Outer Dowsing Offshore Wind

Equinor IPs Wake Effects Position Statement

Title**:**		
Outer Dowsing Offshore Wind Examination submission **Equinor IPs Wake Effects Position Statement**		
Document no.: C282-EQ-Z-GA-00040		
Date:	Classification	
April 2025	**Final**	
Prepared by: **Eversheds/Equinor**		
Approved by: **Sarah Chandler, Equinor**	Date: **April 2025**	

Table of Contents

Table of Tables

Table of Figures

Glossary of Acronyms

DCO	Development Consent Order
DEL	Dudgeon Extension Limited
DEP	Dudgeon Offshore Wind Farm Extension Project
DOW	Dudgeon Offshore Wind Farm owned by DOWL
DOWL	Dudgeon Offshore Wind Limited
EIA	Environmental Impact Assessment
FIA	Financial Impact Assessment
SEL	Scira Extension Limited
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
SHS	Sheringham Shoal Wind Farm owned by SOEL
SOEL	Scira Offshore Energy Limited
SoS	Secretary of State for Energy Security and Net Zero
WTG	Wind Turbine Generators

Glossary of Terms

The Applicant	GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4 Limited (a joint venture between Corio Generation (and its affiliates), Total Energies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The Project is being developed by Corio Generation, TotalEnergies and GULF.
DEP Array area	The area offshore within which the DEP wind turbine generators (WTG), offshore substation, and infield, interlink and export cables will be positioned.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
Equinor IPs	Dudgeon Offshore Wind Limited (DOWL), Scira Offshore Energy Limited (SOEL), Scira Extension Limited (SEL) and Dudgeon Extension Limited (DEL), together or in any combination.
Orsted IPs	Hornsea 1 Limited, the collective of Breesea Limited, Soundmark Wind Limited, Sonningmay Limited and Optimus Wind Limited (together, the “Hornsea 2 Companies”), Orsted Hornsea Project Three (UK) Limited, Orsted Hornsea Project Four Limited, Lincs Wind Farm Limited, Westermost Rough Limited and Race Bank Wind Farm Limited, together or in any combination.
The EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
The Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Project Array area	The area offshore within which the Project’s generating station (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned.
ROC	Renewable Obligation Certificates was the support mechanism used for offshore wind until 2017, providing a fixed price for the electricity a project produced for the first 20 years of project life.

SEP and DEP Order	Sheringham Shoal and Dudgeon Extensions Offshore Wind Farm Order 2024.
SEP Array area	The area offshore within which the SEP wind turbine generators (WTG), offshore substation, and infield, interlink and export cables will be positioned.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.

1 Executive Summary

1. The Applicant submitted a **Wake Loss Technical Note** [REP4-114] at Deadline 4. The Equinor IPs made submissions in relation to wake effects and the impacts cited in the **Wake Loss Technical Note** [REP4-114] at Deadline 4a [REP4a-128], Deadline 5 [REP5-157], and in their additional submission accepted at the discretion of the examining authority on 27 March 2025.
2. The impacts on energy yield modelled in the Wood Thilsted **Wake Impact Assessment Report** [REP5-152] are accepted by the Equinor IPs as suitable for the definition of a worst-case scenario for wake impact assessment. The Equinor IPs consider that Revision 2 of the **Wake Impact Assessment Report** (document reference 23.6 submitted at Deadline 6) provides an improved and more realistic basis for the assessment. Should the Order be granted it will be necessary to re-model the impacts on energy yield post-consent once all relevant final design parameters are known.
3. A Financial Impact Assessment (FIA) (Revision 2) quantifying the potential economic loss predicted to be suffered by the Equinor IPs projects / assets as a result of wake effects caused by the operation of the Project, using the outputs of Revision 2 of the Wood Thilsted **Wake Impact Assessment Report** (document reference 23.6 submitted at Deadline 6) and publicly available datasets has been undertaken (**Appendix 1**).
4. The economic loss to the Equinor IPs projects / assets, without measures to mitigate the impact, is anticipated to be between £42m and £164m (**Appendix 1**).
5. As noted in Equinor's **Deadline 5 Submission** [REP5-157], the Awel y Mor decision establishes the Secretary of State's (SoS) position that, for the purposes of NPS-EN-3, other offshore windfarms should be considered as "*other infrastructure*", "*NPS EN-3 does apply to offshore wind farm effects on other windfarms*" "*that a wake effect assessment should be carried out*" and that this would ensure that any identified wake effects "*are mitigated and minimised*." Further analysis of the policy context relevant to the assessment of wake effects is made in Section 3 of this submission.
6. The Applicant's position is based on the following premises:
    i. That NPS EN-3 does not apply to offshore wind farm effects on other offshore wind farms.
    ii. That the wake effect impacts they have presented in the Wood Thilsted report are not significant in EIA terms.
    iii. That the Equinor IPs have not provided sufficient evidence to demonstrate that the bar in policy test NPS EN-3 para 2.8.347 of '*likely to affect the future viability*' has been met.
    iv. That there is no precedent for compensation to be paid from one developer to another to offset revenue loss arising from residual effects of one scheme on another.
7. In response, the Equinor IPs submit that the Secretary of State has already made a judgement as to whether NPS EN-3 applies to offshore wind farm effects on other windfarms, and irrefutably concluded that it does.
8. Further, it is the Equinor IPs position that the Applicant's conclusion that the impacts are not significant has not been adequately substantiated and that the Applicant has not engaged with its own EIA methodology as presented in the rest of the Environment Statement, including the Other Marine Users chapter. The Applicant has placed a heavy

reliance in the Wake Impact Assessment Report on references to the effect on Equinor IPs assets and projects being "*"vanishingly small" or even simply "small""* in arriving at its conclusion that "*they are not significant in EIA terms".* The Equinor IPs have presented evidence in its submissions which aids the ExA's understanding of the magnitude of the impacts in discussion, which can be summarised as an impact of between £42m and 164m to the net present value of the Equinor IPs' assets and consented projects.

9. With respect to the policy test set in NPS EN-3 para 2.8.347, the Equinor IPs have presented evidence that clearly demonstrates a material risk to the future viability of its assets and projects; and highlights that the test does not require a demonstration that impacts would make a scheme *unviable*, simply that they are likely to impact future viability. The Equinor IPs note that in other instances where the test on para 2.8.347 is applied in the DCO decision making process (e.g. for impacts on the operations of an oil and gas platform), the Secretary of State has not required any evidence above that which has been presented by the Equinor IPs in order to reach a reasoned conclusion on the likelihood of impact to viability.

10. The Applicant asserted at ISH8 (EV13-008) that there is no precedent for compensation being secured through a planning process. The Equinor IPs consider that NPS EN-3 makes clear provision for economic loss suffered by third parties to be an important and relevant matter in the determination of applications, and that there are a considerable number of cases in which developers cooperate to establish a basis for co-existence; the promoting developer seeks to mitigate or minimise any impacts to the third party's assets as far as practicable; and finally, where residual effects remain, provide for a mechanism through which parties can agree compensation to offset the economic loss.

11. The predicted impacts to the operation and energy yields of SHS, DOW, SEP and DEP represent significant economic loss to the Equinor IPs. These impacts cannot be accepted without mitigation or compensation through suitable protective provisions and are inconsistent with the policy expectation of successful co-existence.

12. The Applicant has not sought to propose mitigation for the impacts as assessed in [REP4-114] and [REP5-152]. Nor have protective provisions been included in the draft DCO for the protection of the Equinor IPs' assets and consented projects in relation to wake effects.

13. The Equinor IPs are therefore not in the position at the close of examination to withdraw their objection to the proposed unmitigated operation of the Project's WTGs under Schedule 10 of the draft Development Consent Order, Deemed marine licence under the 2009 Act - generation assets, Work No. 1.

14. Should the Secretary of State be minded to grant the order on the basis of the inclusion of protective provisions in the form submitted in **Appendix 2 – Protective Provisions** then the Equinor IPs would be able to withdraw their representations in relation to wake effects.

2 Introduction

15. The Equinor IPs operate the Sheringham Shoal (SHS) and Dudgeon (DOW) offshore wind farms and are developing the Sheringham Shoal Extension Project (SEP) and Dudgeon Extension Project (DEP), all off the coast of north Norfolk and located to the south of the Project.

16. The Equinor IPs have made submissions in relation to the issue of wake effects and the potential impacts on the energy yields of their offshore windfarm assets and consented projects in submissions at Deadline 4a [REP4a-128], Deadline 5 [REP5-157], and in their additional submission accepted at the discretion of the examining authority on 27 March 2025.

17. This submission at Deadline 6 summarises the Equinor IPs' position on the issue of wake effects; further develops their view on the relevant points of policy and precedent; and provides additional evidence with respect to the quantification of the impacts (**Appendix 1**) and the risks to viability.

18. Given the absence of efforts by the Applicant to suitably mitigate or minimise the potential significant impacts due to wake effects, the Equinor IPs have requested that protective provisions be included in the draft Development Consent Order (DCO) for the protection of their assets and consented projects. An updated form of protective provisions is presented in **Appendix 2**.

2.1 Background and context

19. During the course of the examination [EV13-003], it has been suggested by the Applicant that there is no precedent for the assessment of wake impacts from a proposed offshore wind farm on an operational or consented offshore wind farm asset / project, leading to requirements for mitigation and compensation. Whilst this position is acknowledged by the Equinor IPs, it is worth exploring the situation in relation to the UK offshore wind industry in the context of previously consented offshore wind farms where such precedents might have been expected.

