DBS Offshore Wind

RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Ornithological Mitigation Option Report

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Glossary

Term	Definition
Development Consent Order (DCO)	DCO
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.
Habitats Regulations Assessment (HRA)	The process that determines whether or not a plan or project may have an adverse effect on the integrity of a European Site or European Offshore Marine Site.
Highest Astronomical Tide	The highest level of the sea surface that under average meteorological conditions.
Impact	Used to describe a change resulting from an activity via the Projects, i.e. increased suspended sediments / increased noise.
Lowest Astronomical Tide	The lowest level of the sea surface that under average meteorological conditions.
Mean Sea Level	The average level of the sea surface over a defined period (usually a year or longer), taking account of all tidal effects and surge events.
The Applicants	RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South (DBS) Offshore Wind Farms).
Wind Turbine	Power generating device that is driven by the kinetic energy of the wind.

Acronyms

Acronym	Definition
DBS	Dogger Bank South
DCO	Development Consent Order
HAT	Highest Astronomical Tide
HRA	Habitats Regulation Assessment
LAT	Lowest Astronomical Tide
MCA	Maritime & Coastguard Agency
MHWS	Mean High Water Springs
MOD	Ministry of Defence
MP	Monopile
MSL	Mean Sea Level
NPS	National Policy Statement
O & M	Operations & Maintenance
PSR	Primary Surveillance Radar
TP	Transition Piece
WTG	Wind Turbine Generator
UK	United Kingdom

1 Background

1. An increase in the air gap between mean sea level (MSL) and the lowest point swept by the turbine blades can reduce collision risk as it avoids peak sensitive bird flight height densities for species such as kittiwake and consequently reduces collision impacts. However, this increase in the turbine height has implications for the engineering design of the foundations and turbine towers (which also requires increased quantities of steel), costs and feasibility of installation. It can also affect the assessment of impacts for other environmental topics.

2. In the UK, the minimum clearance of the blades above the water is 22m above Mean High Water Springs (MHWS), in accordance with Maritime & Coastguard Agency (MCA) requirements (MGN654 and MGN372). In the past this is the minimum air gap that has been used for offshore wind farms (e.g. London Array, Triton Knoll, Galloper, Greater Gabbard, etc). However, more recently, developers have increased the minimum air gap to reduce the collision risk for birds, considering different site conditions and engineering implications on each project. The air gap has varied from project to project as the feasibility of increasing the air gap is influenced by factors including water depth, ground conditions, metocean conditions, the scale of available installation vessels and other consenting risks as mentioned above. **Table 1-1** details the minimum air gaps for other recent UK projects[1]. The information illustrates that air gap is project specific and requires careful evaluation of consenting, engineering and cost impacts to ensure that the projects remain consentable, buildable and economically viable.

[1] It should be noted that the minimum air gap can be presented in DCO application/consents using different water levels metrics, including: Mean Sea Level (MSL),Lowest Astronomical Tide (LAT) and Highest Astronomical Tide (HAT) or Mean High water Springs (MHWS). While the difference between these metrics is site specific (as tidal conditions vary between locations), based on the tidal still water levels at the DBS West Project, it HAT is 3.5m higher, MHWS is 3.1m and MSL is 1.9m higher than LAT.

Table 1-1 Minimum Air Gap for Recent Offshore UK Wind Farm Projects

Project	Proposed / consented WTG Air Gap from MSL, LAT, Highest HAT or MHWS (approx.) (metres)
Hornsea Project 3	37.5m MSL / 39.3m LAT
Hornsea Project 4	40m MSL/ 42.43m LAT
Sofia	26m HAT
Dogger Bank C	26m HAT
Dogger Bank A & B	26m HAT
Norfolk Vanguard	30m to 35m from MHWS
Norfolk Boreas	TBC - either 30m or 35m from MHWS
EA1N	24m from MHWS
EA2	24m from MHWS
Rampion 2	22m MHWS
Awel Y Môr	22m from MHWS
Berwick Bank	37m LAT
Dudgeon / Sheringham Extension	30m HAT
North Falls	27m from MHWS
Five Estuaries	28m from MHWS
Mona	34m LAT
Morecambe	25m HAT
Morgan	26m HAT
Outer Dowsing	40m MSL

3. **Figure 1-1** illustrates the Dogger Bank South (DBS) Offshore Wind Farms design parameters.

