SUPERGEN WIND

EPSRC
Engineering and Physical Sciences Research Council

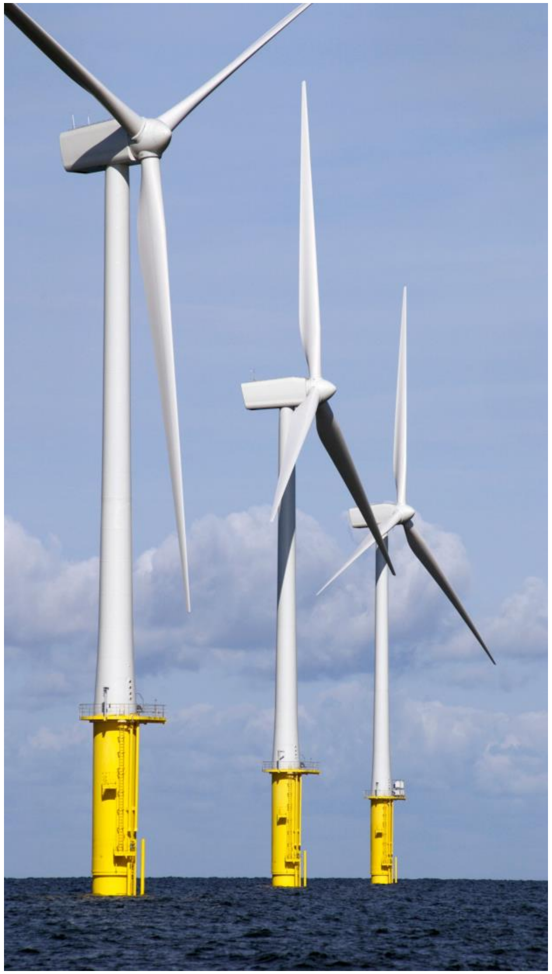
EPSRC SUPERGEN Wind Hub General Assembly
Thursday 8th November, 2018, Dundee

Dr Michael Brown, University of Dundee

PI Grand Challenge project:
Screw piles for wind energy foundation systems

https://www.supergen-wind.org.uk/

Our vision



- In 2014 The Supergen activities in Wind Energy were successfully renewed as part of Phase 3 Hub funding from EPSRC.
- The Supergen Hub takes a leadership role in bringing together the research efforts in Wind Energy in the UK, and linking them more strongly to the development research being supported by other funding organisations.
- The Hub received £3M in funding to September 2019 to carry out our innovative work packages.

Our members

- SUPERGEN Wind members:

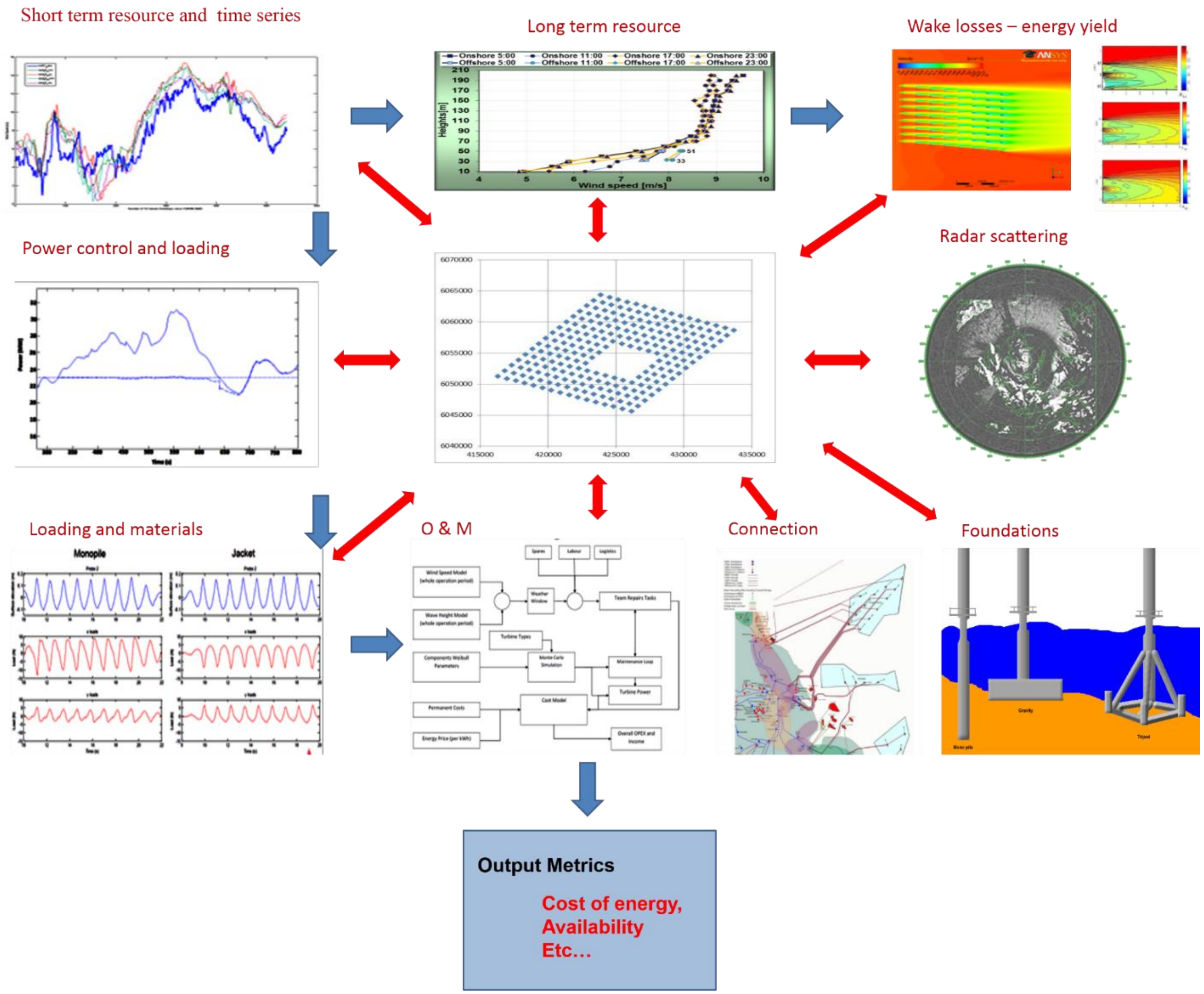
  Universities of Strathclyde, Durham, Loughborough, Cranfield, Manchester, Oxford, Surrey, Bristol, Dundee, Imperial College London, Exeter, Edinburgh, UCL, Glasgow, alongside STFC, DNV-GL, OREC.

