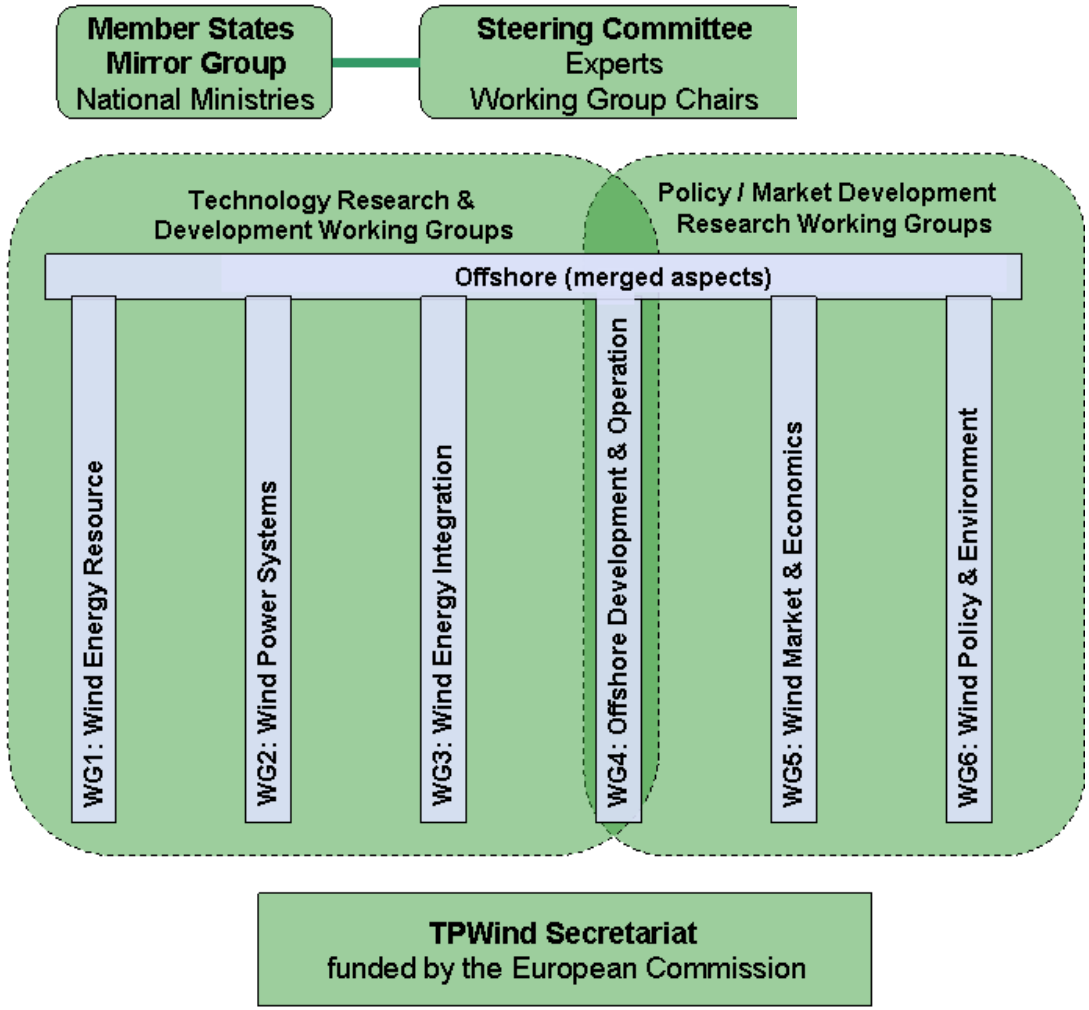
European Wind Energy Technology Platform

EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

European Wind Energy Technology Roadmap

Making Wind the most competitive energy source

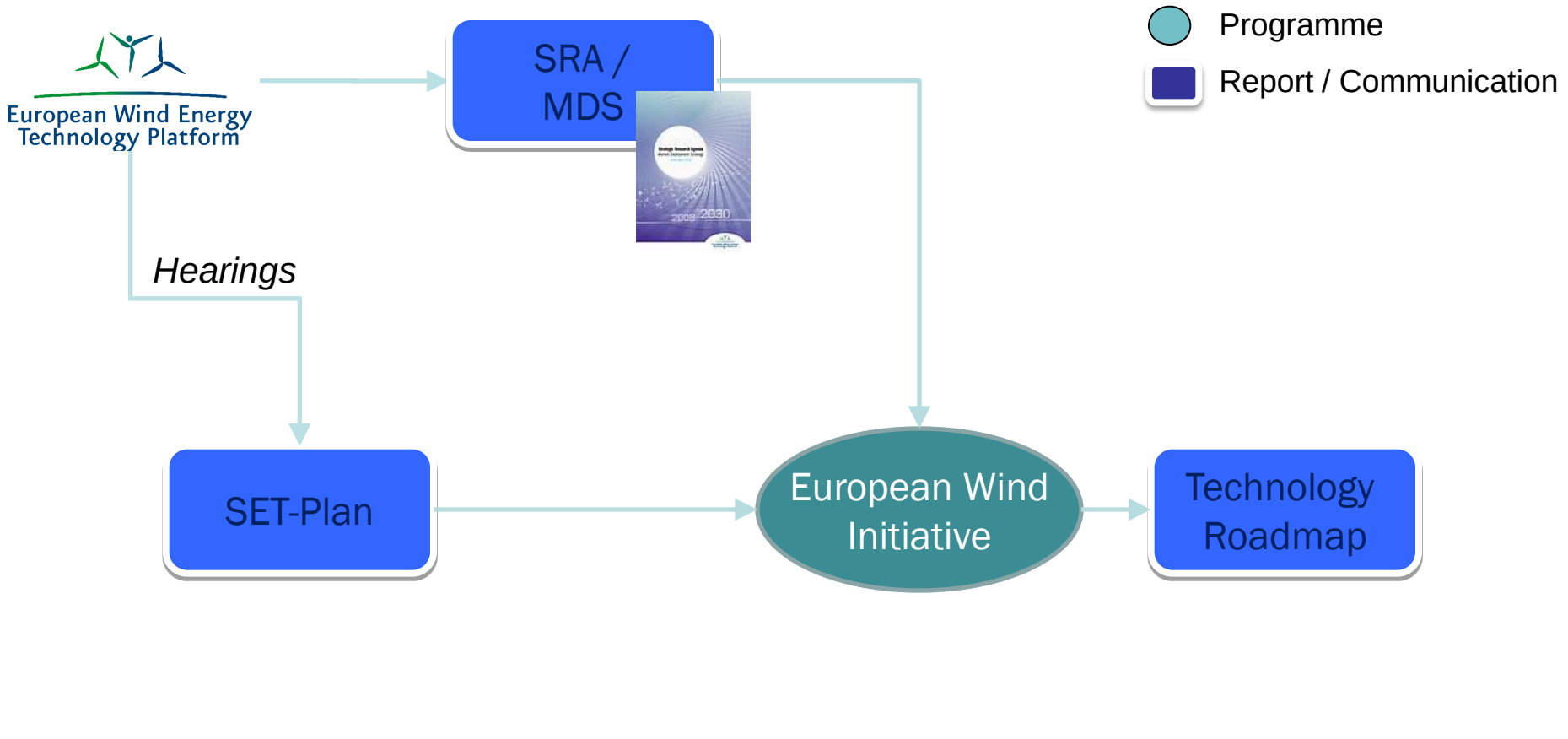
TPWind – The European Wind Energy Technology Platform



Key data:

- ✓ Official Technology Platform
- ✓ Launched in 2007
- ✓ 150 members
- ✓ 6 working groups
- ✓ SRA / MDS published in 2008

TPWind involvement in SET-Plan process



European Wind Initiative – SET-Plan objectives (2007)

- *European Wind Initiative:* focus on large turbines and large systems validation and demonstration (relevant to on and off-shore applications).

- SET-Plan - Reaching 2020 objectives
  - Double the power generation capacity of the largest wind turbines, with off-shore wind as the lead application.
  - Enable a single, smart European electricity grid able to accommodate the massive integration of renewable and decentralised energy sources.

