Hawaii, USA, March 26 - 28, 2012

AMI-ADEME
Invitation for expression of interest by the French Agency for Environment and Energy Management

AAP IEED
Call for projects for Institute of Excellence in Carbone-free Energies

France Energies Marines

Marc Le Boulluec
Institut Français de Recherche pour l'Exploitation de la Mer
French Research Institute for Exploration of the Sea
IFREMER
France

Emergence of the Marine Renewable Energy Sector in France : a long story

30's then 50's then 60's…

OTEC during 30's (feasibility demonstration by Georges Claude), 50's (studies for Abidjan, in Ivory Coast et Guadeloupe),
Tidal energy : The Rance barrage, 254 MW installed, inauguration 1966, production since 1967

70's and 80's :

Wave Energie : Ifremer (Wave energy "contest"), Ecole Centrale de Nantes (Ecole Nationale Supérieure de Mécanique) (PhD thesis)
OTEC (Ifremer, feasibility studies and preliminary draft with Ergocéan for a 5MW plant in Tahiti – stopped in 1986)

Since 1986 to end of 90's : « valley of death » for Marine Renewable Energies…

Call for project (AAP) in 1999 in the frame of Eole 2005
1 wind project selected for Dunkerque, France (SEM+Total+Shell) and then cancelled

2002 : Joint ministerial report SGMER
Recommendations for the development of wind energy at sea in France

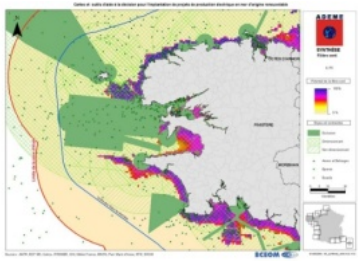
2004 : Call for wind energy project at sea
1 selected project : 21 wind turbines for a total of 105 MW on Côte d'Albâtre (Enertrag) -> cancelled

Emergence of the Marine Renewable Energy Sector in France : a long story

Since early 2000's : some MRE projects with strong growth since 2005
First approved MRE projects by the Pôles Mer (regional competitiveness networks)
(Hydrohélix current turbine end 2005) and Tenerrdis in 2006 (Harvest)

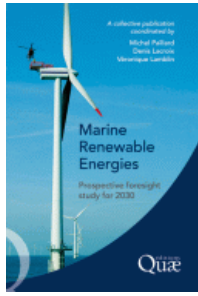
July 2006 : Tariff for wind energy at sea
13 c€/kWh~17 ¢/kWh

2007 : Zoning tool by ADEME : CIADT dated 14/09/04 published in 2007 (without consequences)
Decision-making tool (2007) for public services
(3 marine renewable energies: wind, waves, current)



April 2007 : Tariff for marine renewable energies
15 c€/kWh~20 ¢/kWh
(at the same period : Portugal 23 ¢/kWh~30 ¢/kWh and UK : 27,5 c€/kWh~36 ¢/kWh)

2008 : Foresight study by Ifremer on MRE horizon 2030 (Publication QUAE, Ifremer & Futuribles)



2007 / 2008 : Grenelle de l'Environnement
Proposal for research demonstration fund, including MRE

Since 2008 : structuring the MRE sector

2008 / 2009 : Partnership initiative for MRE emergence : IPANEMA

138 partners and one report

2009 : Grenelle de la Mer

Plan Energies Bleues (Blue Energies) – demonstrators support - importance of overseas – need fo test sites

2009 : Research demonstrator fund managed by ADEME

Invitation for expression of interest (AMI) for MRE (Energies : waves, current, floating wind turbines, OTEC)

21 candidates : 7 current, 9 waves, 4 floating wind turbines, 1 OTEC, 5 selected projects (1 waves, 2 floating wind turbines, 2 on current)

Approximate total budget : 40 M€ from "investing to the future". Contracts with consortiums in 2011.

2009 : National Strategy (Speech from French President N.Sarkozy on 16 July 2009 in Le Havre)

Strategic planning for defining the deployment zones. Real industry policy to start.

Creation, in France, of a Technological Platform on MRE with Ifremer as a leader.

