Offshore wind
Lessons from the Dogger Bank EIAs

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FOREWIND
DELIVERING YOUR ENERGY FUTURE

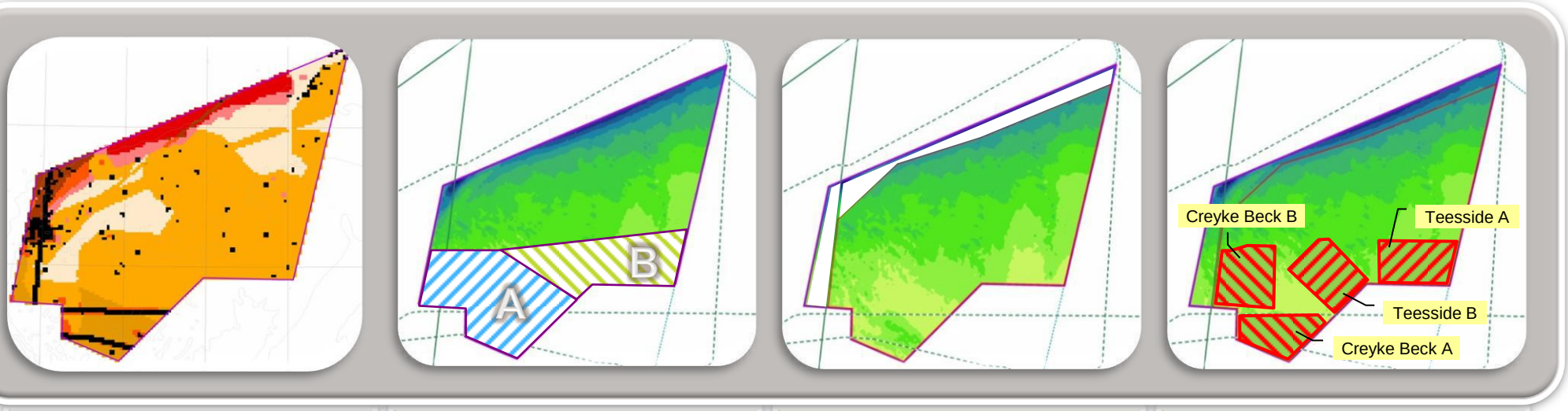
Forewind

- Forewind is a consortium of leading energy companies: RWE, SSE, Statkraft, Statoil
- Forewind is committed to securing all necessary consents required for the construction and development of safe, economically viable offshore wind capacity on Dogger Bank.

Dogger Bank key facts:

- Capacity: potential for over 9 GW.
- Area: 8660km^2, largest zone, equivalent size to North Yorkshire.
- Distance: 125-290 km from shore.
- Depth: 18-63 m; c.4 GW in <30m water depth, c.8 GW in <35m water depth; shallow compared with other Round 3 zones.
- Wind: High wind speeds of >10 m/s average wind speed across the zone.
- History: A "dogger“ was a type of Dutch fishing boat that commonly worked in the North Sea in the seventeenth century.

Zone development approach



Zone

- Coarse zone-wide surveys.
- Zone appraisal work-shops with stakeholders at start of programme.
- Consent “heat map” and hard constraints identified.
- Relative cost of energy crudely modelled.

Survey tranches

- Most promising areas prioritised for detailed surveying; first area “A” then “B”.
- Onshore grid connections agreed.
- Cable routes to shore identified, starting with reconnaissance survey grids.

Developable area

- Area of high fishing intensity, bird density, and more complicated geology to west of Zone excluded.
- Deeper water, with slope habitat to north of Zone excluded.