- SET-Plan - Reaching 2050 objectives
  - Bring the next generation of renewable energy technologies to market competitiveness.

EWI in 3 objectives

- To make wind energy the most competitive energy source on the market onshore in 2020, and offshore in 2030

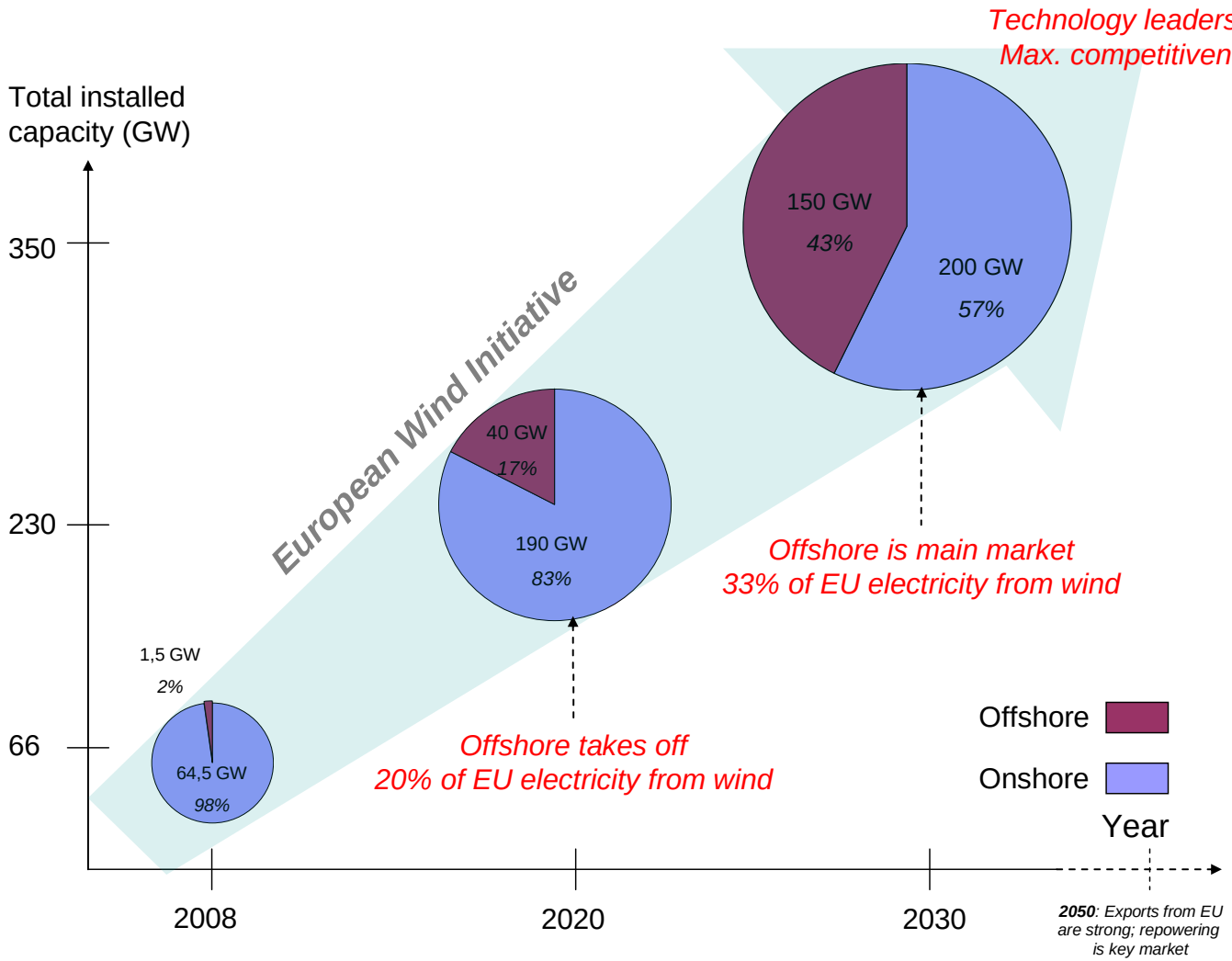
- To enable the required large-scale deployment and grid integration of wind energy offshore and onshore with the aim of reaching wind penetration levels