Our Impact

- Research impact: The UK academic research base has a significant international presence
- Impact on industry: Collaboration with industry is at both the consortium level and individual partner level.
- Specific areas of impact: Health monitoring, Asset Management, Control, Resource Assessment, Radar and Offshore Support Structures & Foundations.
- Standards: Contributions to IEA Annexes 21, 23, 25, 32 and 37, IEA
- Study Groups B4-57 and B4-72 and IEC 61400-1/-3 shadow panel.

Our research scope

- Planning and Consenting
- Design, Manufacturing and Installation
- Operation, Maintenance and Decommissioning



Our highlights

- Innovative new side-band-based methods
- Earlier detection of emerging faults.
- New blade fatigue dual-axis t sting methods
- For the first time, detection of mechanical faults from power signals
- Comprehensive study of UK long term wind variability
- Better modelling and understanding of large array wake losses
- New concepts for HVDC control and DC protection.
- New models for HVDC connections
- State-of-the-art safety critical offshore radar
- New FEM for composite joints in blades.
- New GIS model for assessing economic potential of offshore farms
- More detailed aero-elastic blade model
- State-of-the-art wind farm control analysis and design model.
- Novel hierarchical, decentralised and scalable approach to wind farm control
- First cost benefit analysis including economic, emissions and 'green jobs' impact
- First UK dynamic, energy-economy-environment computable general equilibrium model
- Prediction methods for novel foundation installation requirements

Funding: Our Grand Challenges (£3M)

- MAXFARM (MAXimizing wind Farm Aerodynamic Resource via advanced Modelling): Led by Dr Phil Hancock, Surrey
- Maximising the Carbon Impact of Wind Power: Led by Professor Richard Green, ICL
- Screw piles for wind energy foundation systems: Led by Dr Mike Brown, Dundee
- Servo-aeroelastic tailoring of wind turbines using new active-to-passive control systems: Led by Professor Paul Weaver, Bristol