Project areas

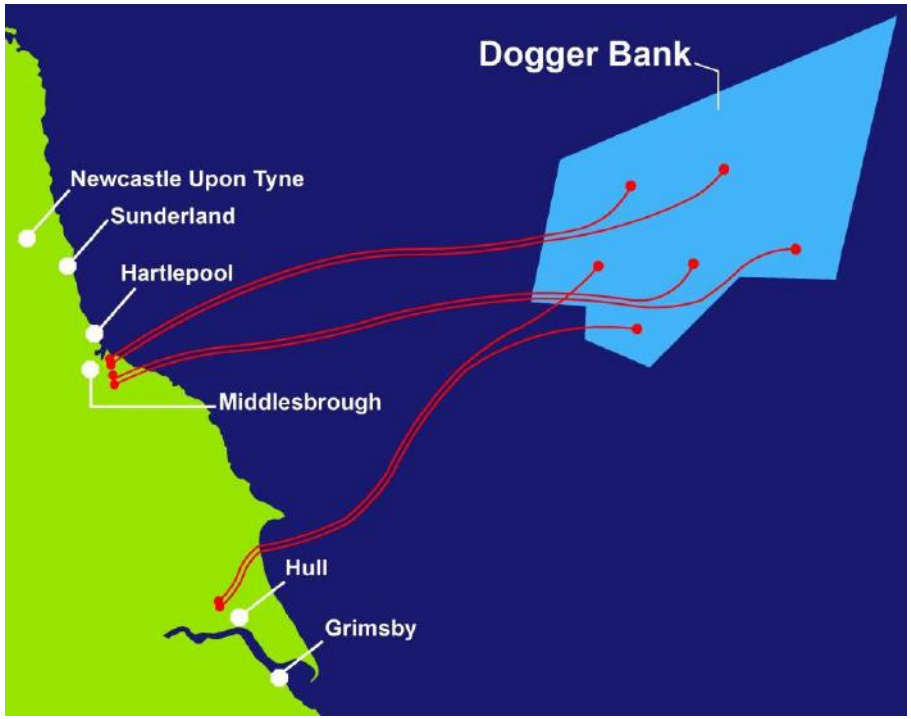
- Narrowing down from zone to tranche to specific project areas.
- Based on detailed environmental assessment and detailed wind resource modelling.
- Stakeholder engagement and consultation throughout.

Balance of maximising energy output with the environment and needs of or concerns of stakeholders

Projects

- Each Dogger Bank project is up to 1.2 GW offshore, linked to National Grid via 1 GW connections.
- *Dogger Bank Creyke Beck A&B*
  Connecting near Cottingham, East Yorkshire – planning application submitted August 2013.
- *Dogger Bank Teesside A&B*
  Connecting at Lackenby on Teesside – currently in final consultation phase, planning application expected spring 2014.
- *Dogger Bank Teesside C&D*
  Two further projects also connecting on Teesside – planned for submission after Teesside A&B.
- Zone appraisal work has identified the possibility for up to eight projects, with a total capacity over 9 GW. We have a clear focus on the first four projects, totalling 4.8 GW.

Connection point		Complete 1st 500MW	Complete 2nd 500MW
P1 – Creyke Beck	Yorkshire	Apr 2017	Apr 2018
P2 – Lackenby	Teesside	Apr 2017	Apr 2018
P3 – Lackenby	Teesside	Apr 2018	Apr 2019
P4 – Creyke Beck	Yorkshire	Apr 2019	Apr 2020
P5 – Tod Point	Teesside	Apr 2019	Apr 2020
P6 – Tod Point	Teesside	Apr 2020	Apr 2021

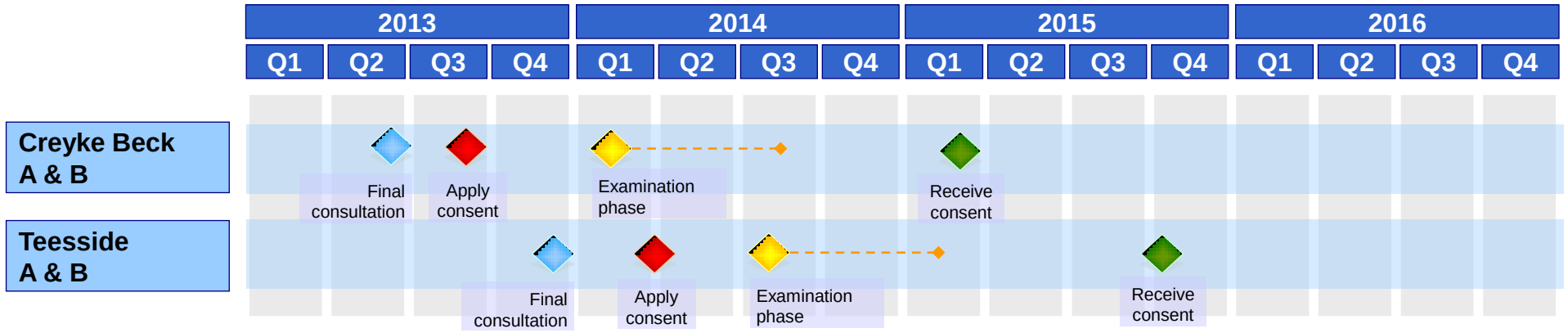


Forewind has secured the best available grid connection points for 6 GW of capacity.