2009 : National Alliance for Coordination of Research on Energy (ANCRE)

ANCRE : IFP, CEA, CNRS, Ifremer, .. -> GP 5 research roadmap on MRE -> 7 priority axes

2009 : "Investissements d'Avenir" (Investing to the Future) (Grand Emprunt)

with funding of Institutes of Excellence in the domain of Carbon-free Energies

Since 2008 : structuring the MRE sector

2009 – 2010 : MRE Planning

** Updating the decision making tool of ADEME and coordination of the dialogue with the aim of call for projects on offshore fixed wind turbines, under the heading of the Region Prefects and Maritime Prefects*

-> 5 zones selected in 2011 -> call for projects in 2011, results in april 2012 (a priori for 3000 MW)

-> 2011, new dialogue for a second call for projects to launch in 2012 (even a call for projects for marine current turbines and floating wind turbines)

Other target : Rules to simplify for offshore wind (and further for MRE) and development of MRE test sites

2010 : Call for projects of Institute of Excellence in the domain of Carbon-free Energies (IEED FRANCE ENERGIES MARINES)

2010 – 2012 : Preparing the proposal for IEED

2011 : Call for projects "Grand Eolien" in the frame of "Investissements d'avenir" (including offshore wind)

Other calls for projects expected in 2012…

11 Mars 2012 : Announcement of the granted IEED by the Prime Minister (including FRANCE ENERGIES MARINES)

AMI-ADEME

Funding from ADEME

French Environment and Energy Management Agency

Clean Current Technology

ORCA **Marine current turbine**

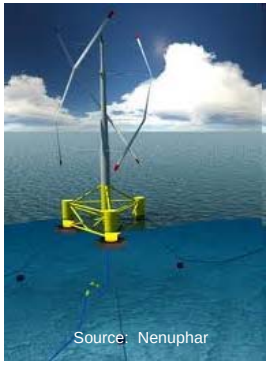
ALSTOM Hydro France, EDF, SECTOR, STX Europe, CETIM,
Ecole Centrale de Nantes, Ifremer, ARTS, INP Toulouse, IUEM

SABELLA **Marine current turbine**

SABELLA, Bureau Veritas, Veolia Environnement,
Direct Energie, Ifremer

WINFLO **Floating Wind Turbine**

Nass & Wind, DCNS, Vergnet, ENSTA Bretagne, Ifremer



S3 **Waves**

SBM Offshore, Ecole Centrale de Nantes, Ifremer,
Arts et Métiers ParisTech, Océanide, ISITV, SEAL Engineering

VERTIWIND **Floating Wind Turbine**

Technip, EDF énergies nouvelles, NENUPHAR,

FRANCE ENERGIES MARINES

An Institute of Excellence in Carbone-free Energy (IEED) offering scientific and technological facilities for an industrial development of MREs

Offshore wind, Tidal current, Tidal range, Wave energy, OTEC

Challenges and opportunities of the MRE development

AN IMPORTANT CONTRIBUTION TO THE FUTURE ENERGY MIX

Commitments to reduce CO_2 emissions

- European commitment (20/20/20)
- Grenelle de l'environnement (23% EnR, 3% MRE)

A very large energy potential worldwide

3 600 TWh/yr of technical potential by 2030

(France electrical energy generation: 600 TWh/yr)

National data	Fixed offshore wind	Floating offshore wind	Tidal current	Wave energy	OTEC
2020 Objectives (inst'd capacity in GW)	6	1	0,5	0,2	0,2
Practical resource, TWh/an	50 ? 15 by 2020	200 ? 2,5 by 2020	15 1,5 by 2020	40 0,8 by 2020	20 000 ? 1,4 by 2020
Investment (excl. R&D costs) 2020, md€	10	3	1,5	1	1

