



Building Partnerships

Delivering Innovation

Informing Policy

Creating Affordability

Offshore Wind Challenges and Opportunities

Liverpool, June 30th 2010

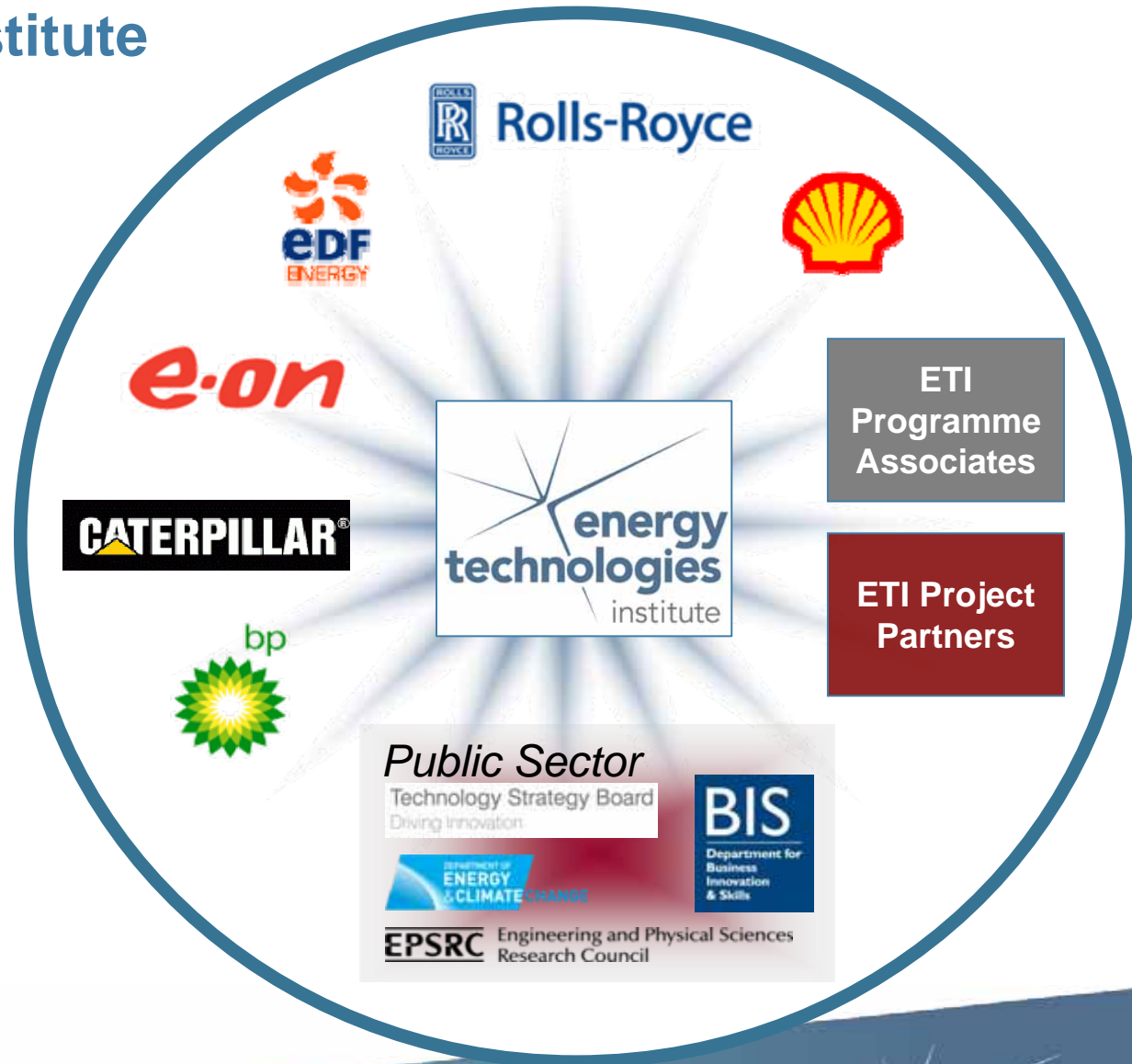
Dr Jun Qiao, Strategy Manager

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Energy Technologies Institute