20. The Crown Estate manages the seabed around England, Wales and Northern Ireland and leases the seabed to offshore wind farm developers. To date, there have been six leasing rounds for offshore wind applying to English waters (excluding one small demonstration round in 2013); Rounds 1, 2, 3 and 4 and two Offshore Wind Extension Projects leasing rounds in 2010 and 2017. Leasing Round 1 in 2001 was considered a demonstration round designed to provide developers with the opportunity to gain technological, economic and environmental expertise in UK waters. These were the first offshore wind farms in UK waters. This was followed by leasing Round 2 in 2003 which saw the UK's first commercial-scale offshore wind projects[1]. Projects identified in Leasing Round 2 were generally smaller (average ~390MW) than those in Leasing Round 4 (where all bar one have a 1.5GW capacity). In 2003, wake effects were relatively poorly understood given the lack of available operational data and projects had sufficient minimum separation distances for this to be of little to no concern.

21. Leasing Round 3 followed seven years later at the start of 2010 and took a significantly different approach to leasing. In this leasing round, The Crown Estate identified nine

[1] [redacted]

offshore wind zones in UK waters, the majority of which had the potential to contain multiple offshore wind farm projects. The zones were sufficiently far apart (greater than 50km) that wake loss between zones was not a concern. Each zone was awarded to one developer or one consortium of developers to deliver projects within that zone as it saw fit. It was therefore within the gift of the developers of each zone to manage wake between projects as deemed most appropriate whilst maximising the potential generating capacity of that zone. For this reason, there was no need for wake assessments within EIAs as it was an inherent part of the way that projects were designed within that zone and up to each zone's developer/consortium to manage this.

22. Later in 2010, The Crown Estate ran a limited leasing round allowing for the potential for developers to extend their existing Round 2 projects. As a result of the structure of this leasing round, the ownership of the original Round 2 sites and their extensions was the same and hence any concerns over wake impacts between the projects would have been managed outside of the planning process as part of the decision to develop the extension. The same principles applied to the 2017 Extension leasing round. This round was open to the owners of existing projects to apply for extensions which were required to share a boundary with their existing asset. Consequently, where wake effects presented a potential issue, these would have been considered in the process to bid for an extension with any commercial arrangements including, where appropriate, compensation considered outside the planning process. This could be achieved relatively easily given the shared ownership of the existing and extension assets.

23. The most recent leasing round (commencing in 2019 but with Agreements for Lease only signed in early 2023), Round 4, saw a different approach to project identification by giving developers the chance to identify project areas within four broad Bidding Areas as shown in Figure 1 below. Outer Dowsing Offshore Wind Farm was one of the projects identified though this leasing round. Where wake impacts are now being identified from Round 4 projects on projects leased under previous rounds, the ownership of the impacted and impacting projects differs. Consequently, there is as a general rule no comparison to previous scenarios where wake was either considered by the same parties in site design (i.e. Round 3) and/or in bidding (Extension Rounds) for the rights to the seabed.

24. Hence, it is not surprising that in this respect, there is limited precedent in historic planning determinations for wake impacts to be assessed, mitigated and, if needed, compensated. In fact, the first decision which substantively considered the issue - the 2023 Awel y Mor decision - was also the first to secure mitigation for impacts due to wake effects. The Awel y Mor project was part of the 2017 Extension leasing round and was an extension of the Gwynt y Mor offshore wind farm. As a result, it was directly adjacent to Gwynt y Mor and there was no discussion around wake impacts from Awel y Mor on Gwynt y Mor in the Examination. However, Awel y Mor also has a minimum separation of approximately 4.6 km from a third project, Rhyl Flats Offshore Wind Farm. Wake effects were a topic of discussion in the examination of Awel y Mor in relation to the Rhyl Flats project. Whilst the largest shareholder in each of the three projects was RWE, the other shareholders in Rhyl Flats differ from those of Awel y Mor and Gwynt y Mor, demonstrating that where ownership of offshore wind farms differs, it can be challenging to reach a commercial agreement if this is not required through other means. During the Awel y Mor examination, the Applicant and Rhyl Flats were not able to agree an approach to wake assessment, mitigation and compensation and hence this became a notable topic of discussion in the written process and hearings. This represented the first such occasion where this topic had been covered

in such detail in the examination and determination of a new offshore wind farm. Since the Decision for Awel y Mor, the issue is now arising in multiple examinations. There are currently six offshore wind farm Applicants making the argument that there are no precedents for assessment of wake effects with all bar one being Round 4 wind farms (the other being part of the 2017 Extensions leasing round). These projects have different ownership than neighbouring existing assets hence, no natural opportunity for voluntary commercial arrangements meaning that the owners of impacted projects (such as the Equinor IPs in this case) must look at appropriate planning policy as a means of ensuring their projects are adequately protected.

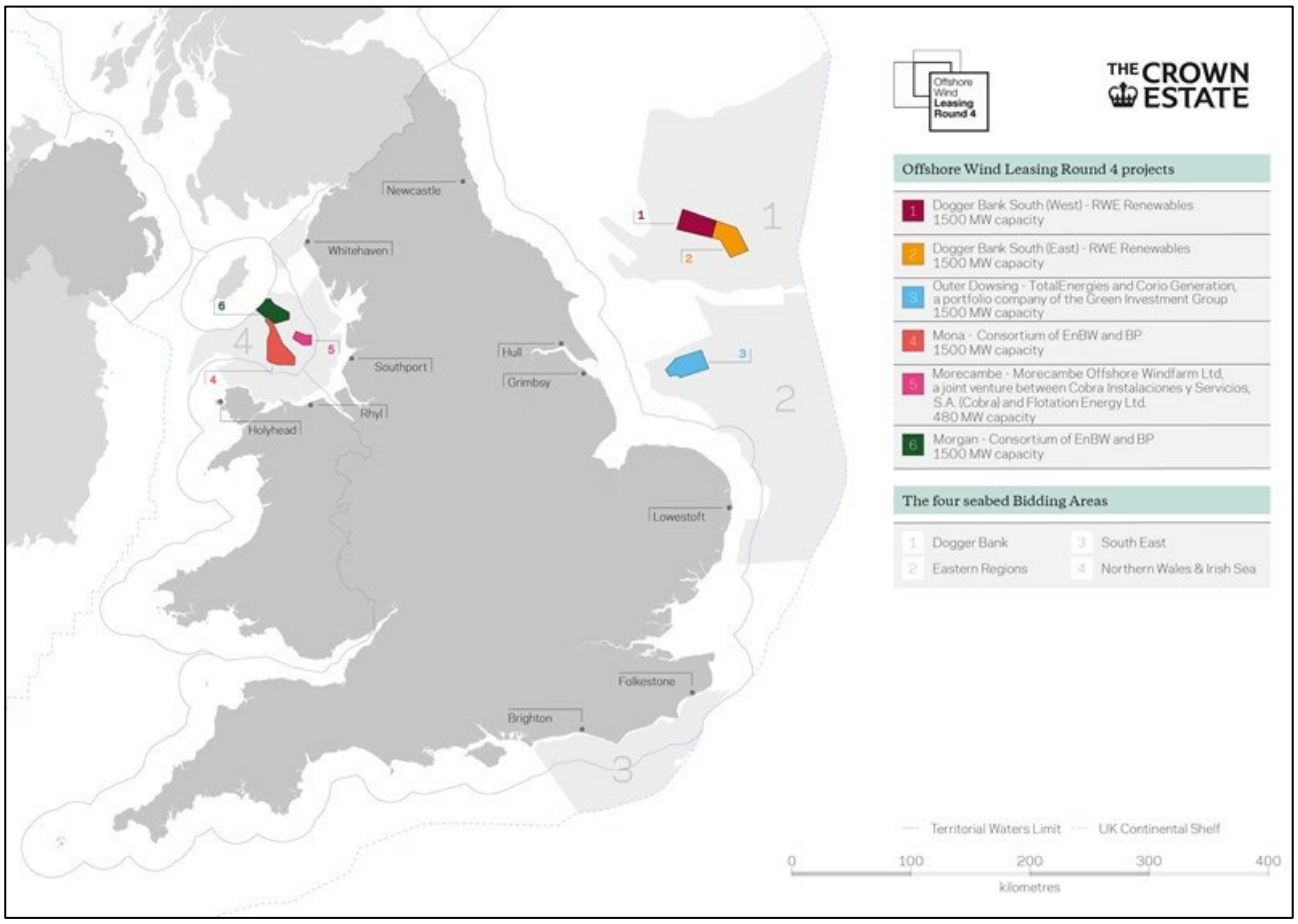

Figure 1: The Crown Estate Offshore Wind Leasing Round 4 projects and Bidding Areas

3 National Policy

25. The relevant legislation and national policy statements that frame the assessment of potential impacts due to wake effects are:

i. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
ii. Overarching National Policy Statement for Energy (EN-1)
iii. National Policy Statement for Renewable Energy (EN-3)

3.1 The materiality of economic loss in NPS EN-3

26. The importance of wind resource to the economic viability of offshore wind farms is expressly acknowledged in National Policy Statement EN-3. At paragraph 2.8.28 it states:

"Available wind resource is critical to the economics of a proposed offshore wind farm."

27. Thus, where the wind resource available to an offshore wind farm is disrupted and reduced by an outside factor, in this case by a proposal for another new offshore wind farm, it is implicitly acknowledged in policy that this will likely affect its economics. Furthermore, given this critical correlation between the availability of wind resource and effect on project economics identified in EN-3, it follows that any disruption to another offshore wind farm's available wind resource has the potential to cause a significant effect on that wind farm warranting further assessment[2].

