Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

Dogger Bank South Offshore Wind Farms – DCO Application

Issue Specific Hearing 6 on Wake Loss, Radar and Other Environmental Matters

Post Hearing Submissions (including written submissions of oral case)

of

the Ørsted IPs

CONTENTS

1. INTRODUCTION

1.1 Section 2 of this document summarises the main oral submissions made by 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 **Ørsted IPs**) at Issue Specific Hearing 6 (**ISH6**) dealing with Wake Loss, Radar and Other Environmental Matters held on 5 June 2025, in relation to the application for development consent for the Dogger Bank South Offshore Wind Farms (the **DBS Project**) by RWE Renewables UK Dogger Bank South (West) Ltd and RWE Renewables UK Dogger Bank South (East) Ltd (the **Applicants**).

1.2 ISH6 was attended by the Examining Authority (**ExA**), the Applicants and a number of Interested Parties, including the Ørsted IPs.

1.3 Section 2 of this document does not purport to summarise the oral submissions of parties other than the Ørsted IPs, and summaries of submissions made by other parties are only included where necessary in order to give context to the Ørsted IPs' submissions in response.

1.4 Numbered items referred to are references to the numbered items in the agenda published by the ExA on 28 May 2025 **[EV11-001]** (the **Agenda**). The Ørsted IPs made oral submissions under Agenda items 1 and 2 only. Where post hearing notes have been added, those notes are prefixed with "Post Hearing Note" and set out in italics for clarity.

1.5 In addition, the ExA published a letter dated 9 June 2025 **[PD-026]** requesting further information under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010, which contained various questions directed to the Ørsted IPs. Section 3 of this document contains the Ørsted IPs' responses.

1.6 The Ørsted IPs also note that Deadline 6 of the examination affords an opportunity for Interested Parties to comment on submissions made by the Applicants at Deadline 5. However, the Ørsted IPs consider that the points they would wish to make in relation to the Applicants' submissions are either already covered within this document or via previous submissions made by the Ørsted IPs during the examination. Therefore, to avoid simply repeating their arguments, the Ørsted IPs have only responded to the Applicants' Deadline 5 submissions to the extent they feel it necessary to do so via Section 4 of this document.

1.7 Therefore, this document comprises the Ørsted IPs' only submission for Deadline 6.

2. WRITTEN SUMMARY OF THE ØRSTED IPS' ORAL SUBMISSIONS AT ISH6

Agenda Item	Ørsted IPs' Oral Submissions and Post Hearing Notes
Item 1	
Welcome, introductions, arrangements for the hearing	**Alex Tresadern, for the Ørsted IPs,** did not make any substantive submissions in relation to this agenda item, other than to introduce the Ørsted IPs.
Item 2	
Wake Loss	**Alex Tresadern, for the Ørsted IPs,** stated that the Ørsted IPs are grateful to the Applicants for undertaking a wake loss assessment **[AS-179]** that considers the wake impact on Hornsea 1, Hornsea 2, Hornsea 3 and Hornsea 4. Whilst the Ørsted IPs would always prefer that an independent assessment of wake loss be commissioned by the Applicants, the Ørsted IPs are willing (given the stage of the examination) to accept the figures presented in this wake loss assessment for Hornsea 1, Hornsea 2 and Hornsea 3, and will use these figures to conduct a financial impact assessment (**FIA**) (which the Ørsted IPs will submit into the examination as soon as possible) showing the impact of this wake loss on these Ørsted IPs' assets, with the exception of Hornsea 4 (as the wake loss objection from this asset was withdrawn at Deadline 5). In addition, the Ørsted IPs are withdrawing the wake loss objections from Race Bank, Lincs and Westermost Rough offshore wind farms – whilst a wake loss assessment has not been done by the Applicants specifically for these assets, the Applicants have stated in their assessment that "*wind farms outside of [the] 100km range are unlikely to have a modellable impact, or feel an impact from DBS*". Acting reasonably, the Ørsted IPs therefore consider it appropriate to withdraw the wake loss objections for these assets. *Post Hearing Note: Following the withdrawal of the wake loss objections from the Race Bank, Lincs and Westermost Rough offshore wind farms, the Ørsted IPs have updated their proposed set of protective provisions (see Appendix 1) for inclusion in the draft DCO to remove reference to these assets.* In response to a question from **the ExA** regarding the FIA on the Ørsted IPs' assets, **Alex Tresadern, for the Ørsted IPs,** stated that this would likely be similar to the FIA submitted by the Ørsted IPs during the course of the examination of the Outer Dowsing Offshore Wind (Generating Station) Project (as provided in Appendix 2 of the Ørsted IPs' Deadline 5 Submission **[REP5-074]**), in that it will comprise an analysis of the wake loss effects (given that these figures have now been made available via the Applicants' assessment) in terms of their financial impact (i.e. loss of revenue) on the Ørsted IPs' assets, which in turn will feed into the Ørsted IPs' arguments regarding significance and the appropriateness of compensation via the proposed protective provisions. *Post Hearing Note: The Ørsted IPs are undertaking the FIA referred to above and will submit this into the examination as soon as possible.* In response to a question from **the ExA** regarding the Applicants' engagement to date, **Alex Tresadern, for the Ørsted IPs,** noted that the Applicants' wake loss assessment that considers the impacts on the Ørsted IPs' assets **[AS-179]** was only provided at Deadline 5 of the examination, despite the Ørsted IPs calling for this to be undertaken from the start of the examination. The Ørsted IPs consider that this should have been undertaken at the pre-application scoping stage or, at the very least, at an earlier point in the examination to assist all parties with their understanding of this important impact, and to facilitate