Consenting timetable

- Each Dogger Bank project is a Nationally Significant Infrastructure Project (NSIP).
- Development Consent Order (DCO) applications include onshore and offshore aspects.
- Examined by The Planning Inspectorate.
- Determined by the relevant Secretary of State, currently Department of Energy & Climate Change (DECC).
- Stakeholder consultation, key element of development process.

Ed Davey, Secretary of State for Energy & Climate Change



Consent project description

- Relevant aspects of the project must be described for environmental assessment.
- The consenting approach to be used by Forewind is called a “Rochdale Envelope”.
- Range of options described – final project must build within that “envelope”.
- Assess “realistic worst case” assumptions - intended to cover anything the shareholders might want to build, but not too conservative as this would increase consent risks.

Project description overview:

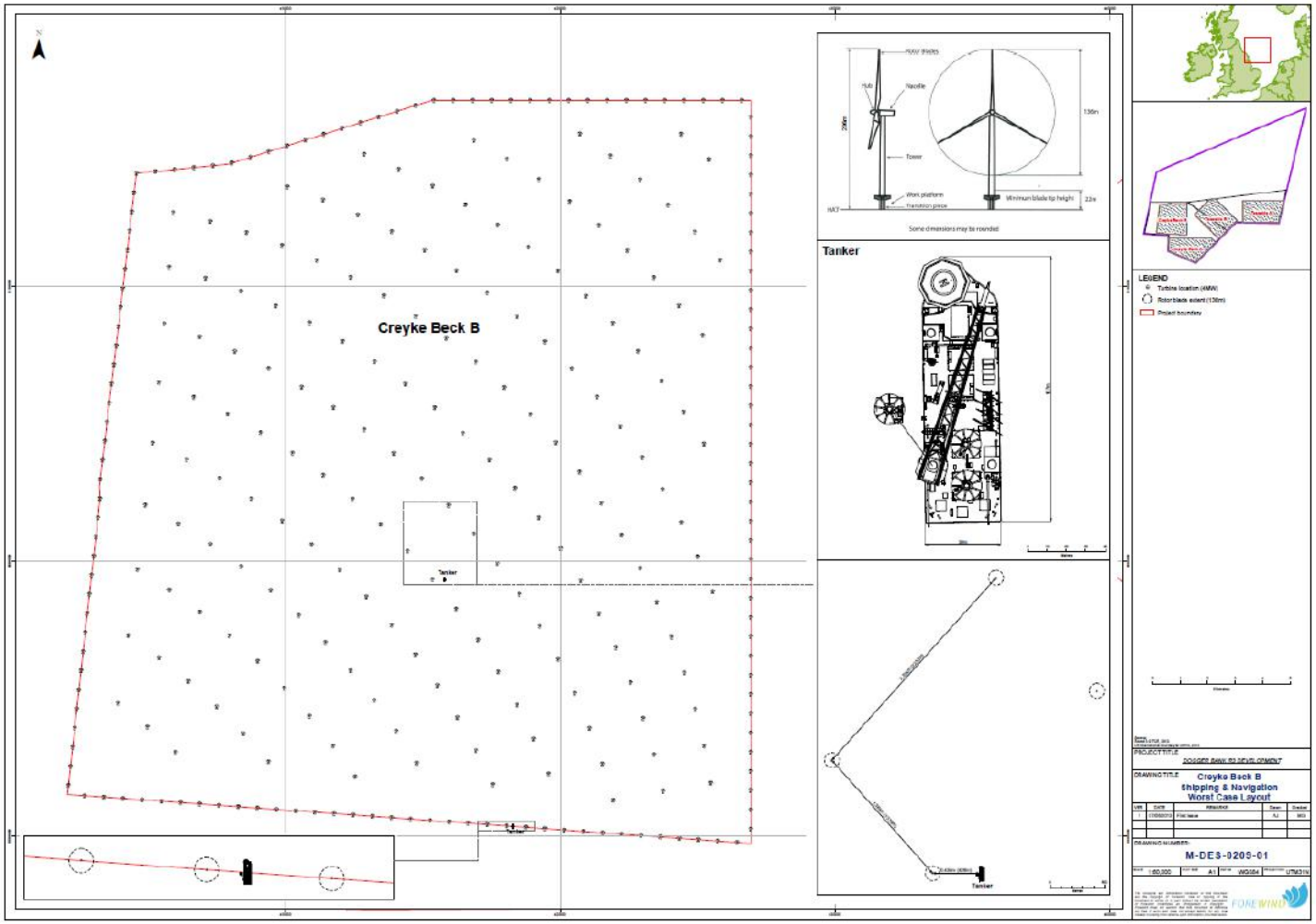
Offshore project components (one project):