28. EN-3 continues in this regard to note:

> *2.8.29: "To inform their economic modelling, applicants may collect wind speed data using an anemometry mast or similar."*
>
> *2.8.30: "Collection of this data is not obligatory as the suitability of the wind speed across the site and economics of the scheme are a matter for the technical and commercial judgement of the wind farm applicant not the Secretary of State."*

29. Developers therefore spend a great deal of time and effort in optimising their applications and design parameters to take advantage of the available wind resource to maximise energy yield in response to the national policy imperative[3], and to do so on a basis which from a commercial perspective provides a low cost of energy to the consumer and which the developer considers will enable it to be successful through a contract for difference process.

30. Whilst EN-3 considers that matters of site economics and commercial judgement are not for the Secretary of State to question when examining the merits of an individual proposal, it would be wrong to consider that the same approach applies when addressing the impacts of that proposal on the economics of pre-existing offshore wind farms or those which already have the benefit of a consent. To suggest otherwise would be to expect applicants to bring forward projects and enter the contract for difference process on the assumption that the wind resource, which is critical to their economic viability, might be disrupted at some point and in an unquantifiable manner by a future project. That assumption would clearly not fulfil the objective of the contract for difference regime to deliver the most cost-effective projects for the consumer.

31. Paragraph 2.8.30 also highlights the importance of the judgement of the prospective developer on the economics of a scheme. In considering that issue, the emphasis on the judgement of the developer in paragraph 2.8.30 indicates that the evidence of the affected wind farm developer should be given considerable weight. Merely because a third party seeks to characterise the effect on the wind resource as objectively low in percentage terms, it should not be assumed that the economic consequence is similarly low.

---

2 EN-3 para 2.8.197
3 See EN-3 para 2.8.2

32. EN-3 is almost unique amongst national policy statements in making economic loss suffered by third parties an important and relevant matter in the determination of applications[4]. It only does this in relation to offshore wind, and only in so far as impacts relate to shipping and navigation, and to other offshore infrastructure and activities. Parliament, in designating the NPS in these terms, considered offshore wind and its potential to impact upon other offshore infrastructure and activities as somewhat of a special case.

33. As a result, it does not assist the Applicant to refer to the absence of precedent in other DCO examinations to third parties being compensated for economic loss, but in any event those submissions are also incorrect. The Equinor IPs refer to the following examples:

    i. whilst the issue of economic loss arising from the reduction in wind resource caused by one project on another is relatively novel[5], the principle of an offshore industry being compensated for economic loss arising as a result of an offshore wind farm proposal through the provisions of a DCO is not. The Applicant, the Examining Authority and the Secretary of State will be aware that it is commonplace for the fishing industry to be compensated for economic loss arising from the construction of offshore wind farms through the application of the FLOWW guidelines[6]. Indeed, the Applicant has provided such a mechanism through its Outline Fisheries Liaison and Co-Existence Plan [PD-061] (section 4.4), the provisions of which are secured through the deemed marine licences[7].

    ii. By way of a further example, the Equinor IPs also refer to the recently made The Associated British Ports (Immingham Green Energy Terminal) Order 2025. Schedule 14 Part 5 contains protective provisions in favour of Network Rail. These include, at paragraph 72, an obligation to reimburse train operating companies for any loss of revenue suffered by them as a consequence of the works.[8]

34. Having established the policy importance of wind resource to the economic viability of offshore wind farms and noting that there is precedent for addressing commercial economic loss through the provisions of the DCO, the question turns to whether that should be the case in relation to Outer Dowsing proposals and its impact upon the Equinor IP's assets.

3.2 Policy justification for protection of the Equinor IP's assets

35. EN-3 establishes an iterative process which requires the Applicant:

    i. to assess the potential impact of their proposals on existing offshore wind farms

    ii. to engage with the operators of those wind farms to resolve issues before submission of their application to ensure successful co-existence

    iii. to work with existing wind farm operators to minimise impacts

[4] The only other NPS which references economic loss is the National Policy Statement for Geological Disposal Infrastructure
[5] It was addressed by the Secretary of State in determining the Awel y Mor application, and is a principal issue in the current Morecombe, Mona and Morgan and Dogger Bank South applications which are either in examination or awaiting determination
[6] The Fishing Liaison with Offshore Wind and Wet Renewables Group published best practice guidance in 2015 which includes disruption settlements and community funds
[7] See condition 13(1)(e)(v) in Part 2 of Schedule 10 of the draft DCO [REP5-002]
[8] A copy of the relevant extract from the Order is at Appendix 3

iv. to approach site selection and design with a view to avoiding and minimising (inter alia) economic loss

36. The following paragraphs are of particular relevance in this regard:

> *2.8.196: "The scale and location of future offshore wind development around England and Wales means that development has occurred, and will continue to occur, in or close to areas where there is other offshore infrastructure."*
>
> *2.8.197: "Where a potential offshore wind farm is proposed close to existing operational offshore infrastructure, or has the potential to affect activities for which a licence has been issued by government, the applicant should undertake an assessment of the potential effects of the proposed development on such existing or permitted infrastructure or activities.*
>
> *2.8.200: "Applicants should engage with interested parties in the potentially affected offshore sectors early in the pre-application phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application"*
>
> *2.8.203: "Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and other uses of the sea to co-exist successfully."*
>
> *2.8.344: "In such circumstances, the Secretary of State should expect the applicant to work with the impacted sector to minimise negative impacts and reduce risks to as low as reasonably practicable."*
>
> *2.8.345: "…the Secretary of State should be satisfied that the site selection and site design of a proposed offshore wind farm and offshore transmission has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries."*

37. In response, the Applicant initially refused to undertake the required assessment before finally submitting one late in the Examination process.

38. No substantive attempt has been made by the Applicant to engage with the Equinor IPs to discuss how the impact identified in its assessment might be addressed or mitigated to enable successful co-existence between projects. As a result, the Secretary of State cannot conclude that the Applicant has approached its proposals with a view to avoiding or minimising economic loss to the Equinor IPs assets. The Equinor IPs' set out at paragraphs 13-20 of its **Deadline 5 submission** [REP5-157] their explanation as to why they consider paragraph 2.8.345 applies to the Outer Dowsing application. In response, the Applicant invites the Secretary of State to either conclude that the NPS does not apply to economic

loss suffered by other offshore wind farm operators[9], or that any loss – noting the Applicant's own evidence is that loss will occur[10] - is insignificant and it is therefore just "tough luck" on the Equinor IP's and other interested parties so affected.

39. At paragraph 32 of their **Deadline 5 submission** [REP5-157] the Equinor IPs noted that they do not consider that mitigation measures will be effective in addressing impacts to their assets caused by wake effects. At ISH8, the Applicant sought to characterise this as acknowledgment that no mitigation is possible. This is not the position of the Equinor IPs. The Applicant may be able to adopt measures during final site selection and design, for example through layout and turbine selection, to reduce these impacts, however the Equinor IPs do not consider that such measures will be able to avoid significant economic loss occurring without also significantly reducing the capacity of the Applicant's project. In any event, the Applicant has not applied its mind to the issue.

40. Following on from the above, paragraph 2.8.347 then states:

> *"where a proposed development is likely to affect the future viability or safety of an existing or approved/licensed offshore infrastructure or activity, the Secretary of State should give these adverse effects substantial weight in its decision-making"*

41. As noted at paragraph 23 of the Equinor IPs Deadline 5 submission, and re-iterated at ISH8, "*likely to affect the future viability or safety*" should not be interpreted as meaning the point at which another infrastructure project or activity becomes unviable or unsafe. In support of that proposition, the Equinor IPs refer to the preceding paragraph 2.8.346 of EN-3 which directs that consent should be refused where there are "*intolerable risks to safety after mitigation measures have been considered"* (i.e. where a project is unsafe). In the Equinor IP's submission, paragraph 2.8.347 therefore refers to adverse impacts which are create a material risk to viability. Further evidence in relation to the risks to the viability of the Equinor IPs' assets / projects is presented in Section 5 below.

42. At ISH8, the Applicant sought to argue that the level of impact identified in the Wood Thilsted report did not amount to a significant effect in EIA terms such that paragraph 2.8.347 was not engaged. Although the Equinor IPs noted that the Applicant then seemingly contradicted itself by stating that the sums involved are "very large".

43. In any event the Equinor IP's note that there is no methodology set out by the Applicant which it has applied to reach that conclusion. Further discussion the significance of the impacts in EIA terms is presented in Section 4 below.

44. Given the clear precedent established by Awel y Mor that consideration of economic loss arising from wake effects engages the paragraphs of EN-3 referred to above, and the equally clear absence of detailed consideration of those issues by the Applicant, the Equinor IPs view is that the inclusion of protective provisions in the terms proposed by the Equinor IP's[11] would sufficiently protect their interests. The inclusion of these protective provisions would allow the Secretary of State to reach a conclusion that the Applicant's proposals have been brought forward with a view to avoiding economic loss. This would also remove the likelihood of the future viability of the Equinor IPs assets being adversely affected by the Applicant's proposals.

[9] See The Applicant's Responses to the ExA's First Written Questions [REP2-051]
[10] See Wood Thilsted Wake Impact Assessment Report [REP5-152]
[11] These were accepted into the Examination at the discretion of the ExA on 26 March 2025 (see Appendix 2 of Equinor's Comments on Deadline 5 Submissions [AS-036])

45. The Equinor IP's suggested protective provisions provide for:

i. the consideration and adoption of mitigation measures in the final design to minimise wake loss effects on the Equinor IP's interests. Whilst the Equinor IP's do not consider that economic loss can be mitigated entirely it may be possible for the impact to be reduced to a level lower than that predicted in the Wood Thilsted report.

ii. mindful of the policy imperative to maximise capacity, the Equinor IP's do not suggest that they should seek to reduce capacity through such design measures

iii. the appointment of an independent party to assess the residual effects of wake loss

iv. the payment of a commuted sum to offset the economic loss arising from that residual effect. It is an accepted concept in protective provisions that the payment of a commuted sum calculated in accordance with an agreed scale makes good loss where a statutory undertaker incurs financial liability arising as a consequence of proximate infrastructure development.

v. an arbitration mechanism if agreement cannot be reached. The Equinor IPs' consider this approach to be aligned with the policy aim of avoiding economic loss set out in paragraph 2.8.345 and applied to other offshore infrastructure and activities (e.g. fishing) and with the pragmatic approach to be adopted by the Secretary of State suggested by paragraph 2.8.342 where a proposed offshore wind farm affects other offshore infrastructure.

