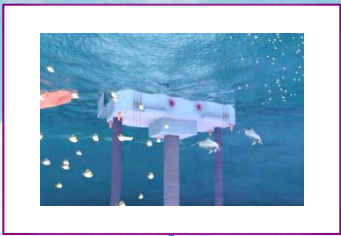




WEST ATLANTIC MARINE ENERGY CENTER

Research, Education
& Innovation
in **PAYS de la LOIRE**



CE PROJET EST COFINANCÉ PAR
LE FONDS EUROPÉEN DE DÉVELOPPEMENT RÉGIONAL

WEAMEC

West Atlantic Marine Energy Center

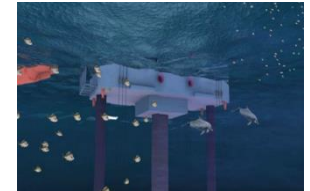
The *West Atlantic Marine Energy Center*

animates, coordinates, supports, amplifies and promotes,
so in a word **federates**

the **Marine Renewable Energy** hub of the Pays de la Loire Region
in the fields of **Research, Innovation** and **Training**



**Stronger Together
to
Collaborate Wider**



WEAMEC is a dynamic [Research-Innovation-Training] ecosystem

Research Training

A network of ~ 30 labs, and R&D structure



About 150 Full Time Equivalent jobs

Innovation

A vibrant innovation ecosystem and many industrial partners (~ 50 companies involved)



> 200 RFI projects (> 50 M€)

Development support

Strong support of collectivities



WEST ATLANTIC MARINE ENERGY CENTER

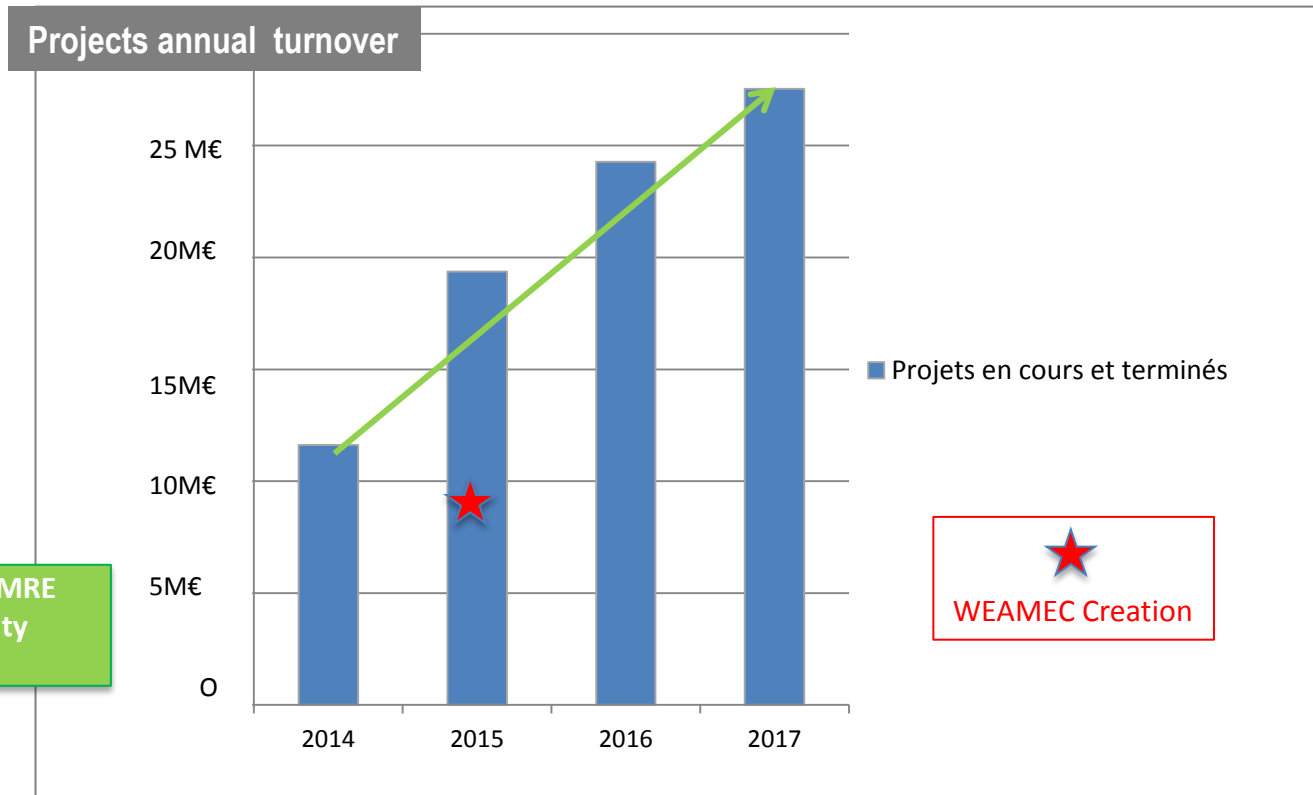
Research, Education & Innovation in PAYS de la LOIRE