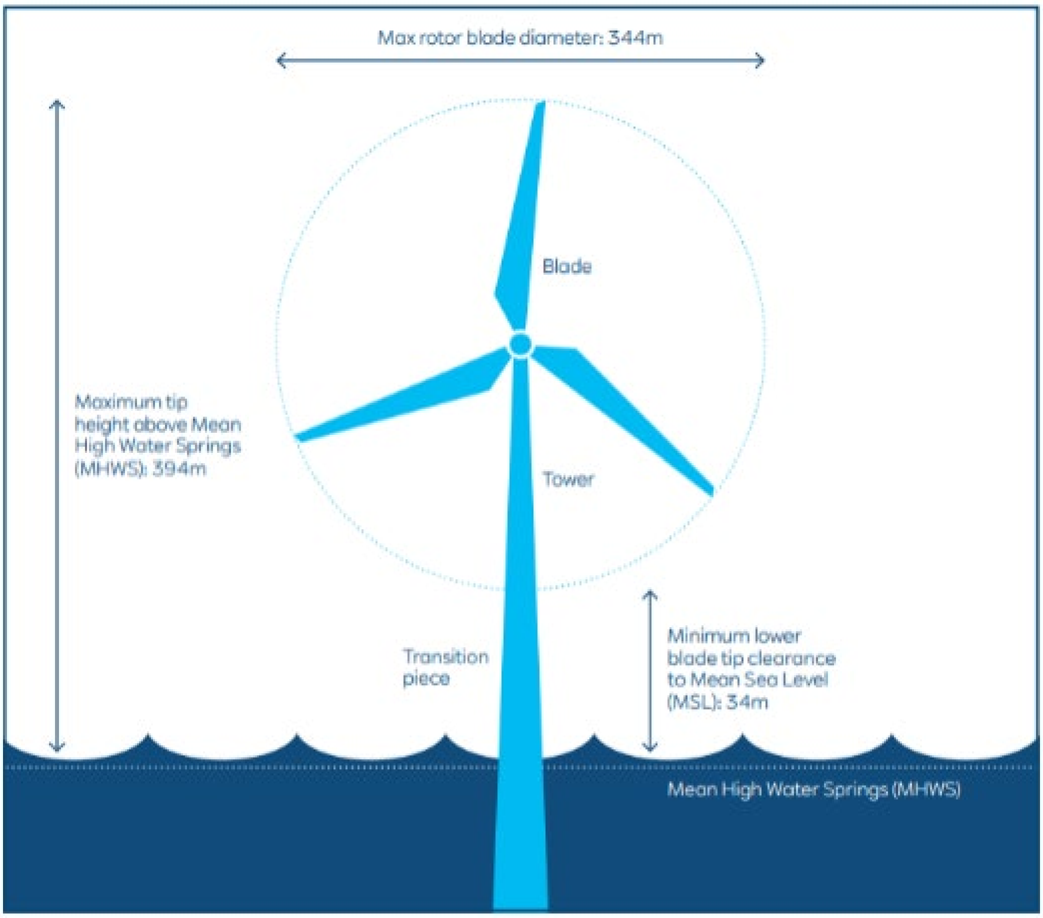

Figure 1-1 DBS Indicative Wind Turbine Parameters

4. The minimum air gap secured in the Applicants Development Consent Order (DCO) is 34m (above MSL) with a maximum turbine tip height of 394m relative to mean high water springs (MHWS). These parameters were selected based on the water depth, ground conditions and consenting considerations at the site as well as The Crown Estate's Round Four Plan Level Habitats Regulation Assessment (HRA) (The Crown Estate, 2022) which stipulated that minimum air gap should be at least 34m.

5. This document provides further detail on the factors that informed the minimum air gap for DBS, to support the information set out in Section 4.5.2 (para 118) of **Habitats Regulations Derogation: Provision of Evidence, Volume 6** [APP-051].

2 Policy context

6. The full policy context that supports the derogation case for DBS is provided in **Habitats Regulations Derogation: Provision of Evidence, Volume 6** [APP-051]. Specifically, paragraph 4.3.27 of National Policy Statement (NPS) EN-1 states that "*alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be physically suitable, can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision.*" Therefore, the below sections of this document provide information to support the conclusion that an increased minimum air gap is not physically suitable or commercially viable for DBS.

