



Offshore wind technology overview: UK Round 2

DTI / DEFRA: Wind Farms - Fisheries Interactions Study

Multi-stakeholder workshop, Birmingham, 10th October 2005



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Garrad Hassan and Partners Ltd – summary

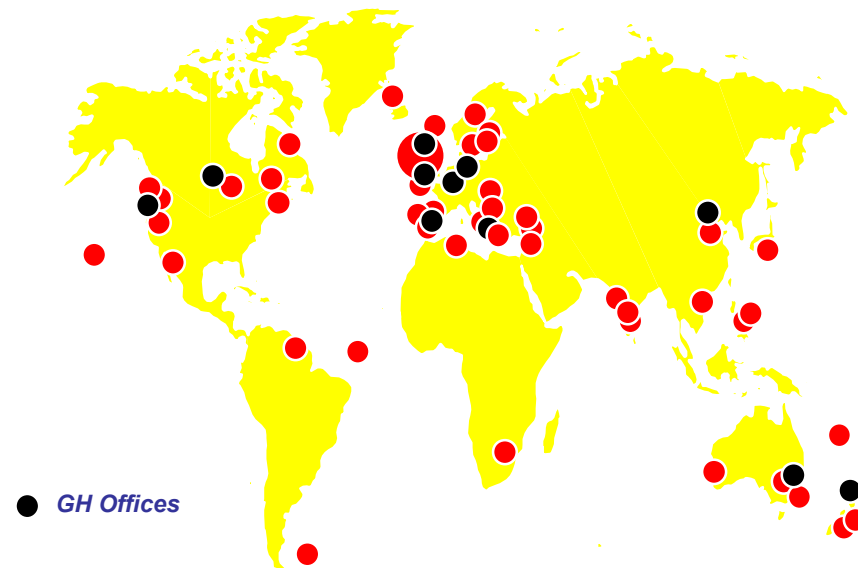
Industry-leading wind energy consultancy

Founded in 1984

150 people in UK, Germany, Netherlands, Spain, Italy, France, NZ, Australia, Japan, USA, Canada, China

