Progress of Offshore Wind Through R&D in FP7 and H2020

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Outline

- *Past Support to Research and Innovation*
- *JRC Wind Status Report*
- *TPWind Strategic Research Agenda*
- *Towards an Integrated Roadmap*
- *First H2020 Calls and the Next WP*

Past support to research and innovation

Programme	N. of Projects	Total Amount M€
FP7-ENERGY	26	168.6
FP7-ICT	2	4.45
FP7-SME	17	19.5
FP7-PEOPLE	19	21.6
FP7-IDEAS-ERC	2	3.0
FP7-INFRASTRUCTURES	2	13.35
FP7-KBBE	1	9.0
FP7-REGIONS	1	1.76
FP7-NMP	4	14.7
FP7-TRANSPORT	1	9.99
TOTAL	74	266.1

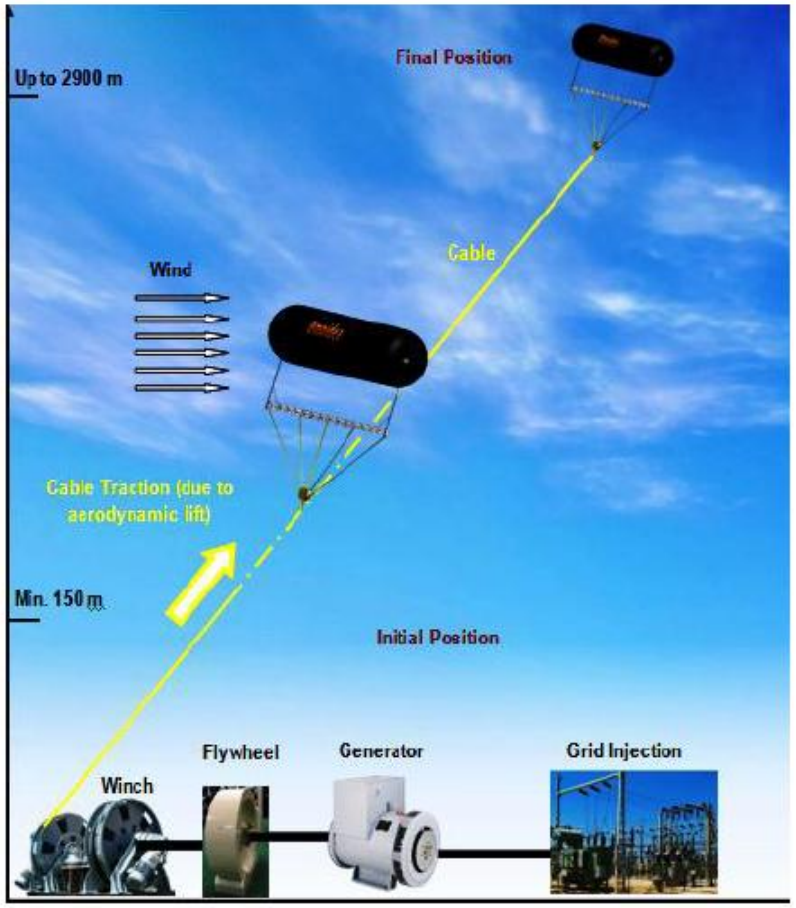
Finished projects FP7

HAWE - HIGH ALTITUDE WIND ENERGY

(FET project, Oct. 2010 – Sept. 2014, ~3MEuro, coordinator SME)

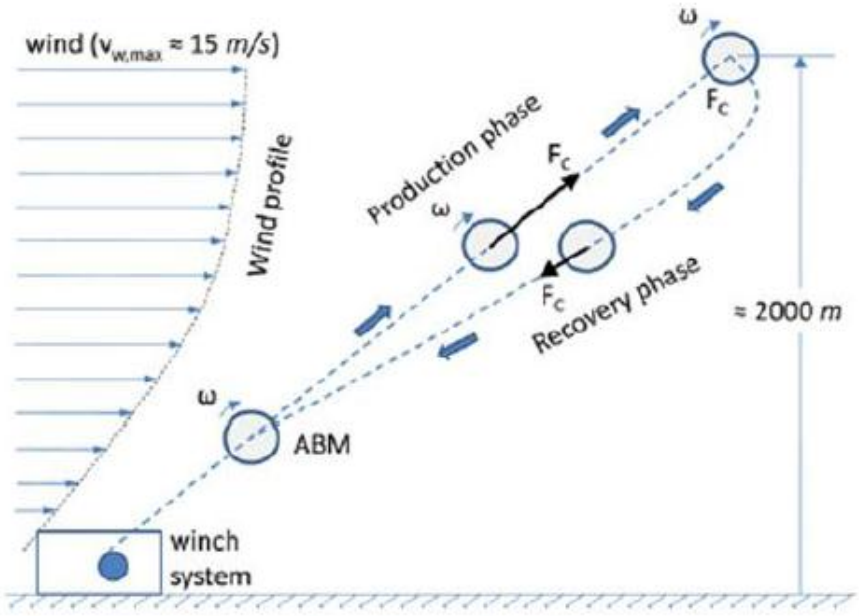
http://sicnoticias.sapo.pt/programas/futurohoje/2014-10-15-Usar-o-vento-para-produzir-energia-mais-barata-

