INNWIND.EU

INNOVATIVE WIND CONVERSION SYSTEMS (10-20MW) FOR OFFSHORE APPLICATIONS

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Abstract

The proposed project is an ambitious successor for the UpWind project, where the vision of a 20MW wind turbine was put forth with specific technology advances that are required to make it happen. This project builds on the results from the UpWind project and will further utilize various national projects in different European countries to accelerate the development of innovations that help realize the 20MW wind turbine. DTU Wind Energy is the coordinator of this large project of 5 years duration and with a total of 27 European partners.

The proposal addresses the heart of the Long Term R&D Programme of the New Turbines and Components strand of the European Wind Initiative (EWI) established under SET-Plan, the Common European Policy for Energy Technologies.

Objectives

The overall objectives of the INNWIND.EU project are the high performance innovative design of a beyond-state-of-the-art 10-20MW offshore wind turbine and hardware demonstrators of some of the critical components with respect ot economic efficiency.

The progress beyond the state of the art is envisaged as an integrated wind turbine concept with:

- ❑ a light weight rotor having a combination of adaptive characteristics from passive built-in geometrical and structural couplings and active distributed smart sensing and control
- ❑ an innovative, low-weight, direct drive generator
- ❑ a standard mass-produced integrated tower and substructure that simplifies and unifies turbine structural dynamic characteristics at different water depths

Principles

Figure 1 demonstrates our overall strategy and approach. Starting from point 1 (reference size/turbine) and then up-scaling in the classical way (cubic law) will drive the design to Point 2, which is not cost-effective for very large WTs.

To achieve cost effectiveness Point 3 is to be reached, where the target-level cost of energy has been set. There are two ways to achieve a cost-efficient larger turbine at point 3, shown in Figure 1: (on the left side) This will be the resulting add-on effect of a series of innovative concepts on the subsystems and (on the right side) major breakthroughs at the WT system design level.

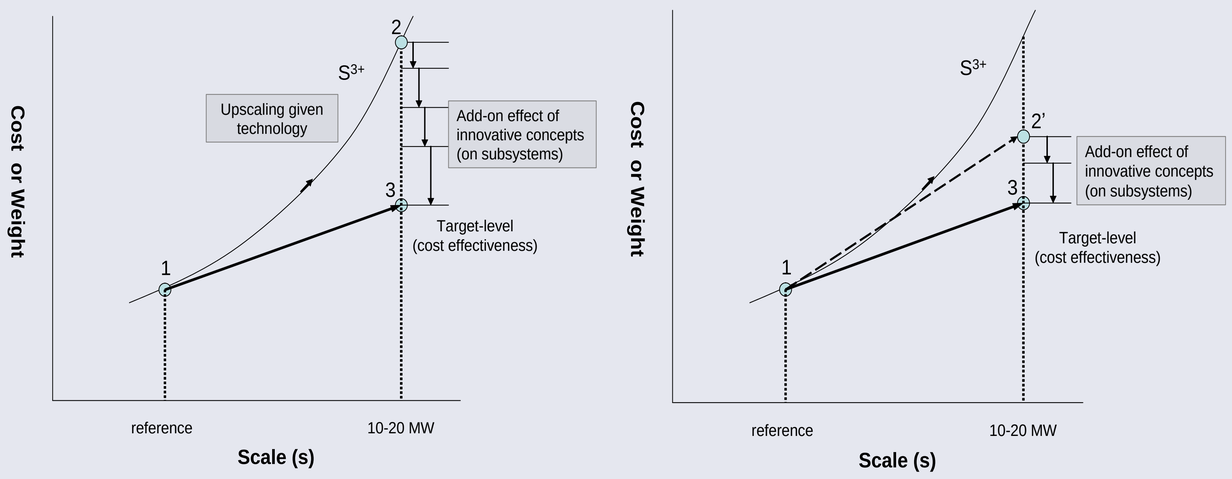
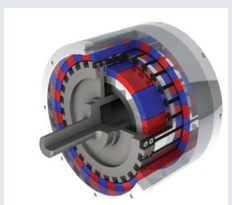
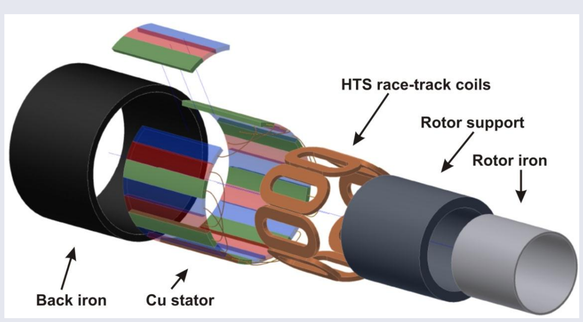


Figure 1

Hardware demonstrations of innovations at the component level will be made covering

1) Superconducting generators
2) pseudo magnetic drive trains,
3) smart rotors with combined tailored couplings between deformations and distributed active control.