	the narrowing of submissions and issues. **Mr Tresadern** also noted that the only bilateral call that has been held between the Applicants and the Ørsted IPs thus far was arranged by the Ørsted IPs. In response to submissions made by the Applicants regarding Leasing Round 4 projects and the buffer distances proposed by The Crown Estate (**TCE**), **Alex Tresadern, for the Ørsted IPs,** stated that an understanding of the true extent of far-field wake effects (i.e. their extension significantly beyond the 7.5km buffer imposed in the Leasing Round 4 process) was only beginning to emerge (from Ørsted's perspective) in 2018/19. **Mr Tresadern** explained that it was this lack of awareness up to that point that explains the relative lack of planning disputes prior to the Awel y Mor DCO examination and the Leasing Round 4 projects; indeed, the Leasing Round 4 projects (and one other 2017 Extension Round project, besides Awel y Mor) are all currently facing wake loss-based DCO objections. **Mr Tresadern** went on to say that the industry understanding of the extent of wake effects has matured considerably since Round 4 leasing; indeed, Ørsted communicated to the market for the first time on this topic in 2019, warning the market that they had observed wakes persisting much further than previously assumed. **Mr Tresadern** stated that what has failed to be acknowledged is that new industry information emerged from 2019 onwards and therefore the Applicants should have reacted to this by undertaking assessments (which they did not, presumably due to the commercial implications of doing so) – the Applicants referred to their practices as "*business as usual*", but the Ørsted IPs submit that it was incumbent upon the Applicants (and other Leasing Round 4 projects) to recognise the new understanding of far field wake effects that emerged from 2019. In response to further submissions made by the Applicants regarding the buffer distances proposed by TCE, **Alex Tresadern, for the Ørsted IPs,** referred back to TCE's Responses to ExQ1 of the examination of the Outer Dowsing Offshore Wind (Generating Station) Project (as provided in Appendix 1 of the Ørsted IPs' Deadline 1 Submission **[REP1-086]**), in which TCE stated that the 7.5km separation distance "*was used for the purpose of processing project proposals in the tender only, being higher than the 5km buffers that are specified within the seabed lease agreements (introduced in Round 3); this was for the purpose of de-risking the Round 4 tender by providing additional mitigation and assurance to participants through limiting proximity*". In that submission, TCE also acknowledged that "*inter-farm wake effects can extend beyond these buffer distances*". In response to submissions made by the collective of Dogger Bank Offshore Wind Farm Project 1 Projco Limited, Dogger Bank Offshore Wind Farm Project 2 Projco Limited and Dogger Bank Offshore Wind Farm Project 3 Projco Limited (together the **Projcos**) in relation to significance and compensation, **Alex Tresadern, for the Ørsted IPs**, stated that the Ørsted IPs are in agreement with the submissions made by the Projcos in relation to these matters and that from the Ørsted IPs' perspective, the position relating to the significance of the effects from wake loss from the DBS Project on the remaining Ørsted IPs' assets will be furthered by the above-mentioned FIA. *Post Hearing Note: The Ørsted IPs also refer to the final row in the table contained in Section 3 of this document on the matter of significance.* In response to discussions regarding consultation responses to the draft National Policy Statements (**NPS**), **Alex Tresadern, for the Ørsted IPs,** noted some points from the Ørsted IPs' consultation response in relation to the matter of compensation that had been discussed. While the Ørsted IPs support elements of the proposed wording on wake effects in the draft NPS EN-3, the Ørsted IPs are concerned by the text proposed in paragraphs 2.8.233 and 2.8.316 of draft NPS EN-3 which is unhelpful, potentially contradictory, and may not encourage applicants to reach an agreement. It could be inferred that compensation is not