Working in 5 continents

No equity stake in wind farm or wind turbine



Summary – GH work scope

Discussions with developers

Site-specific plans

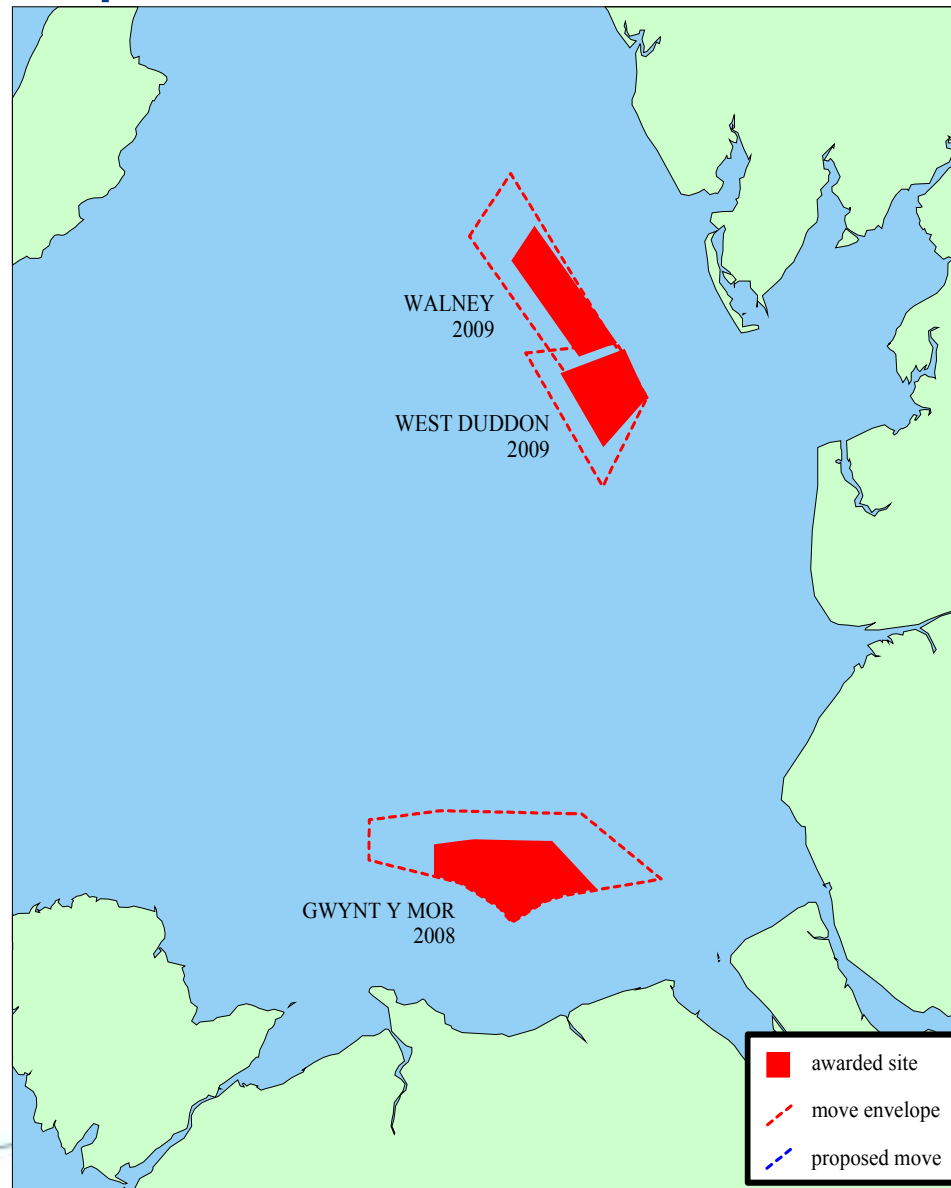
Generic features

- Surveying operations
- Foundation solutions
- Electrical infrastructure
- Offshore wind turbines
- Wind farm layout
- Construction plant and operations
- Operation and maintenance activities