Addressing the challenges of climate change and low carbon energy

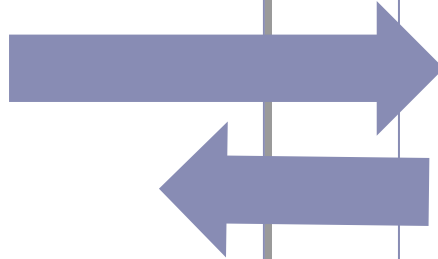
- Improving energy usage, efficiency, supply and generation
- Demonstrating systems and technologies
- Developing knowledge, skills and supply-chains
- Informing development of policy, regulation and standards
- Enabling deployment of affordable, secure, low carbon energy systems



ETI – a unique platform for industry and Government

Delivering system level engineering demonstrations of innovative low carbon energy systems

With unique access to the complementary technology, skills, market access and policy development capabilities of the ETI Members



ETI2010 portfolio addresses key energy challenges

Technology Strategy

- **Low Carbon** - Gas, wind, solar, biomass, hydro, geothermal, tidal, wave, offshore wind, nuclear
- **Energy Storage** - Pumped storage, battery, flywheel, supercapacitor, hydrogen, compressed air, thermal storage
- **Energy Efficiency** - LED lighting, smart meters, smart buildings, smart grids, smart appliances, smart transport
- **Energy Infrastructure** - Pipelines, power lines, gas lines, water lines, rail, roads, bridges, ports, airports

Energy Storage and Distribution

Buildings

Transport

Power

Oil

Gas

Coal

Nuclear

Renewables

Energy Efficiency

Energy Infrastructure

Energy Storage and Distribution

Buildings

Transport

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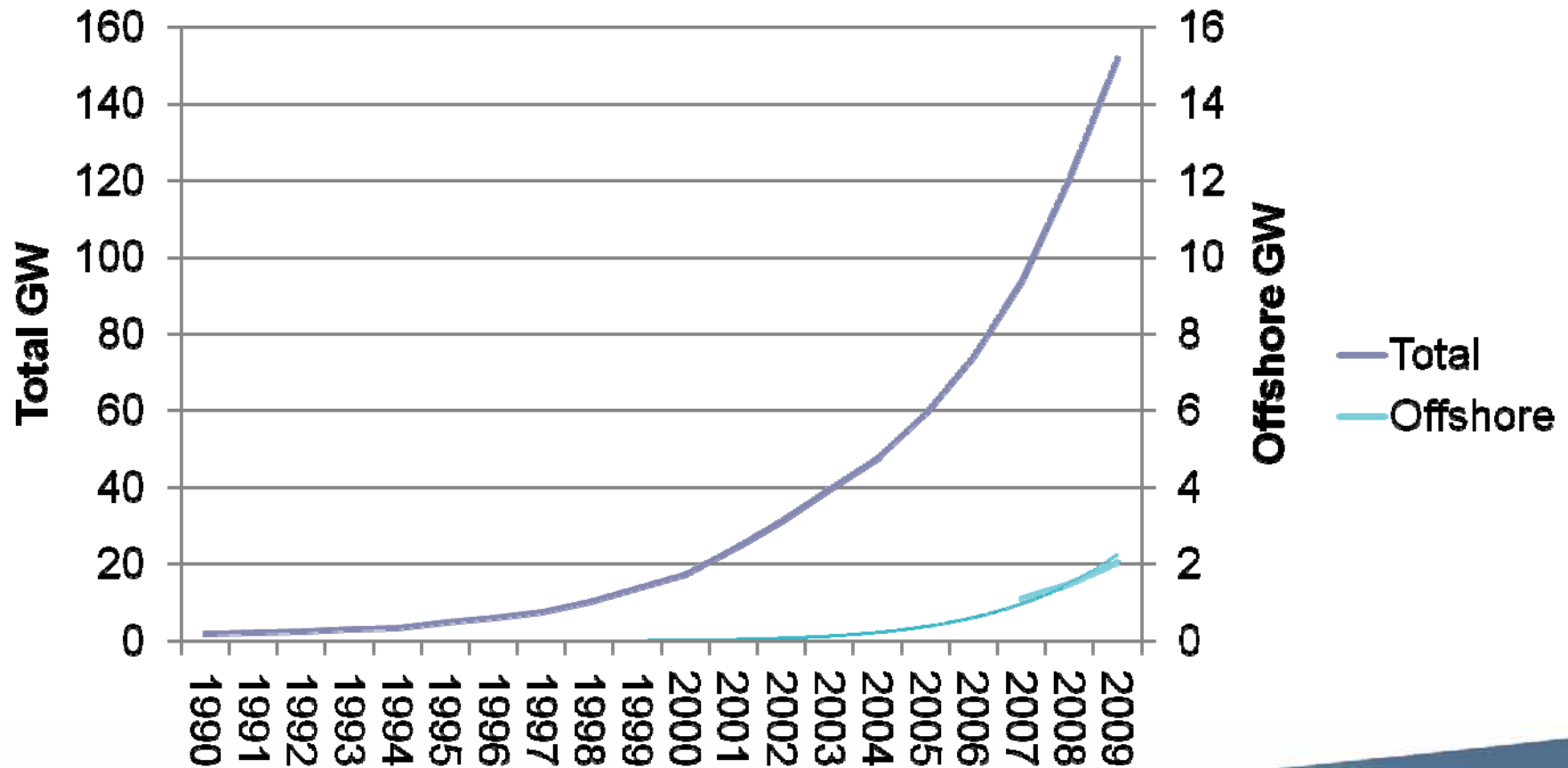
Nuclear

