

Hornsea Project Three  
Offshore Wind Farm



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Appendix 3 to deadline 10 submission - Update to Assessment  
of Airborne Radar Approaches to Spirit Energy operated  
platforms potentially restricted by Hornsea Three using  
J6A data

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Offshore Wind Farm

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## Changes since Deadline 9 submission (REP9-051)

The Applicant has noted some errors in the calculations presented in this technical note at paragraphs 3.3, 3.4, 3.9, 5.4 and 5.5. These have now been corrected and the report resubmitted. The corrections have made no substantial change to the findings in the report.

### 1. Introduction

- 1.1 The Applicant provided a technical note at D7 (Appendix 21 to Deadline 7 submission - Assessment of Airborne Radar Approaches to Spirit Energy operated platforms potentially restricted by Hornsea Three using J6A and Met Office data; REP7-040) (J6A data report) to validate the assessment on Airborne Radar Approaches (ARA) to Spirit Energy platforms considered in Volume 5, Annex 8.1: Aviation, Military and Communication Technical Report of the Environmental Statement (APP-113) with meteorological data from the J6A platforms (J6A data) provided by Spirit Energy (email 18 January 2019).
- 1.2 Since the drafting of the J6A data report the Applicant has had a consultation meeting with Spirit Energy (13 March 2019) in order to reach agreement on the analysis and methodology applied to the J6A data. The meeting has been able to deliver a joint position on the assumptions used and methodology applied which was submitted at Deadline 7 and has since been refined following further consultation between Spirit Energy and the Applicant and resubmitted at Deadline 9 (Joint position on assumptions submitted at Appendix 25 to deadline 9).
- 1.3 Broad agreement has been reached on the weather criteria and the availability of flights. The meeting identified why there had been differences between the number of days affected by Hornsea Three as presented by the Applicant and those represented by Spirit Energy. The Applicant identified the need to change only one of the criteria applied. As an outcome of the meeting the Applicant has refined their analysis of the J6A data.
- 1.4 This technical note provides an addendum to J6A data report (Appendix 21 to Deadline 7). It advises what changes the Applicant has applied to the data and presents a summary of the revised results.
- 1.5 The Applicant can advise that the percentage of flights potentially affected by Hornsea Three remains similar to that presented in the J6A data report (Appendix 21 to Deadline 7).
- 1.6 This technical note also provides a comparison with the values submitted by Spirit Energy in their meteorological data analysis on p17 of their submission at D7 and in the joint position statement submitted by the Applicant and Spirit Energy at Appendix 25 to Deadline 9.
- 1.7 It should be noted that the effect of Hornsea Three on the available flights to the Grove platform is much less than that to the Chiswick platform (Volume 5, Annex 8.1: Aviation, Military and Communication Technical Report of the Environmental Statement (APP-113)) however because the analysis of the J6A data set has assumed that all ARA flights from any westerly direction are potentially affected by Hornsea Three the results of the assessment provides an equal restriction to both platforms.

## 2. Changes to the J6A data analysis made by the Applicant

2.1 The criteria used in the assessment is listed in Table 2.1 below. Only one criteria required amendment by the applicant, The change to this criteria is shown in the table. A separation distance of 2.8 nm has been applied to this analysis from Hornsea Three to the Chiswick platform.