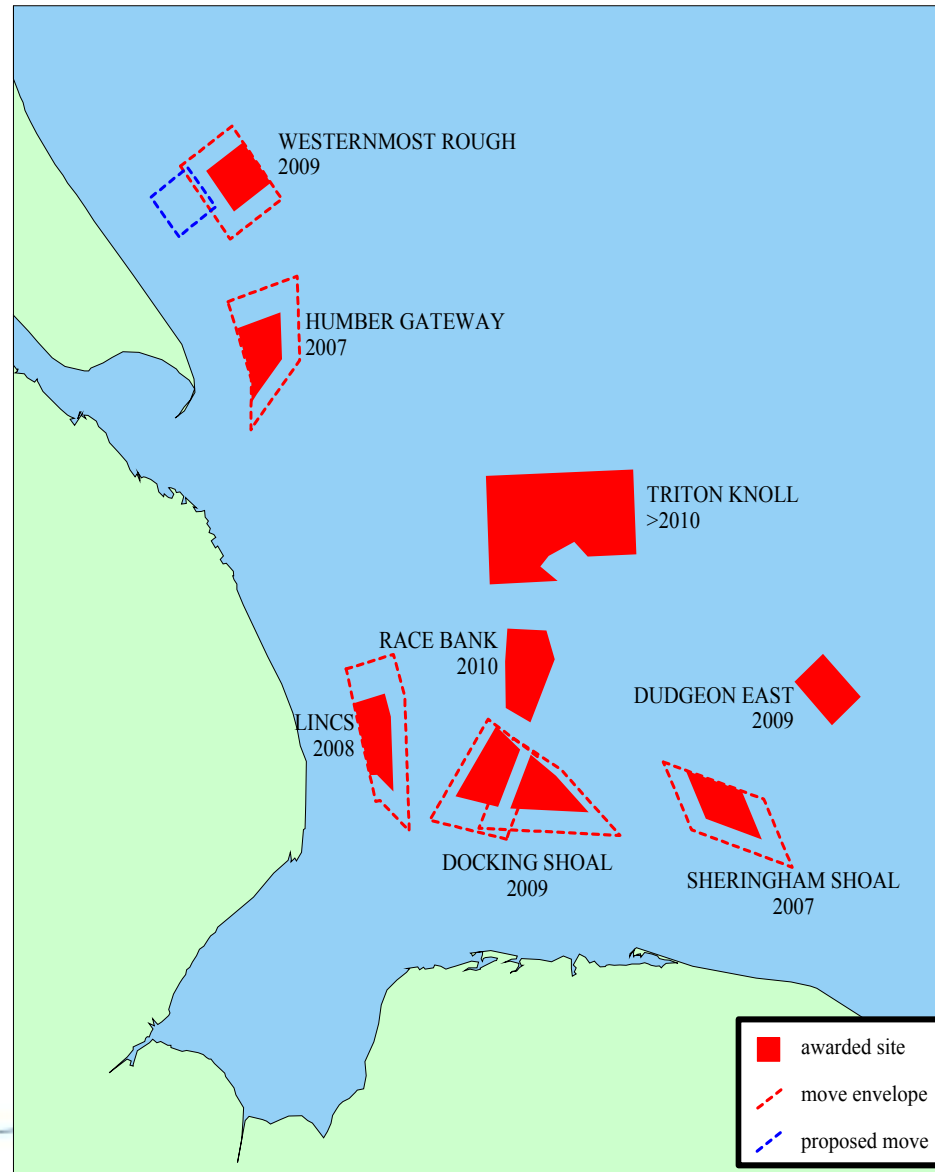
Site-specific descriptions

North West Region



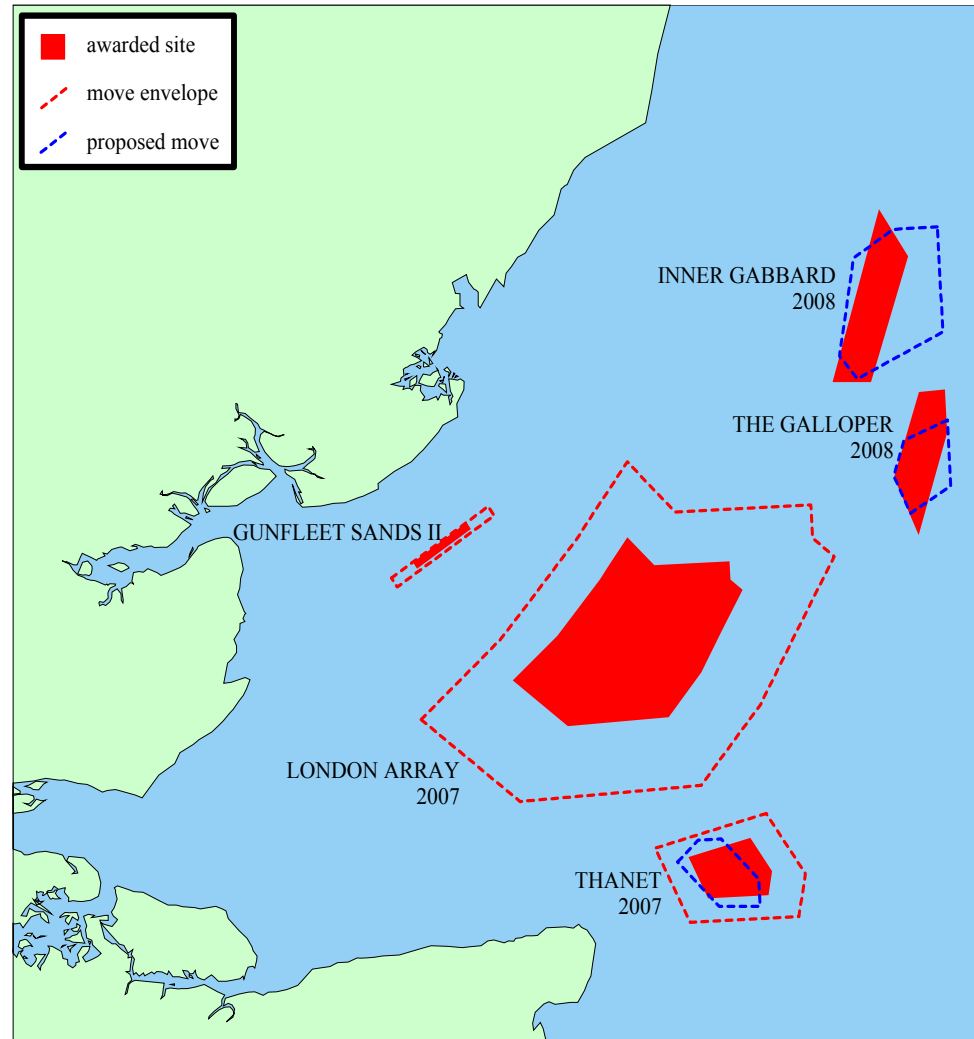
Site-specific descriptions

Greater Wash Region



Site-specific descriptions

Thames Estuary Region



Surveying operations

Wind monitoring
Geophysical
Geotechnical
Metocean
Ecological
Navigation



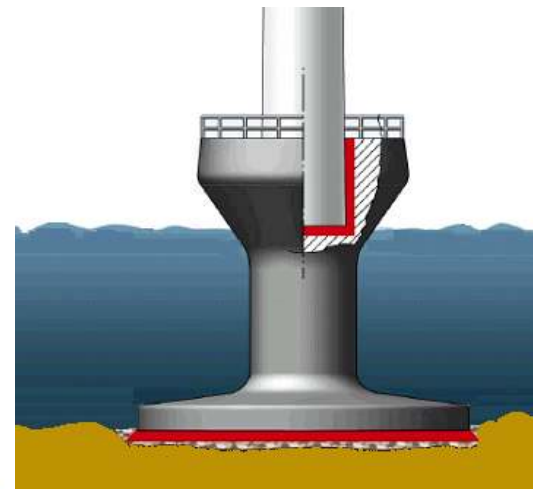