Research and Innovation projects dynamic in WEAMEC ecosystem

- More than **200** projects are ongoing on the strategic lines of the roadmap, **> 50 M€** (obj. 2020 86 M€).
- More than **150 full time job** in partners R&D organizations.



Strong growth of the MRE
Regional R&D activity
2014 > 2017



SUBSTANTIAL, UNIQUE, INTERNATIONALLY RENOWNED TEST FACILITIES for MRE RESEARCH and DEVELOPMENT



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WEST ATLANTIC MARINE ENERGY CENTER

Research, Education & Innovation in PAYS de la LOIRE



Multi-MRE technologies
Offshore test site



Wave Tank and wind



Towing tank



Geotechnical Centrifuge



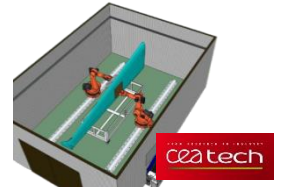
Aerodynamic Wind tunnel



Robotic finishing (up to 18 m)



Fatigue test bench (B up to 8 m)



X ray tomography (NDC up to 9 m)



Mechanical testing for cables



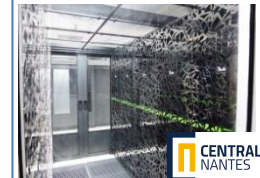
Navigation - offshore simulator



Virtual Reality Center



Energy System (800 kW - HIL)



High performance Computing center (air-water-ground)



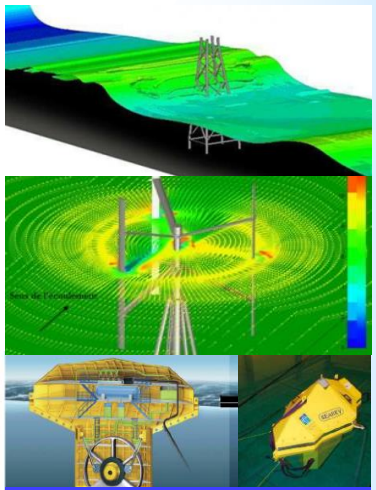
CE PROJET EST COFINANCÉ PAR LE FONDS EUROPÉEN DE DÉVELOPPEMENT RÉGIONAL

Complete and Complementary Competences across the whole Research and Innovation

Wave Tank / Wind Tunnel / Centrifuge / Electrical test benches



MODELING, SIMULATION
Air-water-ground structures



Device Engineering



HIGH PERFORMANCE COMPUTING CENTER
10 000 cores in 2016 (0,4 Pflap)



1 2 3 4 5 6 7 8 9

Experimental tests from scaled model to real size prototype

1 2 3 4 5 6 7 8 9

Sea tests site SEMREV



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<https://www.weamec.fr/en/>

WEST ATLANTIC MARINE ENERGY CENTER

Research, Education & Innovation in PAYS de la LOIRE

WEAMEC: a Gateway to this very rich but complex, ecosystem
Dynamic booster at Regional, National and European levels

Tests facilities



WEAMEC : technological road map



WEAMEC : technological road map



The shared roadmap of the ecosystem lays out the following medium-term objectives :

- Develop **bottom-fixed wind power**, especially in **extreme conditions** (hard ground, strong swell, etc.) of the Atlantic coast area, and develop more powerful and larger offshore wind turbines.
- Accelerate the transition from fixed to **floating wind turbines**.
- Move ahead with less mature MRE technologies, such as **tidal energy**, ocean **thermal energy** and **wave energy**.
- Develop innovative **generic technological building blocks** for these different technologies.

