Pinsent Masons

Ørsted IPs – Deadline 5 Submission

This submission is made in relation to the examination of the Dogger Bank South Offshore Wind Farm Project (the "**Project**") and is made on behalf of Hornsea 1 Limited, the collective of Breesea Limited, Soundmark Wind Limited, Sonningmay Wind Limited and Optimus Wind Limited (together, the "**Hornsea 2 Companies**"), Orsted Hornsea Project Three (UK) Limited, Lincs Wind Farm Limited, Westermost Rough Limited and Race Bank Wind Farm Limited (together, or in any combination, the "**Ørsted IPs**").

The Ørsted IPs note the recent announcement from Ørsted that the Hornsea Four Offshore Wind Farm ("**Hornsea Four**") is being discontinued in the UK in its current form, i.e. Hornsea Four will not be delivered under the Contract for Difference awarded in allocation round 6 in September 2024. Whilst Ørsted are evaluating options for the future development of Hornsea Four, and therefore it is possible for the Project to cause wake effects on Hornsea Four if the latter is built at a later date, Orsted Hornsea Project Four Limited has taken the decision to withdraw its objection to the Project on the grounds of wake loss, as the Applicants cannot make a reasonable assessment of the wake effects of the Project on Hornsea Four in the absence of detailed technical parameters of the latter.

The purpose of this submission is twofold, namely:

- To provide responses to the Examining Authority's Second Written Questions ("**ExQ2**") **[PD-022]** that are directed at the Ørsted IPs; and
- To provide comments on the submissions made by the Applicants at Deadline 4, where appropriate.

Responses to ExQ2

ExQ2	Question to:	Question	Ørsted IPs' Response
IOU.2.3	The Applicants Ørsted IPs Projco IPs	**2025 revisions to the energy NPSs – wake loss** Provide your view on the following proposed changes to the energy NPSs, with regards to the implications on wake loss for the assessment of this application: • The inclusion of the government's Clean Power 2030 Action Plan.	Clean Power 2030 Action Plan The Clean Power 2030 Action Plan identifies that wake effects between developments present a risk to offshore wind development. In particular, the document recognises that new projects with larger and/or a greater number of turbines have "*an even greater propensity*" to cause wake effects on existing downstream operational projects. The document goes on to describe the Awel y Mor decision as setting a "*precedent*" through the imposition of a wake loss condition (where historically the issue had been dealt with privately, outside the planning system). In light of these statements, and the inclusion of the Clean Power 2030 Action Plan in the

ExQ2	Question to:	Question	Ørsted IPs' Response
		• The recommendation that at the design stages for proposed offshore wind farms, an assessment of inter-array wake effects should be undertaken to inform and support the consideration of potential mitigations. • The requirement that developers should make reasonable efforts to demonstrate that they have considered how to manage the impact of wake effects on other occupiers and set out non-exhaustive examples of what this could include, such as how the project configuration has been evolved during the design process to reduce the impact or avoid the most impactful configurations, or manage the planned layout of an offshore wind turbine array to select layouts with reduced long-distance wake impact on other occupiers. • The addition of paragraphs 2.8.176, 2.8.232, 2.8.233 and 2.8.316 to draft NPS EN-3. (You may wish to cross reference the answer to this question with BGC.2.6.)	2025 revisions to the energy NPSs, there can be no doubt that the Government's position is that wake effects from new developments can result in material adverse effects and that there is a need for these effects to be addressed. This does not support the Applicants' position that a wake assessment is outwith the requirements of the NPSs (see also below in relation to paragraph 2.8.176 of draft NPS EN-3). <u>Assessment of Inter-Array Wake Effects</u> The Ørsted IPs support that draft NPS EN-3 recommends that an assessment of inter-array effects is undertaken when considering a new offshore wind farm consent application. Wake effects should not be viewed differently to impacts upon other industries where it is expected that an applicant assess the impact its project will have on other activities and implements measures to mitigate significant effects. This supports the position made by the Ørsted IPs throughout this Examination to date, being that the Applicants must undertake a wake loss assessment that considers the impact of the Project on the Ørsted IPs' assets. Furthermore, it is of note that the Applicants will have access to the information required to carry out the most realistic assessment of inter-array wake effects, including indicative layouts, likely wind turbine generator capacity and detailed knowledge of the wind regime, amongst other factors. The publicly-available design parameters for existing ('waked') offshore assets allows for a robust assessment of likely wake losses. It is also pertinent that, ahead of the submission of a DCO application, the Applicants will, in all likelihood, already have undertaken multiple inter-array wake effects assessments, in order to model the expected impact that wakes from existing and planned offshore wind farms will have on the Project's business case. Indeed, 'reversing' the results of these existing wake assessments is a relatively trivial endeavour, which the Applicants should undertake. <u>Managing the Impact of Wake Effects</u>

ExQ2	Question to:	Question	Ørsted IPs' Response
			The Ørsted IPs support that draft NPS EN-3 recommends that developers should demonstrate that they have considered wake impacts on other wind farms when designing their project. The Ørsted IPs would expect that mitigations of the wake impacts on other sea users are investigated and that an applicant explores potential trade-offs to reduce the wake impact with the owners of impacted offshore wind farms. This is a matter of good design and should be based on the real-world situation for an applicant's project, rather than on hypothetical or simplified examples. <u>Paragraphs 2.8.176, 2.8.232, 2.8.233 and 2.8.316</u> Paragraph 2.8.176 of draft NPS EN-3 states that "*applicants should consider the impact of their proposal on other activities and make reasonable endeavours to address these. At the design stage there are therefore clear merits for applicants to make an assessment of inter-array wake effects between their proposed developments, and nearby offshore wind generating stations that are planned, consented or operational*". This supports the position adopted by the Ørsted IPs throughout this Examination to date, being that the Applicants must undertake a wake loss assessment that considers the impact of the Project on the Ørsted IPs' assets. Paragraph 2.8.232 of draft NPS EN-3 states that "*applicants should demonstrate that they have taken all reasonable steps to minimise as far as possible the impact of wake effects on other offshore industries*", including (as examples) "*explaining how the configuration of a proposed offshore wind project has been evolved during the design process to reduce the impact, or how an applicant has managed the planned layout of an offshore wind turbine array to select layouts with reduced long-distance wake impact on other offshore industries or generating stations*". As above, the Applicants cannot be said to have complied with this paragraph of draft NPS EN-3 without first undertaking a wake loss assessment that considers the impact of the Project on the Ørsted IPs' assets.

ExQ2	Question to:	Question	Ørsted IPs' Response
			Paragraph 2.8.233 of draft NPS EN-3 states that "*there is no expectation that wake effects can be wholly removed between developments, or that inter-project compensation arrangements are a necessary means to mitigate the impact of wake effects, although developers may opt to take such approaches outside of the planning process*". The Ørsted IPs agree that wake effects on their assets cannot be wholly removed as a result of the Project, as that would only be the case if the Project was not built, which the Ørsted IPs (as offshore wind developers themselves) are not advocating for. However, the Ørsted IPs note that inter-project compensation agreements, whilst not automatically considered to be a necessary means of mitigation under this paragraph of draft NPS EN-3[1], are commonplace within the industry. Indeed, it may be the case that such a compensation agreement is an attractive solution for the Applicants to consider, in lieu of the imposition by the Secretary of State of suspensive wake minimisation provisions within the DCO, as alluded to in paragraph 2.8.232; noting that, prior to a decision being made on the Project's DCO, the Applicants will not have access to the design, technical and operational detail that is required to evaluate and take all reasonable wake minimisation steps (for example, steps linked to configuration and/or layout-based mitigations). Paragraph 2.8.316 of draft NPS EN-3 states that "*where an applicant has demonstrated that they have made an assessment of inter-array wake, taken all reasonable steps to minimise as far as possible the impact of wake effects and shown that they have made reasonable efforts to work collaboratively with those who may potentially be impacted, then the existence of a residual wake effect impact is unlikely to carry more than limited weight against a project in the planning process*". Again, the Applicants cannot be said to have complied with this paragraph of draft NPS EN-3 without first undertaking a wake loss assessment that considers the impact of the Project on the Ørsted IPs' assets and without also having taken the subsequent steps set out in paragraph 2.8.316.

