

---

# HiPRWind

High Power, high Reliability  
offshore Wind technology

Jochen Bard, project coordinator, Fraunhofer IWES, Germany

---



# Outline

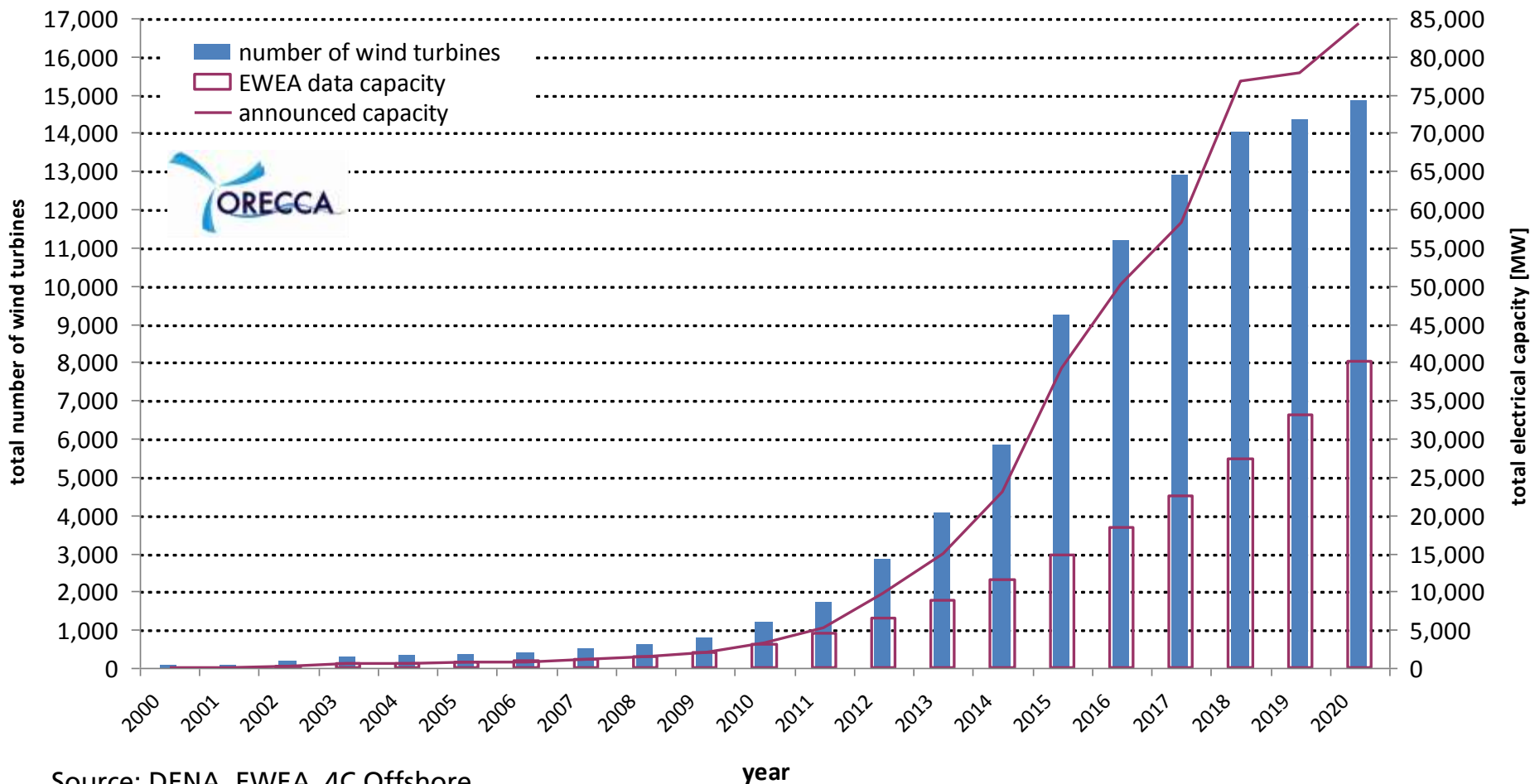


1. Offshore wind in Europe