Source : updated Ifremer foresigth study

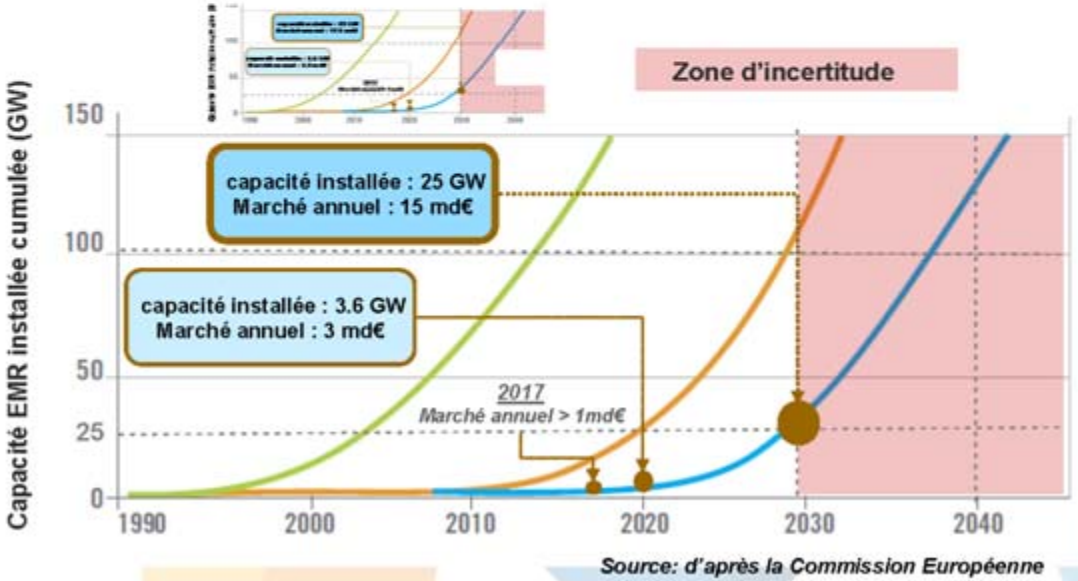
Growing markets, in Europe and worldwide

- 210 G€ investments in Europe by 2020

An emerging industrial sector…