- Capacity up to 1200MW
- Up to 200 turbines (implies minimum 6 MW per turbine)
- 1 to 4 AC collector substations
- 1 DC converter substation
- Up to 2 accommodation or helicopter platforms
- Up to 5 met masts
- Up to 10 vessel mooring buoys
- Minimum construction duration 3 years
- Maximum construction duration 6 years

Cumulative impact assumptions:

- Up to 6 projects in construction simultaneously
- Up to 12 piling rigs in operation simultaneously
- Maximum zonal construction duration 20 years

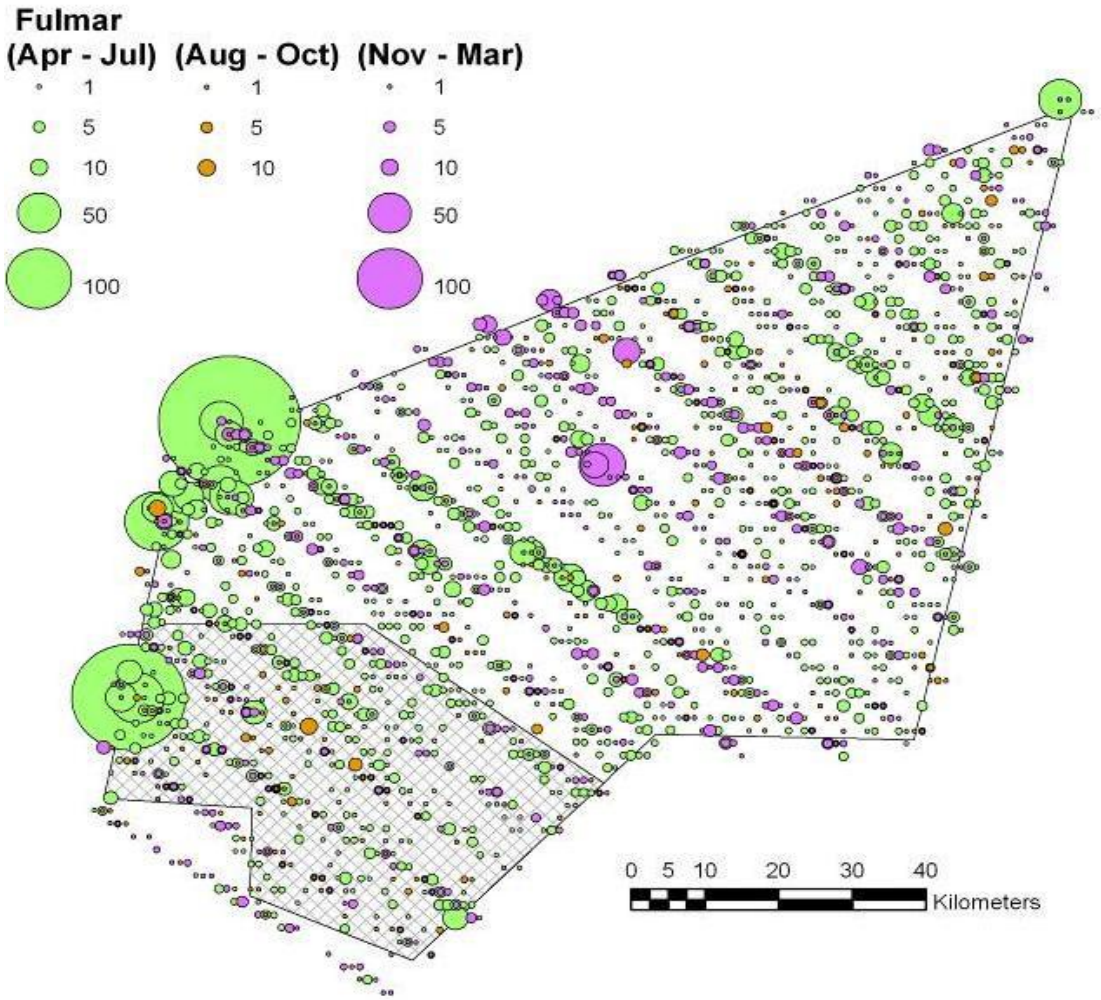
Example Worst Case: Commercial Fisheries & Shipping and Navigation & Search & Rescue