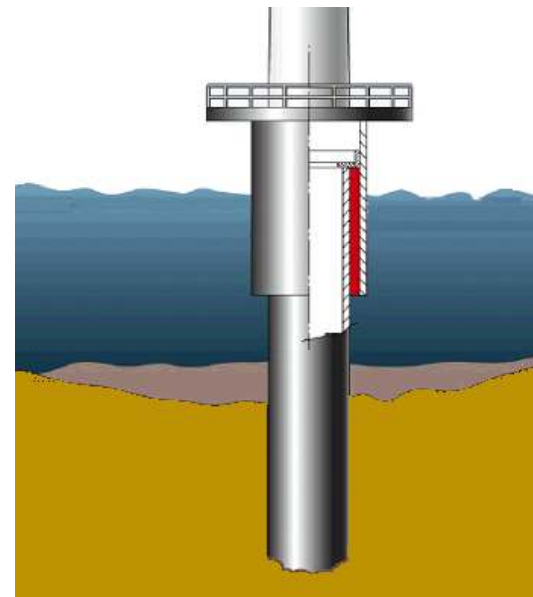
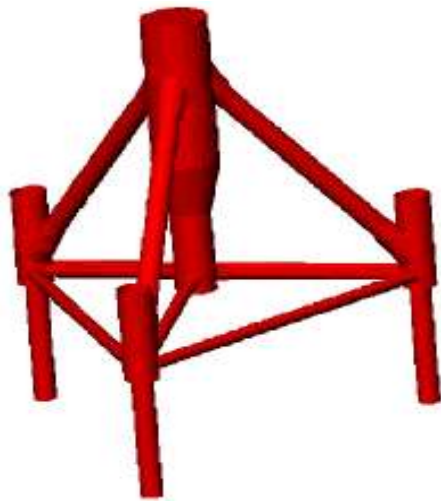
Foundation Solutions

Mono-pile

Multi-pod

- Multi-pile
- Suction caisson

Gravity base



Scour Protection

Scour hole forms due to interaction between currents and seabed structures

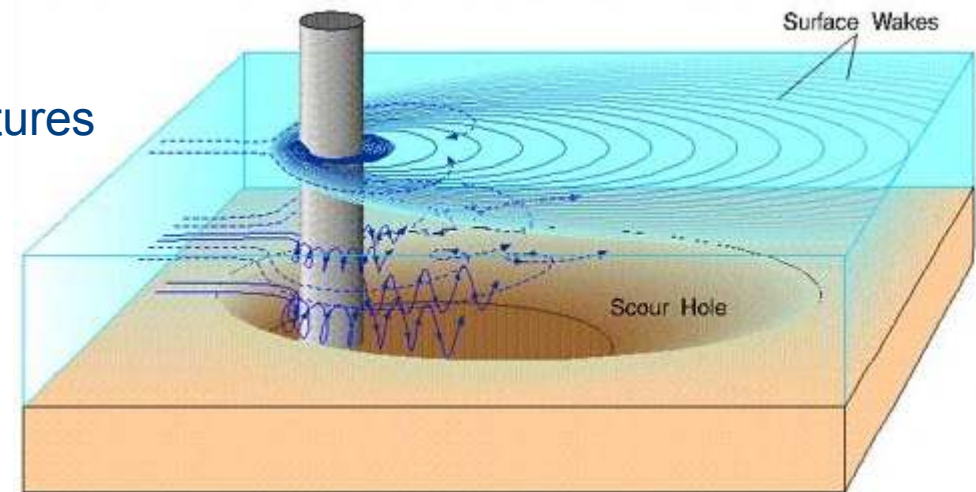
Rock layer around foundation

Stabilises seabed sediments

Extent depends on.....

