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Distributed Control of Large-scale Offshore Wind Farms

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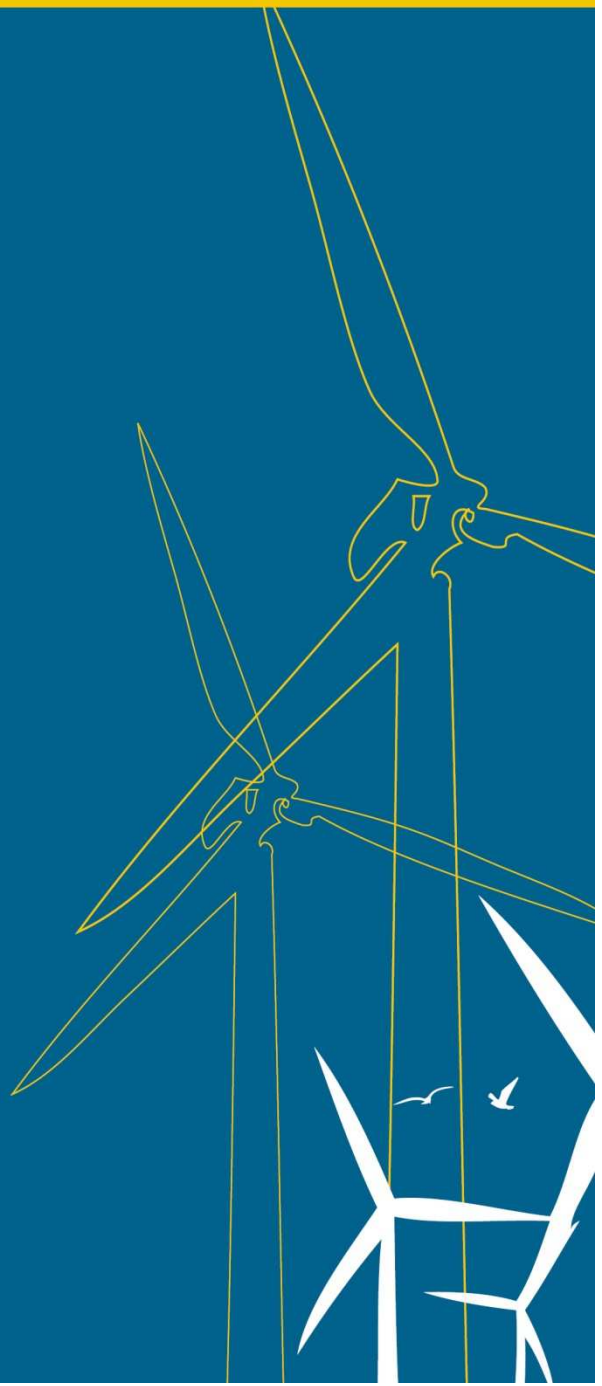


SEVENTH FRAMEWORK PROGRAMME


Challenge: “understanding **the flow** in ... large wind farms” and “**control systems** to optimise power output and **load factors** at wind farm level.”

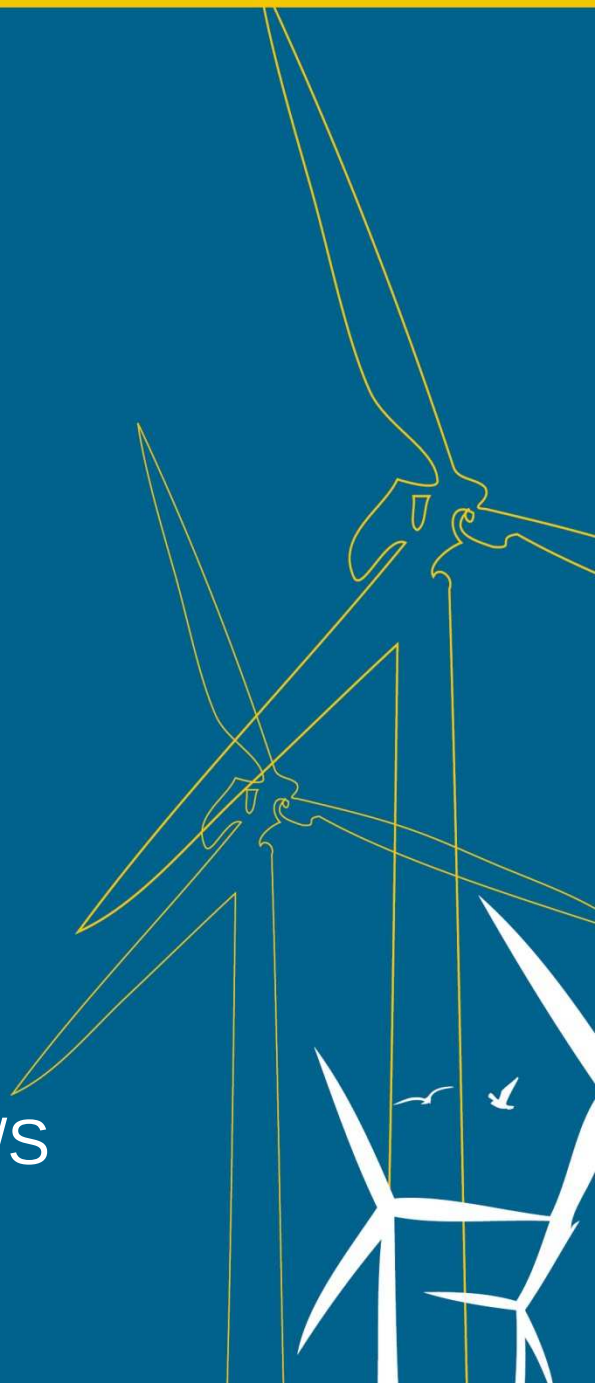
Facts:

Research area:

ICT-2007.3.7

Network embedded and control systems

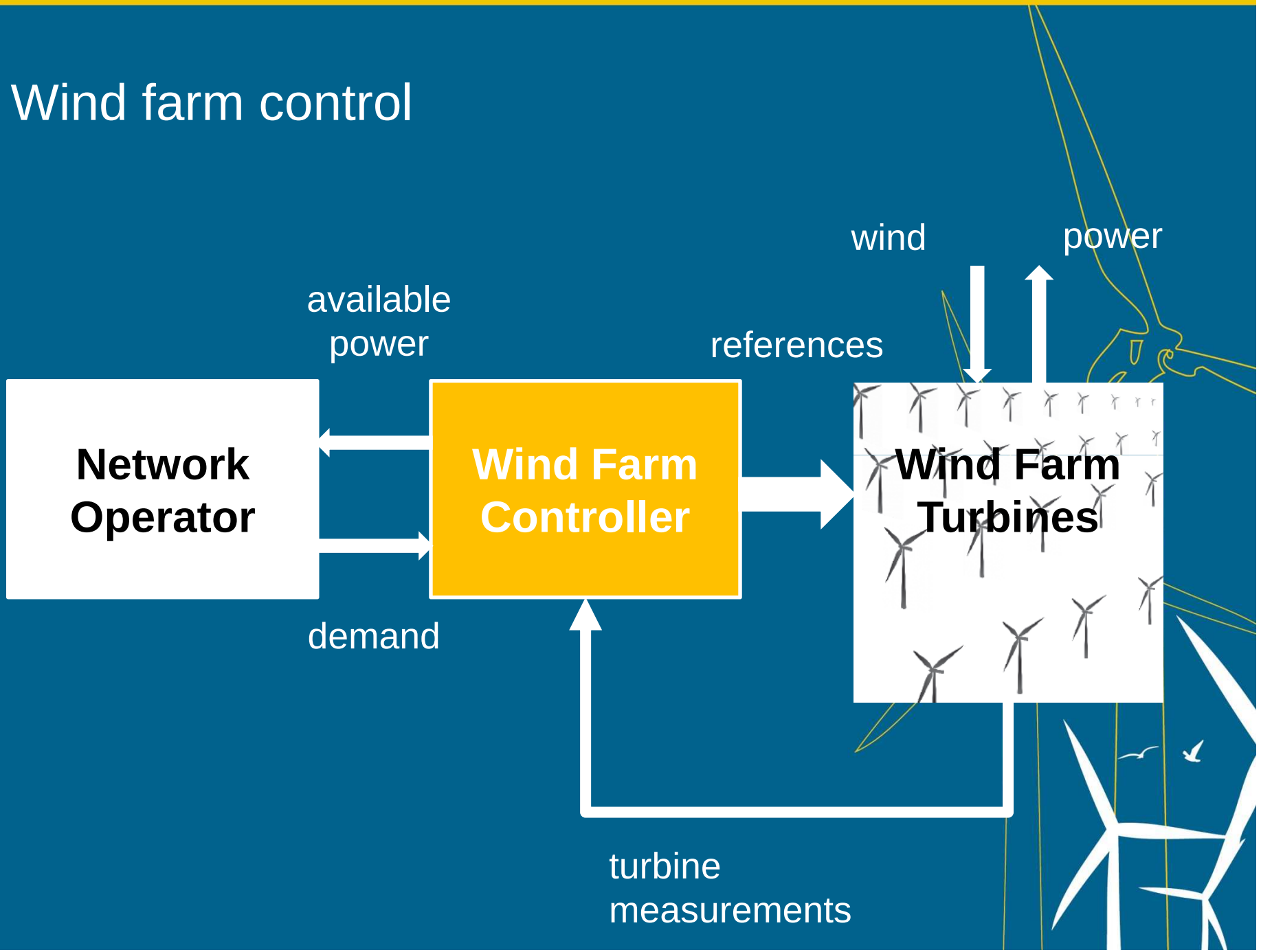
Start Date:	2008-05-01
Duration:	36 months / STREP
Project Cost:	3.36 million euro
Partners:	AAU,
	Lund University
	ECN
	ISC Ltd
	UZAG-FER
	Vestas Wind Systems A/S