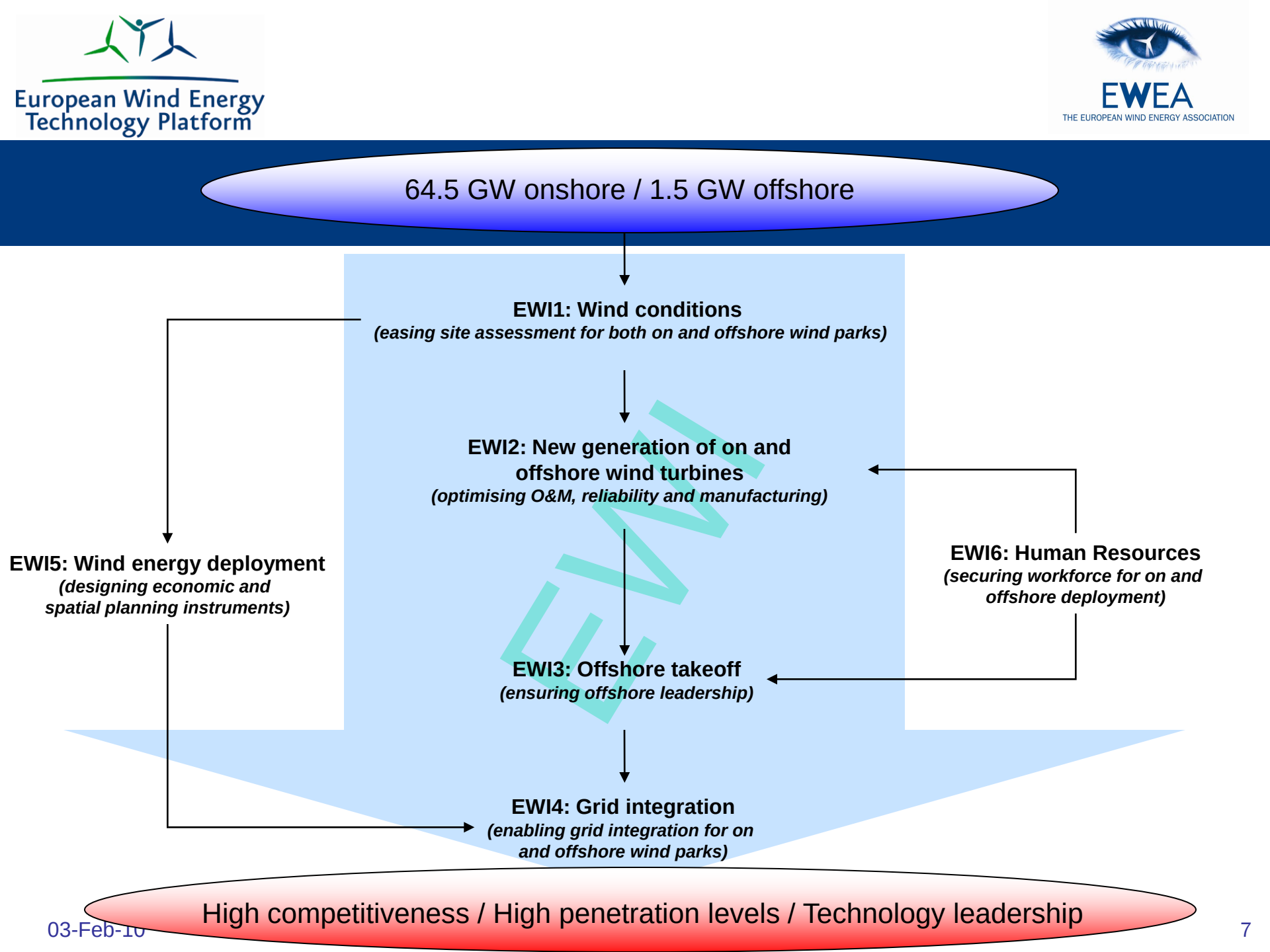
20% in 2020, 33% in 2030 and 50% in 2050

- Ensuring the European technology leadership on- and offshore, and developing large offshore wind turbines

