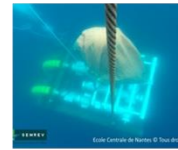


<http://www.semrev.fr>

SEM-REV Open sea test Facility For Wave Energy Converter & Floating Wind Turbine

Operational multi functions testing equipment

SEM-REV is part of the experimental facilities of Ecole Centrale Nantes and has been developed, through public financial support, to validate & to optimize both Wave Energy Converters and Floating Wind Turbine in real open sea conditions.



2009
Beginning of Envir.
Monitoring

2011
1st consent for
WECs

2012
Export cable
laid & buried

2013
2nd consent for
FWTs

2015
HUB
installation

OPERATIONAL
100%

The SEM-REV package

Operations are supervised from the land station in Le Croisic – west coast of France - by a dedicated team with all the required equipment to ensure operability, security and safety of data acquisition, energy converter control and survey. Environmental monitoring is operational since 2009, and the connection HUB was installed in the summer 2015 and thus the site is now **100% operational**. In brief, the SEM-REV package includes:

Equipment and tools

- Land station: research centre and electrical substation.
- Export cable: 20kV and 24 fibre optics.
- 1km² restricted and marked area.
- Met-Ocean instrumentation
- Subsea termination units, for three simultaneous connections.

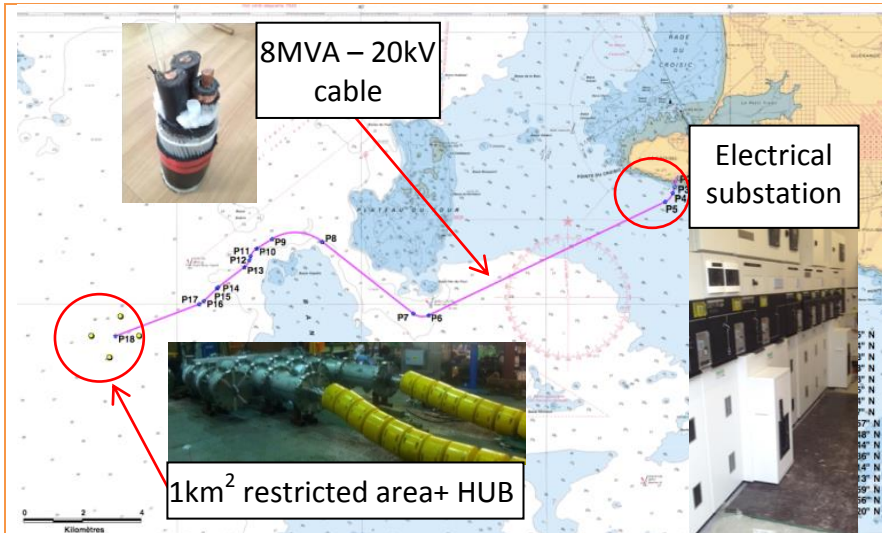
Missions

- Provide a fully consented slot for installation operation and maintenance.
- Electricity resale management for grid connected testing.
- Storage or dissipation alternatives for off-grid projects.
- Offices and data access (met-ocean and device monitoring) for test campaign supervision.
- Maintenance of the equipment and tools in operational conditions.
- Link with local marine stakeholders (sea users, state services, operators, marine surveyor...).
- Environmental Impact Assessment for both the test site and the devices.

A structured regulatory and contractual framework, subdivided in three main documents:

Testing Procedures Documents	Test site Description	Local support and assets Offshore and onshore site characteristics Environmental conditions (operation and survival) Soil conditions (geophysics and geotechnics)
	Test Site User guide	Permits and authorizations obtained by ECN for SEM-REV Regulatory framework description Organisation liabilities Test site risk prevention plan
	Test site Requirements	Specification of the electrical connection Measurement and communication systems (SCADA) MRE design requirements Deliverables required from the developer

<http://www.semrev.fr>



SEM-REV Characteristics

Water depth	32m to 36m LAT
Seabed	Sand (0.2-0.5mm)
Export cable	8MVA – 20kV
3 test slots	24 optical fibers
Wave	3 Datawell buoys
Current, tide	2 ADCP systems
Wind	2 meteo-buoys
Tidal range	6.2m
Max tidal current (10years)	0,7m/s
Mean wave energy	12 kW/m
Extreme Hs (10years)	8,3m
Extreme Hs (50years)	9,6m
Mean wind velocity	7.5 m/s (1h,10m)
Extreme Wind (50years)	29m/s (1h,10m)

Funding

ECN has built a 6 years collaborative research program starting in 2014 to support MRE technologies development. This program aims at providing **leverage funding** for MRE developers willing to demonstrate their technology at SEM-REV.

In practice, **50% of SEM-REV operating costs will be covered** for any demonstration activity on site. In the frame of a collaborative research project, the remaining matching funds should be provided by European or International grants. This funding mechanism is accessible for any type of testing activities in accordance with the 4 following subprograms:

- P1: increase of the knowledge of the marine environment (resource, impacts ...),
- P2: support the development of MRE technologies and components,
- P3: include all aspects related to the Energy (Storage, Transport & Conversion),
- P4: address the Security, Safety, Education & Marine Operation challenges.

Expertise & services

Using the well-known expertise of ECN in the scope of marine renewable energy, the strategy consists in building up a continuous and step-wise approach to testing of technologies, and offers the corresponding facilities and services from the initial proof of concept to the large scale verification of prototypes at sea. The three pillars of ECN's expertise are hydrodynamic modelling, tank testing and open ocean deployment.

In addition, the **SEM-REV is part of a larger regional industrial and research network**, WeAMEC, deeply involved in marine renewables. Therefore, collaborating with ECN will facilitate the access to:

- Hydrodynamic expertise and modelling of the entire chain (floater, moorings, umbilicals and control).
- Small scale experimental modelling in the ocean wave tank (50m x 30m x 5m) and the towing tank (148mx5mx3m).
- Refined environmental analysis (combined resource and interactions)
- Storage and access to local ports and infrastructure
- Support in transport and logistic activities (harbour storage, handling and working area booking)
- Outings and operations at sea (vessels bookings, qualified personnel, divers etc...)
- Soil analysis in laboratory (stemming from geotechnical and geophysical in-situ surveys)

SEM-REV naturally fits within ECN activities & capacities to assist developers from concept stages to the test of prototype.