2. Why floating wind ?
3. The HiPRWind work programme
4. Status
5. Expected impact



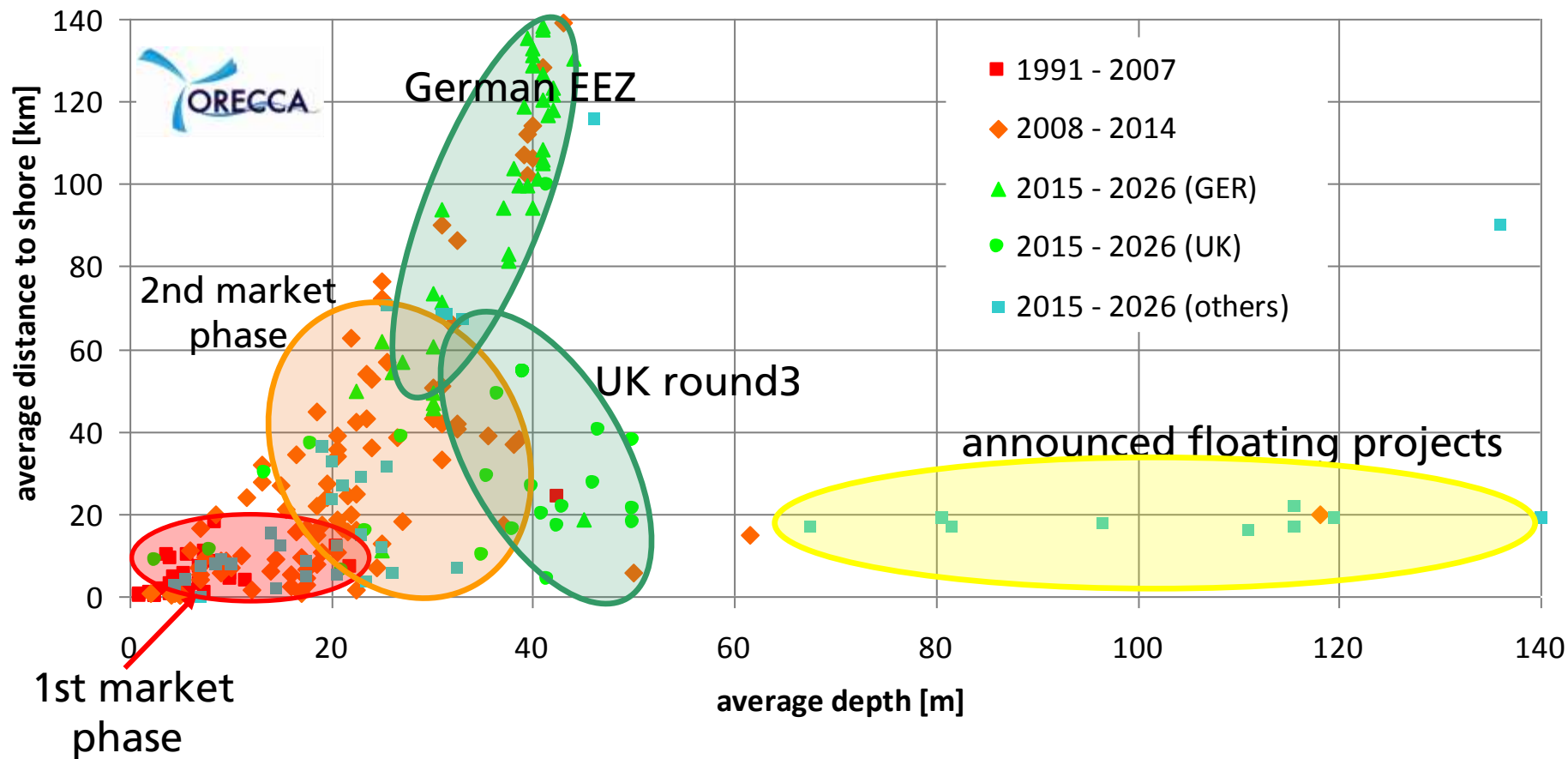
Graph: Acciona Energia

# European offshore wind market development: EWEA scenario and "project pipeline"