Including exploring concepts up to 20 MW (10-20 MW range)

EWI – Large-scale high-tech roadmap




64.5 GW onshore / 1.5 GW offshore
EWI1: Wind conditions
(easing site assessment for both on and offshore wind parks)
EWI2: New generation of on and offshore wind turbines
(optimising O&M, reliability and manufacturing)
EWI5: Wind energy deployment
(designing economic and spatial planning instruments)
EWI6: Human Resources
(securing workforce for on and offshore deployment)
EWI3: Offshore takeoff
(ensuring offshore leadership)
EWI4: Grid integration
(enabling grid integration for on and offshore wind parks)
High competitiveness / High penetration levels / Technology leadership

Financing Communication *COM(2009) 519 final*

- Impact of the Wind Industrial Initiative:
  - Fully competitive wind power generation
  - Capable of contributing up to 20% of EU electricity by 2020 and as much as 33% by 2030
  - More than 250 000 skilled jobs could be created.

Technology roadmap SEC(2009) 1295

- Strategic objective
  - To improve the competitiveness of wind energy technologies, to enable the exploitation of the offshore resources and deep waters potential, and to facilitate grid integration of wind power.

- Industrial sector objective
  - To enable a 20% share of wind energy in the final EU electricity consumption by 2020.

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Technology roadmap

SEC(2009) 1295

New turbines and components - Objectives

- New turbines and components to lower investment, operation and maintenance costs

  - To develop large scale turbines in the range of 10 - 20 MW especially for offshore applications.

  - To improve the reliability of the wind turbine components through the use of new materials, advanced rotor designs, control and monitoring systems.

  - To further automate and optimise manufacturing processes such as blade manufacturing through cross industrial cooperation with automotive, maritime and civil aerospace.

  - To develop innovative logistics including transport and erection techniques, in particular in remote, weather hostile sites.

New turbines and components - Actions

- New turbines and components to lower investment, operation and maintenance costs:
  - A R&D programme focused on new turbine designs, materials and components addressing on- and offshore applications coupled with a demonstration programme dedicated to the development and testing of a large scale turbine prototype (10-20MW).
  - A network of 5-10 European testing facilities to test and assess efficiency and reliability of wind turbine systems.
  - An EU cross-industrial cooperation and demonstration programme drawing upon the know-how from other industrial sectors (e.g. offshore exploration) for mass production of wind systems focused on increased component and system reliability, advanced manufacturing techniques, and offshore turbines. A set of 5 – 10 demonstration projects testing the production of the next generation of turbines and components will be carried out.

Offshore Technology - Objectives

- Offshore technology with a focus on structures for large-scale turbines and deep waters (> 30 m).
  - To develop new stackable, replicable and standardised substructures for large scale offshore turbines such as: tripods, quadropods, jackets and gravity-based structures.
  - To develop floating structures with platforms, floating tripods, or single anchored turbine.
  - To develop manufacturing processes and procedures for mass-production of substructures.

Offshore Technology - Actions

- Offshore technology with a focus on structures for large-scale turbines and deep waters (> 30 m).
  - A development and demonstration programme for new structures distant from shore aiming at lower visual impact and at different water depths (>30m).
  - At least 4 structure concepts should be developed and tested under different conditions.
  - A demonstration programme on advanced mass-manufacturing processes of offshore structures.

Grid integration - Objectives

- Grid integration techniques for large-scale penetration of variable electricity supply.

  - To demonstrate the feasibility of balancing power systems with high share of wind power using large-scale storage systems and High Voltage Alternative Current (HVAC) or High Voltage Direct Current (HVDC) interconnections.

  - To investigate wind farms management as “virtual power plants".

Grid integration - Actions

- A programme focused on wind farms management as "virtual power plants" to demonstrate at the industrial-scale:
  - Offshore wind farms interconnected to at least two countries and combined with the use of different grid interconnection techniques.
  - Long distance High Voltage Direct Current.
  - Controllable multi-terminal offshore solutions with multiple converters and cable suppliers.