Funding: Flexible Funding

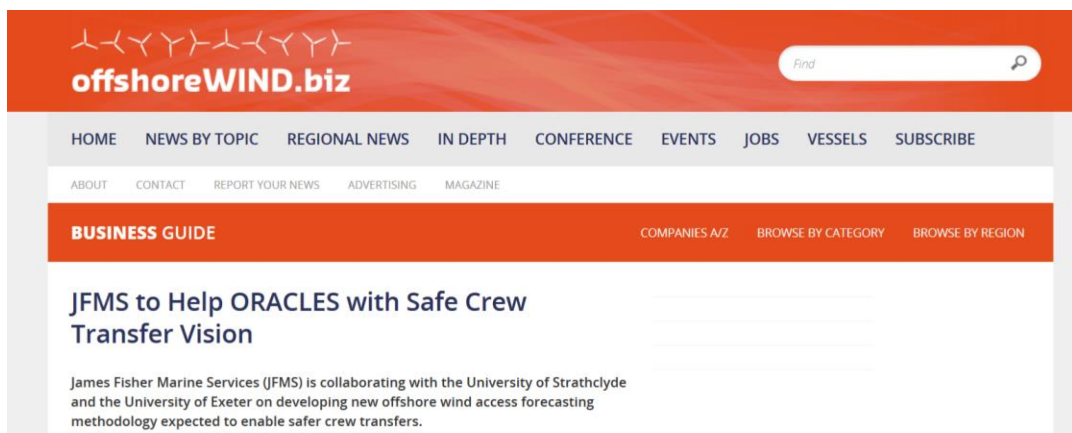
TOTAL AWARDED: £1,257,816

- **Round 1 Call (Dec 2015 – wind energy):**
  £280,029 awarded: Cranfield, Oxford, Strathclyde**)**
- **Round 2 Call (Jun 2016 - relating to OREC Levenmouth test turbine)**
  £319,251 awarded: Durham, Manchester/Glasgow/UCL, Strathclyde/Edinburgh
- **Round 3 Call (April 2017 - health and safety)**
  £234,555 awarded: Strathclyde/Exeter, Cranfield
- **Round 4 Call (Aug 2017 - floating wind)**
  £199,788 awarded: Cranfield/ICL,Cranfield/Strathclyde
- **Special Projects Call (May 2018 – developing current activities)**
  £224,193 awarded to 8 individual special projects

Funding

- 2014-2019 (Phase 3), £3M for core operations
- £1.2M spent on Flexible/reactive funding throughout the project
- ORACLES flexible funding project 1 March 2018 – 28 February 2019

10:30-11:00	*'Offshore Renewables Accessibility for Crew Transfer, Loss Estimation and Safety (ORACLES)'* Dr David McMillan, University of Strathclyde



Industry focus

- The hub and specific projects were built with strong industrial partnerships
- Research in an International and UK context
- Industry setting the research agenda

11:00-11:30	**University of Dundee led industry session** *'Decommissioning Offshore Wind – lessons learned from the O&G industry'* Clare Lavelle, Arup
11:30-11:45	Coffee and refreshment break
11:45-12:15	*'Hywind Project – Status and future challenges'* Bjørn Johansen, Equinor
12:15-12:45	*'Foundation Design for the Beatrice Offshore Wind Farm'* Robert McLean, Atkins Global

The future: UK/China ORE projects

- **2017 £4M UK & 3M RMB for joint research (EPSRC, Newton, NERC, NSFC)**
- **Tackling key technology and engineering challenges**
- **Integrated consideration of environmental science**
- **Resource characterisation, Resilience against extreme events, High efficiency, Integrated offshore natural resource systems**

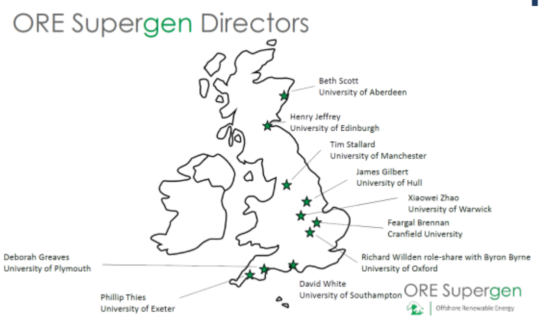
12:45-13:45	Lunch and poster session
13:45-15:15	**UK/China ORE Session** *'Extreme wind and wave loads on the next generation of offshore wind turbines'* Professor Tom Adcock, University of Oxford *'FENGBO-WIND: Farming the Environment into the Grid: Big data in Offshore Wind'* Professor Mike Graham, Imperial College London *'Resilient Integrated-Coupled FOW platform design methodology (ResIn)'* Professor Lars Johanning, University of Exeter
15:15-15:30	Coffee and refreshment break

The future of UK ORE Research

- **In 2019 the Supergen Wind Hub funding period will end**
- **The future of ORE research is the new EPSRC ORE Hub with £5M**
- **Brings together Wind, Wave and Tidal research**

15:15-15:30	Coffee and refreshment break
15:30-16:20	**Supergen ORE Hub session** *‘Ecologically sustainable futures for large scale renewables and how to get there’* Professor Beth Scott, University of Aberdeen *‘EPSRC Offshore Renewable Energy Hub’* Dr Tim Stallard, University of Manchester

ORE Supergen
Offshore Renewable Energy



Poster session

12:45-13:45	Lunch and poster session