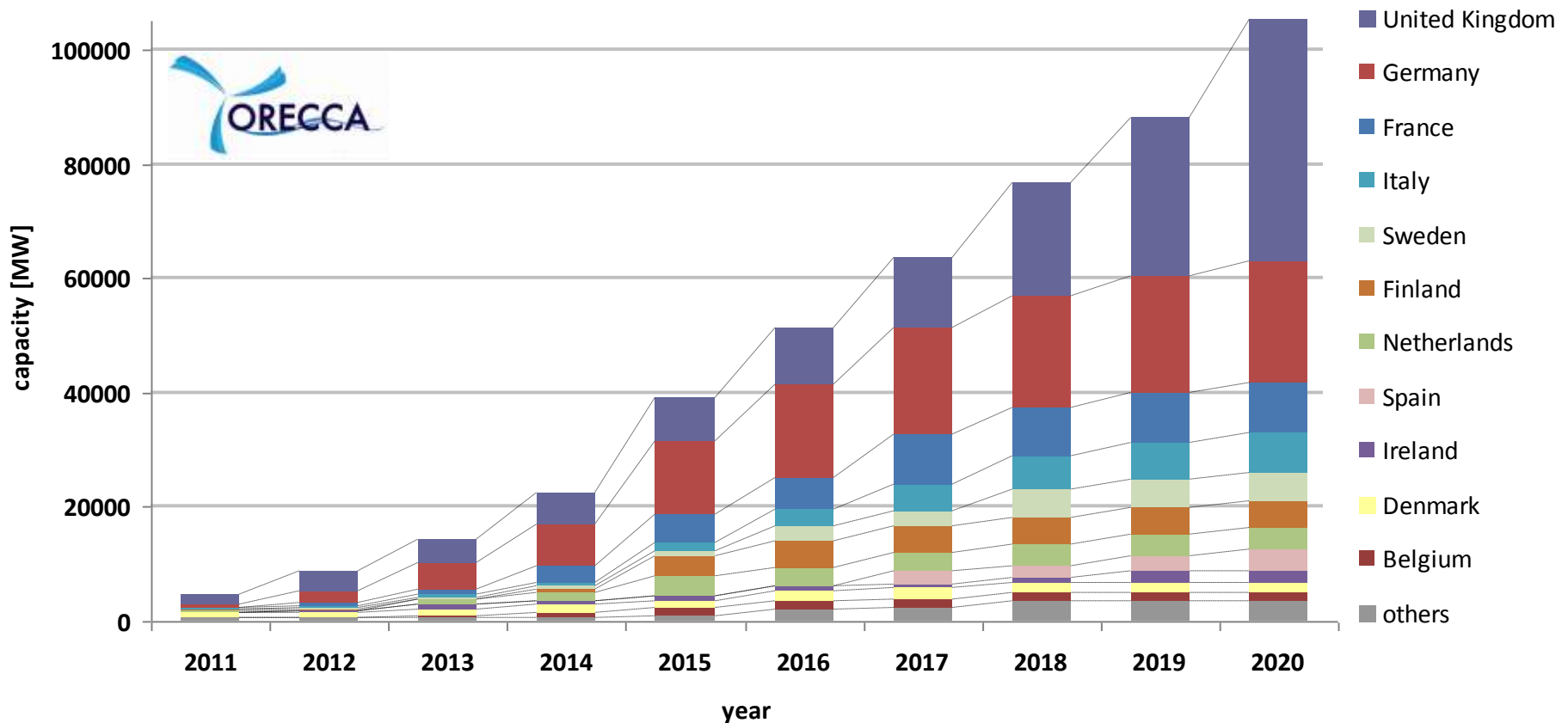


Source: DENA, EWEA, 4C Offshore

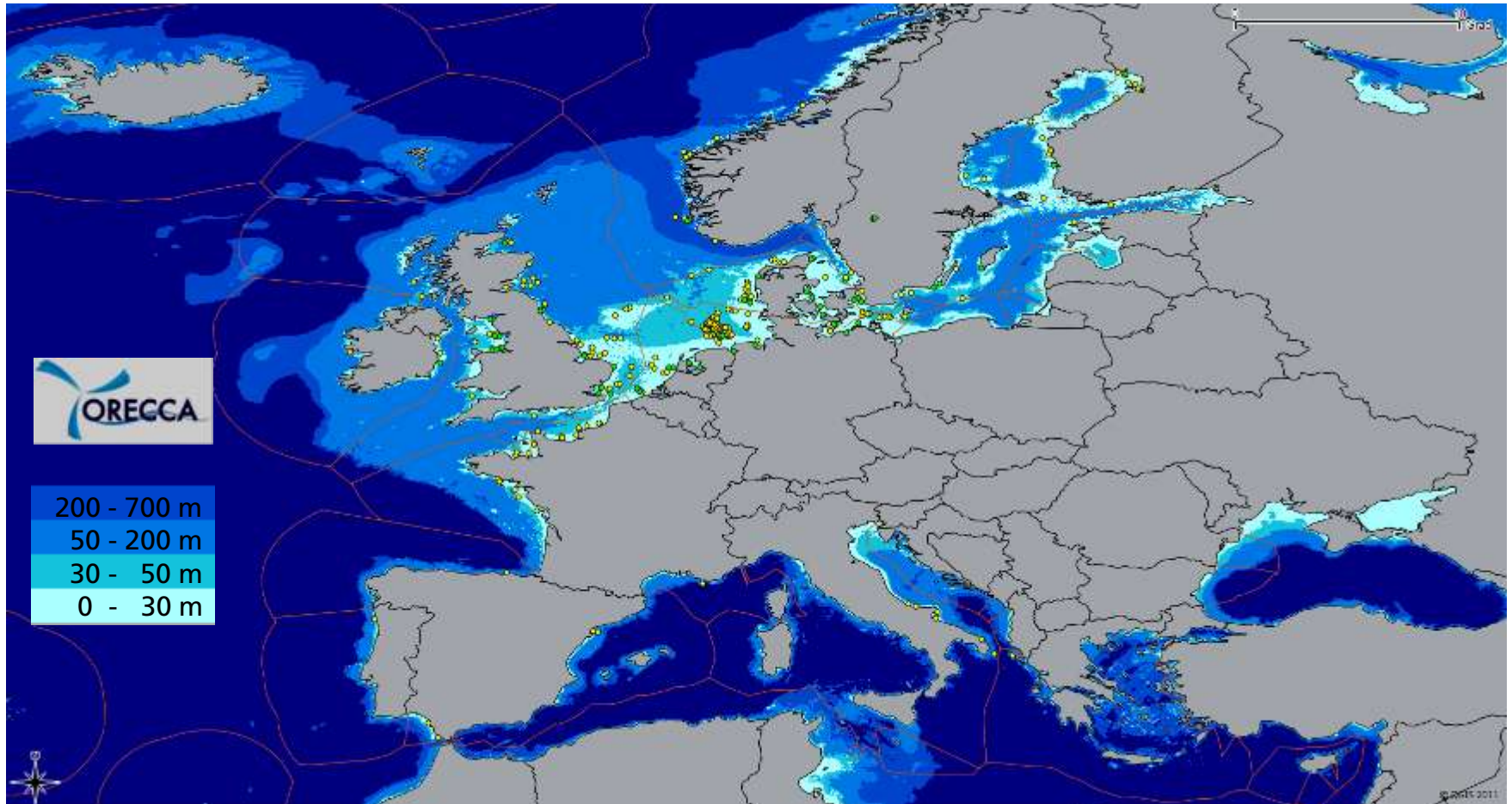
# Development phases of the EU offshore wind market in terms of water depth (m) and distance to shore (km) up to 2025