Table 2.1: Criteria used in assessment

Number	Topic	Criteria Required	Changes applied
1	Flight restricted	Sea state greater than or equal to 6 m SWH (significant wave height) and/or wind speed greater than or equal to 60 knots, and icing conditions.	Icing conditions criteria was agreed to be surface temperature <= 4C and cloud base <= 1000 ft  Maximum wind speed was changed to include gusts >=60 kt at 50 m
2a	VMC +en route descent (day)	VMC Day: Cloud base greater than or equal to 600 ft and Visibility greater than or equal to 4 km	No change
2b	VMC +en route descent (night)	VMC Night: Cloud base greater than or equal to 1200ft and visibility greater than or equal to 5 km	No change
3a	VMC (shuttle) (day)	VMC (shuttle) Day: Clear of cloud at 300 ft and visibility greater than or equal to 2 km	No change
3b	VMC (shuttle) (night)	VMC (shuttle) Night: Clear of cloud at 500 ft and visibility greater than or equal to 5 km	No change
4a	IMC day	IMC conditions are defined as when it is not VMC.IMC Day (not VMC day)	No change
4b	IMC night	IMC Night (not VMC night)	No change
5a	IMC (ARA)	IMC (ARA) Day (not VMC day and cloud base greater than or equal to 200ft and visibility greater than or equal to 1.5 km)	No change
5b	IMC (ARA)	IMC (ARA) night (not VMC night and cloud base greater than or equal to 300ft and visibility greater than or equal to 1.5 km)	No change

Number	Topic	Criteria Required	Changes applied
7	ARA restricted	ARA lower limits are set in accordance with requirement to descend to 200 ft day (clear of cloud) and 300 ft night (clear of cloud) and being able to see platform from Missed Approach Procedure (MAP) (0.75 nm).	No change

### 3. Results of Assessment

#### Annual average (day and night combined)

- 3.1 The total percentage of time flights are restricted as a combined annual total for day and night is presented in the table below. This assumes that flights can take place any time day or night because Spirit Energy has confirmed that night flights will be available at the platforms (see Spirit Energy response to ExA further written questions at Deadline 4; REP4-138).
- 3.2 Based on the analysis of the J6A data, the total percentage of time flights are precluded due to weather restrictions is 8.6%. This is considered to be the base case (without Hornsea Three). The total percentage of times that flights are restricted due to the presence of Hornsea Three, without considering weather restrictions, is 6.7%. The total percentage of time flights are precluded due to the presence of Hornsea Three but are precluded any way due to the weather restrictions is 3.2%.
- 3.3 The effect of Hornsea Three is therefore to increase the total percentage of restricted flights by 3.5% ~~(or 1 day)~~.

Table 3.1: Annual percentage flight availability Day and Night

	Annual (%) average (day and night combined)
Total percentage of time flights are precluded due to weather restrictions (base case without Hornsea Three)	8.6%
Total percentage of time flights are precluded due to presence of Hornsea Three (without including weather restrictions).	6.7%
Total percentage of time flights are precluded due to the presence of Hornsea Three and are also precluded due to the weather restrictions	3.2%
<b>Increase in flight restrictions due to the presence of Hornsea Three</b>	<b>3.5%</b>

### Annual Average (Day and Night)

- 3.4 The total percentage of time flights are restricted as a separate annual average for day and a separate annual average for night is presented in the ~~Table 3.2~~ Table 3.2 below.
- 3.1 The results show that for an annual average (day), 5.1% of the time all helicopter flights are currently precluded due to weather (including, wind speed, wave height, cloud base, visibility and icing conditions). 77% of flights can be flown VFR, En Route and Shuttle (or ARA). An additional 10% can be flown shuttle, Circling ARA (or ARA) and the remaining 7.9% can only be flown ARA.
- 3.2 The annual average percentage of time that ARA flights (day) are potentially restricted to the Chiswick and Grove platforms due to the presence of Hornsea Three (i.e. approaches being required from an easterly direction) without weather restrictions is 5.3%. The annual average percentage of time that ARA flights (day) are potentially restricted to the Chiswick and Grove platforms due the presence of Hornsea Three but are restricted any way due to the weather restrictions is 2.6 %.
- 3.3 The total increase in the annual percentage of time that ARA flights (day) are potentially restricted to the Chiswick and Grove platforms due the presence of Hornsea Three is 2.7%.
- 3.4 The effect of Hornsea Three is therefore to increase flight restrictions in the day to the Chiswick and Grove platforms by 2.7 % ~~(or 0.7 days)~~.
- 3.5 ~~Table 3.2~~ Table 3.2 presents the percentage of weather minima as an annual average for night for different flight approaches.
- 3.6 The results show that as an annual average 10.5% of the time all flights are currently restricted due to weather (including, wind speed, wave height, cloud base, visibility and icing conditions). 63% can be flown VFR, En Route and Shuttle (or ARA). An additional 8% can be flown Shuttle, circling ARA (or ARA) and the remaining 18.5% can only be flown ARA.
- 3.7 The annual average percentage of time that ARA flights (night) are potentially restricted to the Chiswick and Grove platforms due to the presence of Hornsea Three (i.e. approaches being required from an easterly direction) is 9.7%. The annual average percentage of time that ARA flights (night) are potentially restricted to the Chiswick and Grove platforms due the presence of Hornsea Three but are restricted any way due the the weather restrictions is 4%.
- 3.8 The total increase in the annual percentage of time that ARA flights (night) are potentially restricted to the Chiswick and Grove platforms due the presence of Hornsea Three is 5.7%.
- 3.9 The effect of Hornsea Three is therefore to increase flight restrictions in the night to the Chiswick and Grove platforms by 5.7 % ~~(or 1.6 days)~~.