[1] Which, the Ørsted IPs note, is still subject to ongoing consultation.

ExQ2	Question to:	Question	Ørsted IPs' Response
IOU.2.4	The Applicants Ørsted IPs Projco IPs	**2025 revision to NPS EN-3 – wake loss** How do you interpret the word 'nearby' in draft NPS EN-3 paragraph 2.8.176 regarding the need to assess inter-array wake effects between proposed offshore wind farms and 'nearby' offshore wind generating stations? How would you apply this to the proposed development, and which planned, consented or operational offshore wind farms do you consider would be 'nearby' to the proposed development?	The Ørsted IPs consider that the word "*nearby*" has been left deliberately undefined as a specific distance in draft NPS EN-3. There are many factors other than distance which affect wake loss impacts on surrounding assets, such as the wind direction, the scale of an applicant's project, the temporal overlap between the operational lifetimes of the waking and waked offshore wind farms, and the turbine technology and layout; separation distance is not necessarily the most important factor driving the overall loss of generation. A wake loss assessment is required to establish the level of effect and significance and, given that separation distance is just one determining factor amongst many, the Ørsted IPs feel that it is unhelpful for draft NPS EN-3 to make specific reference to it. The Ørsted IPs consider that the word "*nearby*" is defined by the impacts that a proposed project will have on surrounding assets, and that it is not possible to determine what should be considered "*nearby*" without a wake loss assessment. The Ørsted IPs intend to recommend to the Secretary of State that draft NPS EN-3 is updated by deleting the word "*nearby*" and making it clear that the assessment should be undertaken in respect of offshore wind projects that have the potential to be impacted by wake effects. It is of note that, in the examination of the Outer Dowsing Project, some of the Ørsted IPs withdrew their representations regarding wake loss following the publication of an independent wake loss assessment commissioned by the applicant in that examination; that assessment showed a low wake loss impact and hence these assets were able to withdraw their objections. As stated above, the Ørsted IPs expect the Applicants to commission a wake loss assessment, and the Ørsted IPs request that this is actioned as soon as possible in order to facilitate due scrutiny and discussion within what remains of this Project's examination.

ExQ2	Question to:	Question	Ørsted IPs' Response
IOU.2.5	The Applicants Ørsted IPs Projco IPs	**2025 revision to NPS EN-3 – wake loss** Do the proposed changes to NPS EN-3 give direction on which party holds responsibility for carrying out a wake loss assessment? If so, what implication does this have for this examination?	As above, paragraph 2.8.176 of draft NPS EN-3 states that "*applicants should consider the impact of their proposal on other activities and make reasonable endeavours to address these. At the design stage there are therefore clear merits for applicants to make an assessment of inter-array wake effects between their proposed developments, and nearby offshore wind generating stations that are planned, consented or operational*". This supports the position made by the Ørsted IPs throughout this Examination to date, being that the Applicants must produce a wake loss assessment (ideally by commissioning an independent consultant) that considers the impact of the Project on the Ørsted IPs' assets. Alongside the other submissions made by the Ørsted IPs throughout this Examination, it is clear that the Applicants have not complied with the existing or draft NPS EN-3 in relation to conducting this assessment.
IOU.2.9	Ørsted IPs	**NPS EN-3 paragraph 2.8.197** In your DL4 response **[REP4-121]**, in the context of NPS EN-3 paragraph 2.8.197, you state that 'close' is not solely defined by physical distance, but also by the effects a development would have on other sea users. The wording of paragraph 2.8.197 states, '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.' If offshore wind farms fall within the definition of 'operational offshore infrastructure', does this wording	The following response should be read in conjunction with the Ørsted IPs' response to IOU 2.4 above. It is for the Applicants to determine whether potentially impacted projects should be scoped in or out of further assessment based on the establishment of a Study Area that is defined solely upon distance, or whether to employ a more complex screening methodology that utilises multiple factors to determine the spatial extent of the Study Area (including, for example, relative position with regards to the prevailing wind alongside separation distance). If the Applicants were to opt for the former, it will be for the Applicants to ensure that the spatial extent of the Study Area is sufficient to capture, for example, downwind wake impacts. The Ørsted IPs would be happy to comment on a scoping methodology proposed by the Applicants. It is inexpensive and straightforward for an offshore wind farm developer to robustly model the wake effect of its proposed project upon multiple existing and/or planned offshore wind farms within a specified Study Area. There is no valid justification for not commissioning this work or for not doing so in accordance with the latest understanding of the true extent of far-field wake

ExQ2	Question to:	Question	Ørsted IPs' Response
		suggest that the proximity of the existing operational offshore infrastructure should be determined in the first instance (ie whether it is 'close'), in order to then determine whether an assessment of potential effects of the proposed development should be undertaken? If not, why not? If so, which existing offshore windfarms in the Ørsted portfolio do you consider should be assessed for wake loss effects from the proposed development and why?	effects. The approach taken to these assessments should be no different to the numerous other assessments that are routinely completed throughout the Scoping and EIA stages of a project's development. During the examination of the Outer Dowsing Project, some Ørsted IPs withdrew their representations regarding wake loss following the publication of an independent wake loss assessment that was commissioned by the applicant in that examination; that assessment showed a low wake loss impact and hence these assets were able to withdraw their objections. It is reasonable to expect that the same outcome may apply with respect to this Project once the Applicants make a wake loss assessment available.
IOU.2.11	The Applicants Ørsted IPs	**Deadline (DL)4 submission on wake loss** The Projco IPs state in their DL4 comments regarding wake loss **[REP4-117]** that 'There has not been a project which has had such a significant effect in terms of wake losses on other nationally significant infrastructure projects which will deliver the same benefits, outside of an extension project where both projects are ordinarily controlled by the same underlying entity.' To what extent do you agree with these comments and why?	The Ørsted IPs only wish to note that Leasing Round 4 projects have had large wake impacts on the viability of existing offshore wind farms, and refer to the financial impact assessments submitted by the Ørsted IPs during the examinations of the Outer Dowsing Project and the Morecambe Project (included at Appendices 2 and 3, respectively, of this submission).
IOU.2.14	Ørsted IPs	**Generating capacity** The ExA notes your DL4 response **[REP4-121]** and comments regarding generating capacity. However, the ExA requests that generating capacity is provided for the offshore wind farms to understand the likely	The Ørsted IPs have deliberately not disclosed the internally assumed load/capacity factors of their assets, as this would reveal the internal view of the expected annual energy yield for each asset. This is commercially sensitive information. An indicative view could be achieved by using the installed capacities of each wind farm alongside a suitable capacity factor for offshore wind. For

<table>
<tr><th>ExQ2</th><th>Question to:</th><th>Question</th><th>Ørsted IPs' Response</th></tr>
<tr><td></td><td></td><td>effects from wake loss and for reporting purposes.</td><td>example, RenewableUK provide a load factor for offshore wind which they define as the actual output of a turbine benchmarked against its theoretical minimum output in a year. The load factor is calculated as a rolling average of the past five years using data (on an Unchanged Configuration Basis) from the Digest of UK Energy Statistics published by the Department for Energy Security and Net Zero[2]. Using statistics from 2019-2023 (released in July 2024), this figure was found to be 40.58% for offshore wind.