- 150 000 direct and indirect jobs by 2020
  (MRE European market)

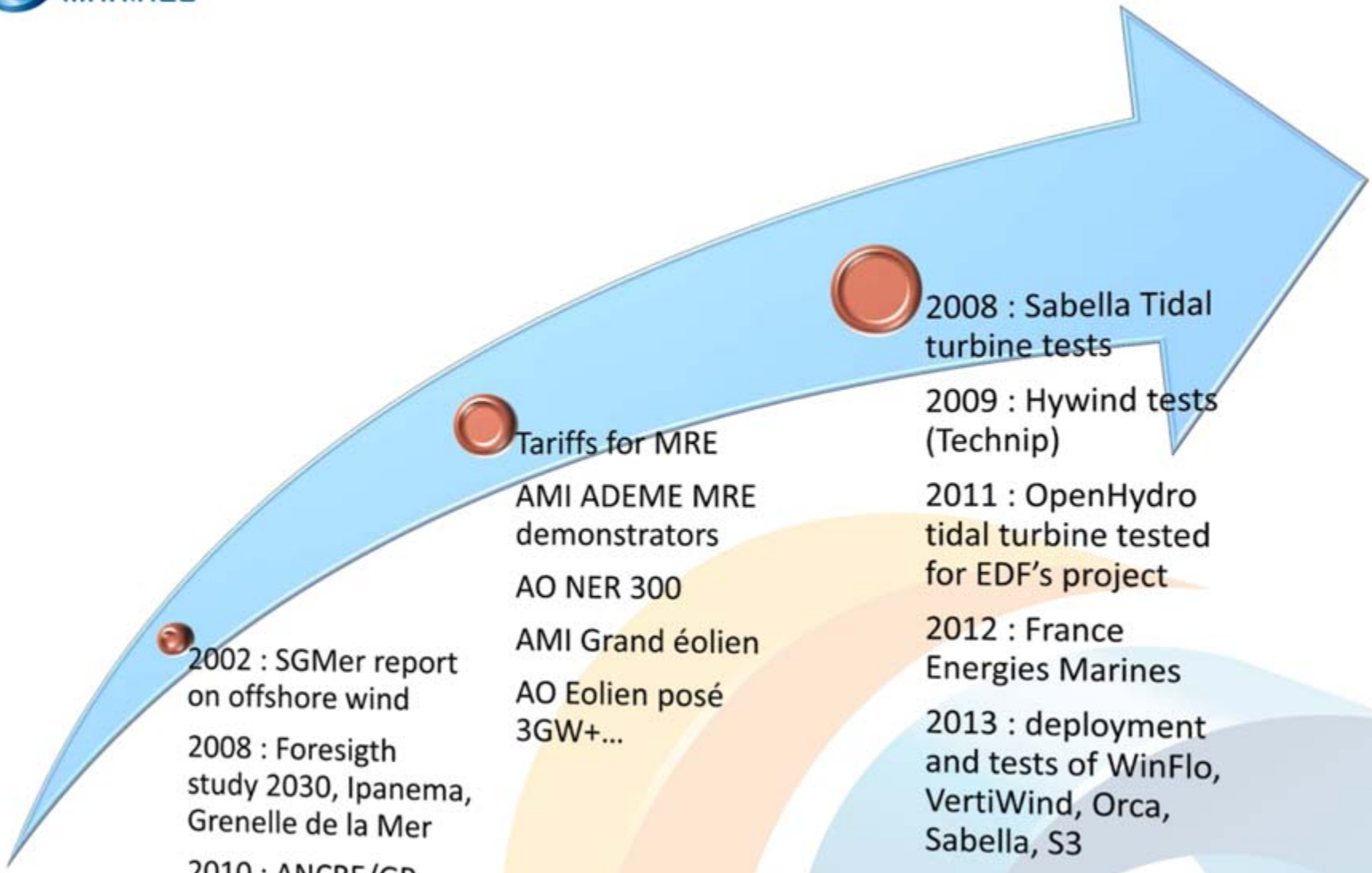
… in which French companies could take a significant share