Table 3.2: Annual percentage flight availability Day and Night

	Annual (%) average day	Annual (%) average night
Total percentage of time VFR, en route, shuttle Circling ARA (and ARA) available	77	63
Total percentage of time Shuttle, Circling ARA (and ARA) available	10	8
Total percentage of time only ARA available	7.9	18.5
Total percentage of time flights are precluded due to weather restrictions (base case without Hornsea Three)	5.1	10.5
Total percentage of time flights are precluded due to presence of Hornsea Three (without including weather restrictions)	5.3	9.7
Total percentage of time flights are precluded due to the presence of Hornsea Three and are also precluded due to the weather restrictions	2.6	4.0
<b>Increase in flight restrictions due to the presence of Hornsea Three</b>	<b>2.7</b>	<b>5.7</b>
*Weather restrictions include wind speed/icing/wave height/visibility and cloud base (Table 2.1).		
** All easterly wind directions considered to result in restricted approaches due to Hornsea Three		

### Monthly Data

- 3.10 The percentage of weather minima for flight options is presented for each month for daytime flights in [Table 3.3](#).
- 3.11 The range in IMC conditions which restrict flights to ARA only is 0% (February/March) to 13.6% (April).
- 3.12 The percentage of time flights are restricted due to weather restrictions (base case) range from 0% in August to 18.4 % in April.
- 3.13 The percentage of time flights may be restricted due to Hornsea Three (considering all easterly winds) range from 0% (July and August) to 21.1% in April. The percentage of time flights may be restricted due to Hornsea Three but would be restricted due to weather restrictions any way range from 0 % (June, July, August and November) to 9.8% in May.
- 3.14 The increase in the percentage of time flights may be restricted due to Hornsea Three from the base case range from 0 % (July, August and September) to 11.2% in April.



- 3.15 Table 3.4 ~~Table 3.4~~ presents the percentage weather minima for each month for night flights. The range in IMC conditions which restrict flight to ARA only is 10.9% (October) to 32.5% (April).
- 3.16 The percentage of time flights are restricted due to weather restrictions (base case) range from 0% in August and November to 35.4 % in March.
- 3.17 The percentage of time flights may be restricted due to Hornsea Three (considering all easterly winds) range from 0% (August) to 26.9% in May. The percentage of time flights may be restricted due to Hornsea Three but would be restricted due to weather restrictions any way range from 0% (July, August, October, November and December) to 12.5% in March.
- 3.18 The increase in the percentage of time flights may be restricted due to Hornsea Three from the base case range from 0 % (August) to 15.8% in April.

