SUPERGEN Wind
Update and Forward Look

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Supergen Wind Hub

- £3M + £3M 2014-2019
- Members:
  - Strathclyde University
  - Durham University
  - Loughborough University
  - Manchester University
  - RAL-STFC
  - Cranfield University
  - Bristol University
  - Dundee University
  - Oxford University
  - Imperial College London
  - Surrey University
  - DNV-GL
  - ORECatapult
Current Research Scope

- Planning and Consenting
- Design, Manufacturing and Installation
- Operation, Maintenance and Decommissioning
Grand Challenge Projects

- EP/N006054/1: Screw piles for wind energy foundation systems
  Dundee, Southampton and Durham

- EP/N006224/1: MAXFARM (MAXimizing wind Farm Aerodynamic Resource via advanced Modelling)
  Surrey, Imperial, STFC-RAL, Loughborough, Strathclyde

- EP/N005996/1: Maximising the Carbon Impact of Wind Power
  Imperial College

- EP/N006127/1: Servo-aeroelastic tailoring of wind turbines using new active-to-passive control systems
  Bristol, Strathclyde
Flexible Funding

Round 1: general call (£350K)
- Evaluation of wind farm support structures performance based on extrapolation of structural health monitoring data from selected instrumented units (Cranfield)
- Integrated structural and foundation health monitoring for offshore turbines (Oxford)
- Dynamic wind power plant control for systems integration (Strathclyde)

Round 2: ORECatapult Levenmouth 7MW wind turbine call (£326K)
- Novel Data Integration Techniques for Enhanced Wind Turbine Condition Monitoring (Durham)
- Comparison of turbine powertrain models and measurements for maximum energy capture (Strathclyde/Edinburgh)
- Experimental Characterisation and Modelling of Multistatic Multiband Radar Signatures of Large Offshore Wind Turbines (Manchester/Glasgow/UCL)

Round 3: safety challenges for offshore wind (£293K)
- OpenO&M: Optimising availability of floating wind turbines for increased safety (Cranfield)
- Offshore Renewables Accessibility for Crew Transfer, Loss Estimation and Safety (Strathclyde)
Impact

- **Research impact**: UK academic research base has a significant international presence
  - More papers at major conferences than any other European country

- **Impact on industry**: Collaboration with industry at consortium and partner levels
  - Secured 40% of Supergen industry funding

- **Standards**: Contributions to
  - IEA Annexes 21, 23, 25, 32 and 37
  - CIGRE B4-57 and B4-72
  - IEC 61400-1/-3 shadow panel.
Networking of UK academic community to:

- Industry
- EU
2017 Cost of Energy for offshore wind hit £57/MWh

How did this happen?
UK Government targets

- 15% of power generation from renewables by 2020
- All electric vehicles by 2040

Forecasts for installed capacity

- 17-36GW with 9-22GW offshore by 2020
- 34-75GW with 14-52GW offshore by 2030
- 20-50% electricity production from wind by 2050

Scottish Government target

- 50% of heat transport and electricity consumption from renewables by 2030
To continue to bring down cost of energy will require advances in many areas:

- wind resource,
- support structures
- Installation
- power systems
- turbine technologies
- operation & maintenance
- condition monitoring

Adopting a systems level approach to exploiting offshore assets

Flexible operation of wind turbines and wind farms
Forward Look

- Bigger turbines and novel designs
Supergen Wind Hub

Thank You
Topics for future development

‘Wind Energy; towards meeting 2030 targets’

TOPIC 1: SYSTEMS LEVEL APPROACH
- flexibility
- responsiveness
- grid integration
- redefine technology
- rolling replacement program
- 10 year lifecycle

TOPIC 2: REPOWERING
- collective repowering
- consenting issues
- community engagement
- environmental issues
- planning

TOPIC 3: ELEMENTS OF STORAGE
- Local scale and grid scale
- perceptions of storage
- how much storage is needed
- flexible storage (gas turbines)
- electric car storage
Overall Objectives

- Address the medium term challenges of scaling up to wind farm clusters
- Consider how to better build, operate and maintain multi-GW arrays of wind turbines and provide support to the UK supply chain
- Provide a cost-effective reliable source of electricity whose characteristics can be effectively integrated into a modern power system such as that in the UK.