

## MaRINET

### Marine Renewables Infrastructure Network for Emerging Energy Technologies

#### Background

Marine renewable energy conversion systems are mostly at the pre-commercial stage of development. They comprise wave energy and tidal-stream converters as well as offshore wind turbines for electrical generation. These devices require research to be undertaken at a series of scales along the path to commercialisation. Each technology type is currently at a different stage of development, but each one also needs specialised research infrastructures to facilitate and catalyse commercialisation.

#### Project Objective

MaRINET (Marine Renewables Infrastructure Network for Emerging Energy Technologies), is a €9 million EU funded FP7 project which aims to accelerate the development of marine renewable energy (wave, tidal and offshore wind) by coordinating marine research and development at all scales (small models through to prototype scales from laboratory through to open sea tests) and allowing researchers and developers access to specialist marine renewable energy testing centres across Europe. It will create a network of expertise in the marine renewable energy sector with experience at all scales of offshore technology research and development.

#### Project Outline

Around half of the funding available will be used to enable transnational access to research facilities and expertise. MaRINET offers research groups and companies periods of marine renewable energy testing at facilities located outside their home European country at no cost to participants through funding from the European Commission. Removing such financial barriers will help to accelerate the development of the offshore renewable energy sector.

As a project partner, Narec will provide 49 weeks of access to its testing facilities for marine prototype testing, tidal turbine drive train (3MW capacity) and electrical grid integration.









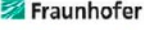
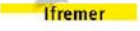














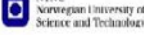
SMD Tidel device



Drakoo III, Wave Energy Converter, Hann-Ocean Technology

## Project Partners

Diverse research centres in the industry have formed the MaRINET network in order to work together to offer their unique capabilities and services in a coordinated way, providing a one-stop-shop for marine renewable energy research and testing in Europe and farther afield.

 	<b>Ireland</b> University College Cork, HMRC (UCC_HMRC) <i>Coordinator</i>	
	Sustainable Energy Authority of Ireland (SEAI_OEDU)	
	<b>Denmark</b> Aalborg Universitet (AAU) Danmarks Tekniske Universitet (RISOE)	
	<b>France</b> Ecole Centrale de Nantes (ECN) Institut Français de Recherche Pour l'Exploitation de la Mer (IFREMER)	
		
	<b>United Kingdom</b> National Renewable Energy Centre Ltd. (NAREC)	
	The University of Exeter (UNEXE)	
	European Marine Energy Centre Ltd. (EMEC)	
	University of Strathclyde (UNI_STRATH)	
	The University of Edinburgh (UEDIN)	
	Queen's University Belfast (QUB)	
	University of Plymouth (UOP)	
	<b>Spain</b> Ente Vasco de la Energía (EVE)	
	Tecnalia Research & Innovation Foundation (TECNALIA)	
		
		
		
		
		
		

Project duration: April 2011 - May 2015 | For more information visit: [www.fp7-marinet.eu](http://www.fp7-marinet.eu)

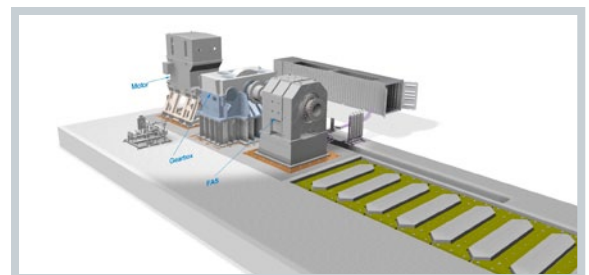
## Narec Testing Facilities

### 3MW Tidal Turbine Drive Train

The facility will perform accelerated lifetime testing of whole turbine nacelles and the individual drive train components of prototype tidal power generation devices. It will simulate the environmental loads likely to be experienced by a tidal device offshore, to reduce the financial risk and improve reliability for developers, before full demonstration and deployment at sea.