Table 3.3: Weather minima and flight availability Day operations

Criteria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	%	%	%	%	%	%	%	%	%	%	%	%
VFR, en route and shuttle (and ARA) available	80	81	61	52	68	76	91	93	85	83	81	73
Shuttle (and ARA) available	11	12	14	12	9	10	5	6	8	9	11	15
ARA only available	6.3	0	0	13.6	11.3	7.7	2.9	1	3.6	6.1	6.6	6
Flight restricted due to weather*	2.7	9.9	28	18.4	11.7	6.3	1.1	0	3.4	1.9	1.4	6
Flights restricted by Hornsea Three**	5.3	3.5	9.6	21.1	16.0	0.6	0.0	0.0	1.4	1.9	2.1	2.7
Flights restricted by Hornsea Three already restricted by weather	2.0	2.8	4.5	9.9	9.8	0.0	0.0	0.0	1.4	0.6	0.0	0.7
<b>Increase in restricted flights due to Hornsea Three</b>	<b>3.3</b>	<b>0.7</b>	<b>5.1</b>	<b>11.2</b>	<b>6.2</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.3</b>	<b>2.1</b>	<b>2</b>

Criteria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
* Weather restriction includes wind speed/icing/wave height/visibility and cloud base.												
** All easterly wind directions considered to result in restricted approaches due to Hornsea Three.												

Table 3.4: Weather minima and flight availability Night operations

Criteria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	%	%	%	%	%	%	%	%	%	%	%	%
VFR, en route and shuttle (and ARA) available	62	70	45	37	58	58	77	80	77	76	68	58
Shuttle (and ARA) available	10	6	3	6	4	9	6	6	6	12	17	4
ARA only available	22.4	14.8	12.6	32.5	21.9	20.7	15.3	14	14.6	10.9	15	25.8
Flight restricted due to weather*	5.6	9.2	35.4	24.2	16.1	12.3	1.7	0	2.4	1.1	0	12.2
ARA available flights restricted by Hornsea Three**	6.7	11.5	18.8	25.3	26.9	5.3	3.3	0.0	2.4	2.1	1.2	6.7
Flights restricted by Hornsea Three already restricted by weather	3.3	4.6	12.5	9.5	11.8	1.8	0.0	0.0	1.2	0.0	0.0	0.0

Criteria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Increase in restricted flights due to Hornsea Three	3.4	6.9	6.3	15.8	15.1	3.5	3.3	0	1.2	2.1	1.2	6.7
* Weather restriction includes wind speed/icing/wave height/visibility and cloud base.												
** All easterly wind directions considered to result in restricted approaches due to Hornsea Three.												

### Comparison of the revised results with data presented in the J6A data report

- 3.19 A comparison of the revised results with the previous results presented in the J6A data report (Appendix 21 and Deadline 7 (REP7-040)) is presented in [Table 3.5](#)~~Table 3.5~~ below for day and [Table 3.6](#)~~Table 3.6~~ for night.
- 3.20 The flight restrictions (day) due to weather (base case) has reduced from that previously reported (from 6.7% to 5.1%). The increase in flight restrictions due to Hornsea Three from the base case has increased from that previously reported by an increase of 1.6% (from 1.1% to 2.7%). This change is due primarily to the amendments made to the assessment criteria for weather restrictions (see Table 2.1).
- 3.21 The flight restrictions (night) due to weather (base case) has increased from that previously reported (from 5.1% to 10.5%). The increase in flight restrictions due to Hornsea Three from the base case has increased from that previously reported by an increase of 3.6% (from 2.1% to 5.7%). This change is due primarily to the amendments made to the assessment criteria for weather restrictions (see Table 2.1).