	necessary and that this issue falls outside of the planning process. The Ørsted IPs firmly believe that the planning process offers the only time bound, legally secure way to ensure impacted projects are adequately protected and a precedent is not set whereby a new project is permitted to pull the rug from underneath existing assets (that are already operational and are currently benefitting the UK) without adequate mitigation and/or compensation. Compensation agreements are a form of mitigation that is likely to be necessary to address residual impacts not addressed by other (physical) mitigation (e.g. spacing out turbines, different layouts, operational strategies, etc). Without the planning lever, there is a risk that offshore wind projects will be materially commercially impacted by waking projects with no recourse. This is a serious concern for the Ørsted IPs and other impacted developers, setting a precedent that is contrary to the points made by the ExA during ISH6 regarding decision-making pragmatism. Paragraph 2.8.233 of draft NPS EN-3 is unhelpful and potentially contradicts earlier wording in the NPS which states that applicants should take "*all reasonable steps to minimise as far as possible*" as this could be considered to include compensation where appropriate. This level of detail regarding a specific impact and the appropriateness of compensation is not found elsewhere in the NPS. The statement that there is "*no expectation…that inter-project compensation arrangements are a necessary means to mitigate the impact of wake effects...*" is inappropriate and assumes the outcome. There are physical mitigation measures that can reduce wake impacts, but it is unlikely these measures will be sufficient to remove the concern over remaining wake. Compensation may be required as a form of mitigation as part of the "*reasonable steps*" taken by the applicant to protect asset viability. *Post Hearing Note: The Ørsted IPs also wish to note that, in respect of paragraph 2.8.316 of draft NPS EN-3, it is vital that this paragraph is subject to the policy in paragraph 2.8.314 of draft NPS EN-3. This recognises that new proposals could affect the viability of existing or consented offshore infrastructure or activity and in such circumstances substantial weight should be given to such adverse effects in decision making. It would be wholly inappropriate and unreasonable for the policy to apply a different threshold to offshore wind projects whose future viability is threatened by wake effects. The Ørsted IPs have proposed new wording for these paragraphs as part of their consultation response.* *It is anticipated that the financial impact of the wake effects of the DBS Project on the remaining Ørsted IPs assets are significant, due to the sums of money (likely significantly in excess of £100m) in question. Therefore, it is reasonable under the current regime of the NPS that wake impacts are mitigated and/or that the Ørsted IPs be adequately compensated for this.* *In any event, whilst compensation is not directly referred to in the relevant paragraphs of the extant NPS EN-3, there is a broader consideration regarding co-existence that brings compensation into play. Paragraph 4.3.4 of NPS EN-1 states that "to consider the potential effects, including benefits, of a proposal for a project, the applicant must set out information on the likely significant environmental, social and economic effects of the development, and show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for" (emphasis added). The Applicants not compensating the Ørsted IPs would set a precedent whereby a commercial rival developing a new project is enabled to devalue existing operational assets by tens or hundreds of millions of pounds without consequence, i.e. without having to shoulder the burden of, or in any way share the pain of, coexistence.* *The policy drive of the current NPS regime includes the requirement for applicants to implement best efforts to work with owners of existing infrastructure to ensure adverse effects are addressed and/or resolved, which could include compensation; indeed, this is a perfectly valid form of mitigation for economic impacts, as it can reduce an economic impact from a significant level to*