Renewables

Achieved through world-class capability in strategic analysis and energy system modelling

Focused on the integrated UK energy system – power, heat, transport and associated infrastructure

Offshore Wind at an early stage



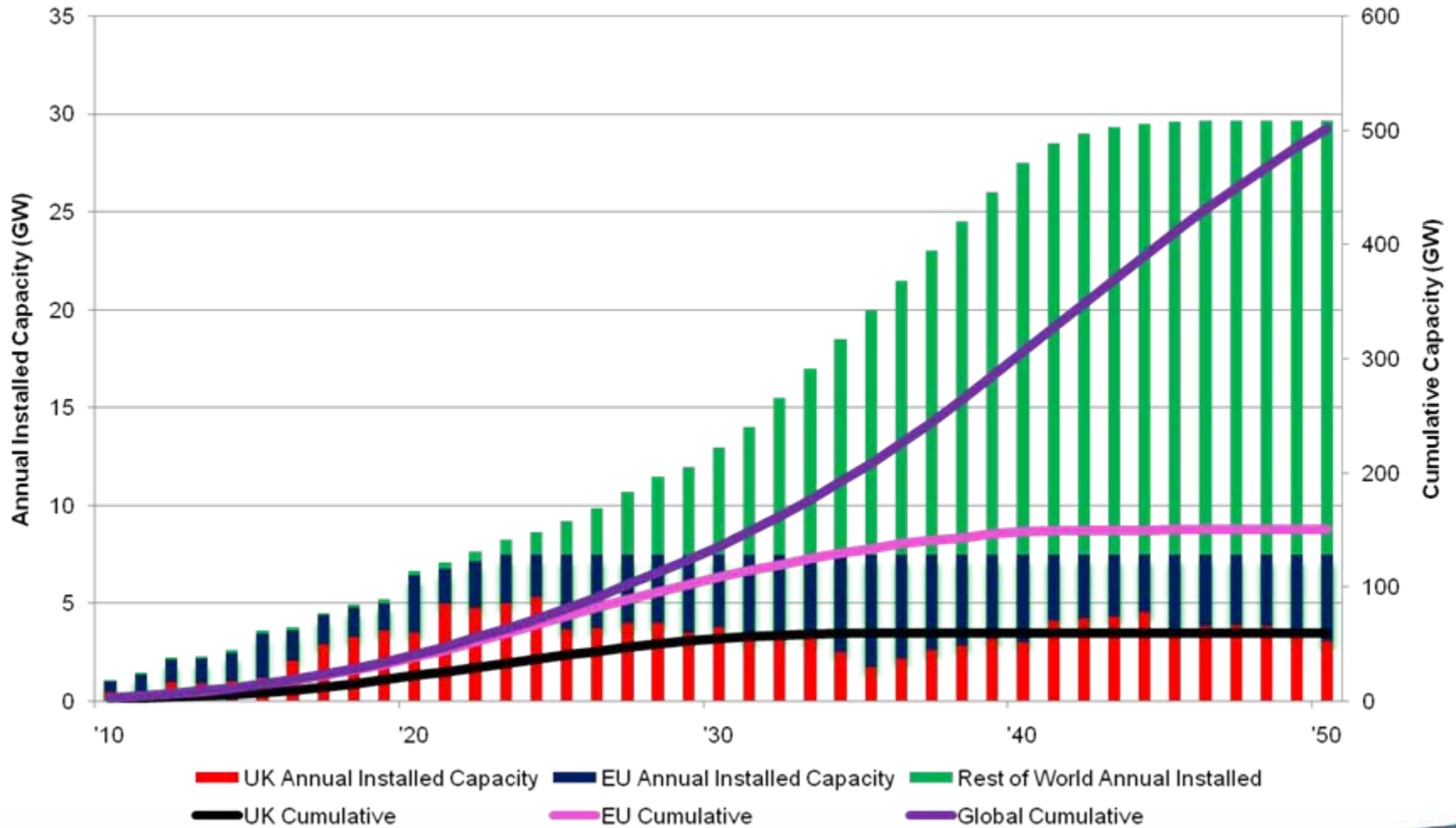
Offshore requires new developments