# Cumulated capacity of offshore wind farms in selected European countries project pipeline data from 2011 to 2020



# Areas suitable for offshore wind installations in European seas

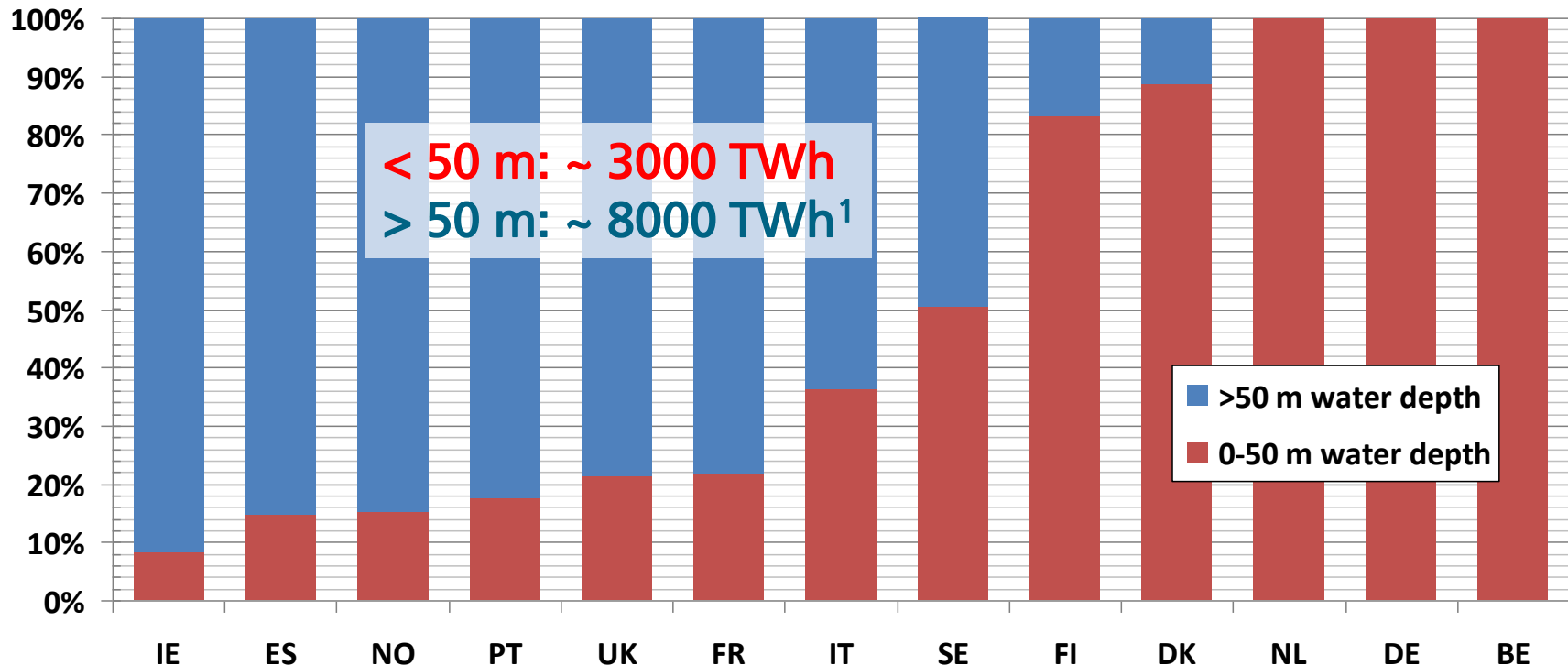


Map shows operational (green) and planned (yellow) offshore wind farms

# Offshore wind resources in Europe



Share of offshore wind energy potential of selected countries



EU electricity production:

2010  
3250 TWh

2020  
3800 TWh

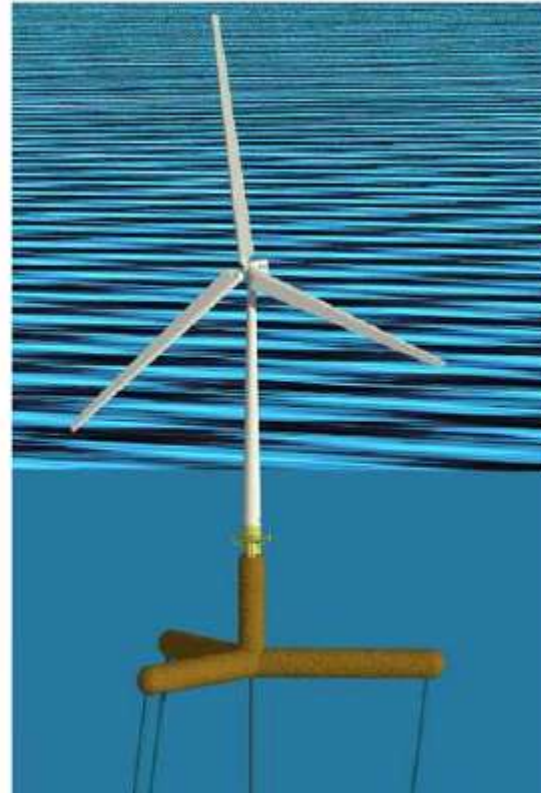
2030  
4250 TWh

<sup>1</sup>max 700 m water depth, max. 200 km offshore, 20% of the area

# Main floating wind turbine concepts



**Spar**



**Tension Leg Platform**

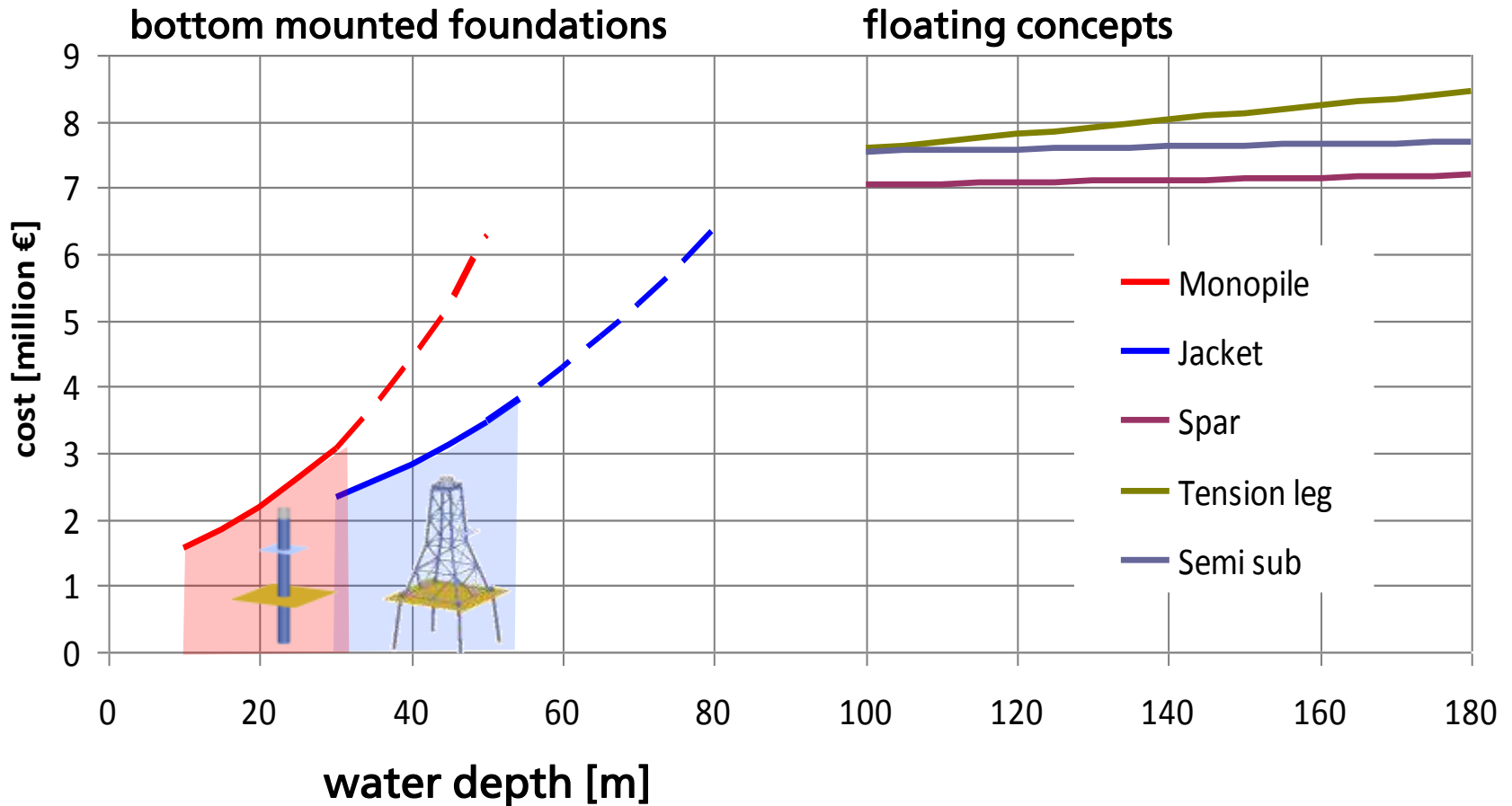


**Semi-Submersible**

Source: [Drifwind Study](#), ECN et al. 2002

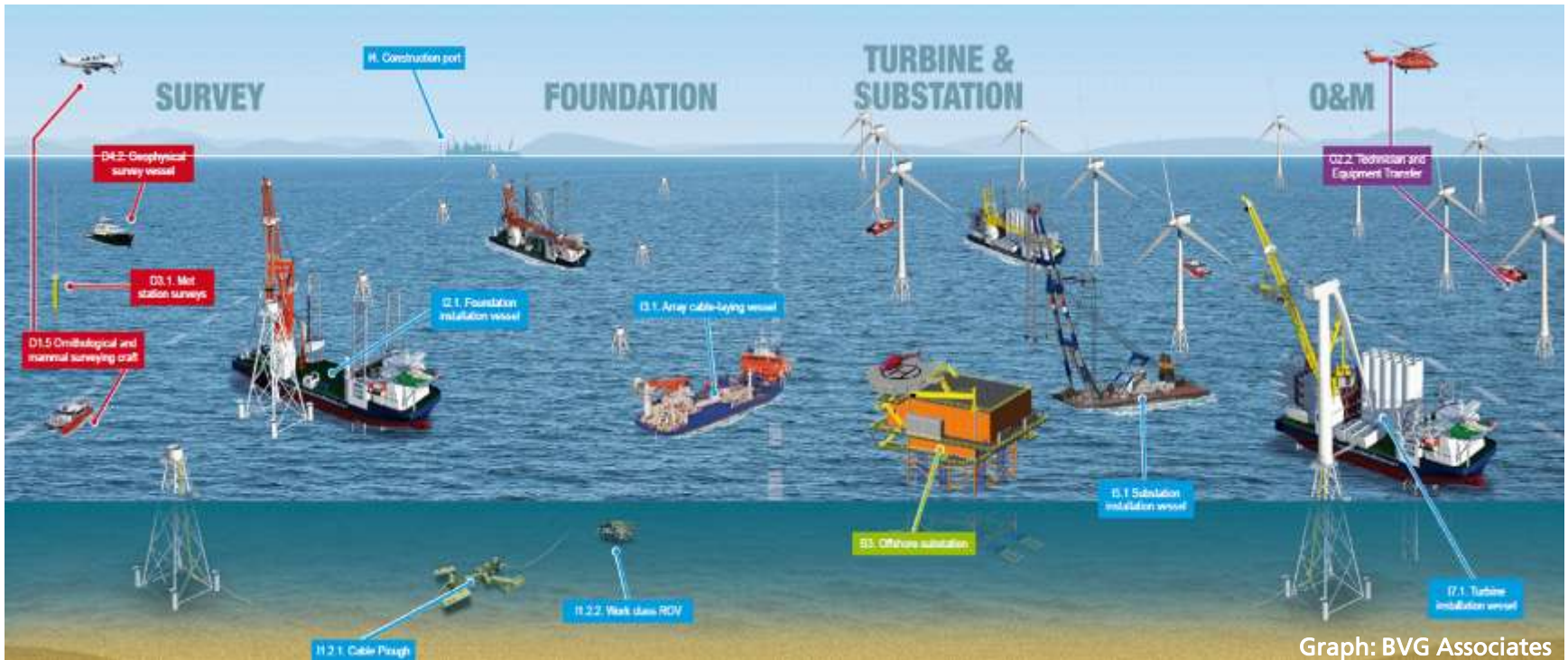


# Cost challenge in deep water



**Manufacturing cost models for 5 MW turbine foundations (various sources)**

# Offshore supply chain and infrastructure



Graph: BVG Associates

Pre-Installation	Installation		Operation
Surveys Geot&Env.	Foundation	Turbine	O&M visits
	Grid	Substation	
Port A	Ports B+C		Port A
Service Vessels	Installation Vessels & Equipment, Offshore Grid		Service Vessels