	an acceptable level (or at least to a not significant level) and is often the only form of mitigation that is available and/or practicable in relation to human environment impacts. *The policy drive of the relevant sections of NPS EN-3 is for new offshore wind development to engage with existing sea users to ensure that the effects of proposed developments are appropriately mitigated, such that co-existence is possible.* *While compensation is not specifically mentioned in the relevant paragraphs of NPS EN-3 (though it is in NPS EN-1, per the above), the expectation of NPS EN-3 is clearly that applicants for new development will implement best efforts to engage with existing sea users on adverse effects and identify solutions. For example, this is how fisheries coexistence has typically been managed – and, in addition, Fisheries Liaison and Co-Existence Plans usually provide for compensation payments for commercial losses (the Fishing Liaison with Offshore Wind and Wet Renewables Group published best practice guidance in 2015, which includes disruption settlements, and the Applicants have indeed provided such a mechanism through its Outline Fisheries Liaison and Co-Existence Plan **[REP4-056]** at section 4.4, the provisions of which are secured through the deemed marine licences). In addition, the Ørsted IPs note that the Applicants have proposed these disruption payments as a mitigation measure for the Dredge and Inshore static gear receptors in Chapter 13 (Commercial Fisheries) of the Environmental Statement **[APP-119]**, stating that they will "encourage coexistence through disruptions payments and cooperations agreements in accordance with FLOWW guidance. This will be detailed in the Outline Fisheries Liaison and Coexistence Plan".* *The expectation is that applicants take a broad approach to addressing adverse effects, and there is no reason why this cannot include compensation. The mitigation of economic loss is routinely secured within DCOs, whether in the form of a requirement or protective provisions.* *Furthermore, governmental targets and intentions (e.g. the Clean Power 2030 Action Plan) will be impacted if co-existence is not prioritised in line with the position set out above, between existing and new assets – practically, within the industry, it should not be the case (as proposed by the Applicants) that a new project is permitted to pull the rug from underneath existing assets (that are already operational and are currently benefitting the UK) without adequate mitigation and/or compensation.* In response to further discussions regarding the buffer distances proposed by TCE, **Alex Tresadern, for the Ørsted IPs,** referred again to TCE's Responses to ExQ1 of the examination of the Outer Dowsing Offshore Wind (Generating Station) Project (as provided in Appendix 1 of the Ørsted IPs' Deadline 1 Submission **[REP1-086]**), in which TCE stated that "*inter-farm wake effects can extend beyond these buffer distances*". **Mr Tresadern** also noted, in the context of the Ørsted IPs' consultation response to the draft NPS, the Ørsted IPs are recommending that the reference to "*nearby*" in paragraph 2.8.176 of draft NPS EN-3 is deleted, as distance between offshore wind farms is only one part of the equation, i.e. separation distance will not necessarily be the primary factor determining wake effect – for example, relative positioning with respect to the predominant wind direction may have a greater bearing on wake effect than distance alone, alongside other factors such as 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. The Ørsted IPs consultation response therefore proposes to remove the word "*nearby*" in this paragraph and replace this, via text at the end of the paragraph, to ensure that it applies to offshore wind generating stations "*which have the potential to be impacted*".

	The ExA asked the Ørsted IPs if they agreed with the findings of the Applicants' Greenhouse Gas Sensitivity Analysis of Wake Effects **[REP5-034]**. **Alex Tresadern, for the Ørsted IPs,** stated that a response to this question would be provided in writing. *Post Hearing Note: The Ørsted IPs note that this comprises Action Point 5 of the ISH6 Action Points **[EV11-002]**. The Ørsted IPs have reviewed the Applicants' Greenhouse Gas Sensitivity Analysis of Wake Effects **[REP5-034].** The document includes a sensitivity of the carbon payback period considering the wake impacts that the DBS Project will have on neighbouring windfarms. Although the document uses generic wake scenarios of 0.5%, 1% and 2%, which are less preferable than direct modelling of the wake impacts, the document can be assessed alongside the Applicants' Addendum to Wake Effects – Response to ISH3 Action Points **[AS-179]** to assess the net carbon benefit of the DBS Project. In the case of the Ørsted IPs' assets, the predicted wake loss is between 0.35% and 0.75% (considering the average of the TurbOPark + Correction and VV 3.4 results presented in Table 2. The EV-DAWM results are not considered, as the Applicants state that "it should be noted that while EV DAWM performs reasonably well at shorter ranges, it is known that its performance worsens the further wakes travel") and this can be interpreted relative to the 0.5% and 1% wake loss scenarios. Additionally, the Applicants assume a 35-year lifetime for the waked assets, which is a reasonable assumption given current knowledge.* *However, the document fails to consider a reasonable worst-case scenario whereby the stand-alone and/or cumulative wake loss caused by the DBS Project, including in combination with the Outer Dowsing Offshore Wind (Generating Station) Project, results in the early decommissioning of one or more existing neighbouring wind farm(s), resulting in the entire production of that asset being lost for a potentially significant period of time. This topic has been raised in other recent DCO examinations where wake loss has been discussed, and it should also be a consideration as part of the DBS Project's Environmental Impact Assessment. Including this scenario would improve the robustness of this document.*