WEAMEC : technological road map

Develop innovative **technological bricks** for these different energy systems :



Cables
Electric arrays
and networks



Mooring



Materials
Marine envir.



Marine growth



SHM

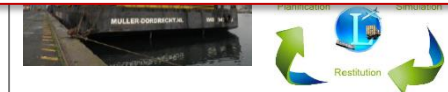
**High value added technological bricks
based on solid and recognized expertise in the ecosystem**



Modelization - Engineering



Resources
Impacts



Maintenance vessels
Logistics
From harbour to sea



Research, Education
& Innovation
in PAYS de la LOIRE

Specific tools for the support of Research at WEAMEC

Complementary Tools available for Research & International collaboration:



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Complementary Tools available for Research & International collaboration:

* International Chairs:

- Attracting a renowned foreign researcher (~ 650 k € max)
- > WEAMEC award for two Chairs.
- > Target a partner in WEAMEC's international strategy



Specific tools for the support of Research at WEAMEC

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* **Attractiveness tool:**

- Attracting a confirmed researcher through financial support (€ 165k max)
- > WEAMEC grant for 3 attractive actions.



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* In and out "Junior" Mobilities:

- Attracting a promising young researcher in the region.
- Experience in a partner ecosystem of a promising young researcher.
- > 24-month "Marie Curie" scholarships type.
- > Target a partner in WEAMEC's international strategy
- > WEAMEC grant for two grants (~ 215 k€ / scholarship).