46. Following ISH8, the Applicant and the Equinor IPs met on 31 March 2025, in which meeting it was agreed that the parties hold fundamentally differing positions regarding the policy tests and the need for protective provisions, with both parties intending to set out their positions in writing at Deadline 6 for the Examining Authority's consideration.

4 Significance in EIA terms

47. The EIA Regulations, NPS EN-1 and NPS EN-3 require the consideration of likely significant effects on the environment.

48. In Table 1.1 Compliance with the EIA Regulations 2017 of **6.1.5 Chapter 5 Environmental Impact Assessment Methodology** [APP-060] the Applicant notes the chapters of the environmental statement within which each of the factors specified in regulation 5(2) of the EIA Regulations are assessed, including the assessment of impacts on material assets in **Chapter 18: Marine Infrastructure and Other Users** [APP-073].

49. **Chapter 18: Marine Infrastructure and Other Users** [APP-073] assesses the likely significant effects of the Project on marine infrastructure and other users, including on other offshore wind farm assets and consented projects at Section 18.4.3.1.

4.1 Requirement for an assessment

50. Section 18.4.3.1 of [APP-073] does not include an assessment of impacts on other offshore wind farms due to wake effects. Impacts due to wake effects were not scoped into the assessment at the scoping stage.

51. However, as noted in above, the Secretary of State's decision on the Awel y Mor project establishes a precedent for the requirement for potential likely significant effects on material assets (other offshore windfarms) due to wake effects caused by the operation of wind

turbine generators to be assessed in offshore wind farm environmental impact assessments.

52. The Awel y Mor decision establishes the SoS's position that other offshore windfarms should be considered as "other infrastructure". The SoS's decision letter notes the Awel y Mor ExA's conclusion that "*NPS EN-3 does apply to offshore wind farm effects on other windfarms and that RFWF falls within the definition of existing operational infrastructure. The ExA reasoned that had NPS EN-3 intended to exclude existing wind farms this would have been made explicit [ER 5.14.75] [ER 5.14.78].*"

53. The SoS further notes and agrees that "*The ExA also agreed with RFWF's view that a wake effect assessment should be carried out, as drafted in the rDCO, which would ensure any identified effects on RFWF are mitigated and minimised [ER 5.14.84] [ER 5.14.86]".*

4.2 Likelihood of impacts due to wake effects

54. Wake effects and their impact on energy yield is well understood at the distances relevant to the Equinor IPs assets and consented projects. The likelihood of there being an effect of the order of magnitude assessed in the Wood Thilsted report (document reference 23.6 submitted at Deadline 6) is therefore considered to be high and to approach 100% for a suitable margin of error. The Applicant has not disputed the likelihood of the impact arising.

4.3 Methodology for assessment of significance of impacts due to wake effects

55. The Applicant has not provided an assessment of the significance of wake effect impacts on the Equinor IPs' assets and consented projects with reference to the methodology as set out in 18.6 of [APP-073]. It is not therefore possible to comment on the Applicant's assessment of significance in EIA terms against this methodology.

56. Rather, the Applicant has undertaken a technical wake impact assessment which demonstrates that there is an impact on Equinor IPs assets and projects and has drawn a conclusion that '*they are not significant in EIA terms'* without stepping through the necessary methodology to arrive at such conclusion.

57. Equinor IPs reiterate the point made in Section 3 above regarding the importance of the judgement of the operator or developer on the economics of a scheme.

58. The Equinor IPs therefore provide the following in support of its position that a conclusion can be drawn by the Secretary of State that likely significant effects in EIA terms are relevant here, as was inherently concluded in the case of Awel Y Mor.

59. There is no established guidance on EIA methodology for the assessment of the significance of impacts on other offshore wind farms due to wake effects. Furthermore, significance does not have a fixed definition in the EIA Regulations. The availability of topic-specific best practice guidance notwithstanding, it remains the responsibility for the Applicant to have assessed the likely significant effects of the Project in consultation with affected stakeholders. Guidance can therefore be drawn from NPS EN-1 and NPS EN-3.

60. The methodology by which the environmental impact assessment for marine infrastructure and other user receptors is undertaken is presented in Section 18.6 **Chapter 18: Marine Infrastructure and Other Users** of [APP-073] which states that "*The approach to determining the significance of the effect is a two-stage process that involves defining sensitivity of the receptors and the magnitude of the impacts against set criteria*."

61. Impact magnitude definitions are given in Table 18.13 with reference to the degree of shift away from the baseline, the physical extent of impact, and the duration of the impact.

62. The sensitivity or importance of the receptor is defined in Table 18.14 with reference to the value or importance of the receptor, the vulnerability to impacts, and the levels of recoverability.

63. Conclusions on the significance of the impacts due to wake effects are made by the Applicant in the Wake Loss Technical Note (document reference 23.6 submitted at Deadline 6). No methodology is presented here with respect to the assessment of significance. Reference is instead made to the language used in the **Crown Estate's Offshore Wind Leasing Programme Array Layout Yield Study** [REP2-056] with respect to the descriptors "small" and "vanishingly small". The Equinor IPs do not consider these descriptors to be useful in the assessment of significance due to the lack of consideration of context with respect to important commercial and operational factors.

4.3.1 Magnitude of the effect

64. As noted, the magnitude of the shift away from the baseline with respect to energy yield is assessed in the **Wake Loss Technical Note** [REP4-114] and the Wood Thilsted report (document reference 23.6 submitted at Deadline 6). The Equinor IPs have accepted that the Wood Thilsted report (document reference 23.6 submitted at Deadline 6) presents a suitable worst-case scenario for impact on energy yield. The Equinor IPs have reviewed an update to [REP5-152] which has been shared by the Applicant prior to its submission at Deadline 6 and consider that this revision improves upon the technical assessment by a more realistic placement of WTGs with the SEP and DEP order limits.

65. Further evidence has been submitted by the Equinor IPs in Appendix 1 to the Equinor IPs' **Comments on Deadline 5 Submissions** with respect to the shift away from the baseline in economic terms. A revision to this Financial Impact Assessment is presented at **Appendix 1**, providing evidence of the consequences in terms of economic loss with respect to their projects. The values range between £42 and £164m impact on net present value (NPV) in total dependent on the discount rate applies to future cashflows.

66. The Equinor IPs consider these commercial impacts to be of significance to the economic operation of their assets and consented projects.

67. It should be noted that a 1% reduction in revenue due to an impact on energy yield will in general result in a proportional impact on NPV of greater that 1%. NPV takes into consideration all cashflows related to a project, including revenue as well as capital expenditure (CAPEX) and operational expenditure (OPEX). The NPV for a project is therefore necessarily smaller than the sum of all revenues.

68. As detailed in the Equinor IPs Financial Impact Assessment (**Appendix 1**), a shift away from the baseline that may be perceived as low in terms of percentage of energy yield, in the case of the impacts on energy yield due to wake effects caused by the Project represents a significant shift in terms of the economic loss of the Equinor IPs assets and consented projects.

69. With reference to the methodology presented in **Chapter 18: Marine Infrastructure and Other Users** [APP-073] it is further noted that the physical extent of the impacts due to wake effects is considerable. Offshore windfarms with a minimum separation of up to 60.4 km (in the case of Westermost Rough) have been considered in the Wood Thilsted Report. With respect to the Equinor IPs' assets and consented projects the combined area covered

by the offshore wind farms sites is approximately 282 km^2 at minimum separations of up to 34 km.

70. The duration of the impact is also significant, being for the period of overlap in the lifetimes of the respective assets. For SEP and DEP this overlap in operation is for up to the whole operational lifetime of the Project and for Sheringham Shoal and Dudgeon is for the period from the commissioning of the Project to the decommissioning of the Equinor IPs' assets

4.3.2 Sensitivity / importance

71. With reference to the methodology presented in **Chapter 18: Marine Infrastructure and Other Users** [APP-073], it is noted that the Equinor IPs' assets and consented projects are of high value and importance, being Nationally Significant Infrastructure Projects making significant contributions to the government's Clean Power 2030 policy objectives.

72. The Equinor IPs' assets and consented projects are vulnerable to the impacts due to wake effects with respect to the critical importance of the wind resource to their operations and to their main function of generating electricity. There is no prospect of recoverability in the absence of mitigation or suitable protection as the impact on energy yield will endure for as long as the Project is operational.

4.4 Significance of impacts due to wake effects

73. The Equinor IPs conclude that giving consideration to the factors referred to here, an environmental impact assessment, were it to have been conducted by the Applicant with reference to the methodology in Chapter 5 [APP-060], would have concluded that the impacts on the Equinor IPs' assets and consented projects to be either moderate (significant) or major (significant), and therefore meriting consideration of mitigation or compensation.

74. As noted above the level of deviation from the baseline is considered significant by the Equinor IPs, and the Applicant noted in ISH8 that there are "large sums of money involved" in any compensatory arrangements, implicitly agreeing with the Equinor IPs view on the significance of the impacts.

5 Effect on Future Viability

75. The Applicant submitted at Issue Specific Hearing 8 (ISH8) that the Equinor IPs have not provided sufficient evidence to demonstrate that the bar in policy test NPS EN-3 para 2.8.347 of '*likely to affect the future viability'* has been met.