- **Aggressive** environment
- High costs of **installation**
- **Maintenance** more costly and constrained
- Offshore **electrical systems**

New, **larger turbines** & focus on **reliability**

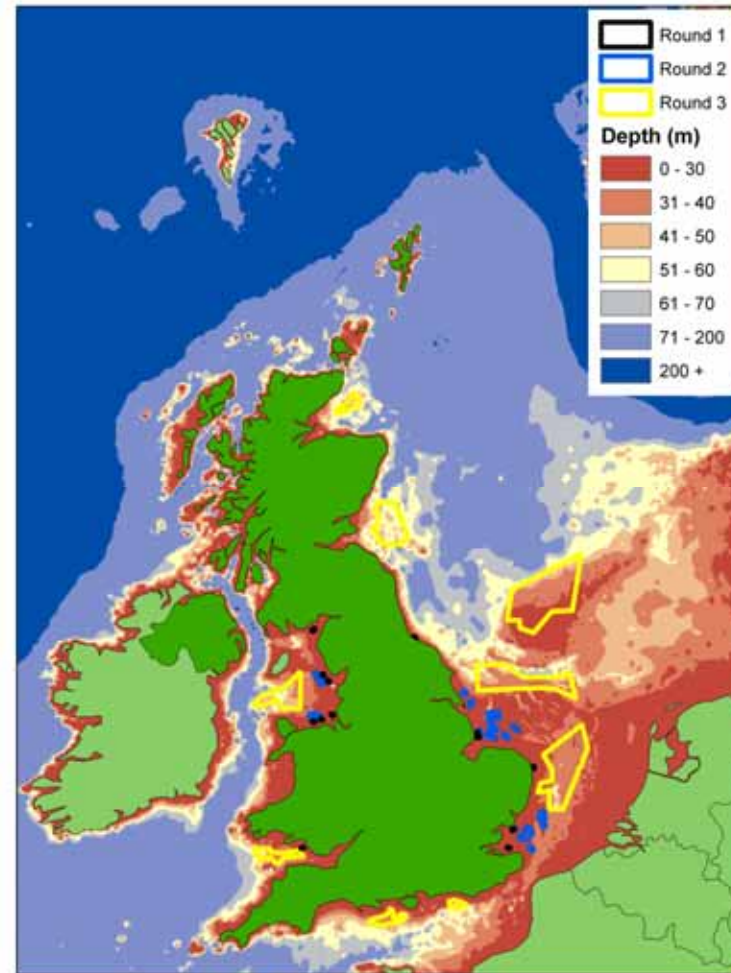
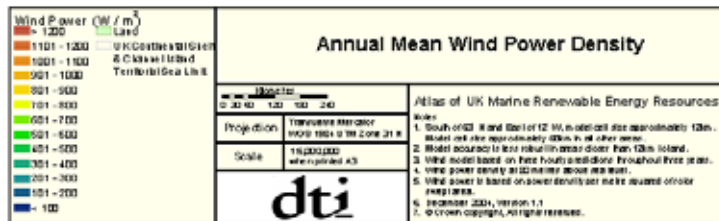
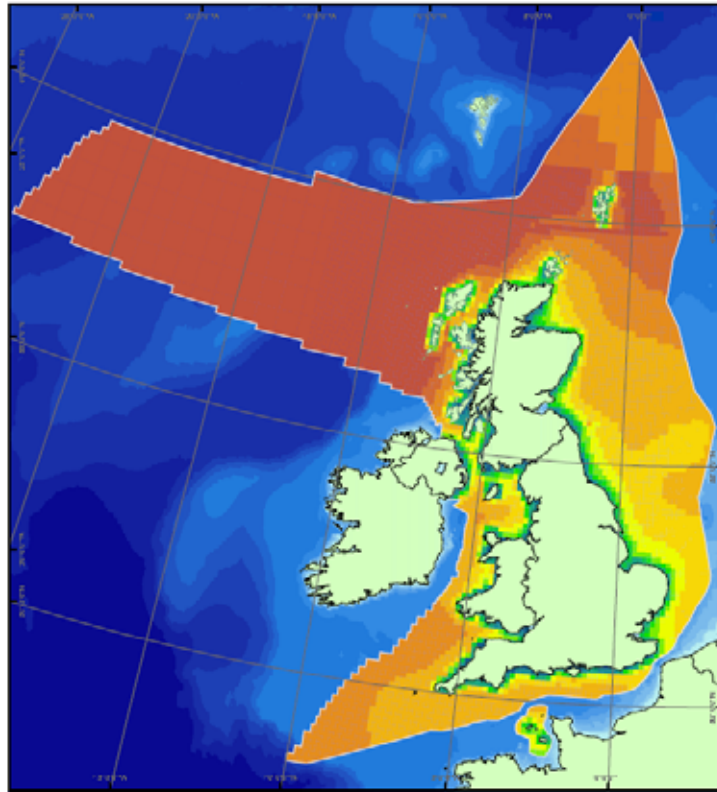