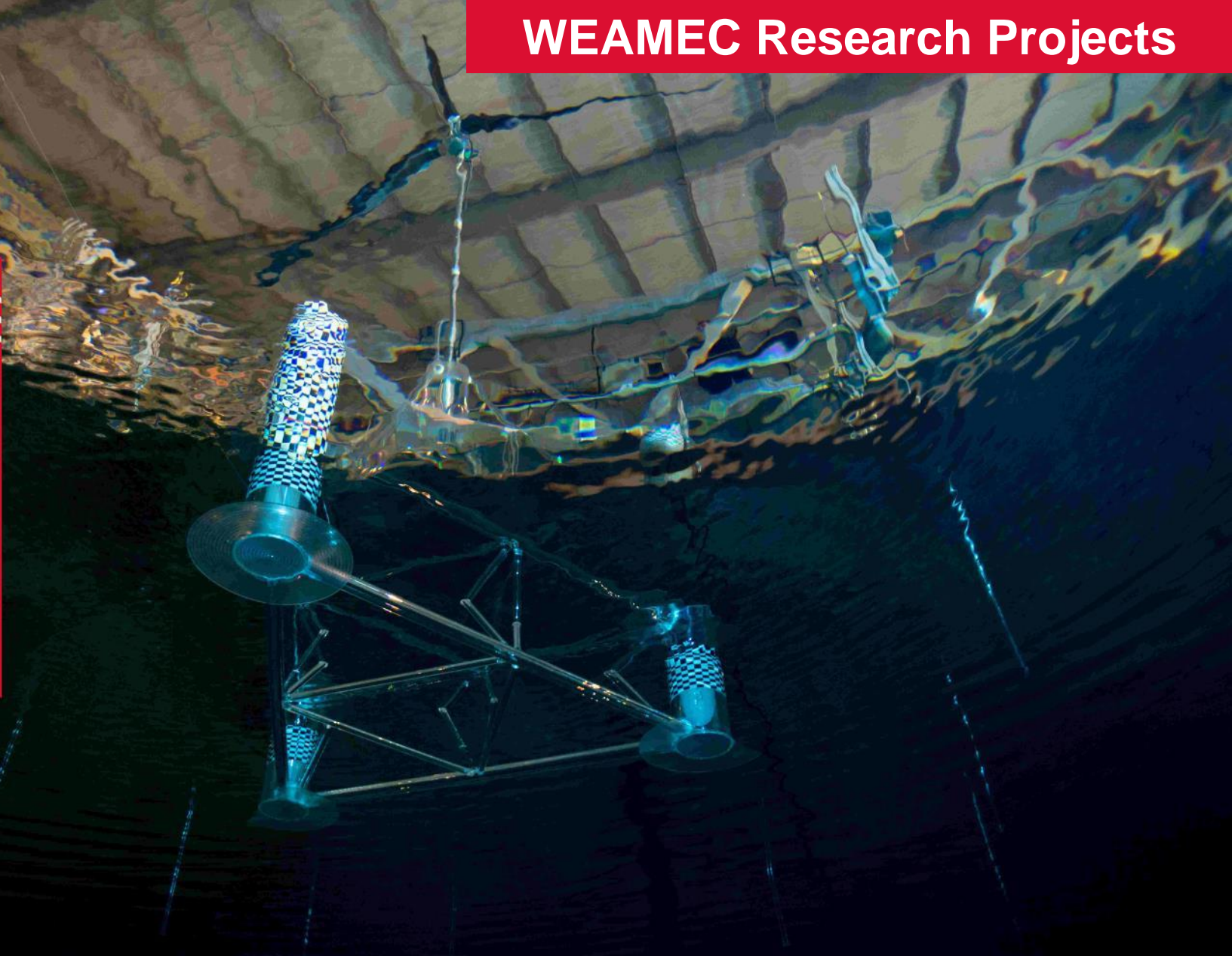


WEAMEC Research Projects





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Marine Ren. Energy Projects - WEAMEC projects 2016 & 2017

FRYDOM
Simulation of complex marine operations



EOS
CFD simulation of FWT, and Farms



FIRMAIN
Composite damages in marine environment






LEHERO_MG
Bio colonization roughness Hydrodynamic load






2017 **SOFTWIND**
FOWT tests in tank Software in the Loop

OMCEND 
SHM of cable protection layer





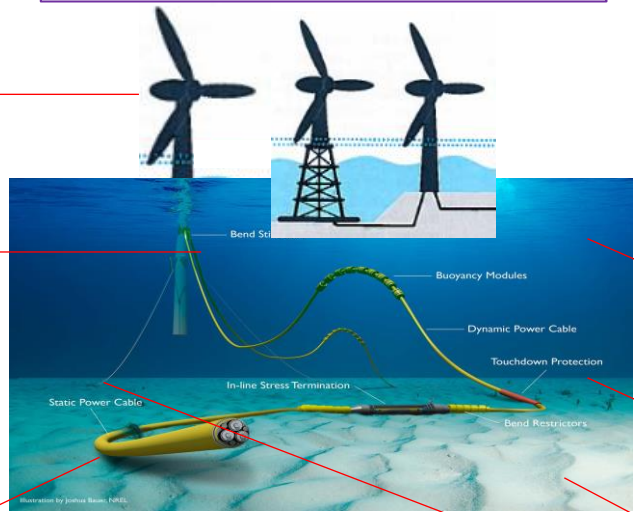
OWARD 
AC/ connexion of an offshore wind farm



2017 **COMEOL** 
Dynamic reconfiguration command for OWF



2017 **OPT-EMR**
Optimisation of the MRE logistic chain







2017 **AMM** 
Advanced Mooring Monitoring EMR





RENDEVEOL 
Anchoring Geotechnic data base



ROS-3D 
Heterogeneities effects on foundations design



2017 **SHM OWTGrout** 
SHM of grout mast/foundations




Simulation & tests tools for engineering


Foundations and mooring


Electrical connection and cables


Environmental characterization tools


Logistic and installation


ECHOSONDE 
Pelagos continuous survey on site by width band acoustic



HOOPLA 
Benthos survey by biological marker (Haploops)



PROSE 
Heterogeneous soils characterization by seismic and electric waves



Specific conditions:

- Consortia of regional labs
- Industrial interest must be expressed



**WEST ATLANTIC
MARINE ENERGY
CENTER**

Research, Education
& Innovation
in **PAYS de la LOIRE**

BROAD-BASED COMPREHENSIVE TRAINING

- Training from operator to engineer level covering all disciplinary fields
- **12** master's and engineering courses covering **all marine sciences**.
- About **250** students receiving initial training each year.
- A continuous training.