3. ØRSTED IPS' RESPONSES TO RULE 17 LETTER

Reference	Question	Ørsted IPs' Response
R17.23	**Infrastructure and other users – Wake loss – mitigation** Do you agree with the applicants' statement in paragraph 66 of **[REP4-099]** that if any wake mitigation was to be applied to the proposed development, it must also be "reasonable", and do you agree with the criteria for reasonableness regarding mitigation which the applicants set out under table 4?	The Applicants state that for a wake mitigation to be considered reasonable it must: (1) have a meaningful impact; (2) not significantly harm the net generated renewable energy; and (3) be proven possible and implementable with available technology by the date of construction of the wind farm. In general, these criteria seem sensible, and the Ørsted IPs would not disagree with any of them. However, the criteria contain ambiguous words, such as "*meaningful*" and "*significant*", which the Applicants then choose how to interpret later in **[REP4-099]**. The Applicants provide some extreme examples of what would be unreasonable (for example, if a wind farm must curtail its capacity factor by half to bring a 1% gain to another) but fail to provide any examples that would support a reasonable mitigation. Finally, the Applicants require mitigations to be proven possible, which raises the risk that the Applicants are the decision-makers as to whether a technology is proven, when they have a clear incentive to avoid mitigation and maximise the production from their own asset.
R17.24	**Infrastructure and other users – Wake loss – mitigation** Do you consider that there are any additional wake loss mitigation measures which the applicants should consider other than those set out in table 5 of **[REP4-099]**?	The mitigation measures described in this document are targeted at physical or technological mitigations. While these are a very sensible starting point, given that the wake impact is an economic impact on the surrounding wind farms financial compensation should also be included as an option an offshore developer may choose to pursue in order to mitigate the wake effect. According to the assessment criteria defined by the Applicants, one additional physical mitigation the Applicants could consider is delaying the construction of the DBS Project and hence reducing the temporal overlap with the neighbouring wind farms. This mitigation was presented as part of representations made by BP plc (**BP**) in the context of the German North Sea leasing rounds. In that case, BP advocated for mitigation for wake effects arising from the proposed new windfarms at their own sites. BP's proposed mitigation measures included delaying tendering for the sites (to reduce temporal overlap with BP's developments) and a reduction to the power density of the sites. This topic has been discussed in other recent DCO examinations. This physical mitigation would pass the Applicants' criteria: (1) it would have a meaningful impact on the neighbours of the DBS Project as 100% of the wake loss would be deferred; (2) it would result in an increase in the net generated energy, as there would be less wake both caused by the DBS Project on its neighbours and also wake from the neighbours affecting the DBS Project; and (3) there would be no technology barriers to delaying the construction. The Ørsted IPs would not expect the Applicants to pursue this mitigation, though, as it would be damaging to the economic viability of the DBS Project; however, this illustrates that another important criterion in assessing whether a wake mitigation is reasonable is economic viability of both the project causing the wake effect and the projects suffering the wake loss.

R17.29	**Infrastructure and other users – Wake loss – mitigation** Provide a comprehensive view on the mitigation measures set out in section 7 of 'Wake Effects - Response to Issue Specific Hearing 3 (ISH3) Action Points' **[REP4-099]**. Do you consider the findings to be reliable – why or why not?	The Applicants have listed six potential wake mitigation methods and discussed whether they can pass the criteria the Applicants have put forward to assess whether the mitigations can be considered reasonable. The Applicants have not performed any site-specific analysis of the mitigations, yet dismiss them all as unworkable based on very limited analysis from a different wind farm and their opinion about future technological solutions. The design of an offshore wind farm is very specific to the wind conditions, the seabed, the lease area, the turbine technology, the operational philosophy and many other physical parameters. No two wind farms are identical and hence the Ørsted IPs believe it is necessary for any mitigations to be assessed, in accordance with standard EIA practice, using the DBS Project site and its neighbours, rather than using generic assumptions or other sites which do not share the same characteristics. Unfortunately, the Applicants have failed to assess any of the mitigation measures for the actual situation facing the DBS Project site. In section 7.3, the Applicants demonstrate that, for a site in the Irish Sea with different wind speed and direction distributions and different neighbours, increasing the buffer to one neighbour did not increase the overall production. The Applicants also refer to a generic study undertaken by Fraser Nash for TCE, which they state is in broad agreement. The Applicants do not discuss how this should be applied or interpreted in the context of the DBS Project. It does not follow that simply because increasing buffer distance did not work for one site, that it will never work for any site or that this can be considered a general result. The Applicants should be requested to perform a similar study on buffer distance for the neighbours of the DBS Project. In section 7.4, the Applicants report that they have investigated designing their wind farm to maximise the combined production of both the DBS Project and the neighbouring Dogger Bank A offshore wind farm (**DBA**), and that in some cases a total increase of 0.1% AEP has been achieved. The Applicants have only attempted this optimisation for DBS West and not for the entire development considering the total area available to place turbines. Nor have other neighbouring wind farms been considered. The Applicants then dismiss this approach as "*the impact…is insignificant*". This conclusion seems very premature and the Ørsted IPs recommend that further investigations are undertaken on the entire DBS Project array, also considering other neighbours. The Ørsted IPs have examples from their portfolio where a "*co-design*" of two neighbouring wind farms has resulted in a net positive increase in production versus the situation where each wind farm is designed to maximise its own production. Meaningful mitigations may be possible for the DBS Project through further investigation into layout modification. In section 7.5, the Applicants only consider a very large reduction of 50% of the DBS Project's capacity and do not then use the full area available to them to place the remaining turbines. It is obvious that removing half of the turbines would not be a reasonable mitigation with respect to delivering against UK offshore wind targets; however, the Applicants use this unrealistic scenario