76. The Equinor IPs submitted a Financial Impact Assessment (FIA) (our document reference C282-EQ-Z-GA-00035) into the Examination on 27 March 2025 which was accepted at the discretion of the Examining Authority. The FIA aimed to provide a quantification for the range of the likely economic loss to be suffered by the Equinor IPs assets and projects. As set out in Section 4 above, the Equinor IPs consider the impacts to be significant. (An updated FIA has been included at **Appendix 1**).

77. At ISH8 the Equinor IPs explained that such loss presents a material risk to the future viability of the projects (see **Written Summary of Equinor IPs' Oral Submissions at Issue Specific Hearing (ISH) 8**, submitted at Deadline 6). Sections 5.1 and 5.2 below set out further evidence that demonstrates the effect on future viability for SHS, DOW, SEP and DEP.

78. This evidence, coupled with the policy justification set out in Section 3.2, together demonstrate that the NPS EN-3 para 2.8.347 test has been met i.e. the proposed development is likely to affect the future viability.

5.1 Sheringham Shoal and Dudgeon

79. The financial return pattern of a typical offshore wind farm will change during its life cycle, impacted by factors such as the end of the support regime (e.g. CfD and Renewable Obligation Certificate (ROC)) and increases in the costs associated with maintenance, including major component exchanges, as the asset ages. These factors will contribute to determining the potential to extend the lifetime of the wind farm. Negative factors, like permanent wake loss, will contribute to shortening the expected lifetime.

80. After the CfD/ROC period, which is shorter than the lifetime of the asset, the revenue from the power generation will be reduced but the operational cost will remain broadly the same with maintenance (including major component replacement) costs likely to increase as the assets age.

81. Hence, a 1% decrease of generation output will have significantly higher impact on the returns during this period. Consequently, the business case for life extension of the DOW and SHS projects are likely to be significantly impacted by the wake losses.

82. To illustrate the above statement Equinor has performed analyses on the impact from the wake loss on the returns of the DOW and SHS projects for the period from end of support until extended lifetime (as referenced in the FIA). The analysis was done by comparing the expected returns for the period with and without the ODOW wake loss effect. We have included a discount factor of 5% in the examples below as a reasonable middle case. The details behind these calculations are commercially sensitive and cannot be shared though build on the calculations using publicly available information as presented in the FIA.

- For DOW (revenue period 2033 – 2052): 5% return loss (after tax) from 0.88% wake loss
- For SHS (revenue period 2033 – 2042): 5% return loss (after tax) from 0.76% wake loss

83. Decisions around longevity of a wind farm are likely to depend upon commercial and market considerations that apply at the time that the support contract ends. Wake effects that significantly reduce the revenue will therefore impact those decisions and are relevant for future viability, so weight should be given to this under paragraph 2.8.347 of NPS EN-3.

84. SHS is currently supported by ROCs whilst DOW benefits from a CfD contract. However, both projects will have reached the end of their respective support mechanisms after 2032, at around the time ODOW is expected to be operational. The period post revenue support contract for these assets is marginal with respect to the commercial business cases and therefore any energy production loss such as that expected from the wake impacts caused by ODOW is considered likely to reduce the lifetime of the Assets and bring forward decommissioning.

85. When considering an AEP impact of between 0.5% - 1% or greater such as that predicted in Revision 2 of the Wood Thilsted Wake Impact Assessment Report (document reference 23.6 submitted at Deadline 6) is unlikely to result in decommissioning of a project in the short term but is likely to bring decommissioning forward.

5.2 Sheringham Shoal and Dudgeon Extension Projects

86. The Contracts for Difference scheme (CfD) was established in 2014 to support the UK's journey to Net Zero. It is currently the main mechanism that offshore wind farm developers utilise to secure a price for the offtake of the electricity they will produce and both SEP and DEP are eligible to bid for a CfD. In simple terms, the CfD is a contractual mechanism designed to incentivise investments in renewable energy projects in the UK at the least cost to the consumer.[12] The scheme uses a competitive auction process to secure long-term, fixed prices (strike prices) for the electricity produced by a variety of renewable energy projects including offshore wind. The competitive nature of the auction is considered necessary by government in order to ensure that the lowest cost to the consumer is achieved and to prevent developers securing contracts that exceed the level needed to deliver a project at a reasonable rate of return. The government sets a total budget for each Allocation Round (AR) in advance as well as defining the specific rules for each auction. Certain rules have tended to be tweaked in each AR based on the range, nature and total capacity of projects eligible to bid. For example, offshore wind has at times been considered in a competitive 'pot' with other technologies such as onshore wind and solar (AR5) whilst in other rounds it has been considered in its own 'pot' (AR6). Other rules have at times been applied to ensure maximum competition. For example, in AR3 over 9GW of offshore wind projects were eligible to bid so to ensure competition and drive down costs, the government introduced a maximum capacity limit for the total CfD contracts for offshore wind that could be awarded. This was set at just 6GW and was intended to ensure maximum competition and price reduction to the benefit of the consumer. The government determines the structure of the pots and then allocates budget to the different pots to support its ambitions for specific technologies and a diversified energy mix whilst always focusing on cost to the consumer.

87. Whilst the exact rules for each AR vary slightly, all ARs are run as competitive sealed bid auctions with projects ranked from the lowest bid until the budget pot is exceeded at which point no further projects are awarded CfDs. Since its inception, there have been six Allocation Rounds with Allocation Round 7 expected later in 2025. The outcomes of the ARs as they relate to offshore wind are captured in Table 1 below. ARs 1-3 saw significant cost reduction for offshore wind, as well as increased competition for the available budget. Whilst there was still some cost reduction for offshore wind between AR3 and AR4, the level of reduction was markedly smaller as the industry reached a point that largely represented the lowest level at which it could deliver new offshore wind. In AR5, no offshore wind farms bid into the auction as government sought further cost reductions but in an environment where offshore wind was seeing significant regulatory uncertainty and supply chain price increases[13]. Eligible developers simply could not make the economics work to deliver at the prices that government were seeking[14].

88. Collectively, the industry's experience across ARs and particularly AR3-6 demonstrate that offshore wind projects must strive to deliver at the lowest possible price to ensure that they are competitive in an auction and can deliver projects within the AR that government structures (taking account of the potential variability in pot structure which may see offshore wind competing with cheaper technologies) with the clear aim of minimising cost to the

[12] Contracts for Difference - Low Carbon Contracts
[13] Energy-UK-AR5-response.pdf
[14] Offshore wind chiefs slam government's AR5 auction failure - [redacted]

consumer. In this respect, it is vital that should SEP and DEP seek to secure a CfD, they are able to deliver at the lowest possible cost to ensure that they are able to compete and succeed in the relevant auction where the difference between winning and losing can come down to the finest margins. As expressed in the Equinor IPs representations at ISH8, the addition of the impact of wake loss from ODOW on the economics of SEP and DEP would present a material threat to the competitive position of these projects representing a material risk to their viability and even small changes in project economics, where the wake losses from ODOW represent clearly quite large changes in project economics, can mean the difference between winning and losing the support required for the projects.

Table 1: CfD Allocation Round Prices and Capacity for Offshore Wind

CfD Allocation Round	Lowest clearing price per MW/h for offshore wind	Total offshore wind farm capacity awarded CfD
1	£114.39	2.08GW
2	£57.50	3.34GW
3	£39.65	5.77GW
4	£37.35	6.99GW
5	No offshore wind bidders	0GW
6	£54.23	4.94GW

6 Economic loss and Protective Provisions

89. The Equinor IPs are not in the position at the close of examination to withdraw their objection to the proposed unmitigated operation of the Project's WTGs under Schedule 10 of the draft Development Consent Order, Deemed marine licence under the 2009 Act - generation assets, Work Number 1, for the reasons set out in this document.

90. The form of protective provisions required by the Equinor IPs in order to provide sufficient protection of their assets and consented projects is submitted at **Appendix 2**. Should the Secretary of State be minded to grant the order on the basis of the inclusion of protective provisions in the form submitted in **Appendix 2** then the Equinor IPs would be able to withdraw their representations in relation to wake effects.

91. The text of the protective provisions submitted at **Appendix 2** has been updated from the version submitted as an appendix to the Equinor IPs' Comments on Deadline 5 Submissions with one change to reference the Institute of Marine Engineering, Science and Technology as taking the place of the Institute of Civil Engineers with respect to arbitration under article 39 of the draft DCO.

92. The Applicant asserted in Issue Specific Hearing 8 that there is no precedent for protective provisions in a development consent order providing for compensation being paid from one developer to another to offset economic loss arising from residual effect of one scheme on another. As noted in Section 3, reference is made to the recently made The Associated British Ports (Immingham Green Energy Terminal) Order 2025, appended at **Appendix 3**,

as an example of reimbursement for loss of revenue, in that case for loss suffered by train operating companies as a consequence of the works.

93. The inclusion of protective provisions and the withdrawal of the Equinor IPs representations would be a pragmatic approach to mitigation of the significant potential impacts on the Equinor IPs' assets and consented projects, that would enable the policy goal of successful co-existence to be achieved.