3 Review of opportunities to increase air gap/hub height

7. The Applicants have continued to review the consenting, technical and commercial feasibility of increasing the minimum air gap throughout the pre-application and pre-examination phase. The below sections provide an update on these matters.

3.1 Consenting

8. As set out in **Environmental Statement, Volume 7, Chapter 15 – Aviation and Radar** [APP-125], part of the DBS West West Array Area would be in the operational/detectable range of Staxton Wold Primary Surveillance Radar (PSR). When operational (with blades fitted and rotating), wind turbines have the potential to generate 'clutter' (or false targets) upon radar displays because current generation PSRs are unable to differentiate between the moving blades of wind turbines and aircraft. As a consequence, radar operators can be unable to distinguish between primary radar returns generated by wind turbines and those generated by aircraft.

9. This could compromise the ability of the Ministry of Defence (MOD) to undertake its Air Defence role utilising the Staxton Wold Air Defence PSR. Further increasing the minimum air gap and resultant tip height will increase the area where the operability of the Staxton Wold PSR could be impacted and increase the likelihood that a mitigation solution will be required. The mitigation measures may include structural design changes to wind turbines and/or the offshore converter platform to accommodate radar equipment, with associated long-term Operation and Maintenance (O & M) implications. The cost and delay implications of such a requirement could be substantial (based on experience from other projects).

3.2 Foundations Installation

10. High level analysis undertaken by the Applicants engineering consultants indicates that an increased minimum air gap results in impacts including (but not limited to):

- ~12% increase in steel mass of the heaviest monopile option for an increase to 37m air gap and ~24% increase for a 40m (MSL) air gap;
- Reduces the feasibility of using the preferred "Transition Piece (TP)-less" concept due to the feasibility of fabrication/installation of a single monopile section with increased weights/dimensions to support a taller tower and hub height. A shift to the more 'traditional' monopile and separate TP would be more costly (less efficient use of steel) and requires costly flanges for mating the two sections of the foundation. The feasibility of a monopile (MP):TP flange for such large wind turbine generator (WTG) options is also yet to be demonstrated, having not been

delivered to date. See **Environmental Statement, Chapter 5 - Project Description [APP-017]** for an overview of monopile design; and
- Greater CO2 emissions due to additional steel being required.

11. Increased foundation size and weight would result in a reduced pool of suitable vessels to transport and install larger and heavier monopile foundations. Consequently, with an increased hub height, to avoid the Transport & Installation risk and potential for a significantly reduced vessel availability, there may be a shift towards an alternative foundation concept such as a three-legged jacket solution, with a step change increase in costs.

3.3 Developments in WTG scale

12. The Applicants Project Design Envelope allows for a maximum 344m rotor diameter, to allow for future WTGs that may come to market in the timescales the Projects will be built. Consequently, an increase to the lower blade tip clearance to 40m (MSL), it is highly likely that future vessel developments may not target crane sizes to facilitate such hub height increases. The Applicants could be in a situation where they cannot design a wind farm for the most competitive WTG.

3.4 WTG Installation

13. Having a larger minimum air gap would impact the type and availability of vessel that would be able to undertake the installation works and the Applicants therefore need to maintain the current minimum air gap as a minimum in order to ensure that vessel availability can be taken into account when final detailed design and procurement decisions are made post-consent.

4 Summary

14. This document provides a summary of engineering and cost modelling that been undertaken by the Applicants to assess feasibility of increasing the minimum air gap further. The conclusion of this work is that increasing the airgap beyond 34m is not feasible due to:

- Increased MoD consenting risk/mitigation requirements;
- The increased scale of foundations that would be required;
- The potential requirement to use a more costly foundation design concept;
- Limited availability of vessels to install the largest turbines and foundations; and
- Increased project costs.

15. Such an increase in minimum air gap reduces the likelihood of the project being delivered as the costs are increased to such an extent as to make the project potentially commercially unviable. As such, further increasing the minimum air gap does not meet the policy set out in paragraph 4.3.27 of NPS EN-1 - "*alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be physically suitable, can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision".*

5 References

The Crown Estate, 2022. Record of the Habitats Regulations Assessment.

RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Windmill Business Park
Whitehill Way
Swindon
Wiltshire, SN5 6PB