		to produce a general conclusion that this method is unreasonable. The Applicants should investigate whether more limited reductions in capacity would result in a situation where a meaningful reduction in wake loss on neighbouring wind farms could be achieved without significant harm to the net generated renewable energy. Additionally, there may be benefits to the performance of remaining turbines in the DBS Project due to reductions of the internal wake loss through reduced turbine density if the whole area available to the Applicants is used. In section 7.6, the Applicants explain how neighbour wake mitigation could be achieved through wake steering and induction control. However, it is not clear whether the Applicants think these technologies are unsuitable to mitigate external wakes or whether they are not available. In both cases, at the very least, these technologies require a watching brief to see whether developments between now and the construction of the DBS Project will mature the technology to allow wakes to be mitigated In section 7.7, the Applicants explain wake reenergisation, a promising emerging technology to increase the rate of wake recovery from the surrounding air. The paper referenced by the Applicants opens with the line: "*Recent advancements in the use of active wake mixing (AWM) to reduce wake effects on downstream turbines open new avenues for increasing power generation in wind farms*". The Applicants prematurely conclude that "*…they won't be industry-ready for at least 15 years*" without any justification or explanation. The Applicants also prematurely (given that research in this area is still developing) conclude that "*these methods are only likely to have a minimal impact if any*". In section 7.8, the Applicants discuss another proposed mitigation strategy referred to as wind farm curtailment, which includes direction curtailment or wind sector management. The Applicants refer to a single study completed on a different wind farm where only one control strategy was investigated. The investigated strategy was to completely shut off all turbines when they were causing wakes on their neighbour and, unsurprisingly, they found that this resulted in a net negative energy production. For most real-world situations, the control strategy is not to turn off turbines, but to operate them slightly less aggressively for specific wind directions. Unfortunately, the Applicants again use a single unrealistic example from a different wind farm to completely discount the entire concept. They conclude with the statement that "*note that the same conclusion will hold for other curtailment strategies. Partial directional curtailment will have a lower but still net-negative impact*" without any justification or analysis to back up this statement. Finally, in the conclusions to the document the generic assumptions that no mitigations are possible are repeated and presented in a table. The Ørsted IPs do not believe that these conclusions are justified for the DBS Project based on the evidence presented. No site-specific studies have been performed, only very unrealistic and extreme scenarios have been assessed on one other wind farm. Finally, the Applicants have pronounced that technologies are immature and will not work, long before the science has reached this conclusion.