References

Array Layout Field Study, Outer Dowsing Offshore Wind, 2024, REP2-056
Chapter 18: Marine Infrastructure and other users, Outer Dowsing Offshore Wind, 2024, APP -073
Comments on Deadline 5 Submissions, Equinor, 2025, [AS-036]
Deadline 5 Submission, Equinor, 2025, REP5-157
Department for Energy Security & Net Zero, National Policy Statement for Renewable Energy Infrastructure (EN-3)
Energy UK, 2023, Energy UK response to the AR5 consultation
Environmental Impact Assessment Methodology, Outer Dowsing Wind Farm, 2024, APP-060
Equinor's comments on 21.9 Wake Loss Technical Note, Equinor, 2025 [REP4a-128]
Equinor IPs Wake Effects Position Statement, Equinor, 2025
Low Carbon Contracts Company, n.d. *Contracts for difference*.
Planning Inspectorate, 2025. *Outer Dowsing Issue Specific Hearing 8: Action Points*.
The Applicant's Comments on Deadline 4a Submissions, Outer Dowsing Offshore Wind, 2025, REP5-150
The Applicant's Responses to The ExA's First Written Questions (ExQ1), Outer Dowsing Offshore Wind, 2024, REP 2-051
The Crown Estate, n.d. *The Crown Estate's role in UK offshore wind*.
The Energyst, 2023. *Offshore wind chiefs slam government's AR5 auction failure*.
Wake Loss Technical Note, Outer Dowsing Offshore Wind, 2025, REP4-114
Wake Impact Assessment Report, Outer Dowsing Wind Farm, 2025, REP 5-152
Wake Impact Assessment Report (Revision 2), Outer Dowsing Wind Farm, 2025 (P0232-C1751A-CA-REP-001-2.0)

Appendix 1 - Wake Loss Financial Impact Assessment on behalf of the Equinor IPs (Revision 2)

Outer Dowsing Offshore Wind

Appendix 1 - Wake Loss Financial Impact Assessment on behalf of the Equinor IPs (Revision 2)

Title**:**		
Outer Dowsing Offshore Wind Examination submission **Appendix 1 - Wake Loss Financial Impact Assessment on behalf of the Equinor IPs (Revision 2)**		
Document no.: C282-EQ-Z-GA-00036		
Date:	Classification	
April 2025	**Final**	
Prepared by: **Equinor**		
Approved by: **Sophie Banham, Equinor**	Date: **April 2025**	

Table of Contents

Table of Tables

Glossary of Acronyms

DCO	Development Consent Order
DEL	Dudgeon Extension Limited
DEP	Dudgeon Offshore Wind Farm Extension Project
FIA	Financial Impact Assessment
ODOW	Outer Dowsing Offshore Wind
SEL	Scira Extension Limited
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
SoS	Secretary of State for Energy Security and Net Zero
WTG	Wind Turbine Generators

Glossary of Terms

Dudgeon Offshore Wind Farm (Dudgeon)	The Dudgeon Offshore Wind Farm including all onshore and offshore infrastructure.
Dudgeon Offshore Extension Wind Farm Project (DEP)	The Dudgeon Offshore Extension Wind Farm onshore and offshore sites including all onshore and offshore infrastructure.
Equinor	Equinor New Energy Limited acting on behalf of the Equinor IPs.
Equinor IPs	Scira Offshore Energy Limited, Dudgeon Offshore Wind Limited, Scira Extension Limited and Dudgeon Extension Limited, together or in any combination.
Sheringham and Dudgeon extension arrays	The area offshore within which the Sheringham and Dudgeon extension generating station (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned.
Sheringham Shoal Offshore Wind Farm (Sheringham Shoal)	Sheringham Shoal Offshore Wind Farm including all onshore and offshore infrastructure.
Sheringham Shoal Extension Offshore Wind Farm Project (SEP)	The Sheringham Shoal Extension Offshore Wind Farm onshore and offshore sites including all onshore and offshore infrastructure.
Sheringham Shoal and Dudgeon Extension	The combined SEP and DEP.

1 Summary of updates to this document

This document presents an update to the Equinor IPs submission on 27th March in Appendix 1 (our document reference C282-EQ-Z-GA-00035). As previously, the assessment has been prepared using publicly available information (**Annex A**) to avoid using commercially sensitive data while being able to provide evidence of the significance. Since submission on 27th March, Equinor IPs identified two errors in our previous submissions, specifically, the NPV calculations for SOW and DOW had been presented from 2025 rather than from the Start of Operations of ODOW (2031). This has been rectified in the updated tables herein. In addition, on further review of the AEP figures provided by ODOW in the **Wake Loss Technical Note** submitted at Deadline 4 [REP4-114], a significant (approximately 10%) underestimate of the AEP for DOW was identified. We have therefore also updated the calculation for DOW to reflect the AEP for the project (for which data can be accessed publicly through the Elexon database[1]). Finally, ODOW provided the Equinor IPs with an updated version of the Wood Thilsted report on 3rd April (document reference 23.6 submitted at Deadline 6) which provided updated wake loss estimates for SEP and DEP based on an updated understanding of the restrictions on turbine numbers and positions in certain parts of the Sheringham Shoal and Dudgeon Extensions Offshore Wind Farm Order 2024 order limits. These updated wake loss values have also been worked through the calculations in the remainder of this document.

2 Executive Summary

This Financial Impact Assessment has been produced in response to the Examination of the Outer Dowsing Offshore Wind project (ODOW) and provides estimates of the financial impacts to inform a conclusion on the extent to which they impact on the economic interests and future viability of the generating assets and consented projects listed below.

- Sheringham Shoal Offshore Wind Farm – Operational
- Dudgeon Offshore Wind Farm – Operational
- Sheringham Shoal and Dudgeon Extension Offshore Wind Farm – Consented

The assessment has been prepared using publicly available information (Annex A) to avoid using commercially sensitive data while being able to provide evidence of the significance. The updated results show the indicative financial impact on each of the assets due to the wake effects from the proposed ODOW development. The analysis is presented as a range of reduction in Net Present Value (NPV) for a selection of discount factors for the total potential financial impact. While it is acknowledged that actual impacts may differ from those presented in this assessment, it is expected that the impact would be within these ranges.

[1] Open Settlement Data - Elexon BSC

Table 1: Overview of Wake Loss Financial Impact

Asset	Wake Loss (%)	NPV (£m) Total potential financial impact
Sheringham Shoal	0.76%	6 - 13
Dudgeon	0.88%	12 - 31
Sheringham Shoal and Dudgeon Extension	0.89% & 0.30%	24 - 120
Total		**42 - 164**

As shown in **Table 1**, the analysis shows the potential financial impacts of wake losses from ODOW are significant on each asset included in the analysis. The total impact ranges from £42m to £164m depending on the discount rate applied.

It is recommended that an independent third-party assessment should be undertaken following detailed design of ODOW to determine final expected wake loss on these assets. This should also account for confirmed design parameters once available for the Sheringham Shoal and Dudgeon Extension projects.

3 Introduction

In response to the ODOW **Wake Loss Technical Note** submitted at Deadline 4 [REP4-114] and the **Wood Thilsted Wake Impact Assessment Report** submitted at Deadline 5 [REP5-152], Equinor has completed a Financial Impact Assessment on behalf of the three impacted joint venture assets in their portfolio, the owners of which are collectively referred to as the Equinor IPs:

- Sheringham Shoal Offshore Wind Farm – Operational
- Dudgeon Offshore Wind Farm – Operational
- Sheringham Shoal and Dudgeon Extension – Consented

The Sheringham Shoal Extension Project (SEP) and Dudgeon Extension Project (DEP) shareholders have agreed to bring the two separate projects under common ownership in one legal entity (Equinor, 2024), subject to regulatory approvals. As a result, it would be expected that commercial decisions on the progress of SEP and DEP would be taken as one. As such, they have been treated as a combined project for this impact report. The combined project is referred to here as the Sheringham Shoal and Dudgeon Extension.

4 Methodology

This assessment is an indicative view of the extent of financial impact of wake loss, resulting from ODOW, on each asset. The assessment does not represent the Equinor IP's internal view of the financial impact, due to the highly sensitive and confidential nature of the commercial information underpinning such matters. This commercial sensitivity is particularly critical for the future viability of the Sheringham Shoal Extension and Dudgeon Extension Offshore Wind Farms which are yet to secure an offtake contract. One of the main offtake options available for offshore wind is a Contract for Difference (CfD). A CfD is the government mechanism that supports new offshore wind generation by setting a price for the electricity that a project will produce. Whilst the detailed rules of each CfD Allocation Round can vary slightly, all CfD Allocation Rounds are run as a competitive auction process where developers submit sealed bids which are ranked by price until either a total capacity or budget cap is reached. Projects must therefore seek to ensure that they are as competitive as possible and able to deliver electricity at the lowest price possible to ensure the best chance of succeeding in an auction and hence being able to move forward to Financial Investment Decision and subsequent construction. What may appear to be relatively small percentage reductions in revenue can therefore be the difference between being able to submit a winning bid and subsequently deliver a project or being unsuccessful in an auction process.

The Sheringham Shoal and Dudgeon offshore wind farms were originally identified as part of The Crown Estate's offshore wind leasing Round 2. Both projects currently benefit from support contracts in the form of Renewables Obligation Certificates (ROC) for the former and a Contract for Difference for the latter. However, both support contracts are due to expire at around the time that the wake impacts from ODOW would be expected to commence. Despite this, both projects, alongside other Round 1 and 2 offshore wind farms are still considered to be a valuable part of governments ambitions for energy production from offshore wind. Certainly, it is not

government's intention that all of these early offshore wind farms are simply decommissioned at the end of their support contracts. However, at this point, the projects will no longer be eligible for government support mechanisms such as the CfD and will need to instead look to other offtake arrangements for the electricity that will be produced in order to make a business case for their continued operation. Whilst we cannot currently have certainty over the electricity prices in that time frame (and in lieu of a support mechanism that guarantees the prices the projects will secure), we are able to use publicly available data[5] to support our assessment of what market prices may be achieved and hence what the impact of the wake effects from ODOW may be on the future economics of these projects. Given the higher risk of continuing to operate these projects without a guaranteed price for the electricity produced, the NPV losses outlined below are considered to represent a threat to the business cases for these projects continuing to operate in this period (the actual threat level will only be determined by the wake loss assessed from the final ODOW project design and with more up to date information on the market and expected market prices at the time the wake losses start to occur).