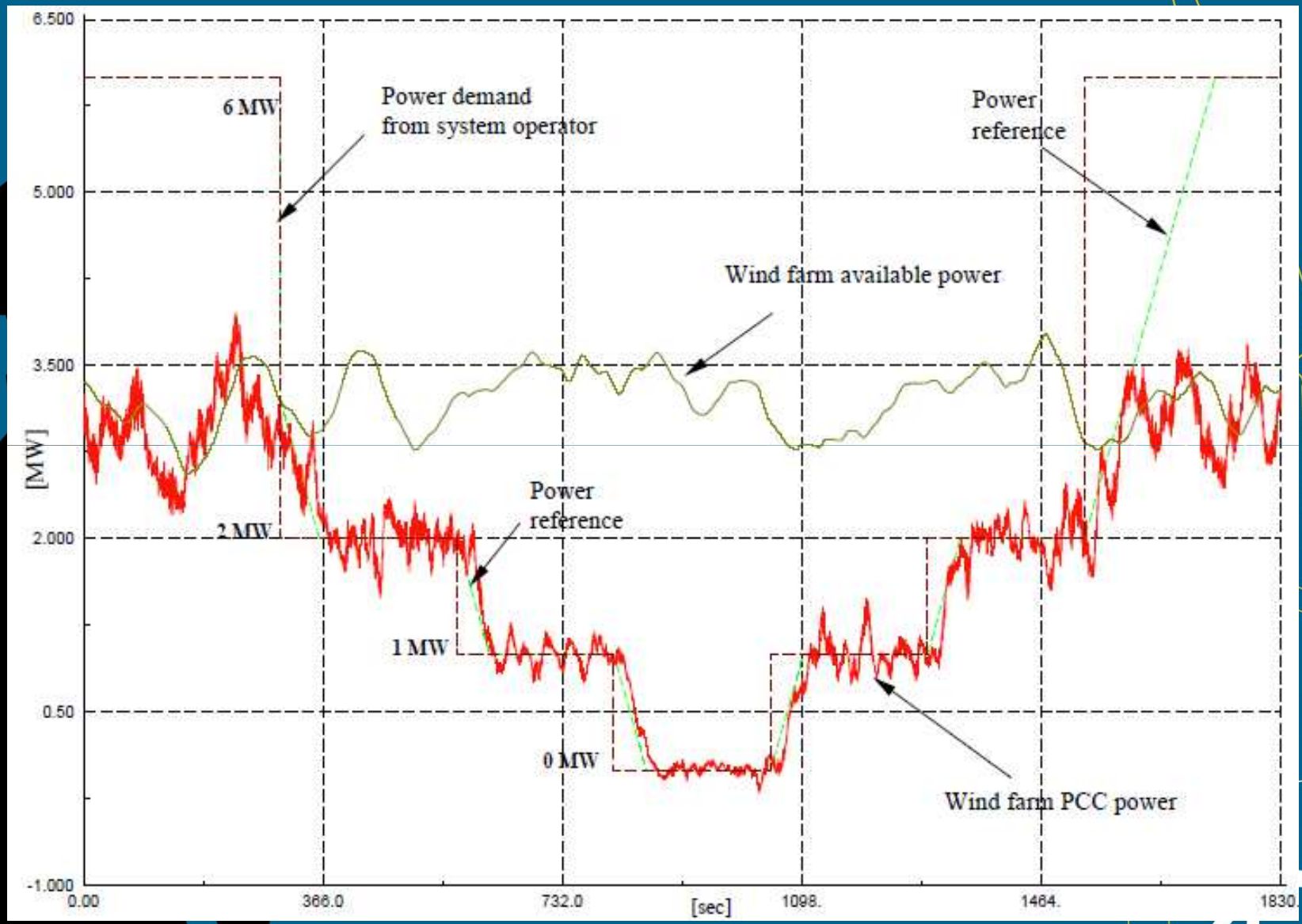


Two themes

1. **Flow models**: Research and develop models that allow real-time predictions of flows and incorporate measurements from the spatially distributed flow sensing
2. **Control:** Use the flow information as a basis for new control paradigms that manage the flow resource in order to optimise specific control objectives (load and power)

Wind farm control




6.500
5.000
3.500
2.000
0.50
-1.000
[MW]
0.00
366.0
732.0
1098.
1464.
1830.
[sec]
6 MW
2 MW
1 MW
0 MW
Power demand
from system operator
Power
reference
Wind farm available power
Power
reference
Wind farm PCC power

ICT-2007.3.7 Network embedded and control systems

Control of large-scale complex distributed systems: New engineering approaches that ensure efficient, robust, predictable, safe and secure behaviour for manufacturing and process plants and for large scale infrastructures such as distributed energy production, energy distribution, airports or seaports etc. Key challenges include (1) developing generic modelling and design methods, dynamically reconfiguring architectures, languages and scalable algorithms for the control of evolvable, distributed and adaptable systems; (2) mastering complexity, temporal and spatial uncertainties such as delays and bandwidth in communications and node availability; and (3) integrating advances in sensor networks for closing the control loop. Research should strengthen and consolidate European excellence in systems sciences and engineering by encouraging the control, computer and communications sciences and engineering communities to work together.