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Supergen Offshore Wind Challenge Workshop
Overview – Landscape of Offshore Wind in the UK

Offshore wind farms in the UK

• 30 operational offshore wind farms including 1 EDF ER windfarm Teesside: around 5.4 GW.
• 10 offshore wind farms under construction including 1 EDF ER windfarm Blyth: around 5.1 GW.

The biggest 10 windfarms dominate UK offshore production and represent 74% of the production.

Hywind Scotland Pilot Park: Floating demonstration project
End of 2017

Over the coming years, these producers look set to be overtaken by Beatrice (588MW), Walney Extension (659MW) and Hornsea Project 1 (1.2GW). Hornsea 1 will become the world’s largest offshore wind farm in 2020.

The offshore wind fleet generated over 16.4 TWh last year, that’s enough to supply the electricity needs of 4.1m homes, around 15% of the UK total.

Offshore wind supplied 5.4% of the UK’s total estimated electricity consumption in 2016.

This performance reduced the UK’s CO₂ emissions by 7.0 million tonnes.

Offshore Wind Costs

Cost reduction has been driven by several factors:
Scale effects
Innovation
Competition
Learning by doing
Financing
Market economics
Site de-risking
Site conditions
Technologies – Trends for main components

Turbines

- New turbine models with higher capacity are entering the market and **10-12 MW models are being built for 2020.**
- Sill plenty of room for innovation in design.
- Gear boxes / Direct Drive trains

Blades

- Blades are typically made from fibreglass and epoxy resin.
- Blade lengths keep increasing with the new 88.4 m record for the Adwen180-8MW designed by LM Wind Power.

Foundations

- UK Foundation Share once all OWF are developed
Offshore Wind Asset Management

EDF Group Offshore Wind Interests

Wind Farm Lifecycle

- Design
- Construction, Installation & logistics
- Operations & Maintenance
- Decommissioning & Life Extension

French Projects A01 & A03, Floating, Intl dpvt

Profitable
Reliable
Smart
Sustainable

Asset Management

Sustainable & Safe
Intelligent Systems
Knowledge Culture
Cost Reduction
Disruption through Innovation

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Offshore Wind Asset Management

Innovative Monitoring & Inspection
- New cheap sensor technology - improved reliability & survivability during installation & operations
- Optimisation of sensor placement – getting the most benefit out of the minimum number of sensors
- “Reduce the costs, time & risks of traditional inspections through innovation – internal foundation, blades (including repair), bathymetric, cables etc

Being Green while Maintaining Structural Integrity
- Low environmental impact corrosion protection solutions for foundations (including coatings)
- Innovative use of bio and nano technology to control marine growth on foundations & cables

Profitable
Reliable
R&D
Smart
Sustainable

AI for Optimised O&M
- Predictive analytics combined with automated work flow management – detect – action within minimum human intervention
- Just-in-time Root Cause Analysis of component failure using diverse data sets (text, images, numerical data etc)
- Real-Time O&M planning
- Optimised automated marine logistics for assisted decision making of day-to-day marine operations

End of Life & Repowering
- Technologies for recycling and repurposing GFRP composite blades
- Innovative inventory management for recycling – reengineering used components for continued use on existing WTG fleets
- Optimised logistics for low impact environmentally friendly deconstruction of WTG’s

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Non exhaustive list of challenges and possible innovative solutions to work on:

- **Improving layout**
  With optimisation in terms of LCoE/ improve wake models

- **Improving installation processes**

- **Improving efficiency of the turbines**
  10MW+ turbines, direct drive, capture stronger winds, windfarm control

- **Improving O&M**
  Better sensors and predictive analysis, improve yield and optimise lifetime, windfarm control reducing, corrosion, improving HSE (drones)...

- **Improving Public Acceptability**
  Augmented/Virtual Reality, social science

- **Floating wind**
  Getting prepared for commercial floating wind farms, adapting tools and methodologies, developing solutions to deep water conditions

- **Identification and assessment of disruptive solutions**
  Drones, batteries, AR/VR, Artificial Intelligence, …

**Aims:**
0 accidents, maximum access, increased performance, minimal need for human intervention in the management of assets while continuing to reduce costs
Thank you