R17.32	**Infrastructure and other users – Wake loss – significance of effect** In EIA terms, what do you consider the significance of effect from wake loss impacts would be on the Ørsted IPs? Set out clear justification for your conclusions.	In the Applicants' document entitled Wake Effects – Response to ISH3 Action Points **[REP4-099]**, the Applicants allege that the effects from wake loss from the DBS Project on DBA are of low sensitivity and negligible magnitude, meaning that the significance of these effects is negligible in EIA terms. The Applicants then state, in their Addendum to Wake Effects – Response to ISH3 Action Points **[AS-179]**, that because the impacts on any other wind farms (i.e. including the remaining Ørsted IPs that hold objections to the DBS Project relating to wake loss) will be smaller than for DBA, these impacts will therefore also be not significant. The Ørsted IPs note that previously in the examination, in Chapter 16 (Infrastructure and Other Users) of the Environmental Statement **[REP1-011]**, the Applicants stated that "*the sensitivity of offshore wind farms to interference is high*". The Applicants state, in **[REP4-099]** at paragraph 59, that "'*Interference' is taken to mean direct interference with the receptor. The wake effects dimension of an offshore wind farm fall into an unusual category which, as noted, there is no guidance or custom or practice. The Applicants' headline position is that this cannot properly be regarded as an 'environmental effect'. Forced to bring it within this framework, the Applicants consider that the sensitivity to wake effects in an EIA context, the most applicable rating would be Low. This takes account of the context of The Crown Estate's buffer system, which has taken account of wake effects as a factor in the distance set*". The Ørsted IPs disagree with a number of the Applicants' points here. The Ørsted IPs consider that wake loss assessments are essential to business cases for offshore wind farms, and do not agree that wake effects cannot be regarded as an 'environmental effect', given that other economic impacts on other sea users (relating to, for example, oil and gas, shipping or fishing) are routinely assessed as part of a DCO application for an offshore wind farm. In addition to the submissions made above and below relating to TCE's buffer system, the Ørsted IPs do not consider that TCE intended that the 7.5km buffer they set would absolve developers of all wake effects extending beyond 7.5km (clearly, because such wake effects could still cause economic loss in excess of £100m) – TCE simply set this buffer as a distance within which active consent would be required. Whilst the Ørsted IPs agree with the Applicants that there is little precedent or guidance on how to apply the EIA definitions of sensitivity, magnitude and significance of effect to the impacts relating to wake loss – a situation that also applies for many other forms of economic impact that proposed offshore wind farms impose on other sea users – the Ørsted IPs have nevertheless responded to this question from the ExA by addressing the same EIA limbs as considered by the Applicants in **[REP4-099]**. The Ørsted IPs disagree with the Applicants' position on this matter. <u>Receptors</u> The relevant receptors are the Hornsea 1, Hornsea 2 and Hornsea 3 offshore wind farms.

		Sensitivity The Applicants argue that the most applicable rating for the sensitivity to wake effects in an EIA context would be 'Low', in the context of TCE's buffer system and the distances between the relevant projects. However, as set out in Section 2 above, the Ørsted IPs note the TCE's Responses to ExQ1 of the examination of the Outer Dowsing Offshore Wind (Generating Station) Project (as provided in Appendix 1 of the Ørsted IPs' Deadline 1 Submission **[REP1-086]**), in which TCE stated that "*inter-farm wake effects can extend beyond these buffer distances*". In addition, the distance between offshore wind farms is only one part of considerations regarding (amongst other things) sensitivity, i.e. separation distance will not necessarily be the primary factor determining wake effect – for example, relative positioning with respect to the predominant wind direction may have a greater bearing on wake effect than distance alone, alongside other factors such as 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 loss of generation. Further, the Ørsted IPs' assets are of high value and importance, being Nationally Significant Infrastructure Projects (and Critical National Priority projects, per draft NPS EN-3) making significant contributions to the government's policy objectives, including the Clean Power 2030 Action Plan. The Ørsted IPs' assets are vulnerable to the effects from wake loss 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 of the effects from wake loss in the absence of mitigation and/or compensation, as the impact on energy yield will endure for as long as the Ørsted IPs' assets are operational. The Ørsted IPs therefore consider that the sensitivity rating for the Ørsted IPs' assets is, without doubt, higher than 'Low'. Magnitude The Applicants argue that the impact magnitude is assessed to be 'Negligible', primarily due to the percentage figures for wake loss resulting from the assessment. As stated above, the Ørsted IPs are, for the time being, willing to rely on the figures for wake loss presented in the Applicants' assessment for Hornsea 1, Hornsea 2 and Hornsea 3. However, the Ørsted IPs do not agree that these figures warrant a 'Negligible' impact magnitude. Whilst the figures may appear low in terms of percentage of energy yield, the impacts represent a significant economic loss for the Ørsted IPs' assets. The Ørsted IPs are in the process of preparing a Financial Impact Assessment, which will be submitted into the examination as soon as possible and which is expected to show that the economic loss for the Ørsted IPs' assets as a result of the