Forecast Installations for UK, EU and Global Offshore Wind

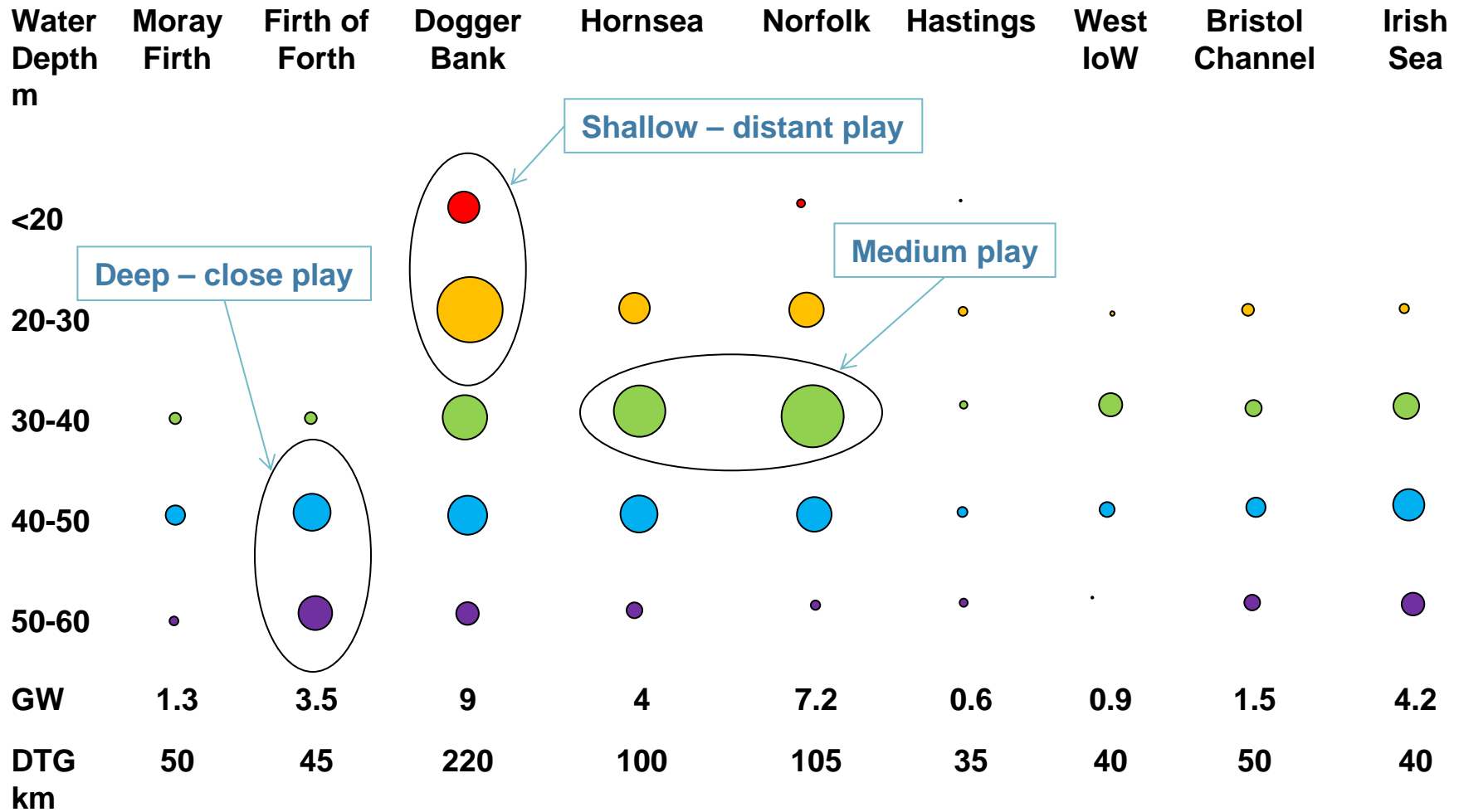


Source: BVG Associates

UK Offshore Wind Resources, Crown Estate R1, R2, R3 and Water Depth

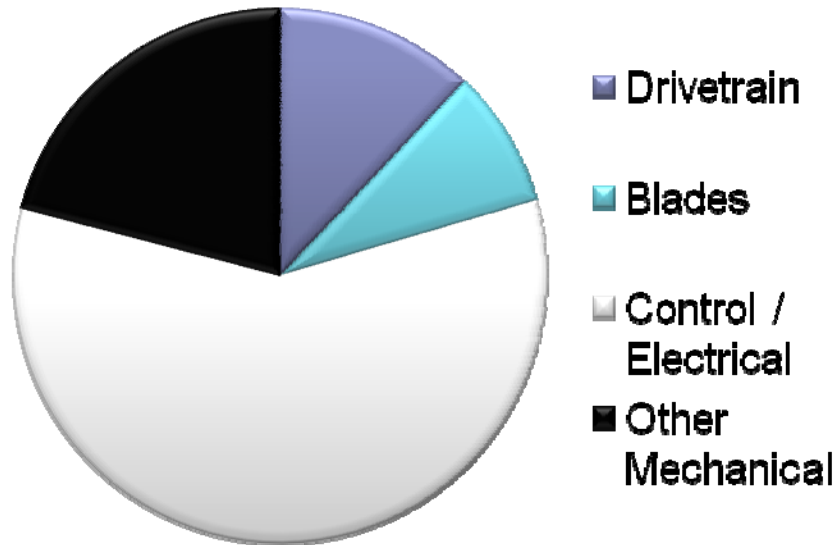


Round 3 Licences - Area

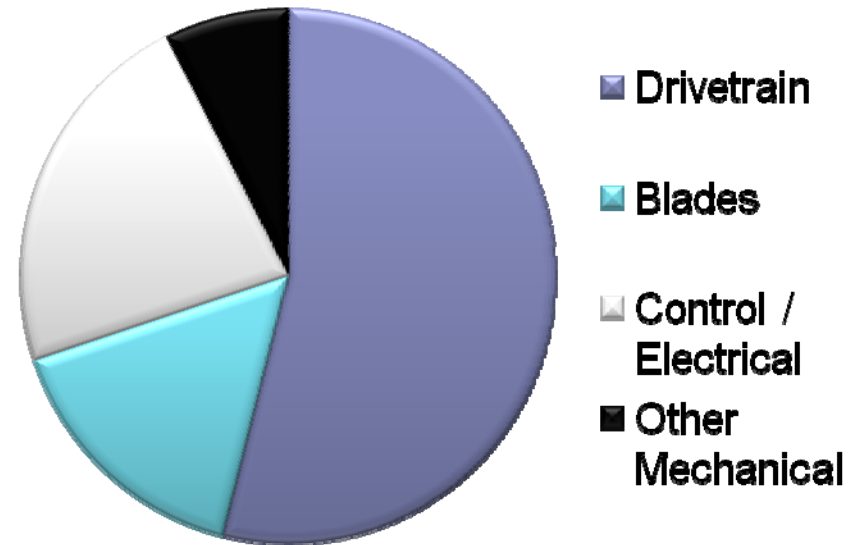


Predicted reliability performance offshore

Events/yr



Downtime/yr



Condition Monitoring

- **ETI funding – £5.1 million announced in Sept 2009**
- Aim is to develop a system that can detect causes of faults and component failures in offshore wind turbines
- It will provide operators with sufficient warning to allow a suitable maintenance strategy to be planned, predicting faults before they occur, identifying potential causes and overall, reducing turbine downtime
- The system will be demonstrated both onshore (late 2011) and offshore (mid 2012) and has the capability to reduce the cost of offshore electricity by 0.5p/kWh.