Finished projects FP7



HAWE

Schematic view of operating concept: dotted lines represent ABM path during a cycle; wind speed profile and operating height represented.



Finished projects FP7

- *Deepwind- FET project – (coordinator DTU)*

Novel Concept for Floating Offshore Wind Turbines

- New promising high-performance airfoil family was developed for the 2 bladed design with potential increase of rotor efficiency, to provide a design of a permanent magnetic generator and a magnetic bearings system for the 5 MW conceptual design with a laboratory facility testing the bearing, to provide the controls of the power at the different wind speeds with rotor speed limitation.
- Furthermore, the team has achieved to provide a simulation tool for the pultrusion manufacturing process of specimen up to 60mm shell thickness, and in the HAWC2 simulation tool to integrate an engineering formula of the Magnus forces exerted on the rotating floater in waves, and to develop an optimised floater and mooring system integrated with the 5 MW conceptual design.

http://www.deepwind.eu/

Finished projects FP7

- *Marina platform – (coordinator Acciona)*

Marine Renewable Integrated Application Platform

- Established criteria for generating, assessing and evaluating combined concepts for wind & ocean energy utilisation;
- Produced an atlas for the combined offshore renewable energy resources, and a wide set of system design, modelling and optimization tools.
- Cost aspects, risk modelling, key components, grid issues, and other relevant aspects of multi-purpose energy platforms addressed.
- Evaluated many different designs.

Finished projects FP7

- *Sopcawind - FP7 ICT (coordinator Tecnalia ES)*
  - To develop a set of procedures to combine large heterogeneous datasets into a common usable format.
  - On the other hand this project also aims at developing Software for the Optimal Place Calculation for WIND-farms (SOPCAWIND).

- *DEMOWFloat – FP7 energy (coordinator EDP/Principle Power)*
  - Demonstration of the WindFloat Technology

Finished projects FP7

- *Monitur - FP7 SME (coordinator Microsay AS Turkey)*
  - Reduction in Maintenance Costs of Wind Turbine Renewable Electricity Generation through Online Condition Monitoring
- *WINTUR demo - FP7 SME (coordinator INNOTECUK UK)*
  - In-situ wireless monitoring of on - and offshore WINd TURbine blades using energy harvesting technology - Demonstration
- *WIND TURBARS - FP7 SME (coordinator H V WOODING Ltd UK)*
  - On-line Intelligent Diagnostics and Predictive Maintenance Sensor System Integrated within the Wind Turbine Bus-Bar structure to aid Dynamic Maintenance Scheduling
- *Windheat - FP7 SME (coordinator GEOLICA INNOVATIONS ES)*
  - Opening New Markets for SMEs: Intelligent Ice Sensing and De-icing System to Improve Wind Turbine Efficiency in Cold Climates