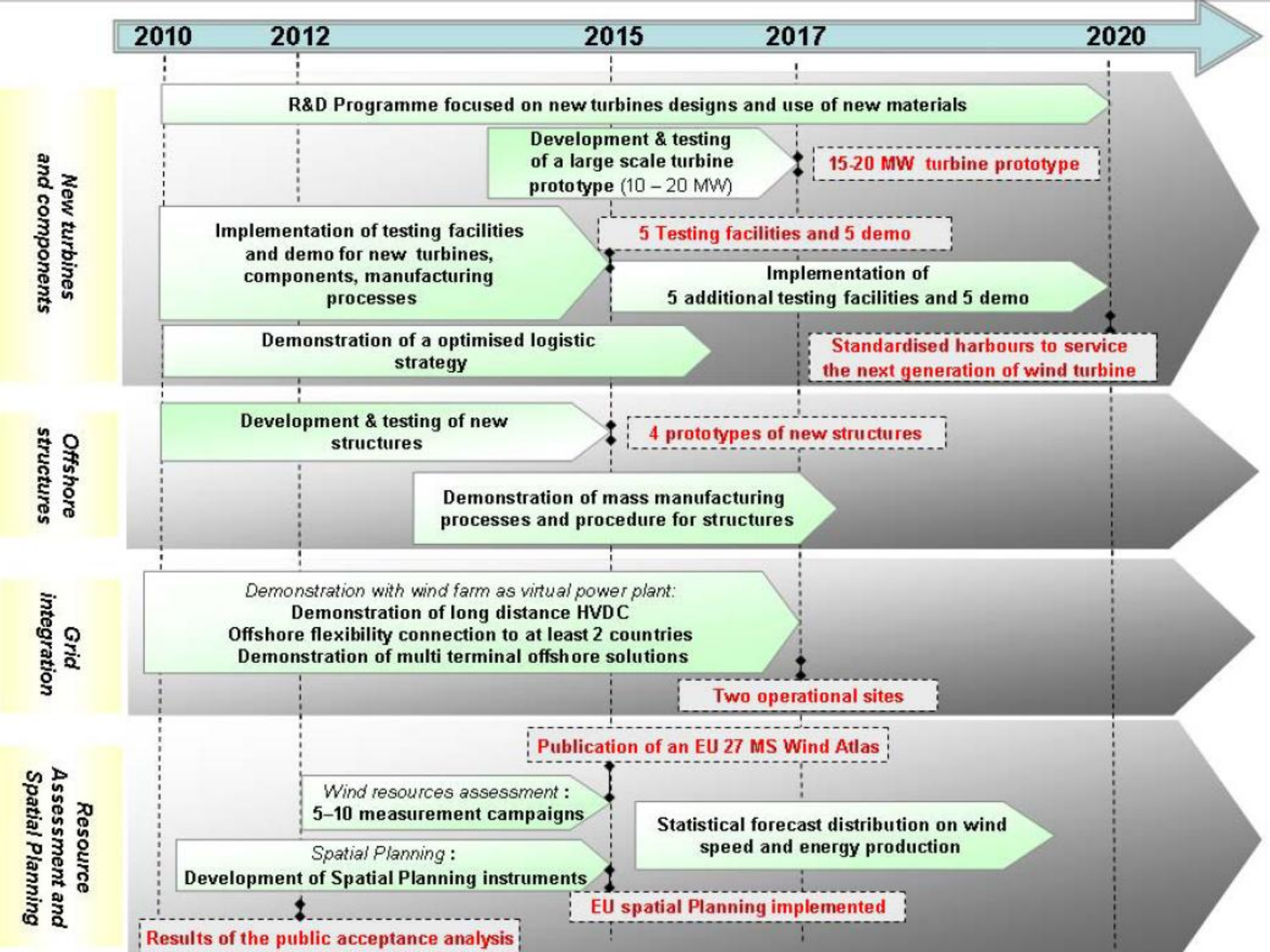
A virtual power plant is a cluster of distributed generation installations which are collectively run by a central control entity in order to increase the system flexibility (including with the support of existing storage systems) and to make the best of available potential (spatial smoothing)

Resource assessment & spatial planning - Objectives

- Resource assessment and spatial planning to support wind energy deployment.
  - To assess and map wind resources across Europe and to reduce forecasting uncertainties of wind energy production.
  - To develop spatial planning methodologies and tools taking into account environmental and social aspects.
  - To address and analyse social acceptance of wind energy projects including promotion of best practices.

