SHEPHERD+ WEDDERBURN

**Submission on behalf of (1) Barrow Offshore Wind Limited (ref: 20049974) (2) Burbo Extension Ltd (ref: 20049975) (3) Walney Extension Limited (ref: 20049977) (4) Morecambe Wind Limited (ref: 20049973) (5) Walney (UK) Offshore Windfarms Limited (ref: 20049978) (6) Ørsted Burbo (UK) Limited (ref: 20049976) (the "Ørsted IPs")**

In response to Action Point 8 of the Actions Arising from Issue Specific Hearing 1 - Project Definition and Draft Development Consent Order [EV3-009], the Ørsted IPs have submitted the documents outlined below relating to the evidence and data that they wish to rely on to support the contention of potential for loss of yield due to wake effects. These documents are accompanied by an explanatory memorandum.

| **Index of Documents Concerning Assessment of Wake Effects Provided in Response to Action Point 8 in Actions Arising From ISH1** | |
|---|---|
| **Satellite Observations & Aircraft** | |
| 1. | Platis, A., Siedersleben, S., Bange, J. et al. First in situ evidence of wakes in the far field behind offshore wind farms. Sci Rep 8, 2163 (2018). |
| 2. | Platis, A et al. Long-range modifications of the wind field by offshore windparks – results of the project WIPAFF. Meteorologische Zeitschrift Vol. 29 No. 5 (2020) |
| 3. | Hasager, C.B.; Vincent, P.; Badger, J.; Badger, M.; Di Bella, A.; Peña, A.; Husson, R.; Volker, P.J.H. Using Satellite SAR to Characterize the Wind Flow around Offshore Wind Farms. Energies 2015, 8. |
| **Scanning LiDAR** | |
| 4. | J. Schneemann et al. Cluster wakes impact on a far-distant offshore wind farm's power. Wind Energ. Sci., 5, 2020 |
| 5. | B. Cañadillas et al.: Offshore wind farm cluster wakes as observed by long-range-scanning wind lidar measurements and mesoscale modelling. Wind Energ. Sci., 7, 2022 |
| **Wake and other atmospheric Models** | |
| 6. | D. Rosencrans et al.: Seasonal variability of wake impacts on offshore wind plant power production. Wind Energ. Sci., 9, 2024. |
| 7. | Akhtar, N., Geyer, B., Rockel, B. et al. Accelerating deployment of offshore wind energy alter wind climate and reduce future power generation potentials. Sci Rep 11, 11826 (2021). |
| 8. | R. Borgers et al.: Mesoscale modelling of North Sea wind resources with COSMO-CLM. Wind Energ. Sci., 9, 2024 |
| 9. | Sara C. Pryor, Rebecca J. Barthelmie, Tristan J. Shepherd. Wind power production from very large offshore wind farms. Joule 5, October 20, 2021. |
| 10 | P. Baas et al. Energy production of multi-gigawatt offshore wind farms. Wind Energ. Sci., 8, 2023. |
| 11 | Sanchez Gomez M. et al. Can mesoscale models capture the effect from cluster wakes offshore? Journal of Physics: Conference Series 2767 (2024) 062013 |
| 12 | Stoelinga M. et al 'Estimating Long-Range External Wake Losses in Energy Yield and Operational Performance Assessments Using the WRF Wind Farm Parameterization' |
| **Orsted SCADA Presentation** | |
| 13 | Presentation by Nygaard, Nicolai at wind Europe Technology Workshop (June 2023): "Wind farms interacting with the boundary layer: Impact of long-distance wakes between offshore wind farms assessed using operational data". |