# HiPRwind: key facts and figures



**„High Power, high Reliability offshore wind technology“**

Project coordinator: Fraunhofer IWES



- Funded under the European Commission's 7th Framework Programme
  - Main source for European R&D funding, 50+ billions € over 7 years
  - Theme ENERGY.2010.2.3-1: Cross-sectoral approach to the development of very large offshore wind turbines
  - Involvement of offshore industry stakeholders required
- Project start date: November 1, 2010. End date: October 31, 2015
- Total budget 20 million €, total EC-funding 11 million €
- 1130 man months over 5 years

# HiPRwind: Programme



- Aim:  
install and operate a floating MW-class wind turbine for research purpose
- Potential Location:  
BIMEP, off Bilbao, Spain
- Industrial challenge: design, procurement, construction and installation of the floating WT within three years of project start and within the available budget
- Research prospects: generate field data from experiments on a real wind turbine in harsh offshore conditions during at least two years



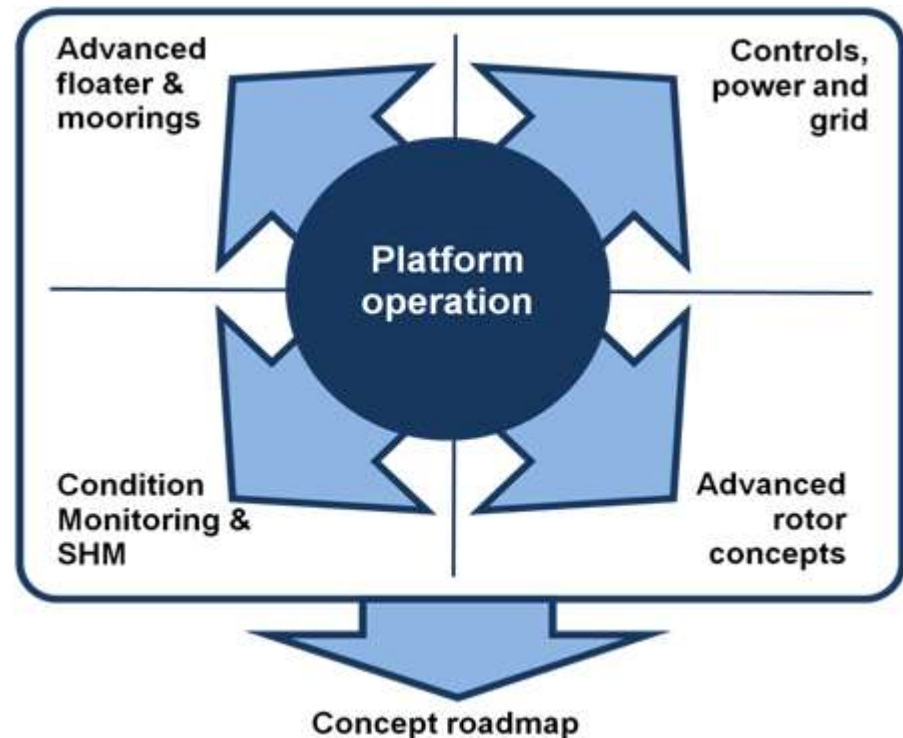
# HiPRwind: Work plan



## Main research topics:

- Floater and mooring systems
- Controls, power and grid
- Condition and structural health monitoring
- Advanced rotor concepts

- Increased scale
- Improved reliability
- Improved cost efficiency



# HiPRwind: Project timeline



## Schedule

Project start  
Nov. 2010

Structural design milestone  
Nov. 2011

Commissioning  
Summer 2013

Project end  
Nov. 2015

Design

Fabrication

Installation and  
commissioning

Operation,  
Research and development



# HiPRwind: Consortium



A strong consortium with experience in offshore developments

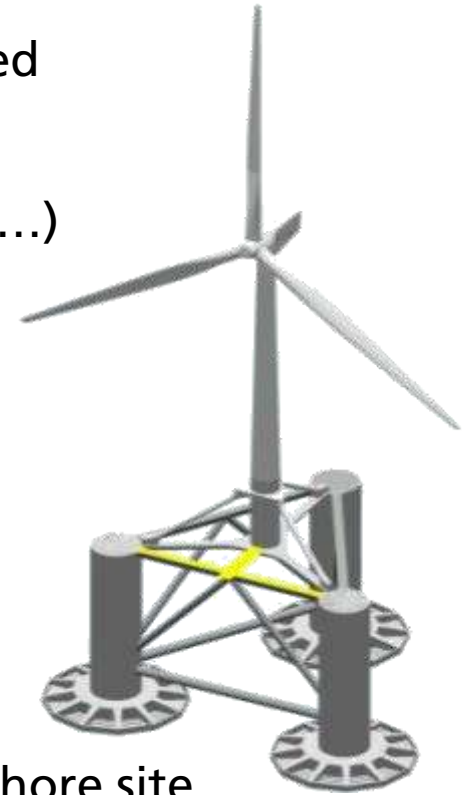


- Industry
- R&D SMEs
- Research org.
- Universities

# HiPRwind: Status of the design process 11/2011



- 10 partners working under Acciona Energia's lead
- Review and evaluation of basic design options completed
  - Semi-submersible selected
- Design framework completed (MetOcean, wind turbine,...)
- Sizing and design completed
- Modeling & simulation supported by tank testing
- Detailed engineering ongoing
  - Structural details, moorings, access
  - Assembly, Installation and Commissioning Procedures
  - Operation and Maintenance concept
  - Certification and Permitting requirements for the offshore site