It is worth noting that load factors have been increasing over time due to technological innovation and the fact that newer wind farms are being placed in areas with higher average wind speeds. The Department for Energy Security and Net Zero states, in its CfD (Standard Terms) Regulations document, that the load factor for new build projects (for delivery years 2026-2029) is 62.3% for offshore wind – see Table J: Assumed Load Factor, pages 6 and 7[3].

In the following table, the indicative generation from each Ørsted IP's asset is provided, using an average of the capacity factor estimates above (51.4%) and the following formula:

Energy per annum = Project Capacity x Capacity Factor x Hours in a Year
<table>
<tr><th></th><th>Project Capacity (MW)</th><th>Capacity Factor (%)</th><th>Hours in year (h)</th><th>Indicative energy per annum (MWh)</th></tr>
<tr><td>Race Bank</td><td>546</td><td>51.4%</td><td>8766</td><td>2,460,125</td></tr>
<tr><td>Lincs</td><td>270</td><td>51.4%</td><td>8766</td><td>1,216,545</td></tr>
</table>
</td></tr>
</table>

[2] https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes
[3] https://assets.publishing.service.gov.uk/media/65e85ee662ff48001a87b243/cfd-ar6-standard-terms-notice.pdf

<table>
<tr><th>ExQ2</th><th>Question to:</th><th>Question</th><th>Ørsted IPs' Response</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Westermost Rough</td><td>210</td><td>51.4%</td><td>8766</td><td>946,202</td></tr>
<tr><td>Hornsea 01</td><td>1218</td><td>51.4%</td><td>8766</td><td>5,487,972</td></tr>
<tr><td>Hornsea 02</td><td>1320</td><td>51.4%</td><td>8766</td><td>5,947,556</td></tr>
<tr><td>Hornsea 03</td><td>2995</td><td>51.4%</td><td>8766</td><td>13,494,643</td></tr>
<tr><td>Hornsea 04</td><td>2400</td><td>51.4%</td><td>8766</td><td>10,813,738</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>40,366,781</td></tr>
</table>
</td></tr>
<tr><td>IOU.2.15</td><td>Ørsted IPs Projco IPs</td><td>Wake effects – response to ISH3 action points and greenhouse gas sensitivity analysis of wake effects

Provide a view on the Applicants' wake effects – response to ISH3 action points [REP4-099] and greenhouse gas sensitivity analysis of wake effects [REP4-095]. To what extent do you agree or disagree with the assessments and their findings, and why?</td><td><u>The Applicants' wake effects – response to ISH3 action points</u>

Please see the Ørsted IPs further comments on the Applicants' Deadline 4 submissions below this table.

<u>The Applicants' greenhouse gas sensitivity analysis of wake effects</u>

This document is a high-level analysis which uses generic wake effects and not the expected impacts on the Ørsted IPs' assets. It would benefit from direct modelling of wake impacts on neighbouring assets, as opposed to using generic assumed wake effect scenarios of 0.5%, 1.0% and 2.0%.</td></tr>
<tr><td>IOU.2.16</td><td>Ørsted IPs Projco IPs</td><td>Wake effects – response to ISH3 action points

To what extent do you agree with the stated background level of environmental fluctuation in energy yield from variations in weather of 5.4% referred to in Table 2 [REP4-099], and the Applicants' statement</td><td>The Applicants are correct that wind resource available to an offshore wind farm will vary from year-to-year in the range of ±5% of the average production. Outlier years can result in fluctuations that extend outside this range. However, the Applicants' conclusion that "wake impacts are lost in the noise of natural variations of the wind" is misleading, as it ignores two fundamental points. Firstly, whilst variations in wind direction and speed will change the effect experienced in a particular year, the effects over several years will average out and it is equally likely that the wake effect will be</td></tr>
</table>

ExQ2	Question to:	Question	Ørsted IPs' Response
		that effects from wake loss would fall within the natural variability of the weather and therefore, the impacts from wake loss would be "lost in the noise" of the natural variation of the wind?	higher or lower than the average in any given calendar year. Secondly, it is very important to note that the wake losses predicted as a result of the Project would occur in both low and high wind years – it would impact the Ørsted IPs' assets in every year post-commissioning of the Project, resulting in a long-term average effect which is what a wake loss assessment would be expected to calculate and report. The wake effect is not in any way mitigated by wind resource annual variability. The Ørsted IPs note that this point was discussed previously in the examination of the Mona Project and an independent wake expert made the following statement: "*…it should be noted that the difference % values provided in Table 5-4 and 5-5 in our report are the difference in the long-term Annual Energy Production (AEP). The Measure Correlate Predict (MCP) method used within the Wake Assessment undertaken seeks to incorporate interannual variability as a long-term effect in the assessment, therefore it is not correct to compare the wake results directly to what a farm would see between one year and the next.* *The wake loss would typically vary between low average wind years and high average wind years as the turbines across the farm would spend different amounts of time at different points on their power curves, causing the resulting wake impacts to vary, but never disappear. The MCP process accounts for annual variability, by allowing calculations over longer time scales representative of the wind farm's potential life, and improves statistical significance of calculated net AEP*".
IOU.2.19	Ørsted IPs	**Wake loss assessment** The ExA notes your DL4 response **[REP4-121]** and position that the Applicants should be required to submit a wake loss assessment to demonstrate the likely	Per the contents of their responses to ExQ2 above, and submissions made throughout the Examination to date, the Ørsted IPs do not currently intend to undertake and submit a wake loss assessment of the likely wake effects of the Project on the Ørsted IPs' assets, as the responsibility for this assessment should fall to the Applicants.

ExQ2	Question to:	Question	Ørsted IPs' Response
		effects from wake loss on the Ørsted portfolio of offshore wind farms. However, the ExA remains unclear whether you intend to submit a wake loss assessment on the likely effects on the Ørsted portfolio of offshore wind farms if the Applicants do not – confirm if you intend to do so. The ExA highlights that it will only be able to report on the information it has available to it at the close of the examination to the SoS.	
IOU.2.22	The Applicants Ørsted IPs Projco IPs	**Wake loss – protective provisions** **Projco IPs, Ørsted IPs**: submit a copy of draft protective provisions for consideration regarding the matter of wake loss. **The Applicants**: submit a copy of draft protective provisions for consideration regarding the matter of wake loss on a without prejudice basis.	Please see attached at Appendix 1 to this submission. In relation to these protective provisions, the Ørsted IPs wish to note: • That the protective provisions are without prejudice to the position of the Ørsted IPs that the Applicants should still undertake a wake loss assessment of the Project on the Ørsted IPs' assets during this examination; and • Whilst the protective provisions are currently drafted to cover all the Ørsted IPs that currently have active objections to the Project, per the response to IOU.2.9 above, it is reasonable to expect that (as was the case during the examination of the Outer Dowsing Project) some Ørsted IPs may withdraw their representations (and therefore no longer require coverage via the proposed protective provisions) regarding wake loss following the publication of a wake loss assessment commissioned by the Applicants, if that assessment shows a sufficiently low wake loss impact.
IOU.2.23	The Applicants	**Wake loss – arbitration** If the ExA or SoS determined that a requirement or protective provisions to address wake loss effects was necessary,	Per the contents of the draft protective provisions for the benefit of the Ørsted IPs included at Appendix 1 to this submission, arbitration can play a role in protecting the interests of the Ørsted IPs and the Applicants. This is

ExQ2	Question to:	Question	Ørsted IPs' Response
	Ørsted IPs	to what extent do you think that arbitration would be useful or necessary in protecting the interests of all parties involved?	because the general arbitration provisions in article 47 of the DCO provide the backdrop for any disputes arising from the protective provisions.