Contact us if you are interested by specific MRE trainings

<https://www.weamec.fr/en/>



Highlights on partners / projects / facilities / trainings through synthetic forms

COBOBIO - Robotique bio inspirée en milieux marin et aérien

L'objectif de ce projet est d'explorer les opportunités de transfert industriel d'un sens électrique à la robotique industrielle, pour dans un premier temps des applications de télé-opérations sous-marine et à terme dans l'air.

CEA Tech

IMPACTS TECHNIQUES et ECONOMIQUES ATTENDUS

- Installation et maintenance in-situ de systèmes EMR
- Sécurité active pour limiter le cas de bras EMR opérés
- Reduction du temps d'intervention offshore
- Élargissement des capacités opérationnelles d'opérations sous-marines
- Amélioration des conditions de travail de l'opérateur

CONTEXTE

Lors d'opérations offshore de maintenance ou inspection, un opérateur commandé à distance via un bras robotisé intégré sur un véhicule téléopéré (ROV), le seul sens dont il dispose alors est la vision. Certains bras de nouvelle génération disposent d'un retour d'effort au contact, mais ces opérations restent difficiles en phase d'approche, et particulièrement en eaux troubles.

RUPTURES SCIENTIFIQUES et INNOVATION

- Ce nouveau type de capteurs électro-haptiques permet avant contact et en amont de détecter un obstacle, d'inspecter une surface, de mesurer une position des objets.
- La boucle électro-haptique permet d'informer l'opérateur par un retour de force sur le bras maître de commande et donc d'augmenter sa perception de la scène d'intervention.

Applications EMR :

Les résultats du projet permettront d'envisager un transfert industriel de la technologie avec des applications directes pour toute les opérations d'installation sur site et maintenance de systèmes EMR (par ex. inspection de jacks, d'échelles, connexions de câbles, vérification de l'enfoncement des câbles, ...).

À terme, on peut envisager d'étendre le cadre applicatif au vecteur de transport lui-même pour le guidage de véhicules sous-marins.

DEMONSTRATEUR

- Démonstration de la boucle électro-haptique dans l'eau
- Démonstration de la télé-opération offshore en piscine
- Démonstration de la boucle électro-haptique dans l'air

Principaux jalons

Novembre 2015: Besoin électro-haptique dans l'eau
Mars 2016: Besoin électro-haptique dans l'air
Mars 2017: Démonstration de télé-opération offshore

Contact projet
Gautier.kocoubs@cea.fr
Contact WEAMEC
philippe.baccol@weamec.fr

Partenaires (Logos: CEA, IFREMER, ALSTOM, STX, etc.)

Financement (Logos: PAYS DE LA LOIRE, etc.)

Cable fatigue test bench

Equipment for testing cables in actual size (up to 16 meters)

SPECIFIC TESTS

- Test cables up to 16 m long.
- Ability to adapt angular deviations and apply transverse forces

EXPLOITANT
IPSTAR

IMPLANTATION
IPSTAR

EQUIPMENT

- Housing made of reinforced concrete with 16-m long rebar, providing a strength of 30,000 kN.
- Three hydraulic jacks fitted with mechanical position clamping legs (to maintain the load after cutting the hydraulic power supply). Maximum tension: 24,000 kN.
- Many opportunities exist for the anchoring cable.

TESTING

- Static loads
- Cyclic loads
- Transverse excitation (bending)
- Monitoring (acoustic, ...) breaks during the test
- End testing capabilities

EXEMPLES D'APPLICATIONS POUR L'ÉNERGIE MARINE RENOUVELABLE

- Resistance and fatigue characterization of the anchoring cables.
- Resistance and fatigue characterization of electrical cables.

FINFUNDING
LPCP (1989)

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Thank you for your attention !