Source: d'après la Commission Européenne

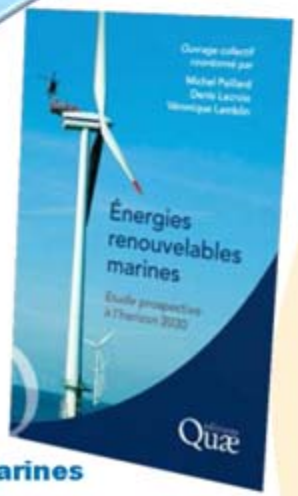
Context

CRUCIAL STEPS IN A GLOBAL TREND



Context

STEPS IN A GLOBAL TREND



France Energies Marines Vision

A EUROPEAN LEADER AND A STRONG POTENTIAL

Objectives of a dedicated research institute

Build a world-class industrial leadership

- bring leading sectors together (off-shore oil & gas, shipbuilding, utilities)
- promote the sustainability of the technologies (European criteria)

Consolidate a scientific excellence

- multidisciplinary teams (as opposed to today's specialized teams)
- public-private synergies (various level of technology development and maturity)

Validate the technologies and reduce their costs

- prototypes/pre-commercial units and arrays (a range of services)
- shared infrastructures (numerical modeling, test benches, test sites)

Support the industry by education and training

- define the appropriate training programs required
- disseminate learning tools

Scope

Offshore wind

Tidal current

Tidal range

Wave energy

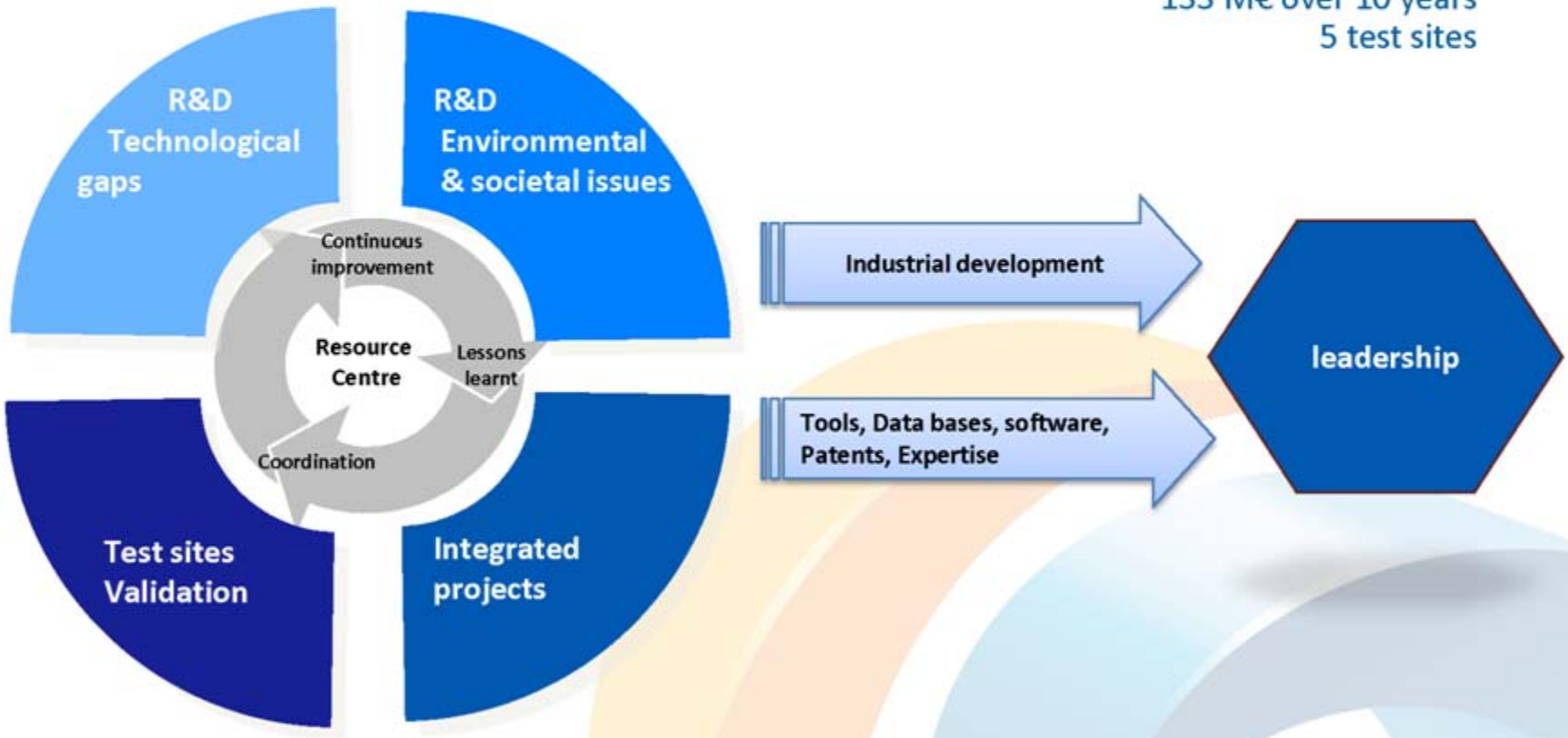
Ocean Thermal Energy Conversion

A single institute offering a complete range of services

R&D, VALIDATION, EXPERTISE, TRAINING, DISSEMINATION

A Public-Private Partnership involving more than 30 companies and 20 public entities representing all the key players of the MRE sector across the different coastal regions mainland and in France's overseas territories.

70 researchers, engineers, technicians
133 M€ over 10 years
5 test sites



Mapping of the 33 members and 23 associate-members

PUBLIC-PRIVATE PARTNERSHIP

14 Public Members

19 Private Members

8 Public Associate - Members

15 Private Associate - Members

Research Themes

A TRANSVERSE APPROACH TO SUPPORT MRE TECHNOLOGIES

Tackle technological gaps

resource assessment
sustainability of conversion systems
conversion efficiency
commissioning, maintenance, de-commissioning
life cycle analysis
network integration
energy storage
industrial process

Solve environmental and societal issues

environmental impact
acceptance wrt other marine activities
law & regulation
cost-benefit analysis
MRE business models in various paradigms
by-products

