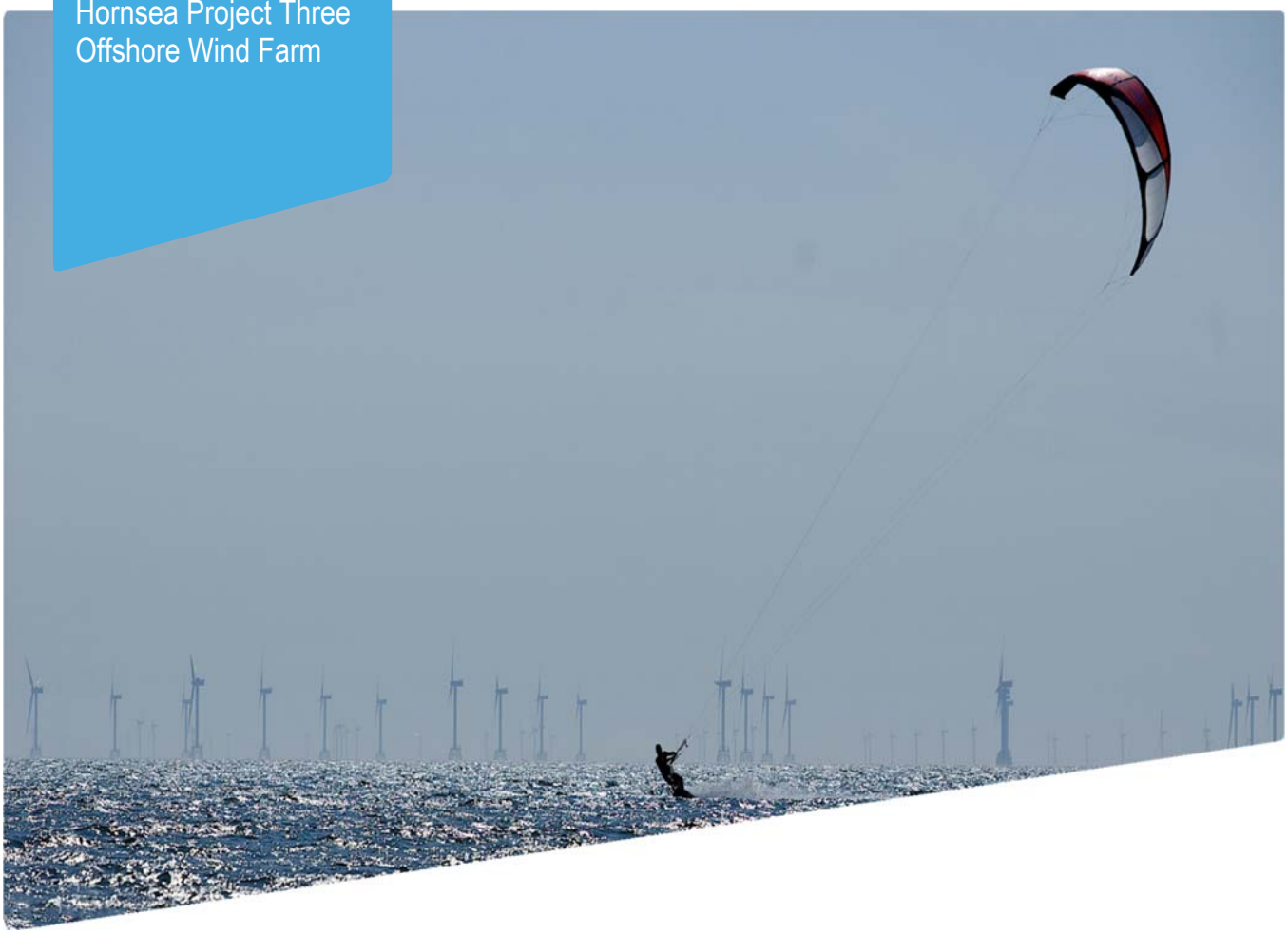
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Appendix 44 deadline 7 submission - Areas of agreement on the J6A data analysis

Date: March 2019

Hornsea 3
Offshore Wind Farm

Ørsted

Appendix 44 deadline 7 submission - Areas of agreement on the J6A data analysis

Ørsted

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Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

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1. Introduction

1.1 This technical note documents the outcome of a meeting held between the Applicant and Spirit Energy on 13th March 2019 to discuss the criteria and methods used in the analysis of the J6A met data. Details are provided on the areas of agreement and method of analysis below. The meeting was constructive in aligning the two parties in the analysis of the dataset.

1.2 For the Deadline 7 submission (14th March 2019), it has not been possible for the Applicant to re-analysis the J6A dataset to implement the areas of agreement listed in this note in order to provide a revised quantification of the number of precluded days. An updated position with regards to the number of precluded days will be provided to the Examining Authority at Deadline 8.

2. Areas of agreement on the J6A data set analysis

Topic	Criteria required	Orsted	Spirit Energy
		Agree or comment to be provided	Agree or comment to be provided
1. Flight restricted	1.1 sea state greater than or equal to 6 m SWH (significant wave height)	Agree	Agree
	1.2 and/or wind speed greater than or equal to 60 knots.	Agree – Orsted to apply gusts >60 knots	Agree – Spirit Energy have considered gusts>60knots
	1.3 Cloud base ≤200 ft day or ≤300 ft night	Agree	Agree
	1.4 Visibility <1500m	Agree	Agree
	1.5 Icing conditions. Surface temperature ≤4°C AND cloud base <1000 ft	Agree	Agree Spirit also applying a requirement that weather description includes "Sunny" and/or "Fair"
2. VMC +enroute descent	2.1 VMC Day: Cloud base greater than or equal to 600ft and Visibility greater than or equal to 4 km	Agree	Agree
	2.2 VMC Night: Cloud base greater than or equal to 1200ft and visibility greater than or equal to 5 km	Agree	Agree
3 VMC (shuttle)	3.1 VMC (shuttle) Day: Cloud base greater than 300 ft and visibility greater than or equal to 2km	Agree	Agree