Table 3.5: Summary Annual percentage flight availability (day)

Scenario	Annual average day (%)	Monthly range day (%) minimum	Monthly range (%) maximum	Annual average day (%)	Monthly range day (%) minimum	Monthly range (%) maximum
	J6 A data report			Revised data		
VFR, en route and shuttle (and ARA) available	82.6	58 (April)	95.7 (August)	77	52 (April)	93 (August)
Shuttle (and ARA) available	10.4	0 (Februray)	20.3 (April)	10	5 (July)	15 (December)

ARA available	0.3	0 (February / March)	9.4 (April)	7.9	0 (February / March)	13.6 (April)
Flight restricted due to weather	6.7	0 (August)	29.5 (February)	5.1	0 (August)	28 (March)
Flight restricted due to Hornsea Three	Not presented	Not presented	Not presented	5.3	0 (July/August)	21.1 (April)
Flights restricted by Hornsea Three already restricted by weather	Not presented	Not presented	Not presented	2.6	0 (June/July/ August/November)	9.9 (April)
<b>Increase in restricted flights due to Hornsea Three</b>	<b>1.1</b>	<b>0 (February, June, July August)</b>	<b>4 (May)</b>	<b>2.7</b>	<b>0 (June/July/ August)</b>	<b>11.2 (April)</b>

Table 3.6: Summary Annual percentage flight availability (night)

Topic	Annual average night (%)	Monthly range (%) minimum	Monthly range (%) maximum	Annual average night (%)	Monthly range (%) minimum	Monthly range (%) maximum
	J6A Report			New data		
VFR, en route and shuttle (and ARA) available	85	67.9 (April)	93.7 (July)	63	37 (April)	80 (August)

Shuttle (and ARA) available	4.1	0 (February)	10.8 (December)	8	3 (March)	17 (November)
ARA available	5.8	0 (February)	18.2 (April)	8.5	10.9 (October)	32.5 (April)
Flight restricted due to weather*	5.1	0 (August and November)	21.1 (March)	10.5	0 (August/ November)	35.4 (March)
Flight restricted due to Hornsea Three**	Not presented	Not presented	Not presented	4	0 (August)	26.9 (May)
Flights restricted by Hornsea Three already restricted by weather	Not presented	Not presented	Not presented	9.7	0 (June/July/ October/ November/ December)	12.5 (March)
<b>Increase in restricted flights due to Hornsea Three</b>	<b>2.1</b>	<b>0 (August and November)</b>	<b>8.88 (April)</b>	<b>5.7</b>	<b>0 (August)</b>	<b>15.8 (April)</b>

#### 4. Comparison with Spirit Energy data presented at D7 and at D9

- 4.1 Spirit Energy submitted a 9% restriction on flights due to the presence of Hornsea Three at Deadline 7 (REP7-093) for a separation distance of 2.5 nm and 3 nm (therefore representative of the 2.8nm separation as provided by the Applicant). The Applicant and Spirit Energy have reassessed the data and have provided a joint approach at Appendix 25 to Deadline 9. In this document Spirit Energy have presented a refined value of 5% for a separation distance of 2.8 nm.
- 4.2 This value is 1.5% higher than the values calculated by the Applicant of 3.5%. However, the Applicant's value of 3.5% has considered both day and night as this was the value previously requested by Spirit Energy (Spirit Energy response to ExA further written questions at Deadline 4; REP4-138).

4.3 When day and night values are considered separately the Applicant has calculated the increase in restriction of flights due to Hornsea Three as 2.7% (day) and 5.7 (night). Spirit Energy's value of 5% is 2.3% higher than the Applicants value (day) and 0.7% lower than the Applicants value (night).

4.4 The Applicant advises that based on the meeting with Spirit Energy on 13 March 2019 and the submission at p17 of Deadline 7 (REP7-093), and a subsequent telecom held with Spirit Energy on 20 March 2019, the difference in values provided by Spirit Energy and the Applicant are considered by the Applicant to be due to the following reasons:

**Flight availability**

4.5 The Applicant has presented flight availability for day and night combined as this was previously requested by Spirit Energy. In order to provide a better comparison with Spirit Energy, the Applicant has also presented the flight availability for day and for night, respectively. The Applicant is not clear how night flights have been considered by Spirit Energy.

**Icing conditions**

4.6 The Applicant and Spirit Energy agreed the criteria to be applied to icing conditions during the meeting on 13 March 2019. Subsequent to this Spirit Energy advised that they have applied an additional test to the criteria that they have used for icing conditions which is that the data should also be sunny and/or fair. By adding this test, the Applicant believes that the percentage of days restricted by weather (base case) is reduced and therefore the increase in percentage of days restricted due to Hornsea Three will be increased.