Whilst Equinor is not at liberty to disclose the Equinor IP's internal view of the financial impact publicly, the approach taken in this document is considered to represent a clear indication of the level of impact expected to arise using equivalent publicly available data (Annex A). Whilst the results are only predictions based on publicly available information and the envelope currently under examination for ODOW, the Equinor IPs are content that the Examining Authority (ExA) can use the conclusions of this assessment as the basis for making its recommendation.

The formula used to calculate the annual financial impact of wake loss is:

Annual Electricity Production (AEP)[2][3] x Wake Loss (%)[4] x Forecast Electricity Price[5] (£/MWh)

The calculations start from the operational start date of ODOW to the potential decommissioning dates for each asset giving the 'Minimum Lifetime' values. The Lifetime Extension analysis continues this assessment until the end of the assumed extended lifetime period of 10 years.

The NPV calculation has been produced using the annual financial impact for each asset using the minimum and extended lifetime. A range of discount rates have also been calculated to account for the reduced value of future cashflows. NPV is a financial measure used to assign a current value to future cashflows. For a 0% discount rate the reduction in NPV is equivalent to the total estimated reduction in revenue as a result of the predicted impacts on energy yield due to wake effects. Discount rates greater than 0% are often used to evaluate investment decisions. An indicative range of potential discount rates and associated impacts on NPV is presented here.

[2] AEP values from Table 5-1, Wake Loss Technical Note, Outer Dowsing Offshore Wind, 2025, REP4-114
[3] The AEP value for Dudgeon Offshore Wind Farm used in the calculation is 1,600 GWh as the AEP value presented by ODOW in REP4-114 presents a significant underestimate of the project's AEP
[4] Average wake loss: Wake Impact Assessment report, Outer Dowsing Wind Farm, Wood Thilsted, 2025, REP5-152 (P0232-C1751A-CA-REP-001-2.0)
[5] Forecast Electricity Price is the total price received for each MWh of production including ROC/CfD/REGO

5 Results

This report presents the calculated ODOW wake effects on the Equinor IPs' assets as an impact on NPV. For the operational assets it covers their remaining lifetime starting from ODOW Start Date and with an assumed 10-year lifetime extension for the operational assets. The extended lifetime value for all assets is indicative and is subject to further investigation and relevant Joint Venture approval.

The impact on NPV has been calculated for the Sheringham Shoal and Dudgeon Extension over the period that it is forecast to be generating simultaneously with ODOW. For this project, the wake effects have been calculated for SEP and DEP separately and then combined for presentation in this report for the reasons outlined above.

5.1 Impact During Minimum Lifetime – Operational Assets

Table 2: Overview of Wake Loss Financial Impact During Minimum Lifetime

Asset	Wake Loss (% AEP)	Total NPV of Wake Losses during Minimum Lifetime (£m)			
		Net Discount Rate of 0.0%	Net Discount Rate of 2.5%	Net Discount Rate of 5.0%	Net Discount Rate of 7.5%
Sheringham Shoal	0.76%	8	7	5	4
Dudgeon	0.88%	23	17	13	10
Total		**31**	**24**	**18**	**14**

5.2 Impact on Lifetime Extension – Operational Assets

Table 3: Overview of Wake Loss Financial Impact During Lifetime Extension

Asset	Wake Loss (% AEP)	Total NPV of Wake Losses during Lifetime Extension (£m)			
		Net Discount Rate of 0.0%	Net Discount Rate of 2.5%	Net Discount Rate of 5.0%	Net Discount Rate of 7.5%
Sheringham Shoal	0.76%	5	3	2	2
Dudgeon	0.88%	8	5	3	2
Total		**13**	**8**	**5**	**4**

5.3 Total Impact – Operational Assets and Developments

Table 4: Overview of Total Wake Loss Financial Impact

Asset	Wake Loss (% AEP)	Total NPV of Wake Losses (£m)			
		Net Discount Rate of 0.0%	Net Discount Rate of 2.5%	Net Discount Rate of 5.0%	Net Discount Rate of 7.5%
Sheringham Shoal	0.76%	13	10	7	6
Dudgeon	0.88%	31	22	16	12
Sheringham Shoal and Dudgeon Extension	0.89% & 0.30%	120	66	39	24
Total		**164**	**98**	**62**	**42**

6 Conclusion

This Financial Impact Assessment demonstrates that the financial impact of the wake losses introduced by ODOW are significant and considered material in all scenarios ranging from £42m to £164m.

Any wake losses from ODOW will represent an increased risk to the commercial viability of all assets included in this analysis. In relation to the existing Sheringham Shoal and Dudgeon wind farms specifically, it reduces the potential of life extension, which is likely to result in earlier decommissioning. Additionally, it will reduce the competitiveness of the Sheringham Shoal and Dudgeon Extension project when securing offtake such as through a CfD auction. Given the tight competition in such auctions, this could mean the difference between being successful in the auction or not.

References

Wake Loss Technical Note, Outer Dowsing Offshore Wind, 2025, REP4-114
UK Government. "Annex M: Assumptions on Growth and Price." UK Government
Wake Impact Assessment Report, Outer Dowsing Wind Farm, 2025 REP5-152 (P0232-C1751A-CA-REP-001-1.0)
Wake Impact Assessment Report (Revision 2), Outer Dowsing Wind Farm, 2025 (P0232-C1751A-CA-REP-001-2.0)
Ofgem. Renewables Obligation (RO) Buy-Out Price, Mutualisation Threshold and Mutualisation Ceilings 2024-2025., 2023
Low Carbon Contracts Company. Low Carbon Contracts Register.
Bank of England. "Inflation."
Outer Dowsing. "About Us." Outer Dowsing
Innovative approach enables Sheringham Shoal and Dudgeon Extension Projects to progress as a joint development, press release, Equinor, 2024.

Annex A – Assumptions

These assumptions have all been taken from publicly available sources.

Table A: Assumptions

Assumption	Reference	Notes
AEP	AEP provided in Table 5-1, Wake Loss Technical Note, Outer Dowsing Offshore Wind, 2025, REP4-114	AEP assumed to remain constant for this assessment. These numbers are used for consistency and not as an acceptance of validity. We observe that the AEP figure for Dudgeon Offshore Wind Farm is underestimated by about 10%. Hence, we have used 1600 GWh as the basis for our calculations.
Electricity Price	Department of Energy Security and Net Zero and emissions projections December 2024	Reference market price has been used for this assessment
Wake loss	Wake Impact Assessment report – Outer Dowsing Wind Farm, 2025 (P0232-C1751A-CA-REP-001-2.0)	Average wake loss derived from Wake Impact Assessment report
ROC Prices	Ofgem Website	
CfD Prices	LCCC CfD Register	
Inflation	OBR and Bank of England	Assumed OBR up to 2027/28 financial year and BoE thereafter
ODOW Start Date	ODOW Website	Target first power in 2030 so first full year of power assumed to be 2031
Minimum Lifetime	Equinor	Base case decommissioning date, not considering any lifetime extension for operating projects.
Asset Life Extension	Equinor	Lifetime extension assumed to be extended for a period of 10 years for the purposes of this assessment. Not considered for projects in development.

Appendix 2 – Protective Provisions

FOR THE PROTECTION OF EQUINOR ELECTRICITY UNDERTAKERS

Application

1. The provisions of this Part of this Schedule have effect, unless otherwise agreed in writing between the Equinor Electricity Undertakers and the undertaker.

Interpretation

2. In this Part of this Schedule:

"authorised scheme" means Works Nos. 1, 2, 4 and 8 described in Part 1 of Schedule 10 to the Order or any part of that work;

"Co-operation Agreement" means an agreement setting out the terms on which the authorised scheme, the Sheringham Shoal Extension Project and the Dudgeon Extension Project will co-operate in relation to the construction and operation of the same in proximity to each other;

"Proximity Agreement" means an agreement setting out the technical and commercial terms on which the authorised scheme, the Sheringham Shoal Extension Project and the Dudgeon Extension Project will be constructed and operated in proximity to each other;

"Dudgeon Offshore Wind Farm" means the 402 MW offshore wind farm located 32 kilometres off the North Norfolk Coast in the Southern North Sea;

"Dudgeon Extension Project" means the proposed offshore wind farm as defined in The Sheringham Shoal and Dudgeon Extensions Offshore Windfarm Order 2024;

"Dudgeon Extension Project Order Limits" means the limits shown on the works plans accompanying The Sheringham Shoal and Dudgeon Extensions Offshore Wind Farm Order 2024;

"Equinor Electricity Undertakers" means, together, separately or in any combination:

(a) Scira Offshore Energy Limited;

(b) Dudgeon Offshore Wind Limited;

(c) Scira Extension Limited;

(d) Dudgeon Extension Limited;

(e) an undertaker as defined in article 2 of the Sheringham Shoal and Dudgeon Extensions Offshore Windfarm Order 2024 or any transferee;

(f) a transferee of the benefit of the Sheringham Shoal and Dudgeon Extensions Offshore Windfarm Order 2024 under article 5 of that Order;

(g) the licensed operator of the Dudgeon Offshore Wind Farm;

(h) the licensed operator of the Sheringham Shoal Offshore Wind Farm;

"Equinor Electricity Undertakers' Projects" means, together, separately or in any combination, the Dudgeon Offshore Wind Farm; the Dudgeon Extension Project; the Sheringham Shoal Offshore Windfarm and the Sheringham Shoal Extension Project;

"MW" means megawatts;

"Sheringham Shoal Extension Project" means the proposed offshore wind farm as defined in The Sheringham Shoal and Dudgeon Extension Offshore Windfarm Order 2024;

"Sheringham Shoal Offshore Wind Farm" means the 317 MW offshore wind farm located approximately 20 kilometres off the North Norfolk Coast in the Southern North Sea;

"Wake Loss" means the total modelled impact of the reduction in energy production at any of the Equinor Electricity Undertakers' Projects due to the authorised scheme reducing the wind resource available to that project; and

"WTG" means wind turbine generator.