		effects of wake loss from the DBS Project exceeds £100m. It cannot be the case that such estimated financial losses are of 'Negligible' magnitude in EIA terms. The Ørsted IPs consider it obvious that no other sea user identified within NPS EN-3, including the owners of other offshore infrastructure, navigation and shipping stakeholders and commercial fisheries stakeholders, would accept that an economic impact in excess of £100m can be of 'Negligible' magnitude in this (or any) context. The duration of the impact is also significant from a magnitude perspective – as stated above, the impact on energy yield will endure for as long as the Ørsted IPs' assets are operational. The Ørsted IPs therefore consider it obvious that these sums of money and the commercial impacts that must also be considered warrant a higher impact magnitude than 'Negligible'. The Ørsted IPs are happy to update their analysis on this matter once the figures in the above-mentioned Financial Impact Assessment are available. <u>Significance</u> Giving consideration to the arguments presented above, the Ørsted IPs consider that effects from wake loss from the DBS Project on the Ørsted IPs' assets is likely to be major (significant), thereby meriting consideration of mitigation and/or compensation. The Ørsted IPs also consider that they have already taken a reasonable approach to the significance of wake impacts on their assets via the withdrawal of the objections to the DBS Project, with regard to wake impacts only, for Hornsea 4, Race Bank, Lincs and Westermost Rough – i.e. the Ørsted IPs are only focusing on, and continuing to object in relation to wake impacts for, their assets (Hornsea 1, Hornsea 2 and Hornsea 3) that will be significantly impacted by the proposed DBS Project.

4. ØRSTED IPS' RESPONSES TO APPLICANTS' DEADLINE 5 SUBMISSIONS

4.1 As set out in paragraph 1.6 above, the Ørsted IPs note that Deadline 6 of the examination affords an opportunity for Interested Parties to comment on submissions made by the Applicants at Deadline 5. However, the Ørsted IPs consider that the points they would wish to make in relation to the Applicants' submissions are either already covered within this document or via previous submissions made by the Ørsted IPs during the examination. Therefore, to avoid simply repeating their arguments, the Ørsted IPs have only responded to the Applicants' Deadline 5 submissions to the extent they feel it necessary to do so via this section.

Burbo Bank Extension and Walney Extension Offshore Wind Farms

4.2 In the Applicants' Responses to Deadline 4 Documents **[REP5-037]**, the Applicants requested that the Ørsted IPs provide further information regarding the consideration of wake effects in the consenting process for the Burbo Bank Extension and Walney Extension offshore wind farms. In response to this, the Ørsted IPs note that in 2011/12, during the pre-DCO application consultation period for Ørsted's (then DONG Energy's) proposed Burbo Bank Extension offshore wind farm, RWE raised concerns regarding potential wake loss effects that the proposed project might have on its Gwynt y Môr offshore wind farm. At that point in time, RWE's Gwynt y Môr offshore wind farm was under construction. In response to these concerns, the DCO applicant (Burbo Bank Extension) undertook a quantitative assessment of wake effects – the EIA assessment and its conclusion were presented in Chapter 23 ('Other Infrastructure and Licensed Activities') of this project's Environmental Statement in March 2013. The assessment undertaken reflected the understanding of far-field wake effects available to the offshore wind sector at the time; however, as noted by the Ørsted IPs in this submission, advances in the offshore wind sector's understanding of far-field wake effects over recent years have confirmed that significant wake effects extend significantly further than was thought to be the case in 2011-13. This Environmental Statement also states that RWE reviewed the wake impact study and accepted the conclusion.

4.3 In addition, the following text is stated at paragraph 21.7.3 of Chapter 21 ('Other Infrastructure and Licensed Activities') of the Environmental Statement that was submitted as part of the Walney Extension offshore wind farm DCO application in June 2013: "*The physical presence of the Project's [Walney Extension's] wind turbines will cause a wake-loss effect on the adjacent Walney I & II, and West of Duddon Sands offshore wind farms. Confidential commercial compensation methodologies have been agreed with the operators of the Walney I & II and West of Duddon Sands offshore wind farms. In view of the confidential nature of these agreements, specific details of the assessment of wake loss are not made public within the ES. In general terms, wake loss is a function of the wind farm power density (MW/km2), rather than the relative mix if the three main contributing factors, i.e. the density of the wind farm, the rotor diameter, and the individual wind turbine capacity*".

Hornsea Four

4.4 In relation to the cooperation agreement between the Applicants and Orsted Hornsea Project Four Limited, the Ørsted IPs have confirmed to the Applicants that they still wish to progress with this agreement and therefore continue to await the provision of a draft of this agreement from the Applicants.

APPENDIX 1

UPDATED 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;

"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;

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

"relevant project" means all or any of Hornsea One, Hornsea Two or Hornsea Three 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);

"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).