



sea THE FUTURE®

DCNS

Meeting the increasing demand for renewable energy in coastal cities and islands PECC, Victoria (CA)

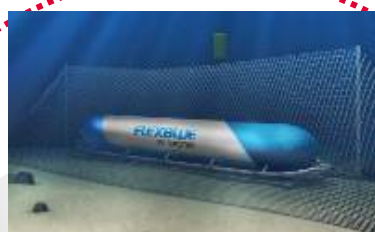
*Bertrand Aubriot, Deputy Director, Strategy and Development
DCNS, Paris, France*

DCNS group

A World leader in naval defence systems ...



Revenue: €2,9bn
Orderbook: €14bn
(40% international)
13 000 employees



... now expanding
into Marine
Renewable Energies
and Civilian Nuclear
Energy

Marine Renewable Energies Market (1)

- **The Marine Renewable Energies (MRE) Market has strongly evolved during the last two years but has not yet emerged ;**
- **30 countries in Europe, North and South America, South Africa, Asia and Oceania have already declared they will use these energies;**
- **Some countries have decided of supporting policies to the MRE and constitute high potential countries for the market development.**
- **DCNS is discussing with 17 countries.**

Marine Renewable Energies Market (2)

- The four types of MRE (wind off shore turbines, tidal turbines, ocean thermal energy conversion and wave energy conversion) are complementary and not competitive :
- Each geographic area has a main marine renewable energetical characteristic : wind, tidal, sea temperature or waves. This main ressource is potentially so energetical that there is no need to deploy different technologies in the same area, as the economic rentability is assured.
- The local renewable marine energy ressource is then exclusive and limits competition between the different types of energy. A geographical area can be adressed with one adapted product.
- The only limit to that lack of competition happens where the electrical grid is enough extended to allow interconnexion between different MRE production centers.

