; therefore, a detailed consultation with the facility manager is necessary to confirm that the proposal is in line with the capabilities of the facility.

Proposal Elements

Annotated photographs or figures should be included in the proposal which illustrate the concept to be tested. This makes it easier for the independent Selection Panel to understand and assess the proposal, and thus increases the likelihood of success. It also aids the facility manager in identifying any potential issues with deploying or testing the device in the facility under consideration. If available, photographs of the scale model should be included to demonstrate the level of preparedness of the applicant.

When applying for access to a tank facility, inclusion of the proposed test plan is also beneficial. Evidence that the proposed testing campaign has been planned and is well thought out is key for a positive decision. This can be discussed with the facility manager during the application process. Include any documentation from previous studies, numerical or physical testing already carried out. Provide as much detail as possible about what is required from the facility (wave conditions, acquisition and sensors, tools, etc.)

Tank Testing Techniques

As a general recommendation, users are advised to do some background research on tank testing techniques before embarking on a testing campaign. This is useful in terms of informing the proposed test campaign as well as avoiding past mistakes.

Model Design and Fabrication

The applicant needs to provide a model for testing, therefore must show how it will be designed and fabricated according to best standard in application. A well-designed and appropriately scaled physical model is imperative for a successful laboratory testing campaign.

Applicants must be aware that the costs of constructing a prototype device are not covered under PORTOS. Designing and fabricating a model takes time, therefore it is recommended that applicants already have a model constructed before applying for access to a test facility.

Scaling

The model must be built at a scale appropriate to the facility where testing is to take place. For already constructed models, it should be confirmed with the relevant manager that the facility is suitable for a device of that scale.

Model Accuracy and Structure

The model structure should be simple to improve accuracy and reduce sources of uncertainty. Robust design required to survive transportation to the test facility and the testing process.

Assembly should be as straightforward and as swift as possible.
Complicated prototypes can lead to delays in set up, reducing the time allocated for testing.
The model must be accurate in terms of geometry and mass distribution.
Small errors in the prototype may be very large when scaled up.
Determining the hydrodynamic properties of the model is a key outcome of tank testing,

The hydrostatics of the model should be assessed numerically before testing to predict the expected centre of gravity, centre of buoyance, radiuses of gyration, metacentric height, and resonance periods. The mass of the model should be minimised to allow moveable ballast, e.g. lead weights, to be positioned to adjust the centre of gravity or achieve a level keel in the tank.

WATER TIGHTNESS AND MATERIALS

The model will be in the water for a considerable length of time.
It is strongly recommended that the water tightness is checked before testing commences.
Adding weights to artificially increase the draft and put pressure on the welds is a suggested method for ensuring water tightness and structural integrity.
Avoid unnecessary welds and joints, use prefabricated beams/tube elements where possible.
Use non-corrosive material (plastics, wood, epoxy, polycarbonate, aluminium, stainless steel, aluminium, etc.)
Avoid certain types of foam, aero-board and chip board as they will eventually take on water. Covering such materials with fibreglass or an epoxy coating may achieve water tightness, but can result in a model that is vulnerable to damage during transportation and testing.

AESTHETICS

It is beneficial to design an aesthetically pleasing model. Testing provides an excellent opportunity to take photographs of the model in operation. Photographs and videos at this stage are very useful for marketing purposes.

MOORINGS

The installation, testing and tightening of moorings is often the most time consuming element of tank testing and should be given careful consideration. The tank depth and area available for mooring spread will impact the design of the mooring system. Contact your test facility for recommendations. Fixtures and fittings commonly used in the boating industry and available from chandleries can make the adjustment of pre-tensioned cables efficient and the final setting secure. On occasion, the model may have to be removed from the tank to adjust the model or instrumentation set up. Excessive downtime can be avoided by designing moorings that can be removed and reattached quickly and easily, without impacting the set pre-tension.

Mooring lines must be anchored. The simplest way of anchoring to the tank bottom is to use a lead weight of sufficient mass with a fitting to which the mooring line can be connected. Some tank facilities will provide attachment points on the tank floor so always check the situation with the facility.

Load cells will need to be connected at the anchor point for taut lines, or near the model for catenary lines. The preferred option should be identified and provision made. The mooring loads expected for each mooring line during testing should be calculated. This information is very useful in the design of the scaled mooring system as well as for the selection of appropriate load cells.

Testing Plan

Agree a detailed test schedule with facility manager, describing the conditions required for each individual test, the test duration, and the total number of tests. The testing process may proceed slower than anticipated. Therefore, the priority of tests should be decided in advance. In the event that testing proceeds quicker than expected, some additional contingency tests should be included in the test schedule. A well thought out test-campaign is essential for getting the most out of the allotted time at the test facility.

The consultation with the facility manager should include clarification on whether set-up and dismantling time is included in the access allocation. The user should know in advance whether any configuration changes will be required during the testing process and how long these will take to carry out. Any dry testing required should also be specified. The user should specify a list of preliminary checks to be carried out before testing commences (metacentric height, decay tests, etc.).

Set-Up and Instrumentation

The data that will be collected during testing should also be agreed with the facility manager, for example, mooring loads, platform motions, accelerations, pressure, structural strain, wave height, etc. When determining the list and size of sensors required, it is recommended that the focus is on obtaining data that is really needed. Excessive instrumentation causes delays, complications, and can lead to interference between sensors. Sensor sizing is also important; for example, a 500 N load cell may not provide accurate results for a mooring load range of 2-3 N.