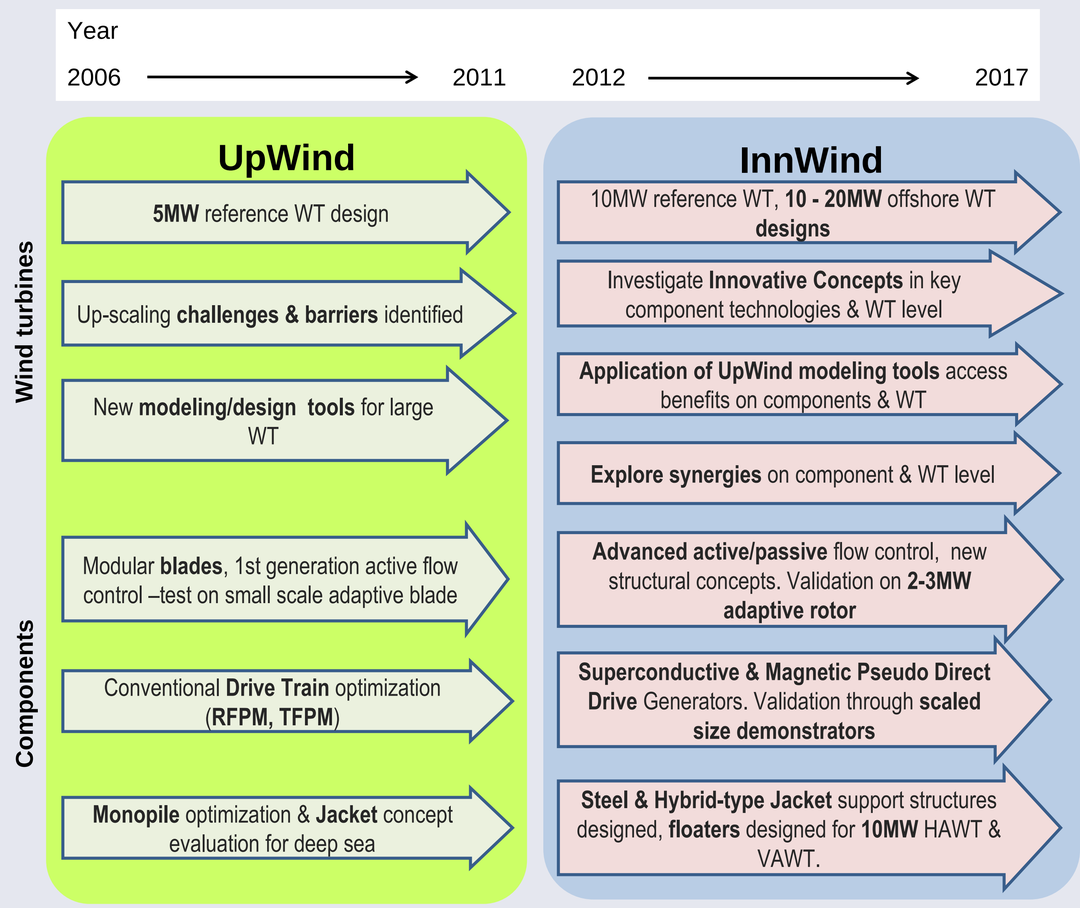




Distributed Control

Work Package Description

WP1 Conceptual Design	External conditions
	Evaluation of innovations at sub systems
	System Innovations and assessment
	Advanced controls and integrated innovative concept
WP2 Lightweight Rotor	High Speed aerodynamics
	Light weightstructure
	Active and passive loads control
WP3 Electromechanical conversion	Super conducting generators
	Magnetic pseudo drive generators
	Reduced rare earth material generators
	Power Electronics
	Mechanical components and integration
WP4 Offshore support structures	Innovation and methods for bottom mounted structures
	Innovation and methods for floating structures
	Structural Implementation
WP5 Exploitation and Dissemination	Minimize Time-to-the-Market of the Innovative Concepts
	Exploitation of the Results
	Dissemination of new knowledge
WP6 Management	Project Management
	Financial compliance
	Contractual obligations



SUMMARY

1. Beat the cubic law of weight (and cost) of classical up scaling and render a 10-20 MW offshore design cost-effective.
2. Develop innovative turbine concepts, design targets and performance indicators and assess the performance of components and integrated conceptual designs.
3. Development of new modeling tools capable of analyzing and assessing 20MW innovative turbine systems.
4. Integrate the design, manufacturing, installation, operation and decommissioning of support structure and rotor-nacelle assembly to optimize the structure and life-cycle as a whole.
5. Establish effective communications channels in the co-ordination of all project activities between the partners and dissemination of the knowledge gained.