Graph: Olav Olsen



# Expected impact of HiPRwind



- Showcases **European know-how**
- Delivers **R&D results** for the benefit of the industry
- Promotes a **Spanish test location** with proposed installation at BiMEP
- Encourages **international collaboration** across borders and sectors
- Provides a **forum** for the floating wind community
  
- Interacts with a cluster of European projects to maximize the impact:
  - **ORECCA**: Development of an offshore wind-wave-current roadmap
  - **Marina Platform**: Research on multi-purpose platforms
  - **Marinet**: Experimental infrastructure for offshore renewables research
  - **Oceans of tomorrow**: sustainable use of the oceans
  - **Floating Wind Demo projects**
  - Further combined wind-wave and wind-tidal projects...

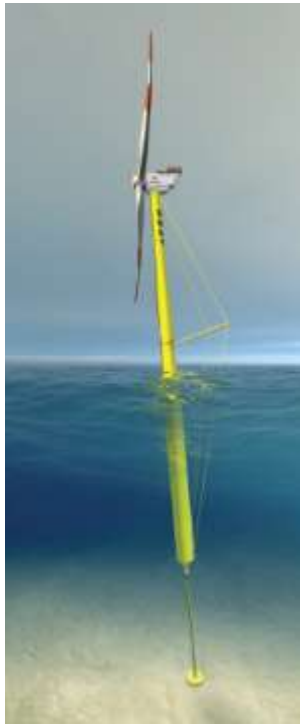
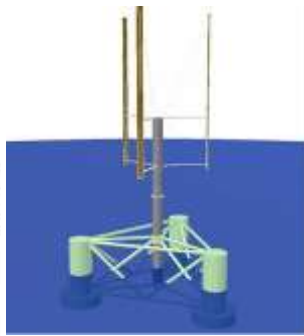
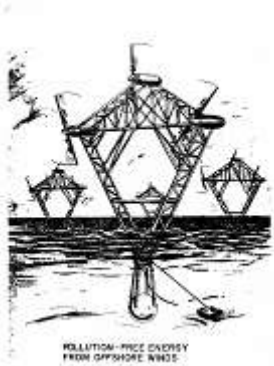
# Combined European and National Funding



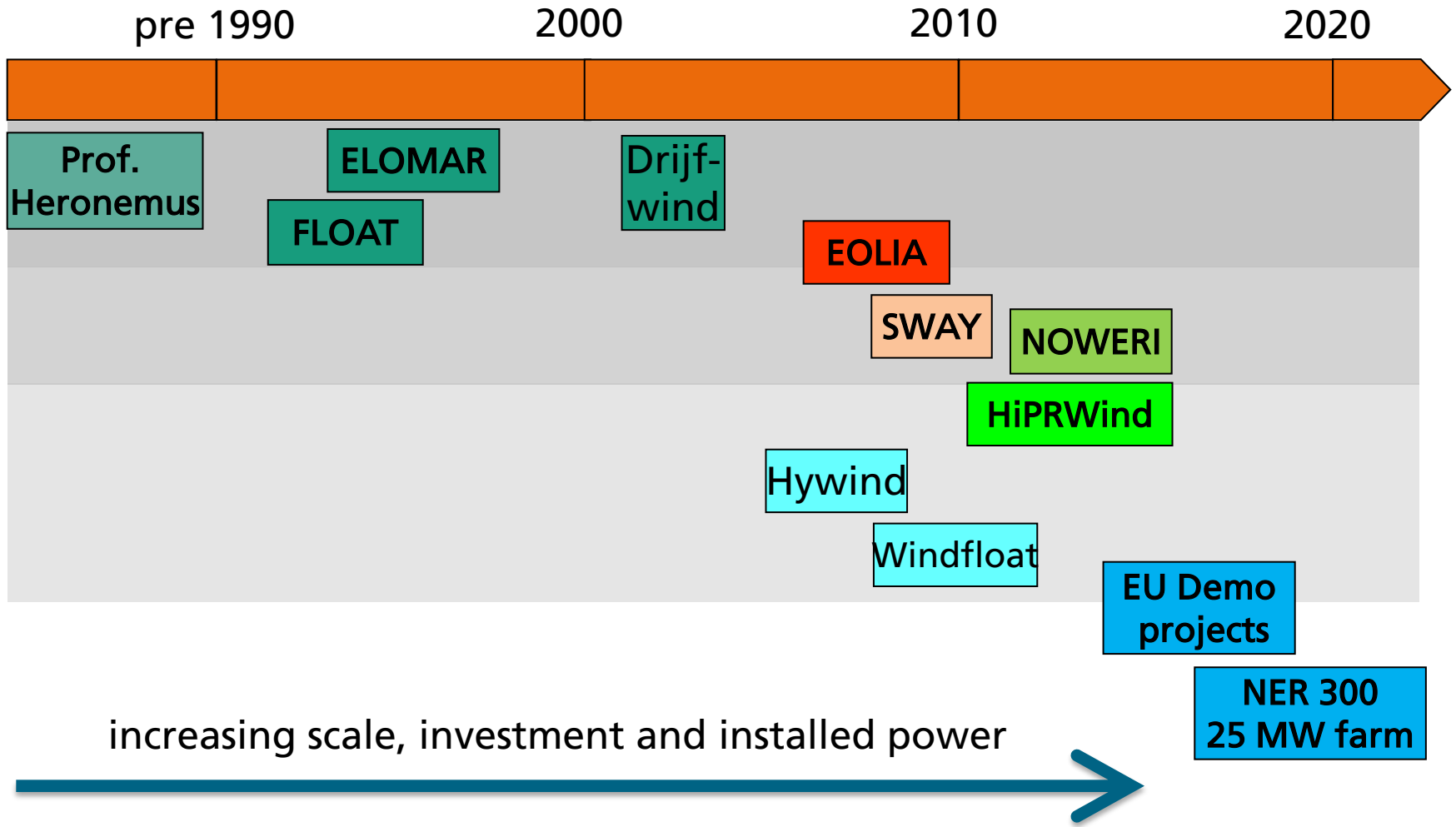
- Pre-HiPRWind: EOLIA project, Spanish funding
- Basque Regional Government co-funding through its public energy agency EVE: a test field area in the Biscay Bay, "BIMEP" Site
- FLOATMET: Spanish-French collaborative project to develop a floating offshore MET station
- WETSITE: Spanish Collaborative project, led by ACCIONA ENERGIA, site assessment, environmental conditions, met ocean resource and study of the wind turbine
- Floating Wind Turbine Structure: Spanish funding