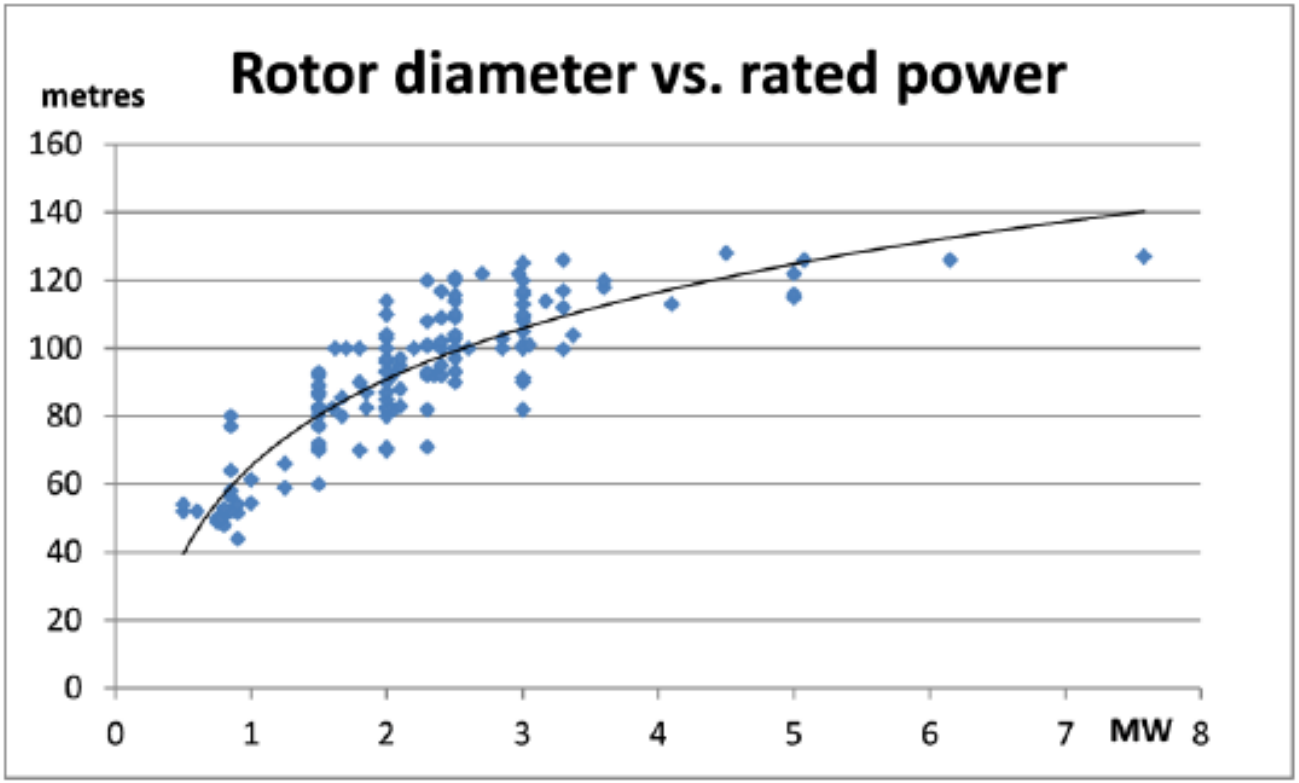
JRC Wind Status Report

"The main driver for developing wind technology further is to minimise the cost of energy (CoE) production, for which efforts focus on minimising capital and operation and maintenance costs and maximising reliability and energy production."

http://setis.ec.europa.eu/system/files/JRC_wind_status_report_0.pdf

JRC Wind Status Report

The trend towards ever larger wind turbines continued during 2013



Comparison of rotor size with turbine rated capacity for turbines currently being commercialised. Source JRC data