Comments on the Applicants' Deadline 4 submissions

The Ørsted IPs consider that the matters addressed in the various submissions made by the Applicants at Deadline 4 are covered in the table above and/or in submissions made previously by the Ørsted IPs in this examination. However, the Ørsted IPs wish to pick up on statements made by the Applicants in their Written Summaries of Oral Submissions made at the April 2025 hearings **[REP4-086]**, their Responses to Deadline 3 Documents **[REP4-088]** and their Wake Effects – Response to ISH3 Action Points **[REP4-099]**.

In **[REP4-086]**, the Applicants state that "*the Ørsted IPs and the Dogger Bank Projcos are better placed to assess wake impacts on their own projects than the Applicants. This is particularly the case because they will have a deep understanding of the wind conditions affecting their projects*".

The Ørsted IPs do not agree with this statement. It is likely that the Applicants' assessment (or, at least, the Applicants' assumptions used for that assessment) would be more accurate than that of the Ørsted IPs because the assessment would revolve around the Applicants' project and could use various measurements (e.g. regarding wind at the Project) and detailed knowledge of the design of the Project that the Applicants have available. While it is correct that the Ørsted IPs have a deep understanding of the wind conditions affecting their assets, the wind conditions at the Ørsted IPs' assets will change as a result of the presence of the Project, and it is this change to wind conditions which is relevant. Indeed, the Applicants have recently published analysis demonstrating their ability to model neighbouring wakes accurately over distances that are similar to the those between the Project and the Ørsted IPs assets.

Additionally, the Applicants have justified their refusal to undertake a wake loss assessment on the Ørsted IPs' assets because they have assessed the impact of the Project on the Dogger Bank A Offshore Wind Farm and concluded, in **[REP4-088]**, that "*the level of impact on DBA (2% of AEP) means specific wake assessments are not justified*". Unless it is the position of the Applicants that the Ørsted IPs should assume a wake loss of 2% of AEP at the Ørsted IPs' assets, then this position is untenable. The Applicants also state, in **[REP4-099]**, that this wake loss of ~2% "*is assessed to be negligible*". It is the position of the Ørsted IPs that a wake loss of 2% of AEP would constitute a material impact on the Ørsted IPs' assets.

Pinsent Masons

APPENDIX 1

DRAFT PROTECTIVE PROVISIONS FOR THE BENEFIT OF THE ØRSTED IPS

PART [X]

For the protection of the Ørsted IPs

1. The provisions of this Part of this Schedule have effect, unless otherwise agreed in writing between the undertaker and the relevant Ørsted IP.

2. In this Part of this Schedule—

"AEP" means annual energy production;

"authorised project" has the meaning defined at article 2(1);

"Breesea Limited" means Breesea Limited with company number 07883217 and registered office at 5 Howick Place, London, SW1P 1WG;

"GW" means gigawatts;

"Hornsea 1 Limited" means Hornsea 1 Limited with company number 07640868 and registered office at 5 Howick Place, London, SW1P 1WG;

"Hornsea One" means the 1.2 GW offshore wind farm located 120 kilometres off the Yorkshire coast;

"Hornsea Two" means the 1.3 GW offshore wind farm located 89 kilometres off the Yorkshire coast;

"Hornsea Three" means the 2.9 GW offshore wind farm located 160 kilometres off the Yorkshire coast and 120 kilometres off the Norfolk coast;

"Lincs" means the 270 MW offshore wind farm located 8 kilometres off the east coast of England, near Skegness in Lincolnshire;

"Lincs Wind Farm Limited" means Lincs Wind Farm Limited with company number SC213646 and registered office at 13 Queens Road, Aberdeen, AB15 4YL;

"MW" means megawatts;

"Optimus Wind Limited" means Optimus Wind Limited with company number 07883284 and registered office at 5 Howick Place, London, SW1P 1WG;

"Orsted Hornsea Project Three (UK) Limited" means Orsted Hornsea Project Three (UK) Limited with company number 08584210 and registered office at 5 Howick Place, London, SW1P 1WG;

"Race Bank" means the 573 MW offshore wind farm located 17 miles off Blakeney Point on the North Norfolk coast and 17 miles off the Lincolnshire coast at Chapel St Leonards;

"Race Bank Wind Farm Limited" means Race Bank Wind Farm Limited with company number 05017828 and registered office at 5 Howick Place, London, SW1P 1WG;

"relevant Ørsted IP" means all or any of Hornsea 1 Limited, Breesea Limited, Soundmark Wind Limited, Sonningmay Wind Limited, Optimus Wind Limited, Orsted Hornsea Project Three (UK) Limited, Lincs Wind Farm Limited, Race Bank Wind Farm Limited and Westermost Rough Limited as the context requires;

"relevant project" means all or any of Hornsea One, Hornsea Two, Hornsea Three, Lincs, Race Bank or Westermost Rough as the context requires;

"Sonningmay Wind Limited" means Sonningmay Wind Limited with company number 10722635 and registered office at 5 Howick Place, London, SW1P 1WG;

"Soundmark Wind Limited" means Soundmark Wind Limited with company number 10721881 and registered office at 5 Howick Place, London, SW1P 1WG;

"Wake Loss" means the total modelled impact of the reduction in AEP at a relevant project as a result of wake impacts from the authorised project;

"Wake Loss Agreement" means an agreement between the undertaker and the relevant Ørsted IP to address the impacts of Wake Loss caused by the authorised project in respect of the relevant project;

"Wake Loss Assessment" means an assessment of the Wake Loss on the relevant project caused by the authorised project that is commissioned and agreed between the undertaker and the relevant Ørsted IP pursuant to paragraph 4(1);

"Wake Loss Mitigation Scheme" means a scheme agreed between the undertaker and the relevant Ørsted IP, or in the absence of such agreement, determined by an independent third party expert appointed under paragraph 4, to provide mitigation in accordance with paragraph 4(2);

"Westermost Rough" means the 210 MW offshore wind farm located 8 kilometres north east of Withernsea off the Holderness coast;

"Westermost Rough Limited" means Westermost Rough Limited with company number 06232914 and registered office at 5 Howick Place, London, SW1P 1WG; and

"wind turbine generator" has the meaning defined at article 2(1).

3. The undertaker may enter into a Wake Loss Agreement with each relevant Ørsted IP in respect of its relevant project. If a Wake Loss Agreement has been entered into and remains in force with a relevant Ørsted IP, then paragraphs 4 to 8 of this Part of this Schedule will not apply in respect of the relevant project.

4. (1) No less than one year prior to first installation of a wind turbine generator, the undertaker and the relevant Ørsted IP shall agree the appointment of one or more independent third party experts to undertake a Wake Loss Assessment, which shall:

(a) take account of any design, technical or operational mitigations that have been, or that will be, implemented in the final design of the authorised project to reduce Wake Loss; and
(b) determine the Wake Loss in respect of each relevant project.

(2) No less than six months prior to first installation of a wind turbine generator, the undertaker and the relevant Ørsted IP shall agree the Wake Loss Mitigation Scheme, which shall include, but not be limited to:

(a) the mechanism for quantifying the financial loss caused to each relevant project as a consequence of the Wake Loss identified in the Wake Loss Assessment;
(b) the financial loss per annum caused to each relevant project; and
(c) the payment mechanism and timescales for mitigating such financial loss.

(3) In the absence of agreement under sub-paragraph (2), the undertaker and the relevant Ørsted IP shall agree the appointment of an independent third party expert to approve or determine such Wake Loss Mitigation Scheme. That expert shall not approve or determine such Wake Loss Mitigation Scheme without first consulting with the relevant Ørsted IP and taking into account any written representations made by the relevant Ørsted IP provided that any written representations are provided to that expert by the relevant Ørsted IP within 40 working days.