Mitigation

3. Prior to the commencement of the authorised scheme, the undertaker must in the design of the authorised scheme take all reasonable measures to minimise Wake Loss effects on the Equinor Electricity Undertakers' Projects provided that this shall not require the undertaker to materially reduce the generating capacity of the authorised scheme.

4. In order to facilitate the undertaker's compliance with paragraph 3:

   a. The undertaker must consult with the Equinor Electricity Undertakers as early as reasonably practicable to identify the details including relevant WTG parameters of the Equinor Electricity Undertakers' Projects which are at risk of Wake Loss impacts from the authorised scheme; and

   b. The Equinor Electricity Undertakers must make available to the undertaker all information in the possession of the Equinor Electricity Undertakers reasonably requested by the undertaker in respect of such details and parameters for the Equinor Electricity Undertakers' Projects identified pursuant to sub paragraph (a).

Commuted Sums

5. (1) The undertaker will agree with the Equinor Electricity Undertakers (both parties acting reasonably) the appointment of an independent third party expert ("the expert") to undertake an Energy Yield Study to assess the impact of the authorised scheme on the baseline energy yield of the Equinor Electricity Undertakers' Projects. In default of agreement the matter will be referred to arbitration in accordance with paragraph 8 of this Schedule.

   (2) Prior to the commencement of the authorised scheme the undertaker will pay to the Equinor Electricity Undertakers the Commuted Sums.

   (3) In this paragraph –

   "Energy Yield Study" means the assessment of the effect caused by the authorised scheme on the baseline energy yield at the Equinor Electricity Undertakers' Projects showing the difference in annual energy production arising from Wake Loss.

   "Commuted Sums" means the sums representing all losses (including loss of revenue) incurred by each of the Equinor Electricity Undertakers as a consequence of the percentage loss in energy yield assessed in the Energy Yield Study.

6. Paragraph 5 of this Part will cease to have effect in the event of a national scheme for assessment and compensation of Wake Loss effects prescribing a scale for calculation of Wake Loss impact provided that:

   a. the authorised scheme is within the scope of the relevant national scheme; and

b. the undertaker complies with the requirements of the relevant national scheme.

7. *Co-operation and Proximity Agreement*

Either prior to:

(a) the date 6 months following the making of the Order; or

(b) commencement of the authorised scheme,

whichever is earlier, the undertaker will enter into the Co-operation Agreement with the relevant Equinor Electricity Undertaker unless otherwise agreed in writing.

Prior to commencement of the authorised scheme, the undertaker will enter into the Proximity Agreement with the relevant Equinor Electricity Undertaker unless otherwise agreed in writing.

Disputes

8. Unless otherwise agreed in writing between the undertaker and the Equinor Electricity Undertakers, any dispute arising between the undertaker and the Equinor Electricity Undertakers under this Part of this Schedule is to be determined by arbitration as provided in article 39 (arbitration) of this Order.

9. In relation to any dispute arising under paragraph 5 of this Part the reference in article 39 (arbitration) to the Institute of Civil Engineers shall be read as a reference to the Institute of Marine, Engineering, Science and Technology.

Appendix 3 – Extract of Paragraph 72 of Schedule 14 Part 5 of The Associated British Ports (Immingham Green Energy Terminal) Order 2025

(9) To the extent that it would not otherwise do so, the indemnity in paragraph 72(1) applies to the costs and expenses reasonably incurred or losses suffered by Network Rail through the implementation of the provisions of this paragraph (including costs incurred in connection with the consideration of proposals, approval of plans, supervision and inspection of works and facilitating access to Network Rail's apparatus) or in consequence of any EMI to which sub-paragraph (6) applies.

(10) For the purpose of paragraph 67(1)(a), any modifications to Network Rail's apparatus under this paragraph shall be deemed to be protective works referred to in that paragraph.

69. If at any time after the completion of a specified work or a protective work, not being a work vested in Network Rail, Network Rail gives notice to the undertaker informing it that the state of maintenance of any part of the specified work or the protective work appears to be such as adversely affects the operation of railway property, the undertaker must, on receipt of such notice, take such steps as may be reasonably necessary to put that specified work or protective work in such state of maintenance as not adversely to affect railway property.

70. The undertaker must not provide any illumination or illuminated sign or signal on or in connection with a specified work or a protective work in the vicinity of any railway belonging to Network Rail unless it has first consulted Network Rail and it must comply with Network Rail's reasonable requirements for preventing confusion between such illumination or illuminated sign or signal and any railway signal or other light used for controlling, directing or securing the safety of traffic on the railway.

71. Any additional expenses which Network Rail may reasonably incur in altering, reconstructing or maintaining railway property under any powers existing at the making of this Order by reason of the existence of a specified work or protective work must, provided that 56 days' previous notice of the commencement of such alteration, reconstruction or maintenance has been given to the undertaker, be repaid by the undertaker to Network Rail.

72.—(1) The undertaker must pay to Network Rail all reasonable costs, charges, damages and expenses not otherwise provided for in this Part of this Schedule which may be occasioned to or reasonably incurred by Network Rail—

(a) by reason of the construction or maintenance or operation of a specified work or a protective work or the failure of it;

(b) by reason of any act or omission of the undertaker or of any person in its employ or of its contractors or others whilst engaged upon a specified work or a protective work;

(c) by reason of any act or omission of the undertaker or any person in its employment or of its contractors or others whilst accessing to or egressing from the authorised development;

(d) in respect of any damage caused to or additional maintenance required to, railway property or any such interference or obstruction or delay to the operation of the railway as a result of access to or egress from the authorised development by the undertaker or any person in its employ or of its contractors or others;

(e) in respect of costs incurred by Network Rail in complying with any railway operational procedures or obtaining any regulatory consents which procedures are required to be followed or consents obtained to facilitate the carrying out or operation of the authorised development,

and the undertaker indemnifies and must keep indemnified Network Rail in respect of such costs, from and against all claims and demands arising out of or in connection with a specified work or protective work or any such failure, act or omission; and the fact that any act or thing may have been done by Network Rail on behalf of the undertaker or in accordance with plans approved by the engineer or in accordance with any requirement of the engineer or under the engineer′s supervision does not (if it was done without negligence on the part of Network Rail or of any person in its employ or of its contractors or agents) excuse the undertaker from any liability under the provisions of this sub-paragraph.

(2) Network Rail must give the undertaker reasonable notice of any such claim or demand and no settlement or compromise of such a claim or demand is to be made without the prior written consent of the undertaker.

(3) The sums payable by the undertaker under sub-paragraph (1) if, relevant, include a sum equivalent to the relevant costs.

(4) Subject to the terms of any agreement between Network Rail and a train operator regarding the timing or method of payment of the relevant costs in respect of that train operator, Network Rail must promptly pay to each train operator the amount of any sums which Network Rail receives under sub-paragraph (3) which relates to the relevant costs of that train operator.

(5) The obligation under sub-paragraph (3) to pay Network Rail the relevant costs is, in the event of default, enforceable directly by any train operator concerned to the extent that such sums would be payable to that operator pursuant to sub-paragraph (4).

(6) In this paragraph—

"the relevant costs" means the costs, direct losses and expenses (including loss of revenue) reasonably incurred by each train operator as a consequence of any specified work, including but not limited to any restriction of the use of Network Rail's railway network as a result of the construction, maintenance or failure of a specified work or any such act or omission as mentioned in sub-paragraph (1); and

"train operator" means any person who is authorised to act as the operator of a train by a licence under section 8 of the Railways Act 1993.

73. Network Rail must, on receipt of a request from the undertaker, from time to time provide the undertaker free of charge with written estimates of the costs, charges, expenses and other liabilities for which the undertaker is or will become liable pursuant to this Part of this Schedule (including the amount of the relevant costs mentioned in paragraph 72(5) and with such information as may reasonably enable the undertaker to assess the reasonableness of any such estimate made or to be made pursuant to this Part of this Schedule (including any claim relating to those relevant costs).

74. In the assessment of any sums payable to Network Rail under this Part of this Schedule there must not be taken into account any increase in the sums claimed that is attributable to any action taken by or any agreement entered into by Network Rail if that action or agreement was not reasonably necessary and was taken or entered into with a view to obtaining the payment of those sums by the undertaker under this Part of this Schedule or increasing the sums so payable.

75.—(1) The undertaker and Network Rail may, subject in the case of Network Rail to compliance with the terms of its network licence, enter into, and carry into effect, agreements for the transfer to the undertaker of—

(a) any railway property shown on the works and land plans and described in the book of reference;

(b) any lands, works or other property held in connection with any such railway property; and

(c) any rights and obligations (whether or not statutory) of Network Rail relating to any railway property or any lands, works or other property referred to in this paragraph.

76. Nothing in this Order, or in any enactment incorporated with or applied by this Order, prejudices or affects the operation of Part 1 of the Railways Act 1993.

77.—(1) The undertaker must give written notice to Network Rail where any application is proposed to be made by the undertaker for the Secretary of State's consent under article 46 (benefit of Order), except in respect of the deemed marine licence, and any such notice must be given no later than 28 days before any such application is made and must describe or give (as appropriate)—

(a) the nature of the application to be made;

(b) the extent of the geographical area to which the application relates; and