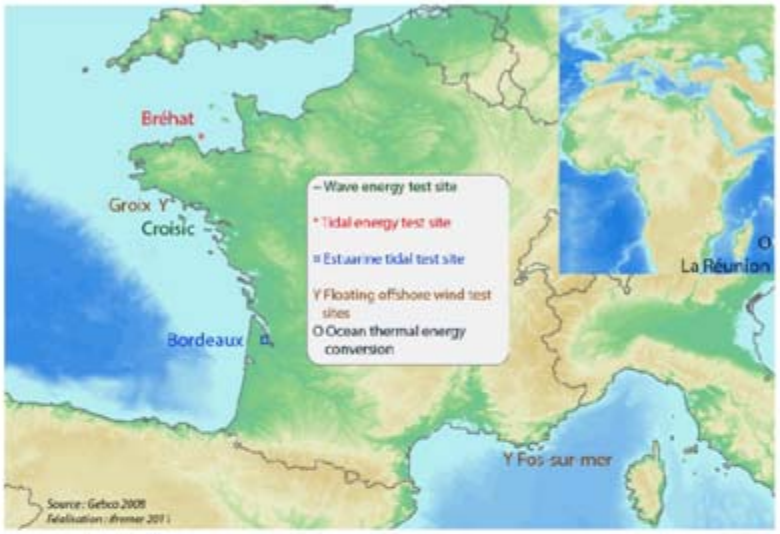
Test sites

TEST AND VALIDATION OF MRE TECHNOLOGIES

A shared investment for full scale prototypes test infrastructures

- Grid connection, cable, hub, instrumentation etc.
- Environmental Impact Assessment, Offices etc.

A streamlined and simplified consenting process, a range of services for technology developers

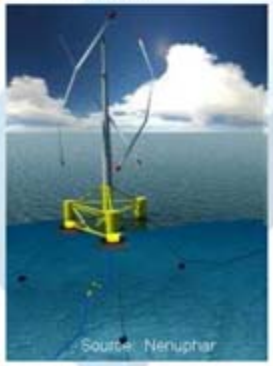


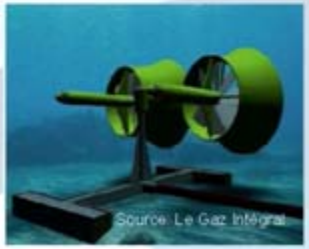
A large number of full scale demonstration projects lead by French industry players

The development of test sites by 2013 is a key element to support the development of a strong MRE industrial sector

Source: ALSTOM


Source: WinFlo


Source: Nenuphar


Source: Le Gaz Intégral

Ressource Centre

AN EFFECTIVE SUPPORT FOR THE MRE BRANCH

Access to facilities

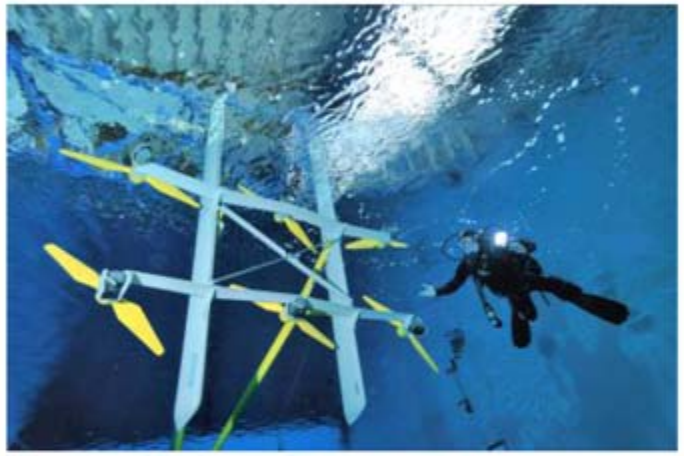
- numerical modelling
- test tanks
- material trial, corrosion, bio-fouling, etc.

An information system

- guidelines, GIS
- Dissemination

Training and expertise

- education & training
- Benchmarking
- representation, e.g. in normative WG



copyright "© Ifremer/O. Dugornay"
Tidalstream project

copyright "© EDF"
Usine marémotrice de la Rance

FRANCE ENERGIES MARINES

www.france-energies-marines.org

Thank you for your attention

Marc.Le.Boulluec@ifremer.fr