- Foundation footprint
- Seabed consistency
- Tidal strength

Up to 20m perimeter from foundation



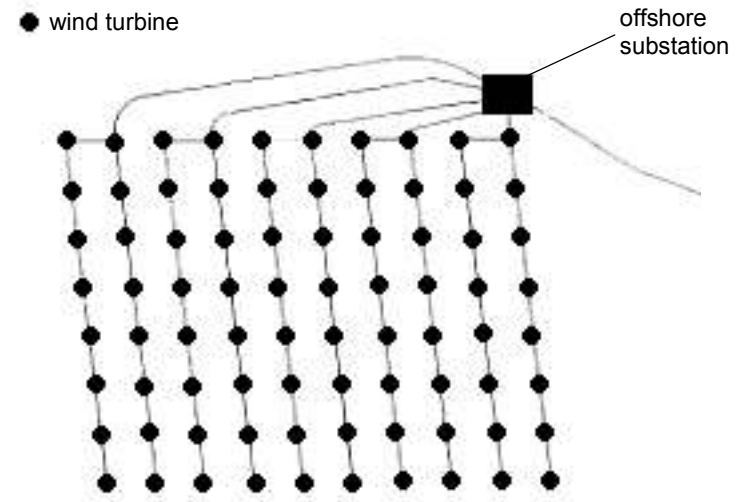
Electrical Infrastructure

Infield cables

Offshore sub-stations

Shorelink / export cables

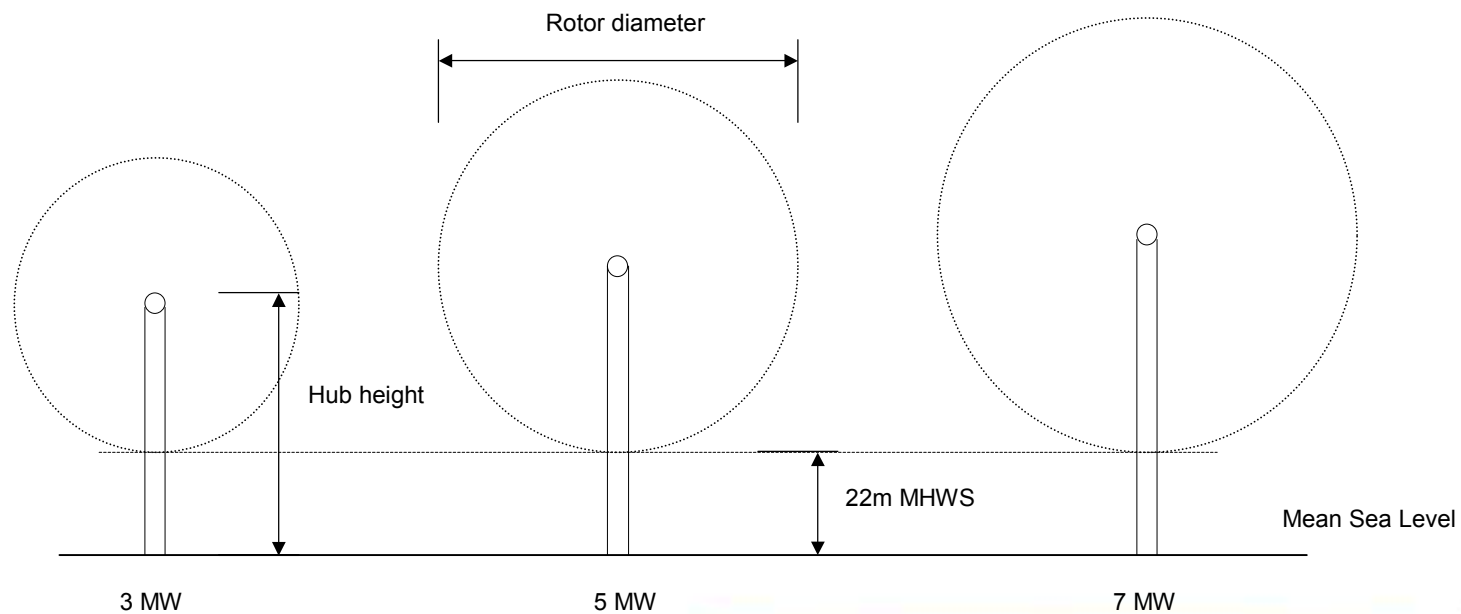
Cable burial



Offshore Wind Turbines

UK Round 2 turbines will be.....

- Installed capacity 3MW – 7MW
- Rotor diameter 90m – 150m
- Hub height 70m – 100m



Wind Farm Layout

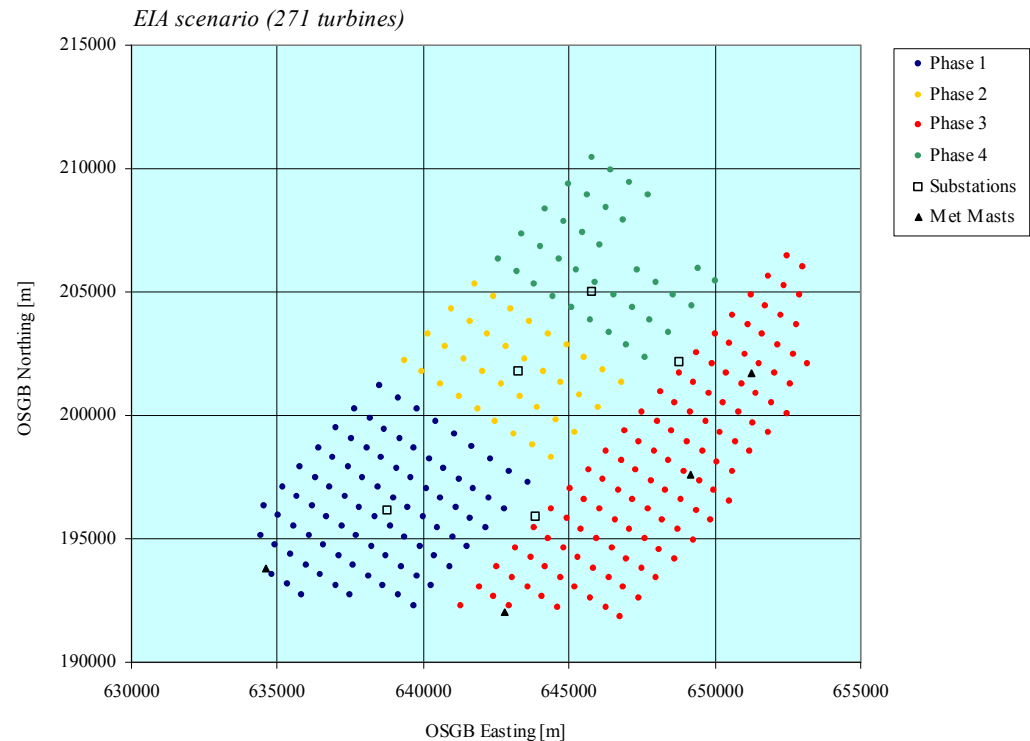
Layout considerations

- Maximise energy capture
- Minimise installation cost
 - Foundations
 - Cables
- Avoidance of sensitive areas

Regular grid preferred

Minimum spacing ~ 500m

Maximum spacing ~ 1500m



Example Layout: London Array



Construction plant and operations

Foundation installation

Cable lay and burial

Turbine and substation installation

Construction spread

Construction timeline

- 1 season build
- Split season build
- Multi phased build



Operation and maintenance activities

Scheduled maintenance and minor repairs

- Most frequent activity
- Small access vessels
- Local service base



Major repair operations

- Specialised equipment required
- Large cranes / jack-up barges
- Infrequent



Conclusions

Projects in varying stages of development

Many common characteristics

- Surveying activities during project development
- 3 main foundation technologies
- Scour protection will mostly be required
- Wind turbines will be similar in nature throughout Round 2
- Wind farm layouts in regular grids
- Cable burial based on risk assessment
- Construction and operational activities

