Hornsea
Offshore Wind Farm Project One

REPORT

HORNSEA PROJECT ONE – NAME PLATE CAPACITY AND LIMIT OF DEVIATION WORK AREA DCO AMENDMENTS

SUPPORTING STATEMENT

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1. Hornsea Project One Offshore Wind Farm

The Hornsea Offshore Wind Farm Project One (Hornsea Project One) is the first project to be developed in the Hornsea Zone, with a total generation capacity of 1,200MW. The Development Consent Order (DCO) was granted on the 10th of December 2014 and was corrected on 30th April 2015 by the Hornsea One Offshore Wind Farm (Correction) Order 2015. The 2014 DCO was subsequently amended by the Hornsea One Offshore Wind Farm (Amendment) Order 2016. The undertakers named in the DCO are Heron Wind Limited ("Heron") Njord Limited ("Njord") and Vi Aura Limited ("Vi Aura") (the Project One Companies). Heron and Njord are owned 100% by DONG Energy Wind Power A/S ("DONG Energy"). Vi Aura is owned 100% by Heron.

DONG Energy Wind Power A/S ("DONG Energy") took over full ownership of the project on the 4th February 2015 and will take the project through into construction and operation. Hornsea Project One was one of the first eight projects to receive a Contract for Difference (CfD) from the Department of Energy and Climate Change (DECC). Construction of the onshore substation commenced in January 2016 and Final Investment Decision was taken on the project in February 2016.

2. The Purpose of this Document

The Project One Companies require an amendment to the Hornsea Project One name plate capacity by 1.5% from 1,200MW to 1,218MW and an amendment to the limits of deviation of the wind farm areas within the overall consented Order Limits in order to amend the internal boundaries of Wind Farm Areas 1, 2 and 3. This document outlines the reasons for the changes sought and the implications of the proposed changes and the case for these changes constituting a non-material amendment to the Hornsea Project One DCO and Deemed Marine Licences (DML) 1, 2 and 3, though the DMLs will be dealt with through a separate process.

2.1 Name Plate Capacity

The fundamental driver behind this minor change is the need to reduce the cost of electricity from offshore wind, which is a key Government objective. Fewer, larger capacity turbines significantly reduce costs. DONG Energy made the following public statement in June 2015 when announcing its decision to use 7MW turbines on this project:

"*Our decision to make Siemens the preferred supplier for our Hornsea Project One wind farm is a crucial step in our efforts to lower cost of electricity. The 7MW turbine is an upgrade of the 6MW platform which we know very well from Westermost Rough in the UK and Gode Wind 1+2 in Germany. Larger and more cost efficient WTGs are key to reach our strategic target of reducing cost of electricity from offshore wind to 100 €/MWh in 2020.*

The decision by Siemens to open new production facilities in Hull on the British east coast is a key factor in bringing down the cost of WTGs for this project. This preferred supplier agreement will both help reduce the cost of offshore wind and create and retain real jobs in UK.

Besides being the preferred turbine for Hornsea Project One, Siemens turbines will also be used at Race Bank and Walney Extension Phase 2[1], which was announced earlier in 2015."

[1] Race Bank will use a 6MW turbine and Walney Extension Phase 2 will use a 7MW

DONG Energy is leading the offshore wind market in being prepared to commit to larger capacity turbines which can then be proved in the water for the benefit of the wider industry and delivery of energy security and climate change goals. In the case of Hornsea Project One, DONG Energy has already made, in June 2015, a contractual commitment to Siemens to secure the 7MW turbine for the project.

The added benefit of using fewer, larger capacity machines is that it is normally the case that the vast majority of the impacts of the project are significantly reduced, compared to using a larger number of smaller capacity turbines. In other words, the vast majority of the 'worst case' impacts in a given project envelope are associated with the largest number of (smaller) turbines. This means that selecting the 7MW turbine will mean a clear overall benefit in terms of reduced impacts.

The corollary to the use of the 7MW turbine is that it is essential that the maximum use is made of the DCO which has been granted, for the overall economics of the project.

The DCO for Hornsea Project One defines the "authorised development" as:

"The nationally significant infrastructure project comprises two or, subject to paragraph 3, three offshore wind generating stations with a combined gross electrical output capacity of up to 1,200MW as follows—".

The term 'gross electrical output capacity' is not defined in the DCO and there is no statutory definition or definition within case law. DONG Energy has taken it to mean 'aggregate name plate capacity'. The name plate capacity of the wind farm is defined as the name plate capacity rating of a WTG multiplied by the number of turbines. It could, however, be argued that the aggregate output capacity of the wind farm should be measured at the export side of offshore substations, as that is a more meaningful measurement in electrical system terms. This output will always be slightly lower than the nameplate capacity, due to array cable losses between the turbines and the substations and at Hornsea Project One will not exceed 1200MW.