	3.2 VMC (shuttle) Night: Cloud base greater than 500 ft and visibility greater than or equal to 5 km	Agree	Agree
4 IMC (ARA)	IMC conditions are defined as when it is not VMC 4.1 IMC (ARA) Day (not VMC day and cloud base greater than or equal to 300ft and visibility greater than or equal to 1.5 km)	Agree	Agree
	4.2 IMC (ARA only) night (not VMC night and cloud base greater than or equal to 400ft and visibility greater than or equal to1.5 km)	Agree	Agree
5 Flight restricted due to Hornsea Three	5 Wind direction All take off and landings are assumed to be into wind	Agree	Agree

3. Method of analysis

Topic	Description of method	Orsted	Spirit Energy
		Agree or comment to be provided	Agree or comment to be provided
Day	Duration of day	Orsted have applied day as 06- 18:00 and 06-21:00 for June and July.	Daylight taken as 30mins before sunrise to 30mins after sunset on each day. Night taken as from 30mins after sunset to 30mins before sunrise on each day. Correction to be applied to include 09:00 and 21:00 within night when appropriate.
Availability	Flight schedules	Orsted have considered arrival and departure can occur at any time.	Spirit Energy have considered shift patterns. Flights must arrive and depart 9 hours later. A further amendment is being made to recognise that unless flights are possible near the start of a 12hr shift, a whole day will be lost.
Corrupted data	Data rows removed that are corrupted	Corrupted rows to be added to dataset	No action required

Duplicate data	Data rows ignored that are duplicate	No action required	Spirit to remove any duplicate rows

4. Summary of findings

4.1 The Applicant and Spirit Energy had a consultation meeting on 13 March 2019 to align on the J6A data analysis.

4.2 The session was productive in that agreement was reached on the assumptions used for the purposes of the analysis (Note Spirit Energy agreement to space requirements for manoeuvres is subject to validation by helicopter operators and simulator evaluation of pilot workload and environmental factors including turbulence). The analysis of frequency of occurrence of cloud base and visibility for types of flights available was in broad agreement. The main differences have been identified to be due to the following factors:

- Spirit Energy has assumed a 9-hour available shift pattern is required. Flights arriving must then be able to depart 9 hours later. The Applicant considered flights could take place at any time.

Ørsted comments	Spirit Energy Comments
The Applicant does not consider shift patterns can be realistically applied to the data set (considering the data is at 3-hour intervals). The data set is not sufficiently robust to calculate this with accuracy.	In order to assess the impact upon Spirit Energy operations (which is the purpose of the exercise) it is necessary to recognise that in order to conduct work on a NUI: 1. A flight to and from the NUI has to be possible near the start of the maintenance team's 12hr shift; and 2. A flight to and from the NUI has to be anticipated to be possible towards the end of the maintenance team's 12hr shift; and 3. A flight to and from the NUI has to actually be possible towards the end of the maintenance team's 12hr shift. It is recognised that 3hrly data does not resolve the transient nature of some weather such as passing fog patches or storms. Spirit is modifying its analysis to assume that the flight taking personnel to the facility could be at 06:00 or 09:00 and the return flight could be at 15:00 or 18:00 where the first flight was at 06:00 or at 18:00 where the first flight was at 09:00.

- Spirit Energy has excluded no fly days in all percentage calculations (apart from % of no-fly days). Orsted have not excluded no fly days.

Ørsted comments	Spirit Energy Comments
The Applicant has not excluded no fly days as the Applicant aims to present what is available now and what is available after the wind farm. The Applicant considers that if no fly days are excluded it reduces the size of the dataset, which means any future reduction in availability will have a larger effect.	The purpose of the analysis is to identify the impact of the windfarm. Days on which flights are already not possible should not be included as this situation is not changed by the presence of the windfarm.

- Spirit Energy has considered a restriction on the availability of VMC flights due to proximity with Hornsea Three. They have considered a requirement for VGA flights requiring 2 nm.

Ørsted comments	Spirit Energy Comments
The Applicant is not in agreement with this approach as they consider that the industry requirement for VGA flights to be 1 nm with a stabilisation point at 0.5 nm. The only helicopter industry guidance on offshore stabilised approaches shows (paragraph 2.2.1.1 of HeliOffshore, 2017) the commencement of the straight in approach from 1nm, with a stabilisation gate at 0.5nm. Stabilisation is required after this 0.5nm gate. Examples of stabilisation criteria are shown at paragraph 2.2.1.2 of HeliOffshore, 2017). Examples of DVE (degraded visual conditions) or night offshore approaches are shown in 2.2.1.3 where the level sector is shown from 1nm, again with a stabilisation point at 0.5nm.	Spirit Energy note that several North Sea helicopter operators have implemented VGA approaches with a requirement that the final 2nm is in a straight line (upwind) to the platform. Other operators are considering doing likewise. The purpose of VGA is to standardise visual approaches ensuring the aircraft is in a stabilised configuration prior to the final approach. Currently, pilots have considerable discretion on a visual approach.
The Applicant has considered that take-off distance is not a limiting factor due to the separation distance proposed by the Applicant.	Spirit Energy has considered the spatial requirements for all manoeuvres, including take-off that would be carried out based on the weather conditions at each time in the met-ocean database and evaluated the impact on Spirit operations as a function of the proximity the Hornsea Three array. It should be noted that when the wind allows approaches clear of the array, take-off becomes the limiting factor.