#### Key characteristics:

- 3MW shaft input power rotary test rig between 6 and 30 rpm for the evaluation of PTOs
- Load application system
- Grid connection and grid fault evaluation
- Comprehensive range of data measurements



3MW turbine drive train test facility

#### Typical testing activities include:

- Prototype testing (system or major component within system)
- New supplier validation testing (major component)
- Internal manufacturing conformance testing (system or major component within system)
- Improvements to models physical and numerical – condition monitoring validation
- Research and development



Narec's Wave Test Facility

## Marine Prototype Testing

*Narec's open access marine testing facilities include a wave test facility (with waveflume), a simulated seabed and a still water tank which can be filled to a depth of 8.2m, providing a flexible and controlled onshore saltwater location.*

Narec is involved in all aspects of the marine technology development process. We have tested a large number of devices in our scaled testing facilities and have designed, developed, assembled and deployed full scale prototype wave and tidal devices in the field.



Narec's site in Blyth, Northumberland

### Typical testing activities include:

- Wave energy extraction prototype design, testing and fabrication support (power take-off systems, hydrodynamic performance in a range of conditions, extreme seas survivability)
- Subsea foundation performance testing (piling techniques and stability, anchoring)
- Cable and pipeline laying equipment trials and trenching
- Prototype scale subsea deployment and assembly trials
- Data acquisition and analysis

Facility	1. Wave Test Facility	2. Simulated Seabed	3. Still Water Tank
	76m x 19m – Depth 7m Wave Flume: 50m x 5m	85m x 15m – Depth 3.5m	75m x 26m – Depth 8.2m Available - April 2012



Energy Link Laboratory, Charles Parson Technology Centre, Narec

## Electrical Grid Integration

Electrical and insulation materials testing can be carried out for voltage levels up to 250kV AC / 1MV DC, lightning impulse up to 400kV and current levels up to 8kA AC at Narec's ASTA recognised Energy Link Laboratory.

The Energy Link Laboratory, located adjacent to Narec's marine test facilities allows for saltwater immersion, simulated seabed trialling and testing of MV cable systems and umbilicals to be carried out. Also on site, our low voltage facility has model-generation technologies linked to a fully controlled electrical grid network.

### Facility

**Electrical test laboratory:** High voltage, high current, lightning impulse, partial discharge, RIV, corona, protection and power quality test facilities.

**Materials test laboratory:** Corrosion assessment/studies, paint and other coating assessments, organic and inorganic analysis, characterisation and performance tests on oils, polymeric and composite materials, SF<sub>6</sub> handling capability.

**Environmental test laboratory:** Environmental chamber (-40°C to +180°C & 10% to 98% RH) with internal HV live testing capability, high humidity/salt corrosion assessment/studies, wet testing for high voltage tests.

**Low voltage power network:** Investigation, demonstration and emulation of a wide range of intelligent network elements - including prime mover and load element configuration.

**Mechanical test laboratory:** Vibration test facility, mechanical lift, impact testing.

### Typical testing activities include:

- Prototype development support for third party LV network devices and renewable generators
- Product testing and demonstration

- G83/G59 grid compliance testing on microgeneration and inverter technologies
- Cable joint integrity and thermal rise
- Smart network component evaluation
- HALT testing, including environmental, mechanical and electrical stresses
- Development and type tests performed on insulators, arresters, bushings, switchgear, transformers, cables, accessories and all associated equipment
- Materials & coatings selection, testing investigations and analysis
- Accelerated ageing tests
- HV/MV development and type testing
- LV testing
- Fault finding and diagnostics
- Environmental assessment and testing
- Polymeric materials testing and analysis
- Electrical rotating machines and drive testing

### Additional support:

- Process engineering
- Power systems consultancy
- Field services
- Forensic investigations
- Insulator materials
- ASTA accredited type test service

### Additional site facilities

- Indoor and outdoor assembly with crane and engineering support
- Exclusive and secure on-site office
- Operational technical support team (electricians, mechanical fitters and plant operatives) and workshop facilities
- Site infrastructure includes a 30 tonne truck mounted mobile crane, cherry picker, 5 tonne forklift, and tele-handler
- Full Health and Safety support is provided
- Mobile tower lighting and flat bottomed work boat
- Engineering support team - civil, mechanical, electrical, marine, instrumentation and control/SCADA technical disciplines