5. The Wake Loss Mitigation Scheme must be implemented as approved for the lifetime of the authorised project.

6. In the event that a relevant project ceases to be operational earlier than accounted for in the Wake Loss Assessment and the Wake Loss Mitigation Scheme, the obligation under paragraph 5 in respect of that relevant project shall no longer be in effect.

7. (1) The undertaker must not commence installation of any wind turbine generator unless a guarantee or alternative form of security in respect of the total liabilities of the undertaker under the Wake Loss Mitigation Scheme is in place.

(2) The form of guarantee or security referred to in sub-paragraph (1), and the amount guaranteed or secured, must be approved by the relevant Ørsted IP (such approval not to be unreasonably withheld) and deposited with the Secretary of State.

(3) A guarantee or other security in accordance with this paragraph 7 that guarantees or secures the undertaker's payment to mitigate the effects of Wake Loss in accordance with the relevant Wake Loss Mitigation Scheme is to be treated as enforceable against the guarantor or provider of security by any person to whom such mitigation is properly payable and must be in such a form as to be capable of enforcement by such a person.

8. Paragraphs 4 to 7 of this Part of this Schedule shall cease to have effect if a national scheme for assessment and compensation and/or mitigation of Wake Loss effects prescribing a scale for calculation of Wake Loss impacts and a mechanism for the payment of any compensation caused by such Wake Loss impacts has legal effect provided that:

(a) the authorised project and the relevant project are within the scope of the relevant national scheme;
(b) the undertaker has complied with the requirements of the relevant national scheme; and
(c) the undertaker and the relevant Ørsted IP, following review of any such national scheme and acting reasonably, agree to paragraphs 4 to 7 ceasing to have effect.

9. Any difference under the provisions of this Part of this Schedule must be, unless otherwise agreed in writing between the undertaker and the relevant Ørsted IP, determined by arbitration in accordance with article 47 (arbitration).

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APPENDIX 2

FINANCIAL IMPACT ASSESSMENT SUBMITTED BY THE ØRSTED IPS DURING THE EXAMINATION OF THE OUTER DOWSING PROJECT

Outer Dowsing

Wake Loss Financial Impact Assessment on behalf of the Ørsted IPs – updated to incorporate and use the findings presented in the Wood Thilsted wake impact assessment

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Executive Summary

This Financial Impact Assessment has been prepared in relation to the Examination of the Outer Dowsing Offshore Wind Project (**Outer Dowsing**) and estimates the financial impacts updated based on the recent wake impact assessment conducted by Wood Thilsted (the **Wood Thilsted Report**) on the Ørsted IPs (being Race Bank Wind Farm Limited, Hornsea 1 Limited along with Breesea Limited, Sonningmay Wind Limited, Soundmark Wind Limited and Optimus Wind Limited (together **Hornsea 2**)) as a result of the construction and operation of Outer Dowsing, as submitted into the Examination at Deadline 5 [**REP5-152]**.

This financial assessment has been carried out by Ørsted, on behalf of the Ørsted IPs, using publicly available information and the wake loss numbers from the Wood Thilsted Report, which Outer Dowsing and Ørsted have agreed are the appropriate numbers to use for this assessment. It shows the financial impact on the concerned projects due to wake effects resulting from Outer Dowsing. The assessment shows the financial impact, as a Net Present Value (NPV), across the Minimum Lifetimes, across assumed 10-year Lifetime Extension periods, and across the combined Minimum Lifetime and Lifetime Extension periods (the total potential financial impact).

Asset	Wood Thilsted's Wake Loss (% AEP)	NPV Impact (£m)[1]		
		Impact during Minimum Lifetime[2]	Additional impact during Lifetime Extension[3]	Total potential financial impact
Race Bank	0.52%	£7m-£15m	£2m-£8m	£9m-£23m
Hornsea 1	0.67%	£28m-£60m	£5m-£31m	£33m-£91m
Hornsea 2	0.68%	£20m-£53m	£5m-£33m	£25m-£85m
Total		**£55m-£128m**	**£12m-£72m**	**£67m—£199m**

Table 1: Overview of Wake Loss Financial Impact using Scenario 1B from the Wood Thilsted Report (all four of HOW03, HOW04, SS Extension and D Extension get built)

As shown in Table 1, the financial impacts of wake losses resulting from Outer Dowsing are significant across the Ørsted IPs' assets, with a total potential financial impact of between £67m and £199m (depending on the discount rate applied). This comprises a reduction in revenue of between £55m and £128m across the Minimum Lifetime of the assets, and a reduction during the assumed Lifetime Extension period of between £12m and £72m.

The wake loss impacts presented in the Wood Thilsted Report reflect a relatively minor deviation from the wake loss impacts presented in the Ørsted IPs' own wake study submitted as Appendix 1 to the Ørsted IPs' Deadline 4a Submission [REP4a-125a]. The Wood Thilsted Report presents slightly higher wake losses for Race Bank and Hornsea 2, and lower wake losses for Hornsea 1. The wake impacts from the Wood Thilsted Report increase the financial impact incurred by Race Bank and Hornsea 2 by 2% and 6.3% respectively, and decreases the financial impact incurred by Hornsea 1 by 9.5%.

The impacts throughout each asset's life are material, irrespective of which set of modelled wake loss inputs are utilised. Furthermore, the impact incurred is likely to result in the earlier decommissioning of one or more of these assets than would otherwise have been the case.

1 Introduction

In light of the Wood Thilsted Report, the Ørsted IPs are satisfied with the independent assessors' analysis and note that these figures are not significantly different from those in the Ørsted IPs' Wake Loss Technical Note, thus confirming significant financial impacts on the Orsted IPs' assets.

This assessment uses a simple formula to provide an indicative view of the quantum of the financial consequences of wake loss for each project. It uses a mix of publicly available data and information submitted throughout the examination process.

[1] Range shown represents Net Discount Rates discount rates from 0% to 7.5%.

[2] The Minimum Lifetime is assumed as 24 years.

[3] Lifetime Extension is assumed as an additional 10 years of life immediately following the Minimum Lifetime.

This assessment does not intend to represent the Ørsted IPs' internal view of the financial impact, which cannot be shared publicly due to its reliance on confidential information.

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

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

This is calculated from the operational start date of Outer Dowsing until the earliest potential decommissioning dates for the impacted projects giving the "Minimum Lifetime" values. The Lifetime Extension analysis continues this assessment until the end of an assumed lifetime extension (+10 years).

The NPV is then calculated using the annual financial impact for each year across the lifetime of the assets, considering both Minimum Lifetime and the extended lifetime. The NPV is then calculated using the annual financial impact for each year across the lifetime of the assets, considering both Minimum Lifetime and the assumed 10-year Lifetime Extension period. A range of Net Discount Rates are used that take into account inflation.

2 Results

In this report, the results of the financial impact assessment have been updated to reflect the wake losses presented in the Wood Thilsted Report. The assessments demonstrate the impact, as an NPV, over the minimum 24-year lifetime of the assets, over an assumed 10-year Lifetime Extension period, and the total potential impact (comprising the combined impact to the end of the Lifetime Extension period).

2.1 Financial impact during Minimum Lifetime

Using the figures presented in the Wood Thilsted Report, the Orsted IPs have assessed the NPV impact of the wake losses introduced by Outer Dowsing across the minimum 24-year life for the impacted assets (Table 2). Ørsted does not consider that it would be appropriate to select one discount rate and has instead opted to run the NPV calculations using a range of potential Net Discount Rates[6] in this section and in all later sections.

Asset	Wood Thilsted's Wake Loss (%)	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%
Race Bank	0.52%	£15m	£12m	£9m	£7m
Hornsea 1	0.67%	£60m	£46m	£36m	£28m
Hornsea 2	0.68%	£53m	£37m	£27m	£20m
Total		**£128m**	**£95m**	**£72m**	**£55m**

Table 2: Minimum Lifetime Impact using the wake losses presented in the Wood Thilsted Report.