It should be discussed with the facility manager what sensors are available. If filming of the testing is required, this should also be discussed and planned, to enable appropriate video camera set-up.

Waves

Test durations of five minutes are typically sufficient for tests involving regular waves. Irregular wave simulation durations depend on the scaling factor and the spectra used to generate the waves. The choice of spectra should be discussed with the facility manager.

The waves proposed for the testing should be run and measured before testing commences with no model in the tank in order that the actual wave generated can be assessed with no model interference or reflections. Slight mismatches in the requested and actual wave produced in the tank are common. These mismatches can be tuned out by adjusting parameters in the tank, however this is a time consuming process and may not be necessary as it is much faster to adjust values in the numerical model. Generally, the best solution is to continue with testing and make a note of any discrepancies between the generated and desired wave field and adjust the numerical model accordingly.

Intellectual Property

On success a Non-Disclosure Agreement (NDA) should be arranged between the facility manager and applicant. If the model is IP sensitive, provisions should be discussed with the facility manager. If the model is not IP sensitive or is IP protected, the local facility may wish to use the testing as a news story or for their own marketing purposes. This can be a good opportunity to gain some publicity for your design. There may also be research opportunities at the test centre which can be used to further explore your concept. In general, it is recommended that some IP protection is in place prior to testing, if it is felt necessary by the user. The European IPR Helpdesk is a useful reference for any questions or issues relating to IP on EU funded research projects.

Logistics and Health and Safety

Transporting and testing a model has logistical and health and safety implications which must be considered. It is recommended that models are loaded onto pallets for ease of transport. The dimensions and mass of individual components should be made available to the test centre so that an assessment of the lifting requirements can be made. Manual handling should be avoided where possible. Assumptions should not be made regarding the lifting capabilities available on site. If a crane or a forklift is required, it should be confirmed with the facility manager beforehand that these are available, and that the lifting capacity is adequate to meet requirements.

The user may be required to complete a Risk Assessment or Safety Statement before arrival at the facility; this should be checked in advance with the test centre. Depending on the rules of the facility where testing is to take place, the user may not be allowed to work in the tank or in the tank hall. This can be problematic if, for example, the assembly of the model is an intricate task. Therefore, it is advisable to check with the facility beforehand whether working on the model while it is in the facility is permitted.

It is recommended that delivery of the model to the facility is arranged for approximately one week before the allocated testing slot, to mitigate against delays and give time for preassembly. Once the model arrives, it should be immediately checked for any damage sustained during transportation, so that assembly can begin as soon as possible. Care should be taken when packaging the model prior to transportation as even minor damage can lead to significant delays. The model should be fully restrained, with no movement possible. The packaging itself should be robust, and labelled as 'fragile' with 'this way up' arrows where appropriate. Any specialised tools or ancillary devices that may be necessary during assembly or testing should be packed with the model, as such items may prove difficult to source locally.

During Testing

General Recommendations

Users should bring the following to the test facility:

- Notebook
- Camera
- Warm clothes, depending on the local climate tank halls can be very cold
- Large external hard drive
- Laptop with numerical model if possible
- Any consumables required, e.g. tape, cable ties, ropes etc.

Users are encouraged to ask questions during the testing process, however, they should be aware that set-up is a very busy time so questions may be more welcome once testing has begun. It is important to voice any concerns, e.g. relating to the testing or health and safety, so that these may be discussed and addressed.

Record Keeping

Users should keep a log of the entire testing procedure, and document what happens on each day. In particular, any changes in set-up should be recorded. Small changes can have unexpected impacts that may only become apparent during post-processing of data. It is thus useful to have a record of what changes occurred and when in order to determine the root cause of data abnormalities. It is also advisable to measure the mass and location of any ballast added to the model during set-up. This may be useful when performing numerical modelling at a later stage.

Users should take note of any unusual behaviour exhibited by the model during testing and discuss it with the local expert, as it may be the case that the behaviour has been observed previously with other test campaigns. Alternatively, the examination of this behaviour may prove to be a good opportunity for further collaborative research.

After Testing

Once testing is complete, the model will need to be removed from the tank and dismantled. This process is generally much quicker than the set-up phase. The user should check for any changes to the model, e.g. damage to moorings, or whether the model has taken on water. Weighing the model before and after testing is useful in this regard. The location of any sensors that were applied to the model during testing should be marked. This can be useful when processing data later.

The user should retain all relevant documentation and if possible any extra components that were used during testing, such as lead weights, swivels, etc. This may be useful when carrying out future testing, or to help understand the data in the post-processing phase. All data obtained during testing should be saved to a hard drive. Video files, in particular require significant storage.

Report Writing

The user is required to produce a short report after testing. The report should include a description of the concept being tested and the test campaign carried out. Results of testing and the main learning outcomes should also be included. Figures and photographs that describe the concept and illustrate the testing should be incorporated where possible.

Conclusions

This document provides guidelines for users applying for access to a PORTOS test facility. Guidance is given on the key features of a successful proposal. Recommendations are made for applicants to ensure a successful proposal. A well-informed developer is more likely to conduct a successful testing campaign, and avoid past mistakes. At all points, communication is key for efficient and well run tests.