insensys



e-on



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Turbine Drive Train Test-Rig

- **ETI funding – £1.53 million announced in Feb 2010 for design studies**
- Two companies are delivering competing technical designs for an indoor test-rig capable of dynamically testing a complete wind turbine drive train and nacelle with input power up to 15MW
- The rig, to be located in the UK, will support the design and manufacturing development of the next generation of very high power wind turbines
- Designed to allow representative offshore loads to be applied to a complete turbine nacelle prior to being taken offshore, thus reducing the technical and commercial risks of mass production and deployment



Deepwater

- **ETI funding – £3.3 million announced in Jan 2009**
- Aims to develop a floating offshore wind turbine which may increase the opportunities for deep water wind turbines. Focus in on cost of electricity reduction potential.
- The Deepwater consortium leaders; Blue H, have established a small-scale machine in the Mediterranean and with the ETI are now bringing this capability to the UK on a commercial scale.



BAE SYSTEMS



PAFA CONSULTING
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Helm Wind

- **ETI funding – £2.5 million announced in Jan 2009**
- Helm Wind is a study to develop the offshore wind power station of the future. Focus on capital and operational cost reduction, and high reliability.
- First comprehensive study assessing the complete system design for an offshore wind turbine array including installation, design, aerodynamics, electrical systems, control and maintenance.



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Nova (Novel Offshore Vertical Axis Demonstrator)

- **ETI funding – £2.8 million announced in Jan 2009**
- Vertical axis wind turbines with vertical facing blades could offer significantly cheaper electricity due to the size and scale of the machines and simpler maintenance compared with conventional turbines.
- Nova will design an innovative vertical axis turbine and predict the cost of electricity from a vertical axis turbine wind farm