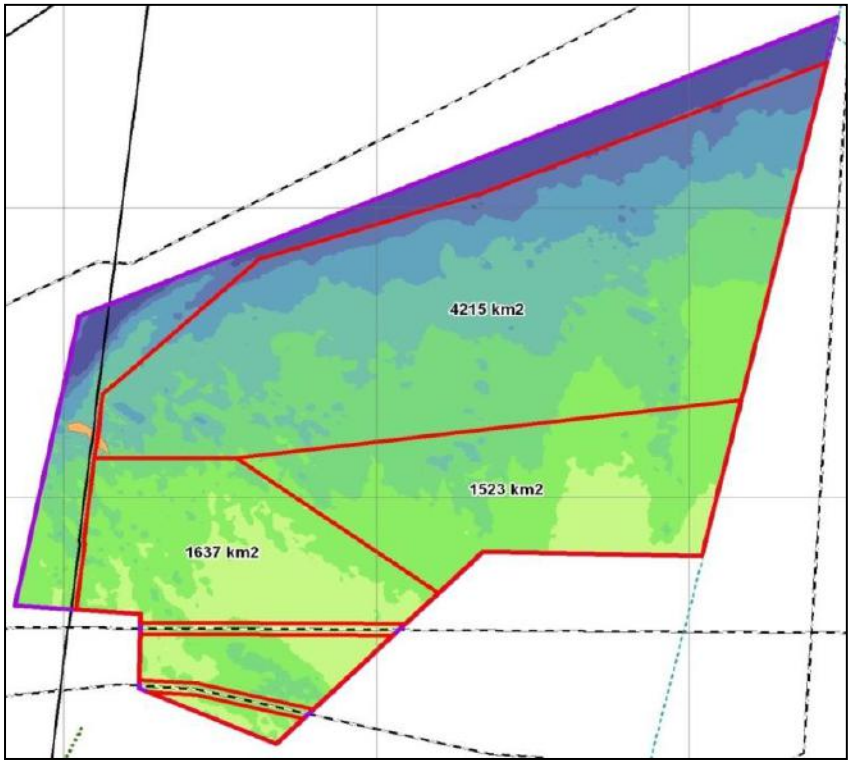
Layout definitions in the Development Consent Order – curved perimeters and straight line arrays

Modification of the developable area

Example bird distribution plot:



- Bird collision identified as a risk
- Western edge of zone higher densities observed correlating with sand eel fishing area
- Moved the zonal boundary in to avoid this area.



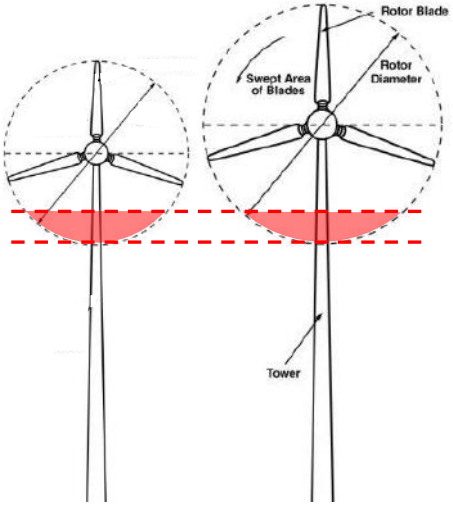
Larger or higher turbines to reduce impacts

Project boundaries

- Forewind has already selected project boundaries that avoid the sand eel stock and fishery on the western edge of the Dogger Bank zone. For some species, that feed on sand eels, this coincides with areas of high bird numbers.