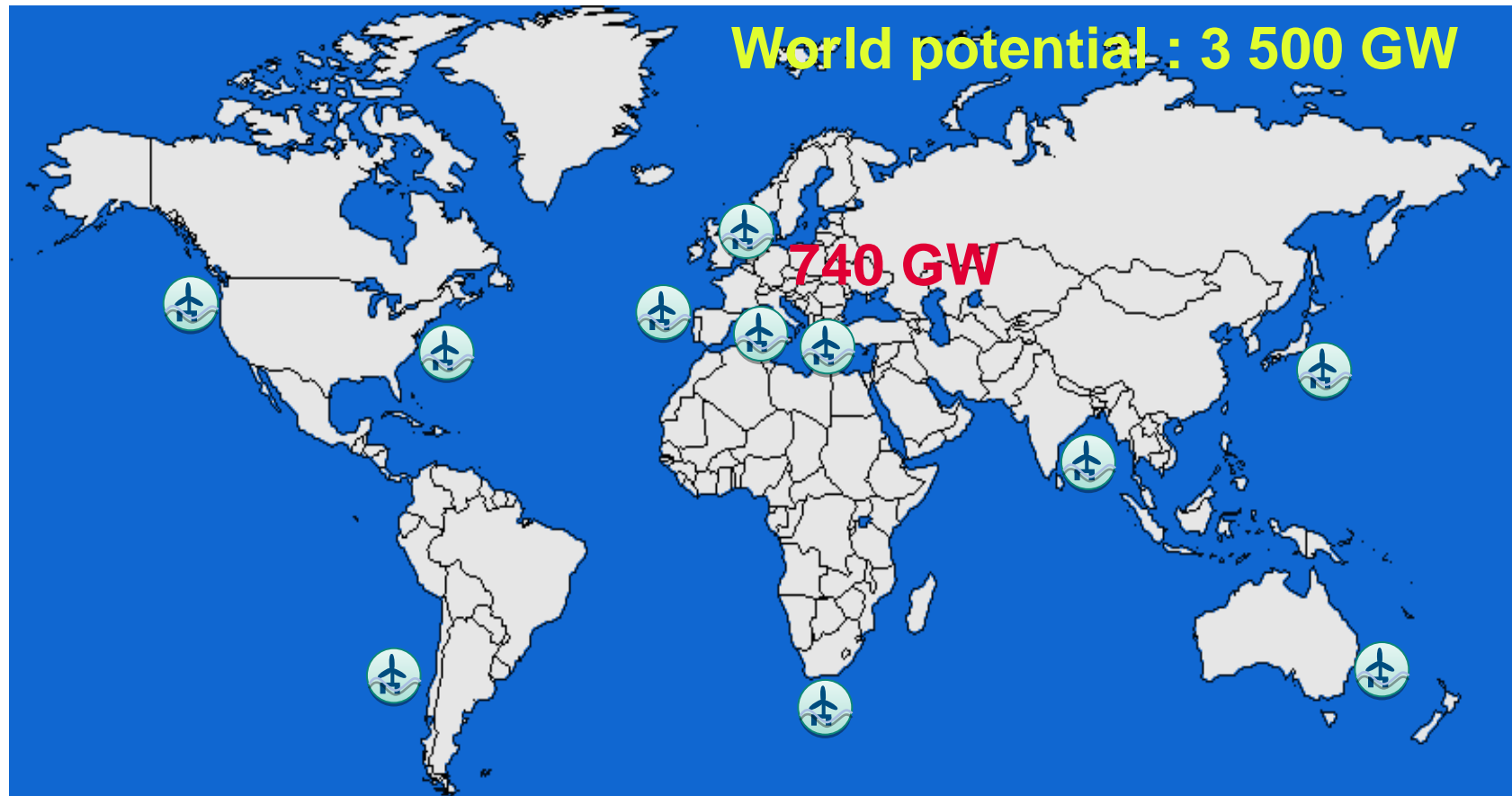
MRE market approach

- Industry has not yet demonstrate the use of the MRE technologies at a commercial scale. Each company is consolidating its own position in the added value chain and is looking for alliances while waiting the market starts.
- Companies have to demonstrate to the investors that they can reduce the cost of the electricity they will produce. They must also guarantee that they control the technological and industrial risks.
- Delivery of electricity by the MRE needs three steps :
 - Development of the products ;
 - Control of the technologies and validation through test farms and test production units ;
 - Industrialization and installation of commercial farms and production units.
- DCNS has established raodmaps to get over these three steps for the 4 types of MRE during the next 10 years.

Some considerations about the impact of MRE

- The development of Coastal countries and Islands States could be strongly impacted by the arrival of MREs as they will give them autonomy in terms of energy resources and bring an unlimited and numerous energy.
- This energy will promote the economical development :
 - Industrialization ;
 - Tourism ;
- ... as well as the welfare of the population.

Off-shore Floating Wind Turbine Market



Off shore floating wind turbine roadmap

- Need for strong and stable wind implies off shore floating wind turbines in deep waters
- Reduced visual impact
- No shore footprint
- Easy installation & maintenance
- Non predictable
- Most favourable areas located in Europe, North and South America, Japan, Australia and India.



- 2017 : A Multi-MW prototype
- 2018 : Test farm

Tidal Turbine Market



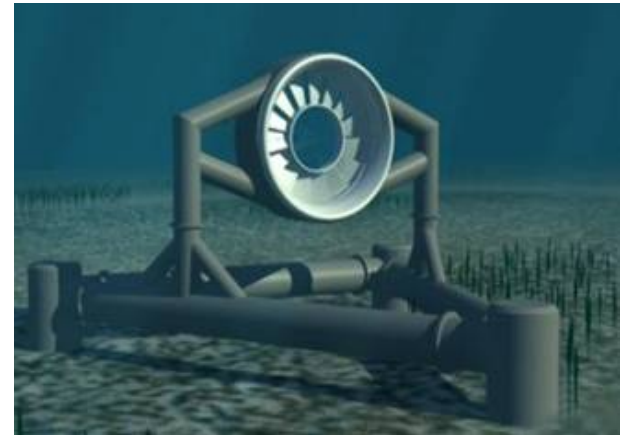
Tidal turbine roadmap

- Predictable flow of energy to the grid
- Advanced maturity
- Accessible potential FR+UK



Openhydro

- 2012 : First turbine at commercial size (16 m diameter)
- 2013 : French Call for Interest
- 2015 : Test farm project at Raz Blanchard

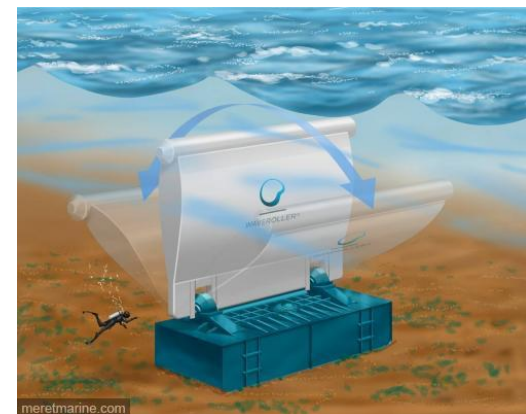
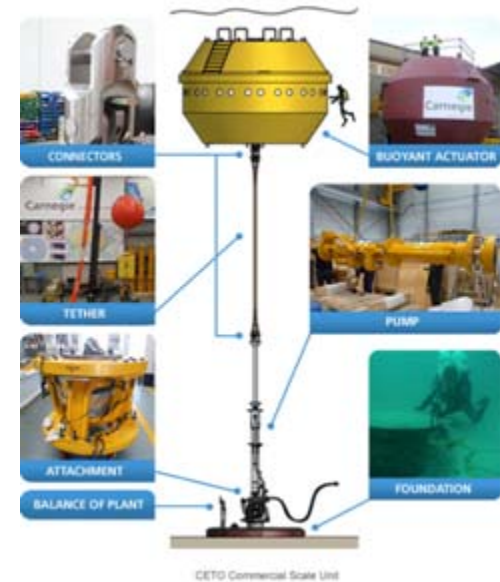


Wave conversion market



Wave conversion roadmap

- Outstanding energy potential
- World wide market
- Different technologies are studied
- 2011: CETO/Carnegie prototype for EDF EN
- 2017 : Pilot farm with FORTUM using Waveroller