Cranfield
UNIVERSITY

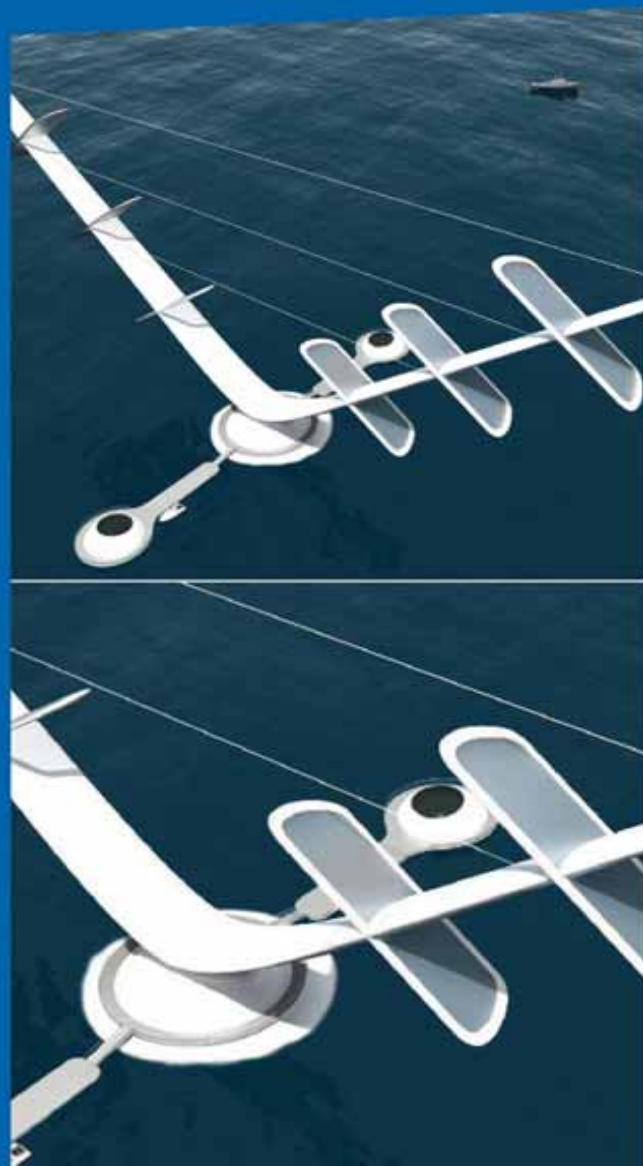


Wind Power

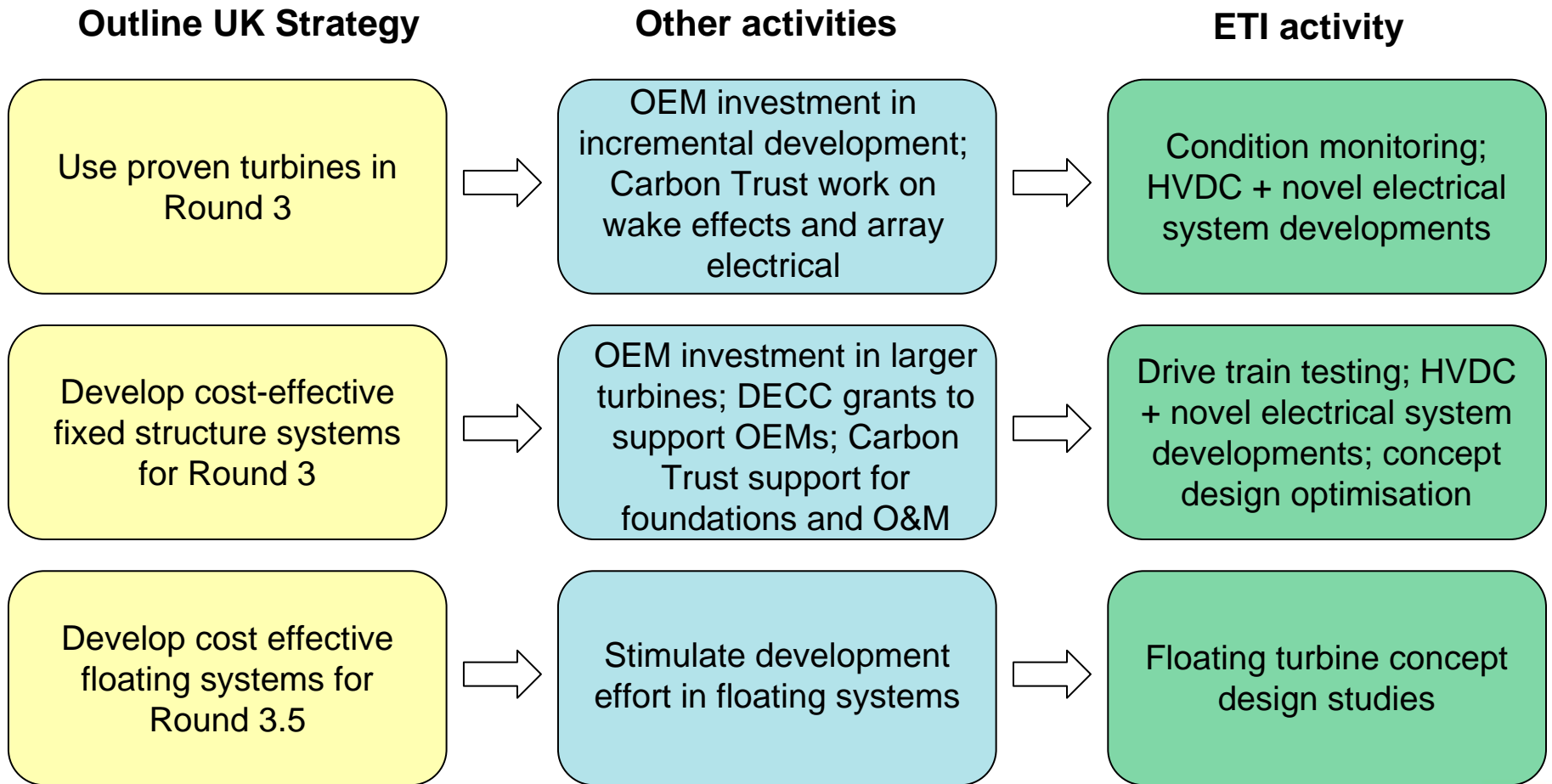
James Ingram
& Associates



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ETI activity summary





Enabling

Large-scale deployment through major industries

Innovation pulled through from smaller enterprises and academia

Sustained support for long-term incentives, skills development and regulatory frameworks



Building Partnerships

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Informing Policy

Demonstrating Affordable systems

for Secure, Low Carbon Energy