www.innwind.eu

PROJECT CONSORTIUM AND CONTACT

The **INNWIND.EU** consortium is made up of leading industrial partners, research institutes and universities.

COORDINATOR

DTU Wind Energy
Department of Wind Energy

PARTNERS

Aalborg University Denmark
CENER National Renewable Energy Centre
CRES Centre for Renewable Energy Sources and Saving
DHI
ECN
EWEA The European Wind Energy Association
Fraunhofer ISI
ForWind Center for Wind Energy Research
Gamesa
GL Renewables Certification
GL Garrad Hassan
Knowledge Centre WMC Wind Turbine Materials and Constructions
Leibniz Universität Hannover
Magnomatics
Politecnico di Milano
Rambøll
Siemens
SINTEF
Suzlon Powering a greener tomorrow
University of Patras
TU Delft Delft University of Technology
University of Bristol
The University Of Sheffield.
University of Strathclyde Glasgow
Universität Stuttgart

SUPPORTED BY

Seventh Framework Programme

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Innovative Wind Conversion Systems

10 - 20 MW

FOR **OFFSHORE** APPLICATIONS

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Project overview

The INNWIND.EU project is about innovative wind turbine design

It will:

- **Investigate and demonstrate new designs** for 10-20 MW offshore wind turbines and their components.
- **Develop methodologies** for assessing innovative subsystem and turbine system designs.

Introduction

Commercial offshore wind turbines are, currently, predominantly bottom fixed, mainly through monopile, tripod or gravity based sub-structures in waters up to 40 metres deep.

Moving into waters 50 metres deep or more opens huge opportunities for offshore wind power generation and is an important step in meeting Europe's offshore wind energy targets. Ensuring this innovative technology's reliability and cost-effectiveness requires new alternatives to the conventional design of wind turbine components.

A previous EU-funded project, UPWIND (www.upwind.eu), demonstrated that the development of large wind turbines (10 MW) is technically feasible but not yet cost-effective. To develop offshore wind farms in deep waters and further from shore, it is more cost-efficient to install turbines with a high rated capacity, 10 MW or more.

INNWIND.EU will build on the UPWIND project to increase cost-effectiveness of deep offshore wind farms by investigating and demonstrating new technologies.

	UPWIND	INNWIND
WIND TURBINES	5 MW reference Wind Turbine (WT) design	10MW reference WT, 10 -20 MW offshore WT designs
	Up-scaling challenges and barriers identified	Investigate innovative concepts for WTs and key component technologies
	New modeling and design tools for large WT	Application of UpWind modeling tools on components and WT
		Explore synergies at component and WT level
COMPONENTS	Modular blades, 1st generation active flow control-test on small scale adaptive blade	Advanced active/passive flow control and new structural concepts. Validation on 2-3 MW adaptive rotor
	Conventional Drive Train optimisation (Radial and transvers flux permanent magnet - RFPM, TFPM)	Superconductive and Magnetic Pseudo Direct Drive Generators validated through prototypes
	Monopile optimisation and jacket concept evaluation for deep sea	Steel and hybrid-type jacket support structures design, floaters design for 10 MW horizontal and vertical axis wind turbines

The project in more detail

INNWIND.EU will investigate and demonstrate innovative designs for large wind turbines of rated capacities between 10 MW and 20 MW and their key components.

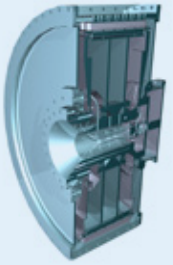
The project will also develop methodologies for assessing innovative designs at the turbine and subsystem levels.

The integrated wind turbine concept will be supported by innovations and demonstrations of the **key components of the 20 MW wind turbine:**

Lightweight direct drive generators

Superconducting Direct Drive and magnetic Pseudo Direct Drive (PDD) generators can offer high shear stresses and, thereby, more light weight and compact machines compared to conventional direct drive generators. Key performance indicators such as size, weight, efficiency and cost will guide the development of a 10-20 MW offshore turbine by striving for decreasing the cost of energy. Demonstrations of down-scaled superconducting poles and a PDD generator are also part of the project.

Superconducting direct drive generator integrated in front of the turbine rotor using the King-pin nacelle layout (10 MW).



Magnetic Pseudo Direct Drive generator based on an integrated magnetic gearbox and an electrical machine.

Lightweight rotor

with a combination of adaptive characteristics from passive built-in geometrical and structural couplings and active distributed smart sensing and control.

Integrated design

- Innovative sub-structures with modular construction for mass production;
- Advanced controls for load mitigation;
- Water depths of 50 m and beyond.

Standard mass-produced integrated tower and substructure

simplifying and unifying turbine structural dynamic characteristics at different water depths.