The assessment shows the impact on the Ørsted IPs' assets due to wake loss from Outer Dowsing of between £55m and £128m across the minimum 24-year life for the impacted assets – all levels in this range are considered material for the assets involved.

2.2 Financial impact during assumed Lifetime Extension

While the minimum lifetime for the assets is 24 years, there are not currently anticipated to be any technical or consenting barriers to extending this by an additional ten years or more. The Ørsted IPs believe there is a likelihood that their assets will be operational beyond the earliest decommissioning date and that an additional 10 years is a reasonable period to use for an impact assessment. Therefore, this analysis also considers an assumed 10-year Lifetime Extension period (Table 3).

[4] The Ørsted IPs' internal expectations of AEP are confidential and cannot be shared publicly. Instead, the AEP numbers are taken from Outer Dowsing's Wake Loss Technical Note which is referenced in Appendix A.

[5] Forecast Electricity Price is the total price received for each MWh of production.

[6] The Net Discount Rate is an adjusted discount rate taking into account the assumed Inflation Rate.

Asset	Wood Thilsted's Wake Loss (%)	NPV of Wake Losses during Lifetime Extension Period (£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%
Race Bank	0.52%	£8m	£5m	£3m	£2m
Hornsea 1	0.67%	£31m	£17m	£9m	£5m
Hornsea 2	0.68%	£33m	£17m	£9m	£5m
Total		**£72m**	**£39m**	**£21m**	**£12m**

Table 3: Impact during 10-year Lifetime Extension period using the wake losses presented in the Wood Thilsted Report.

The reduced NPVs during the Lifetime Extension period of the concerned assets are material in their own right.

2.3 Total potential financial impact assuming 10-year Lifetime Extension

The impact has been shown to be significant both for the Minimum Lifetime and the Lifetime Extension Period. Combining these shows the overall potential impact of the wake effect from Outer Dowsing on the Ørsted IPs' assets (Table 4).

Asset	Wood Thilsted's Wake Loss (%)	Total potential 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%
Race Bank	0.52%	£23m	£17m	£12m	£9m
Hornsea 1	0.67%	£91m	£63m	£45m	£33m
Hornsea 2	0.68%	£85m	£54m	£36m	£25m
Total		**£199m**	**£134m**	**£93m**	**£67m**

Table 4: Total Impact assuming 10-year Lifetime Extension using the wake losses presented in the Wood Thilsted Report.

The assessment shows total impacts across the combined assets' lifetimes ranging between £67m and £199m if one assumes a 10-year Lifetime Extension period. Given that there are not currently any technical or consenting barriers foreseen which would prevent Lifetime Extension of the concerned projects, this is considered a likely range of outcomes for the financial impact on the Ørsted IPs' assets.

2.4 Impact on early decommissioning

Alongside the material loss of revenue set out in Sections 2.1, 2.2 and 2.3, the wake loss impacts imposed by Outer Dowsing will significantly challenge the economic viability of the Ørsted wind farms considered in this report (Race Bank, Hornsea 1, and Hornsea 2). This is expected to apply from the point at which market support for these assets falls away and the assets' revenue streams become fully merchant, i.e. as the financial case for these assets becomes significantly more constrained. The impacts incurred will influence lifetime extension decisions and are likely to result in the earlier decommissioning of one or more of these assets than would otherwise have been the case.

3 Conclusion

This Financial Impact Assessment demonstrates that the financial impact of the wake losses introduced by Outer Dowsing are significant. The revenue losses are material in all scenarios, ranging from £55m to £199m.

Furthermore, from the point at which market support for these assets falls away, the wake losses will threaten the financial viability of the three wind farms considered. The significant revenue losses will have a direct bearing on lifetime extension decisions and are more likely than not to result in the earlier decommissioning of one or more of the three wind farms considered than would otherwise have been the case.

Appendix A – Assumptions Used

In order to produce this high-level analysis, the Ørsted IPs have made several assumptions designed to simplify the modelling and create transparency. These assumptions, based on publicly available data, relate to variable factors such as future energy prices and inflation and have a level of uncertainty. The Ørsted IPs do not wish to suggest these results are the only correct results, but rather they are demonstrative of the magnitude of the impact.

Variable	Source used	Notes	Source link(s)
AEP	AEP provided in Table 5-1 of Outer Dowsing's Wake Loss Technical Note	AEP assumed to remain stable throughout the lifetime of the asset These numbers are used for simplicity and their use should not be interpreted as an acceptance by the Ørsted IPs that they are correct	Outer Dowsing - Wake Loss Technical Note
Electricity price	Market Prices: Department for Energy Security and Net Zero energy and emissions projections December 2024	Reference market price forecast has been used for this assessment	DESNZ
ROC Prices	Ofgem Website	Renewable Obligation Credits (ROCs) are a form of market support that is paid to generators for each MWh of energy produced Race Bank receives 1.8 ROCs/ MWh	Ofgem - ROC Prices Orsted - Race Bank ROCs
CFD Prices	LCCC CfD Register	CfD Assets' revenue per MWh is based on the Contract for Difference price per MWh (CFD Price). The current CFD Prices are publicly available on the LCCC website (see link) For this Assessment the current CFD Price is taken and inflation applied throughout the remaining period in which CFD's are applicable.	LCCC - CfD Register
Inflation	The Office for National Statistics CPIH (2024). Bank of England target inflation rate (2025 onwards)	Inflation assumed at BoE target rate of 2%	BoE
Wake loss	The results of the assessments carried out by Wood Thilsted	Wake losses are assumed static throughout the lifetime of the asset. Scenario 1B from Wood Thilsted report has been used in this financial assessment.	Wood Thilsted Wake Impact Assessment Report
Outer Dowsing Start Date	Outer Dowsing Website	Outer Dowsing website statement states that the target for first power is 2030 and that it has grid connection for November 2030. The Ørsted IPs hence assume their first full year of operation as 2031	Outer Dowsing website
Minimum Lifetime	24 Years	The Minimum Lifetime for the impacted assets is assumed to be 24 years	
Asset Lifetime Extension	10 Years	For the purposes of this assessment, Lifetime Extension is assumed as a period of 10 years immediately following the Minimum Lifetime	

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APPENDIX 3

FINANCIAL IMPACT ASSESSMENT SUBMITTED BY THE ØRSTED IPS DURING THE EXAMINATION OF THE MORECAMBE PROJECT

This document has been prepared by the Ørsted IPs in response to the examining authority's written questions [PD-015] in the examination of the Morecambe Offshore Windfarm Generation Assets ("**Morecambe**"). This submission forms part of the Ørsted IPs' response to questions1OOI3, 2OOI2 and 2OOI3.

Using a mix of publicly available data and information submitted throughout the examinations of Morecambe along with the Morgan and Mona Offshore wind projects (together, the "**MoMoMo developments**"), the Ørsted IPs have modelled the financial consequences of the wake losses for each project. The purpose of this analysis is to provide the Examining Authority (ExA) sufficient information to quantify and understand the magnitude of the financial losses incurred by the Ørsted IPs as a result of the wake effects and the significance of those impacts across the lifetime of each asset without divulging confidential internal commercial information.

This document first explains the methodology used and then lists assumptions. It is then structured in two parts reflecting the two questions asked by the ExA. Part One answers 1OOI3. It provides an analysis of the overall financial impacts of wake impacts of the MoMoMo developments on the Ørsted IPs' portfolio. Part Two answers 2OOI3 and 2OOI4 and, in conjunction with Appendix 3, provides an analysis of the impacts on the assets and explains when wake impacts become particularly relevant in terms of future viability of the assets.