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European Commission

JRC Wind Status Report

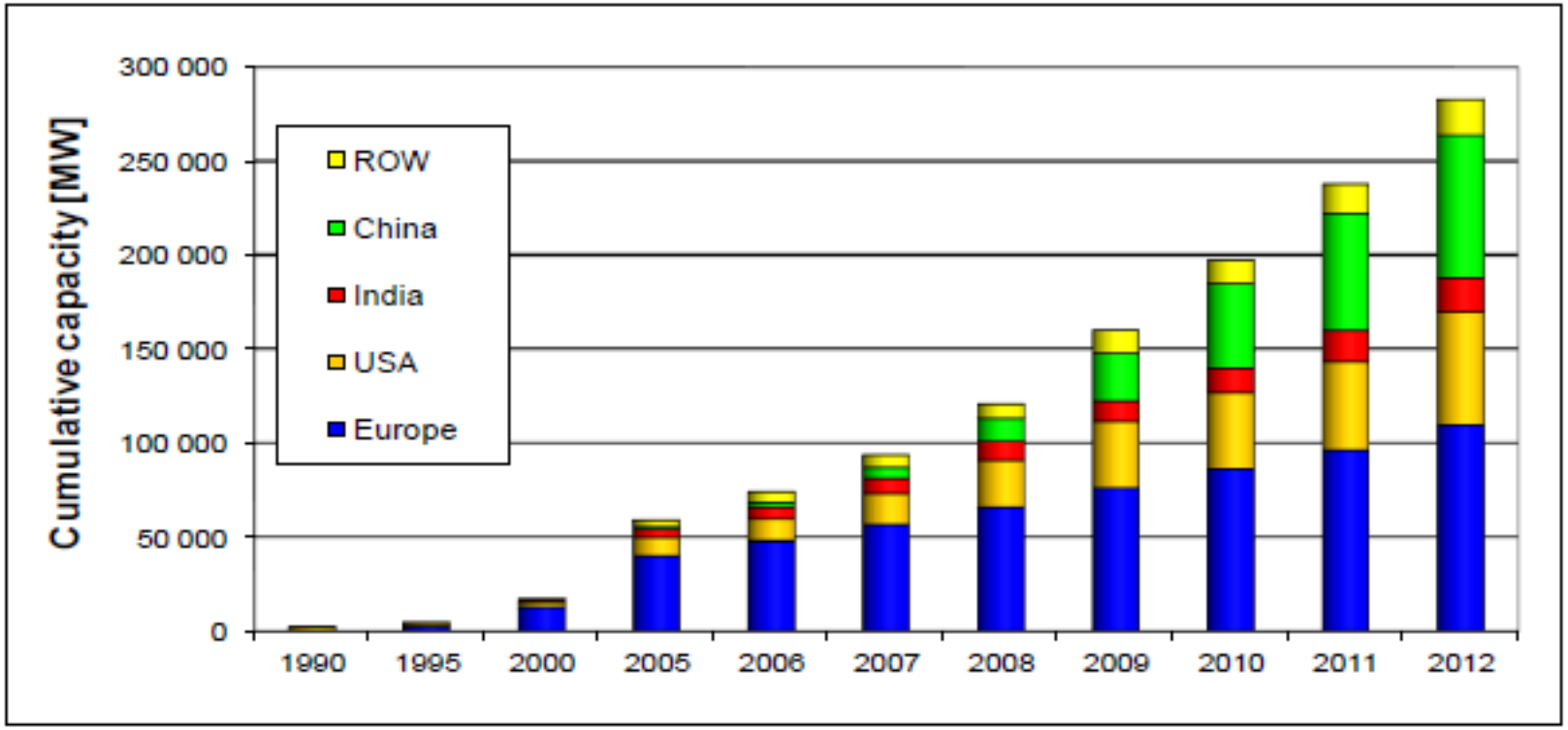

Figure 11: Cumulative worldwide installed wind power capacity from 1990 to 2012. Sources: (GWEC, 2013) and similar reports of previous years.