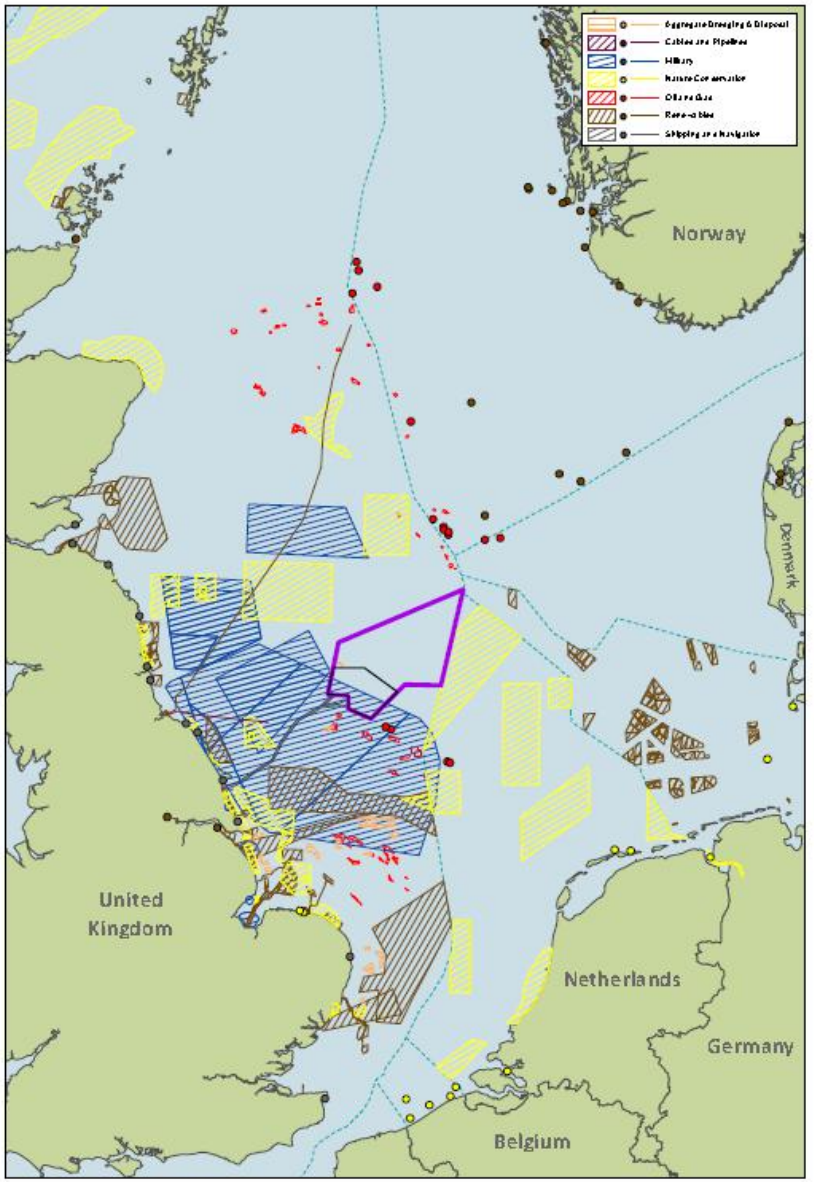
Turbine Size

- Moving to larger machines with bigger rotor diameters would reduce the number of collisions. Forewind has considered the economics of such a decision
- Many species typically fly at heights that are in only the lower portion of the rotor sweep. Greater diameters means more of that swept area is outside the collision zone.
- Larger machines require proportionally less turbines, thus reducing the opportunity for collisions.
- Raising rotor heights would also assist in reducing impact, need to balance with cost and technical ability to raise