Methodology

At its highest level, the formula used to calculate the financial impact of the predicted wake losses at a particular project is a function of:

(1) the Annual Electricity production *multiplied by*

(2) the predicted wake loss (in %) *multiplied by*

(3) electricity prices between the operational commencement date of the "waking" project and the "waked" project's decommissioning date.

Part 3 of the calculation differs depending on the type of market support the asset receives, which is either via Renewable Obligation Certificates (ROC) or Contract for Difference (CfD).

CfD Assets' revenue per MWh is based on the Contract for Difference price per MWh. When the CfD expires (see *Table 8: CfD price*) the assets become fully merchant with revenue calculated as Market Price per MWh. The following assets are currently supported by CfD: Walney Extension Offshore Windfarm (comprising Walney 3 and Walney 4) and Burbo Bank Extension Offshore Windfarm.

ROC Assets' revenue per MWh is based on the number of ROC certificates produced by the assets per MWh multiplied by the buy-out price per MWh plus the market price per MWh. When ROC certificates expire (as outlined in *Table 9: Buy-out price per ROC*), the asset becomes fully merchant with revenue calculated as market price per MWh. The following assets are currently supported by the ROC scheme: Barrow Offshore Windfarm, West of Duddon Sands Offshore Windfarm, Walney Offshore Windfarm (comprising Walney 1 and Walney 2) and Burbo Bank Offshore Wind farm.

Assets are referred by their acronyms, as set out below, throughout the rest of the document.

Barrow	BOW
West of Duddon Sands	WDS
Walney 1	WOW01
Walney 2	WOW02
Walney Extension 3	WOW03
Walney Extension 4	WOW04
Burbo Bank 1	BBW01
Burbo Bank 2 extension	BBW02

Assumptions

In order to produce this high-level analysis, the Ørsted IPs have made several reasonable assumptions designed to simplify the modelling. The scope of the analysis is limited to Morecambe and the cumulative effect of the MoMoMo developments.

The numerical assumptions referred to below are available in the form of data tables in Appendix 2.

1. Annual Production remains stable throughout the lifetime of the asset (*Table 6: Estimated Electricity production per annum (GWh)*. The Ørsted IPs' internal expectations of AEP are confidential and cannot be shared. Instead the AEP numbers are taken from the Mona submission "S_Ex_1 Technical Note: Calculation of the Net Effects on Greenhouse Gas Emissions" [AS-033,] page 16, where an average of the last 5 years of metered production from each asset is sourced from Ofgem.
2. Wake loss remains static throughout the lifetime of the asset (*Table 5: Percentage wake effect)*.
3. Assets operate for an additional 10 years on top of their minimum operational lifetime (*Table 7: Decommissioning dates*)
4. Wake impacts as a result of all three MoMoMo developments, start on the 01/07/2030. In reality, the assets are aiming to be fully constructed by this date meaning the Ørsted IPs' assets will experience wake losses earlier.
5. Revenue loss is a function of Market Price, CfD and ROC and ignores auxiliary services, Renewable Energy Guarantees of Origin and other revenues.
6. CfD prices are available on the LCCC website, see hyperlinks in Table 8: CfD price .
7. ROC prices are available on the OFGEM website, see hyperlinks in Table 9: Buy-out price per ROC
8. Market prices are sourced from DESNZ's Research titled "*Prices from Energy and emissions projections: 2023 to 2050*" (published 17 December 2024), specifically "*Annex M: Growth assumptions and prices*".
9. The market prices used in this paper are based on the main projection or "reference scenario" used by DESNZ in its publication "Energy and emissions projections 2023 to 2050 (*Table 10: "Energy and emissions projections: 2023 to 2050", from DESNZ (p/KWh, 2023 prices)).* This is referred to as the "DESNZ Reference Scenario" in this document.
10. DESNZ scenarios are expressed in 2023 Prices. In order to align with this document, prices have been adjusted to 2025 by means of adding two years' worth of inflation (*Table 11: Table 10 above converted to £/MWh and adjusted to 2025 prices*).

11. For the avoidance of any doubt, this document contains no confidential information. All price forecasts are sourced from DESNZ and are used for illustrative purposes and do not reflect Ørsted's energy market outlook.

Part One – Financial impact analysis of wake losses, response to 1OOI3

The analysis below illustrates the magnitude of the financial impacts of wake loss from Morecambe alone and the MoMoMo developments cumulatively, across the lifetimes of the Ørsted IPs' assets.

By 2034, all of the Ørsted IPs will be fully merchant. Morecambe wake loss will translate into an average £3m lost annal revenue for its first decade of operation. MoMoMo's cumulative wake impacts are expected to reduce the Ørsted's IPs' revenue by between £16m to £20m per annum for the same period. This level of financial impact could be sufficient to result in the ongoing operation of the assets becoming unviable.

As noted above, this analysis is based on DESNZ Reference scenario. Tables outlining the financial impacts in more detail are provided in Appendix 3.

As with any long-term financial predictions, the answer is heavily predicated on underlying assumptions. In particular, the discounting rate used to calculate the current value of the stream of wake losses that will impact the Ørsted IPs' assets. This calculation is usually referred to as a Net Present Value ("**NPV**").

Ørsted does not consider it would be appropriate to select one discount rate and has instead opted to run the NPV calculations using a range. The results of these computations are available in Table 1 and Table 2 below. Table 1 analyses Morecambe only and Table 2 analyses the cumulative impact of the MoMoMo developments. The NPV for the minimum lifetime of the asset is shown separately from the total impact NPV that includes an additional 10-year operation. It is noted that the discounting rates in the tables take into account future anticipated inflation.

In summary, based on DESNZ Reference scenario and assuming a 0.0% discount rate, it is predicted that the effects from Morecambe alone would result in a loss of up to £38 million across the minimum lifetimes of the assets, and cumulatively with the Mona and Morgan developments the predicted loss is up to £250 million. This impact is predicted to almost double if the assets continue to operate for a further 10 years.

As the discount rate increases, the NPV values reduce accordingly. For example, at a 7.5% discount rate, the NPV total impact for Morecambe alone (including a 10 year additional operating period) reduces to £27m, and £169m for the cumulative MoMoMo developments; this is lower than the £68m and £440m predicted using a 0.0% discount rate.

Table 1: Morecambe wake loss NPV impact on Ørsted IPs (inclusive and exclusive of additional 10-year operation) (£m)

	Total impact (min. lifetime + 10 years)				Minimum lifetime			
	0.0%	2.5%	5.0%	7.5%	0.0%	2.5%	5.0%	7.5%
BOW	2	2	1	1	-	-	-	-
WDS	27	20	15	11	16	13	10	8
WOW01	4	3	2	1	1	1	1	1
WOW02	3	2	2	1	2	1	1	1
WOW03	10	7	5	4	6	5	4	3
WOW04	14	10	7	5	9	7	5	4
BBW01	1	1	0	0	0	0	0	0
BBW02	7	5	3	3	4	3	2	2
Total	**68**	**49**	**36**	**27**	**38**	**30**	**24**	**19**

Table 2: cumulative wake loss NPV impact on Ørsted IPs from the MoMoMo developments (inclusive and exclusive of additional 10-year operation) (£m)

	Total impact (min. lifetime + 10 years)				Minimum lifetime			
	0.0%	2.5%	5.0%	7.5%	0.0%	2.5%	5.0%	7.5%
BOW	5	4	3	2	-	-	-	-
WDS	104	76	57	43	61	49	40	32
WOW01	25	18	13	10	9	7	6	5
WOW02	36	27	20	15	17	14	12	10
WOW03	104	73	52	38	64	50	39	31
WOW04	134	94	68	49	83	65	51	40
BBW01	3	2	2	1	0	0	0	0
BBW02	29	20	14	10	16	13	10	8
Total	**440**	**315**	**229**	**169**	**250**	**199**	**158**	**126**

Part Two – detailed analysis in response to 2OOI3 and 2OOI4

As outlined in the Ørsted IPs' response to question 2OOI3 above, as market support for the assets falls away and they become fully merchant, the economic margins for ongoing operation become highly marginal and assets become significantly more vulnerable.