4.7 The reasoning is that icing conditions are defined as: temperature below 0°C and visibility <1000 m and visible moisture in the air. By setting the surface temperature to  $\leq 4^{\circ}\text{C}$  this will be 0°C at the Minimum Safe Altitude (MSA). Setting the cloud base to  $\leq 1000$  ft will capture visibility <1000 m (i.e. in cloud) and visible moisture in the air as agreed by Spirit Energy and the Applicant. The Applicant is not aware how sunny or fair is defined for the J6A dataset or at what height. Sunny or fair have no clear relation to icing conditions and could result in a reduction in the number of days lost at present.

**No fly days.**

4.8 Spirit have calculated 3% no fly days. The Applicant advises that Spirit Energy have only taken account of the times of no fly that fit in with shift patterns. No fly days have not been calculated for day and night. Spirit Energy stated the need for night flying throughout their submissions. It is therefore surprising that they do not consider times of no fly separately both for day and for night.

4.9 The Applicant understands that Spirit Energy have removed the total percentage of no fly days from the data set. This is statistically not correct as it will reduce the number of data points which are assessed and therefore increase the percentage of days reported as being affected by Hornsea Three.

**Shift Patterns**

4.10 Spirit Energy have assessed the data taking into consideration shift patterns (06:00 to 15:00 or 18:00 and 09:00 – 18:00). The Applicant considers these shifts restrictive on what is available as Spirit Energy have now got available night flights (so a 21:00 could be used for example) or as per Spirit Energy submission response to ExA further written questions at D4 (REP4-138) an earlier flight could be flown (depart 06:00 return 12:00 if the weather is closing in).

4.11 In addition, the Applicant does not consider it realistic to apply shift patterns using a three-hour weather data as a single point in time could very well be a patch of bad weather which five minutes later has passed.

## 5. Summary of Findings

5.1 The Applicant considers that good progress has been made between the Applicant and Spirit Energy in aligning the data sets and the assumptions and the criteria used in the data assessment.

5.2 The Applicant has refined the results presented in the previous J6A data report (Appendix 21 to Deadline 7(REP7-040)). The total percentage increase in flights (day) restricted due to the physical presence of Hornsea Three has increased by 1.6% from that reported in the J6A data report to a total value of 2.7%.

5.3 The total percentage increase in flights restricted (night) due to the physical presence of Hornsea Three has increased by 3.6 % from that reported in the J6A data report to a total value of 5.7%.

5.4 The results from the reassessment of the J6A data show that ARA flights to the Chiswick platform and Grove platform are restricted by the presence of Hornsea Three (at a distance of 2.8 nm from the Chiswick platform) for day and night combined, for 3.5% ~~or approximately one day per year.~~

5.5 The results from the reassessment of the J6A data show that ARA flights to the Chiswick platform and Grove platform are restricted by the presence of Hornsea Three (at a distance of 2.8 nm from the Chiswick platform) for day for 2.7 % or approximately 0.79.9 days per year, which is less than comparable to the value reported in Volume 5, Annex 8.1: Aviation, Military and Communication Technical Report of the Environmental Statement (i.e. up to 3.49 days per year for the Chiswick platform at a distance of 1.5 nm and up to 1.31 for the Grove platform at a distance of 2.4 nm) and so this restriction is considered to remain a low occurrence.

5.6 A night value was not reported in the Volume 5, Annex 8.1: Aviation, Military and Communication Technical Report of the Environmental Statement as flights were not authorised to the Chiswick or Grove platforms at the time of submission of the Environmental Statement. This value is considered a low occurrence.

5.7 The Applicant considers that good progress has been made on aligning the results between the Applicant and Spirit Energy. Whilst differences remain these are only 1.5 % (for day and night combined) and 2.3% (for day) and 0.7 % (for night).