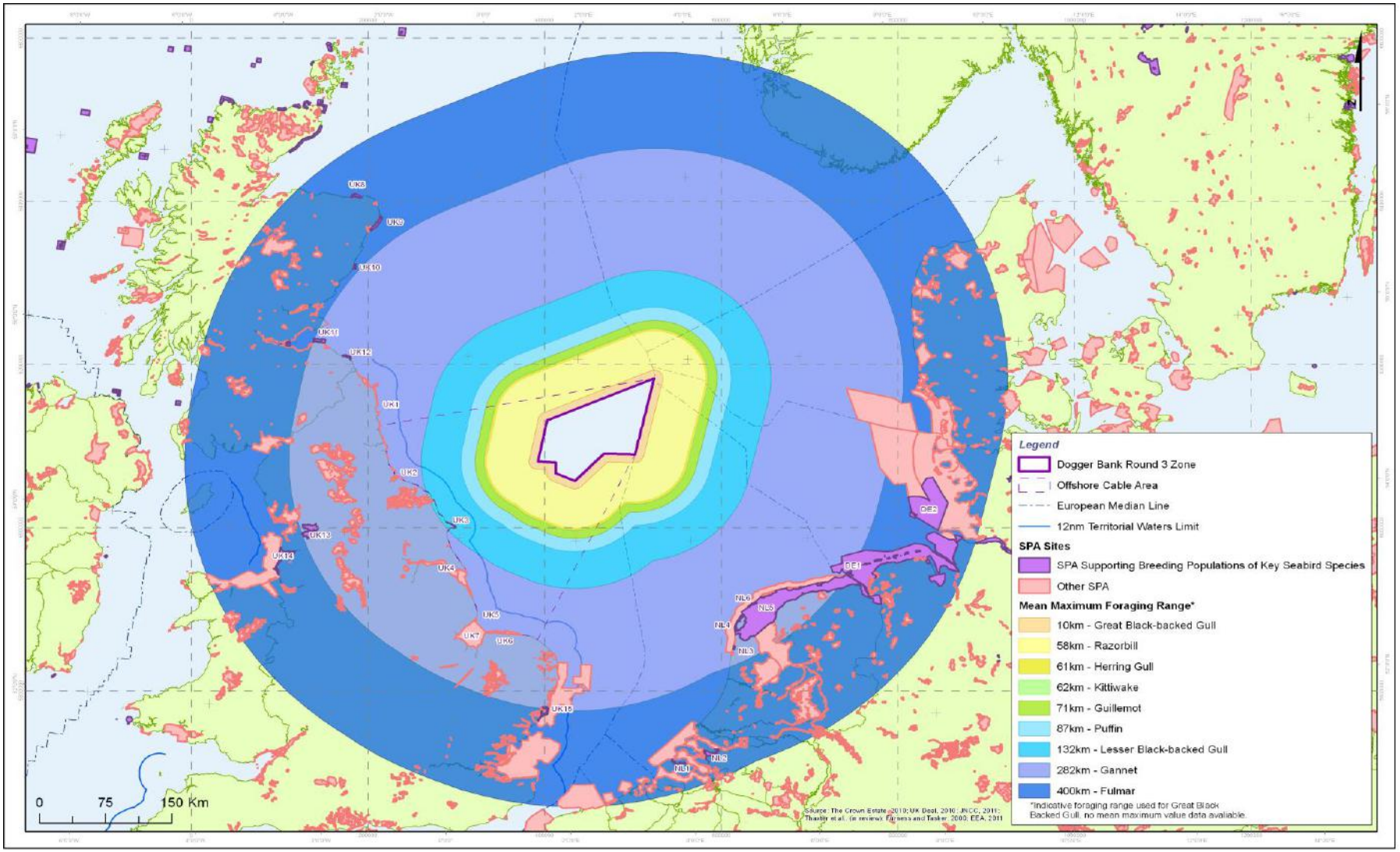


Cumulative Impact Assessments - CIA – A moving target?

- Historically used ‘Building Block Approach’
- Planning Inspectorate Advice (IPC Note 10) –
- “*In assessing cumulative impacts, other major development should be identified…on the basis of those that are:*
  - *under construction; permitted application(s), but not yet implemented; submitted application(s) not yet determined; projects on the Commission’s Programme of Projects; identified in the relevant and emerging Development Plans recognising that much information on any relevant proposals will be limited; and sites identified in other policy documents, as development reasonably likely to come forward*.”
- 1,665 projects identified which then needed to be screened for project and environmental data confidence
- Approach based on medium to high confidence project and environmental data



Birds Directive – Special Protection Areas



- Based on mean maximum foraging ranges after review by Thaxter *et al.* (2012)

Habitats Regulations Assessment challenges

- Environmental Headroom
  - Finite amount of headroom available, extra effort to determine population level trends at SPAs
  - Additional approach? Re-assess earlier consented projects to reclaim unused headroom
- Reduce impact
  - Industry studies to understand further how birds avoid collision with turbines.
  - Projects revising (lowering) their impacts between draft and final applications based on stakeholder responses or increased mitigation measures
- Standardise methodology or approach
  - Different approaches particularly with respect to bird collision modelling and apportionment to SPAs, hard to compare like with like
  - Statutory Nature Conservation Bodies evolving advice, and differences between England and Scotland
- Round 3 and Scottish Territorial Waters projects applying in similar time frames
- Planning Inspectorate advice for developer to make a conclusion with respect to Habitats Directive 15 months ahead of final decision
  - i.e. adverse effect or not, which can be difficult to conclude when other projects are changing! DCO process needs to be more accommodating of HRA