By way of example, the financial impacts of the predicted wake loss on BOW are displayed in tables 3 (for Morecambe alone) and 4 (for the MoMoMo developments cumulatively) below. BOW (an asset with 90 MW installed capacity), will be the first asset in the Ørsted IPs' portfolio to become fully merchant in 2027. By this stage, the price of electricity generated from this asset will be £62.1/MWh (as shown in the 'Total Price' row in tables 3 and 4 below). Meanwhile, the predicted wake loss will continue at 1.37% from Morecambe alone and cumulatively from the MoMoMo developments at 3.09%. These losses translate into a financial impact of approximately £0.2m per annum from Morecambe alone and between £0.5m to £0.6m cumulatively per annum from the MoMoMo developments.

Table 3: Detailed calculations of the financial impact of wake effects on Barrow caused by Morecambe alone

BOW (2025 prices)		'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41
Production	GWh	272	272	272	272	272	272	272	272	272	272	272	188	-
Wake loss	%age	-	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	-
Compensation period		-	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	-
Lost production	GWh	-	(1.8)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(3.7)	(1.8)	-
ROC price	£/MWh	-	-	-	-	-	-	-	-	-	-	-	-	-
Market Price	£/MWh	57.4	47.3	41.6	47.6	52.4	55.2	60.5	62.6	66.2	72.8	72.0	73.8	-
Total Price	£/MWh	57.4	47.3	41.6	47.6	52.4	55.2	60.5	62.6	66.2	72.8	72.0	73.8	-
Financial Impact	£m	-	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.3)	(0.3)	(0.1)	-

Table 4: Detailed calculations of the financial impact of wake effects on Barrow cumulatively from the MoMoMo developments

BOW (2025 prices)		'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41
Production	GWh	272	272	272	272	272	272	272	272	272	272	272	188	-
Wake loss	%age	-	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	3.09%	-
Compensation period		-	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	-
Lost production	GWh	-	(4.2)	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	(8.4)	(4.0)	-
ROC price	£/MWh	-	-	-	-	-	-	-	-	-	-	-	-	-
Market Price	£/MWh	57.4	47.3	41.6	47.6	52.4	55.2	60.5	62.6	66.2	72.8	72.0	73.8	-
Total Price	£/MWh	57.4	47.3	41.6	47.6	52.4	55.2	60.5	62.6	66.2	72.8	72.0	73.8	-
Financial Impact	£m	-	(0.2)	(0.3)	(0.4)	(0.4)	(0.5)	(0.5)	(0.5)	(0.6)	(0.6)	(0.6)	(0.3)	-

As illustrated above for BOW, at the point that market support ends, the price predicted for electricity generated at each asset will become merchant and revenues will likely drop and become volatile.

This will coincide with the assets aging and therefore potentially incurring increased operational expenditures. At this point, the profitability of the assets becomes more marginal and the Ørsted IPs will have limited options to insulate the assets from the volatility of the energy markets. While these factors have been anticipated and planned for by Ørsted, the wake effects of Morecambe alone and the MoMoMo developments could not have been. In summary, at a point where the assets have become more vulnerable, they will also experience new material financial impacts from wake loss from Morecambe (as well as the Morgan and Mona developments). The Ørsted IPs consider the financial impact of the wake loss will compound forecast financial pressures on the assets. At around this point, therefore, the viability of the assets is likely to be particularly impacted.

ASSUMPTIONS USED IN ANALYSIS OF FINANCIAL IMPACTS OF WAKE LOSS

Inputs used in the analysis are clearly highlighted in blue font

Table 5: Percentage wake effect

	Morecambe	Cumulative MoMoMo
BOW	1.37%	3.09%
WDS	1.01%	3.86%
WOW01	0.53%	3.78%
WOW02	0.32%	3.69%
WOW03	0.40%	4.13%
WOW04	0.56%	5.21%
BBW01	0.46%	1.63%
BBW02	0.45%	1.85%

Source: Wake Impact Assessment report (REP3-112) page 9

Table 6: Estimated Electricity production per annum (GWh)

	GWh
BOW	272.0
WDS	1,476.9
WOW01	626.4
WOW02	709.0
WOW03	1,299.0
WOW04	1,299.0
BBW01	252.0
BBW02	896.2

Source: Additional Submission to the examination of the Mona Offshore Windfarm Generation Assets (EN010121) - Accepted at the discretion of the Examining Authority - S_Ex_1 Technical Note: Calculation of the Net Effects on Greenhouse Gas Emissions (AS-033) page 16 (sourced from OFGEM)

Table 7: Decommissioning dates

	Earliest date	With additional 10 years
BOW	30/09/2030	30/09/2040
WDS	31/10/2038	31/10/2048
WOW01	31/07/2035	31/07/2045
WOW02	30/06/2036	30/06/2046
WOW03	31/05/2042	31/05/2052
WOW04	31/05/2042	31/05/2052
BBW01	31/12/2031	31/12/2041
BBW02	31/05/2041	31/05/2051

Table 8: CfD price

Asset	sources
WOW03	• Link to LCCC website
WOW04	
BBW02	• Link to LCCC website

Table 9: Buy-out price per ROC

Asset	source
BOW	• Link to Buy out prices
WDS	
WOW01	
WOW02	
BBW01	

Table 10: "Energy and emissions projections: 2023 to 2050", from DESNZ (p/KWh, 2023 prices)
Prices sourced from "EEP - Annex M - Growth assumptions and prices" (Link to OFGEM webpage)
Using the "Reference" tab > Price – Wholesale > Electricity (baseload) > p/kWh (2023 prices), row 20

Year	p/kWh (2023 prices)	Year	p/kWh (2023 prices)	Year	p/kWh (2023 prices)
2023	9.809	**2034**	5.236	**2045**	7.728
2024	6.808	**2035**	5.742	**2046**	7.902
2025	6.861	**2036**	5.938	**2047**	7.792
2026	6.827	**2037**	6.284	**2048**	7.856
2027	6.155	**2038**	6.906	**2049**	7.844
2028	5.889	**2039**	6.834	**2050**	7.804
2029	5.450	**2040**	7.002	**2051***	7.804
2030	4.488	**2041**	7.240	**2052***	7.804
2031	3.944	**2042**	7.434	**2053***	7.804
2032	4.518	**2043**	7.516		
2033	4.972	**2044**	7.696		

** table extended three years to 2053 assuming 7.80p/KWh in each year*

Table 11: Table 10 above converted to £/MWh and adjusted to 2025 prices
Adjusting from "2023 prices" to "2025 price" by applying an inflationary factor of 3.3%[1] for 2024 and 2.0 %[2] for 2025

Year	£/MWh (2025 prices)	Year	£/MWh (2025 prices)	Year	£/MWh (2025 prices)
2023	98.09	**2034**	55.17	**2045**	81.43
2024	70.32	**2035**	60.50	**2046**	83.26
2025	72.30	**2036**	62.57	**2047**	82.10
2026	71.93	**2037**	66.21	**2048**	82.78
2027	64.85	**2038**	72.76	**2049**	82.65
2028	62.05	**2039**	72.01	**2050**	82.22
2029	57.43	**2040**	73.78	**2051**	82.22
2030	47.29	**2041**	76.29	**2052**	82.22
2031	41.55	**2042**	78.33	**2053**	82.22
2032	47.61	**2043**	79.20		
2033	52.38	**2044**	81.09		

[1] Office for National Statistics https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l55o/mm23
[2] Bank of England inflation target Inflation and the 2% target | Bank of England