All projects are in line with the recommendations of the SET PLAN

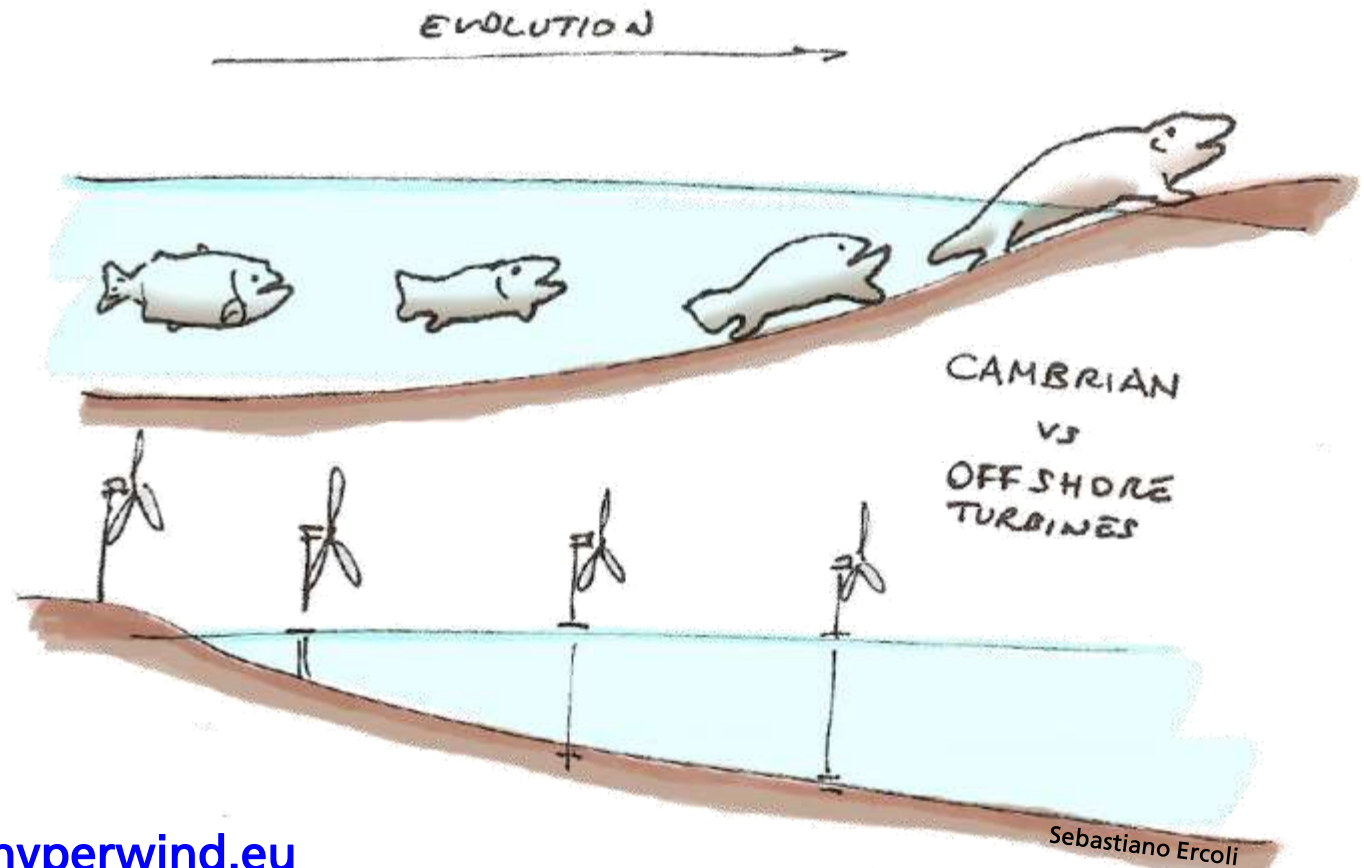
# Floating concepts: other examples



# Floating Wind Projects & Timeline in Europe



# Thank you for your attention



Website: [www.hyperwind.eu](http://www.hyperwind.eu)

Contact: [jochen.bard@iwes.fraunhofer.de](mailto:jochen.bard@iwes.fraunhofer.de)