Lessons learned in summary

- Stakeholder feedback
  - Balance of maximising energy output with needs or concerns of offshore stakeholders
  - Layout definitions, curved perimeters and straight line arrays
- Rochdale envelope
  - Maximise envelope, but not so many options that difficult to assess and consent
  - Capturing the key envelope parameters in the Development Consent Order
- Ecological influences
  - Modification of developable area
  - Consideration of larger (or higher) turbines to reduce collision impact
- Cumulative impact assessments
  - Approach based on medium to high confidence project and environmental data
  - Moving target when other projects evolving and need for a cut-off
- Habitats Regulations Assessment
  - Not aligned with the DCO process
  - Re-assessment of earlier built projects to reclaim environmental headroom

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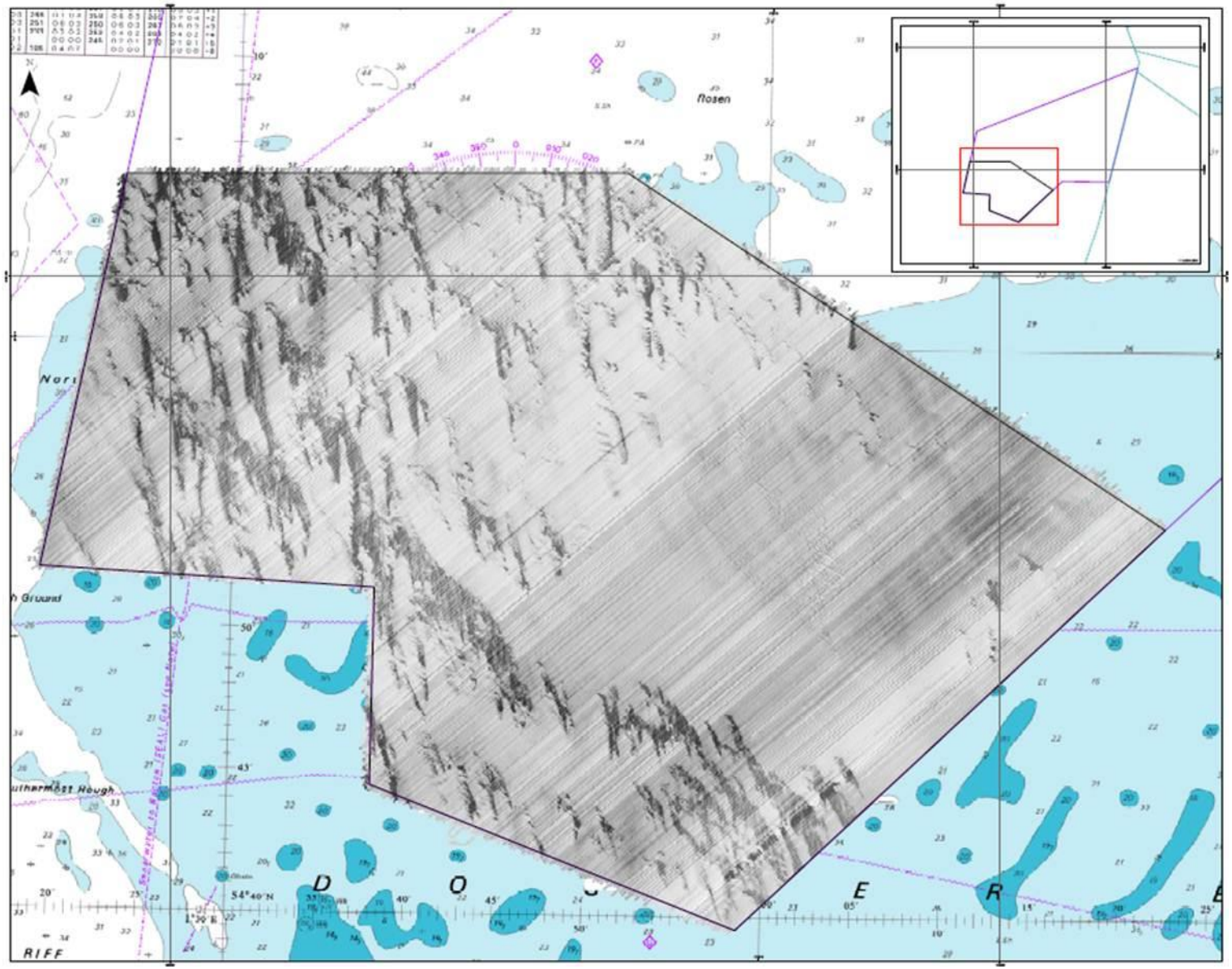
Unparalleled data collection: side scan sonar



Tranche A seabed characterisation