JRC Wind Status Report

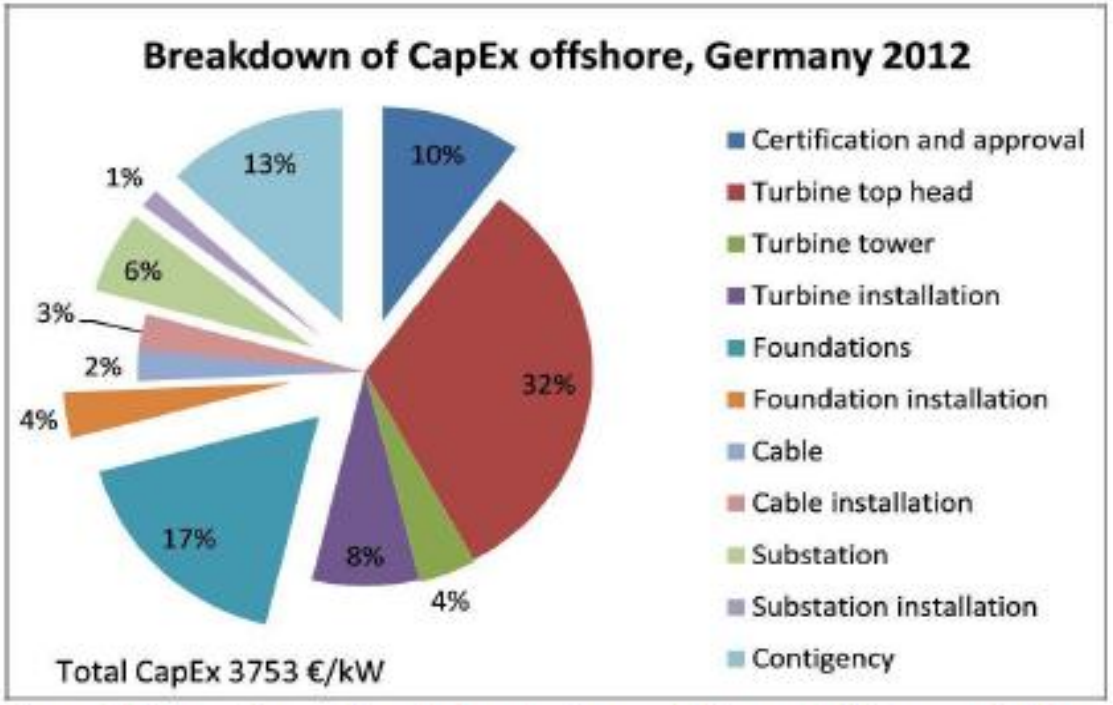

Figure 20: Breakdown of capital costs for an offshore wind farm under the following assumptions: 320-MW total with 80 turbines of 4 MW each, at a water depth of 30m and 40 km from shore, hub height 90 m (Fichtner-prognos, 2013a). The original data from Fichtner-prognos (2013a) has been modified in this graph to include the cost of the tower as part of the turbine instead of as part of the support structure (JRC).

TPWind Strategic Research Agenda

5 key R&D chapters:

- External conditions: climate, waves and soil
- Wind turbine systems
- Grid integration
- Offshore technology
- Market deployment strategy

TPWind Strategic Research Agenda

- External conditions: climate, waves and soil:

Measurement techniques for entire design and siting, Knowledge of external conditions (ice, …), Atmospheric modelling, Forecasting methods, Standardization;

- Wind turbine systems:

Aerodynamics; materials; control systems;

- Grid integration:

Wind power capabilities for grid support services; Grid operation; Grid management and power markets;

TPWind Strategic Research Agenda

- Offshore technology:

Sub-structures; Logistics, assembly and decommissioning; Electrical infrastructure; Wind turbines Operation and maintenance; External conditions;

- Market Deployment:

Enabling market deployment; Adapting policies; Optimising administrative procedures; Integrating wind into the natural environment; Ensuring public acceptance; Human resources.

Towards an Integrated Roadmap: (Research and Innovation Challenges and Needs of the EU Energy System)

The aim of the Integrated Roadmap, in the current context of the EU's energy policy developments, is to consolidate the updated technology roadmaps of the SET Plan and propose research and innovation actions designed to facilitate integration along:

- the innovation chain
- the value chain
- the EU dimension and
- the energy system.

Towards an Integrated Roadmap:

Integrated Challenge 4: Secure, cost-effective, clean and competitive supply

Theme 10, Accelerating the development of renewable electricity and heating/cooling technologies

http://setis.ec.europa.eu/system/files/Towards%20an%20Integrated%20Roadmap_0.pdf

Towards an Integrated Roadmap:

The following actions are considered essential by the stakeholders to deliver these objectives:

Advanced research:

- Develop advanced turbines and components (for onshore and offshore applications, including floating technology) and accurate methodologies for wind resource assessment.

Industrial research and demonstration:

- Demonstrate components and technologies for offshore applications and new logistics, assembly and decommissioning processes.

Innovation and market uptake:

- Grid integration and spatial planning for innovations regarding new market design, financing, and end-of life policies taking into account environmental and social aspects as well as support to
- first scale commercial projects of innovative technologies to reach the market and to lower the perceived risk for cost-reducing innovations in offshore wind.

H2020 Calls and the Next WP

- Wind Projects Funded ????

- H2020 WP14-15 - 2015 LCE3 : Demonstrating innovative substructure and floating concepts - Demonstration of **innovative bottom-fixed substructure concepts for water depths of 30 to 50m capable of reducing costs**; Demonstration of **innovative floating wind turbine concepts**.

- H2020 WP14-15 - 2015 LCE 4 : Market uptake of existing and emerging renewable electricity, heating and cooling Technologies (CSA: focus on best practices and quantified indicators of the market impacts of future policy)

- WP 2015-2016 Timeline

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Thank you for your attention!

More information:
www.ec.europa/research/horizon2020