Resource assessment & spatial planning - Actions

- A R&D programme for forecasting distribution of wind speeds and energy production that includes:
  - Wind measurement campaigns.
  - Database on wind data, environmental and other constrains.
  - Spatial planning tools and methodologies for improved designs and production.


2010
2012
2015
2017
2020
New turbines and components
R&D Programme focused on new turbines designs and use of new materials
Development & testing of a large scale turbine prototype (10 – 20 MW)
15-20 MW turbine prototype
Implementation of testing facilities and demo for new turbines, components, manufacturing processes
5 Testing facilities and 5 demo
Implementation of 5 additional testing facilities and 5 demo
Demonstration of a optimised logistic strategy
Standardised harbours to service the next generation of wind turbine
Offshore structures
Development & testing of new structures
4 prototypes of new structures
Demonstration of mass manufacturing processes and procedure for structures
Grid integration
Demonstration with wind farm as virtual power plant:
Demonstration of long distance HVDC
Offshore flexibility connection to at least 2 countries
Demonstration of multi terminal offshore solutions
Two operational sites
Resource Assessment and Spatial Planning
Publication of an EU 27 MS Wind Atlas
Wind resources assessment :
5–10 measurement campaigns
Statistical forecast distribution on wind speed and energy production
Spatial Planning :
Development of Spatial Planning instruments
EU spatial Planning implemented
Results of the public acceptance analysis

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EWI / Wind Roadmap – 75 % match

EWI component	EWI Action	Roadmap
Wind conditions	European wind resource map	☺
	Measurement campaigns	☺
New generation of on and offshore turbines	Large long-medium term R&D programme	☺
	Industry-led full-scale European demonstration activities	☺
	Optimising manufacturing processes	☺
	Optimising logistics	☺
	Cross-industrial cooperation and demonstration program	☹
Offshore takeoff	Development of offshore access vessels, and best practices	☺
	Automated manufacturing of steel and concrete substructures of varying designs	☺
	Sponsorship of demonstration programmes to test innovations in offshore technology	☹
	Development of onshore facilities supporting offshore deployment	☺
	Strong coordination with the offshore oil & gas service sector	☺
Grid Integration	Grid management solutions	☹
	Long-term planning	☺
	New grid technology solutions	☹
Deployment	Support schemes	☺
	Long-term spatial planning	☺
	Social acceptance of wind energy projects	☹
Human Resources	A European training institute	

Missing elements

- Grid planning – coordination with the European Grid Initiative
- Training – coordination with the European Energy Research Alliance and the European Institute of Technology
- Missing:
  - Offshore access vessels, and best practices
  - Onshore facilities supporting offshore deployment

Indicative costs (2010-2020)

"The overall breakdown of non-nuclear energy research financing in 2007 was 70% private to 30% public. Given the public policy-driven nature of the energy transition and the current economic situation, a significant rise in the public share of the burden in the short term towards a more equal level of commitment would have to be explored." COM(2009) 519 final.

Technology objectives	Costs (M€)
1. New turbines and components	2 500
2. Offshore structure-related technologies	1 200
3. Grid integration	2 100
4. Resource assessment and spatial planning	200
Total	6 000

- R&D investment: 383 M€ (2007)
  - Industry 292 M€ (76%)
  - Public 91M€ (24%)
- SET-Plan 600M€/y

Financing elements – Impact assessment SEC(2009) 1297

- 4 policy options are compared:
  - No action – BAU (business as usual)
  - increased funding channeled through the existing investment vehicles
  - a strengthening of the existing investment vehicles within modified institutional arrangements / specific mandate for the EIB to invest in infrastructural funds / using the Capacity Building Scheme
  - new investment vehicles
- Possible sources of funding:
  - ETS system from 2013 onwards, ETS NER, EEPR
  - Research Framework Programmes
  - CIP High Growth and Innovative SME Facility (GIF)
  - EIB: RSFF, Marguerite fund, a new "efficiency and renewables" instrument

Thank you for your attention!