Ocean Thermal Energy Conversion market

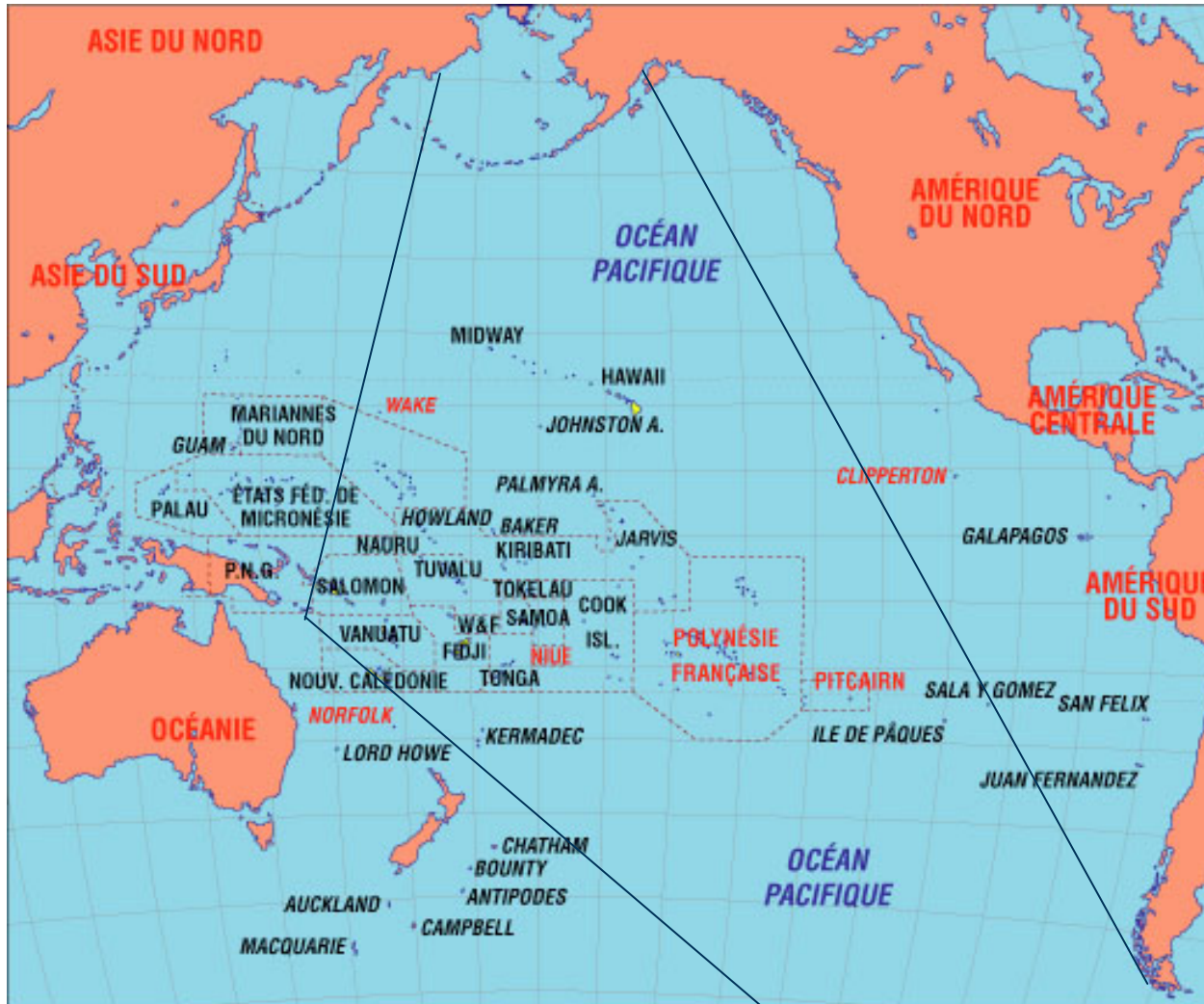


OTEC roadmap

- 24/7 production
 - Steady flow of power delivered to the grid
 - Key component of the islands/isolated areas energy mix by 2020 : 101 potential countries located between the two tropics
 - 55 of them has no other solutions to replace their current expensive use of fossil energy.
-
- 2011 : Land based prototype La Réunion (Indian Ocean)
 - 2017 : 10 MW pilot plant West Indies



MRE and the Pacific Area



MRE and the Pacific Area

- Pacific area allows the implementation of the four MRE technologies.
- It can be roughly separated in three markets :
 - East Pacific : North, Center and South America
 - Center Pacific : Hawaiï, Polynesian islands and State Islands.
 - West Pacific : New Zealand, Australia and Asia.
- There could emerge 4 to 5 industrial centers designed to build the MRE production units of the area.
- The production and maintenance units should be installed in the first country that will develop MRE. They would be used for the following countries using the same technology. The development of this activity should generate employment.

Conclusion

Coastal Cities and Islands States marine renewable energy demand could begin to be satisfied within the next 4 years.

The race has already started between Europe, USA, Canada, Japan & Australia to develop the adequate technologies.

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