DONG Energy has carried out extensive analysis of the proposed layout of the turbines, taking into account the need to maximise energy yield and the various constraints in the DCO and after discussions with relevant stakeholders. DONG Energy has concluded that the optimum number of turbines for the project is 174 turbines of 7MW capacity. Measured at the export side of the offshore substations this represents an installed capacity of 1,200 MW. Measured by way of aggregate nameplate it represents a capacity of 1,218 MW, a difference of 1.5%.

To avoid any debate as to compliance with the DCO, the Project One Companies propose to increase the name plate capacity i.e. the gross electrical output capacity stated within the DCO of Hornsea Project One from 'up to 1,200MW' to 'up to 1,218MW'. The maximum energy exported to the grid would not exceed 1,200MW.

2.2 Internal Wind Farm Boundary Changes

An amendment is required to the limits of deviation for Wind Farm Areas 1, 2 and 3 (Work Nos 1, 2 and 3) detailed within the DCO and DML 1, 2 and 3 to alter their internal boundaries within the Order

Limits. This arises from the layout finalisation work referred to above and through discussions with the Maritime and Coastguard Agency and Trinity House on requirements for the layout of Hornsea Project One. The DCO was always structured to allow for two or three wind farms, which would each operate separately. It was necessary when drafting the DCO to decide the coordinates of the sea areas for both scenarios i.e. two or three wind farms.

DONG Energy has decided to use the DCO to construct three wind farms. Part of the finalisation of the design of the three wind farms has involved deciding which turbines will 'belong' to which wind farm. This analysis has led to a different allocation of the total sea area within the Order Limits across the three wind farms than that which is currently provided for in the DCO in the 'three wind farm' scenario. This means that the sea area needs to be re-allocated between the wind farms under the DCO, by altering the relevant coordinates. No other changes are involved. After discussions with DECC it has been concluded that the appropriate route for this change is a non-material amendment to the DCO, rather than the use of the transfer of benefit provisions between undertakers under Article 34 of the DCO. These revised boundaries will be aligned with the project areas in the lease documentation with The Crown Estate and the Contract for Difference documentation.

The amendments that will be required to the DCO to reflect these proposed changes are shown in the track changed version of the DCO which is enclosed within a separate appendix of this application. A draft Amendment Order to give effect to all proposed changes is enclosed within a separate appendix of this application.

2.3 Structure of the Document

The structure of the document is outlined below:

Section 3 Project Parameters – Consented Envelope and Proposed Changes
Section 4 Assessment of Materiality
Section 5 Cumulative Impacts with Subsequent Non- Material DCO amendment
Section 6 Pre- Submission Stakeholder Consultation
Section 7 Conclusion

3. Project Parameters – Consented Envelope and proposed changes

3.1 Name Plate Capacity Amendment

The Hornsea Project One Environmental Statement (ES), as submitted with the DCO, stated worst case parameters. The stated name plate capacity of 1,200MW was used to determine the composition and numbers of turbines required for Hornsea Project One under different permutations. It was not, in itself, a consideration used for environmental assessment (Chapter 3 - Project Description, Table 3.4 of ES).

As explained above, the Project One Companies propose to increase the name plate capacity of Hornsea Project One to 1,218 MW. The potential effect of this change on the worst case parameters as detailed in the ES are detailed in **Table 3.1**. These are the only parameters relevant to the proposed name plate capacity change and therefore the only ones presented.

Table 3.1 WTG and inter array cabling worst case parameters and required design envelop changes associated with an increase in name plate capacity. (Parameters are taken from Table 3.4 and 3.13 respectively of the Hornsea Project One ES, with details of final consented parameters from the DCO)

Element	ES Minimum	ES Maximum	Parameter value as determined by DCO	Proposed Change from Consented Parameters
Number of WTGs	-	332	DCO consented up to 240	No Change
WTG capacity(MW)	3.6 (but see column 'DCO Minimum DCO Maximum')	8	Based upon a maximum number of turbines of 240 (with no mix of turbine capacity included) the minimum turbine size is 5MW. Up to an 8MW turbine was assessed within the ES.	No Change (though the maximum allowable number of 6MW, 7MW and 8MW turbines, would be 203,174,152 respectively and all remain below 240 number of turbines)
Project capacity (MW)	-	1,200	1,200	1,218
WTG spacing (m)	924	-	924	No change
Hub height (m)	82	-	82	No change
Upper blade tip height (m)	-	200	200	No change
Lower blade tip height (m) RELATIVE T O…	22	-	22	No change
Rotor diameter (m)	-	178	178	No change
Foundation type		Monopile, Jacket, Gravity Base (including mono suction caisson)	Monopile, Jacket, Gravity Base (including mono suction caisson)	No change
Seabed area affected per WTG (m^2)	-	6,362 (Per WTG, includes scour, based on Jacket (Suction Piles)	6,362	No change
Project total seabed area affected (m^2)	-	2,112,093	N/A	No final design, will not change
Spoil Arisings per WTG (m^3)	-	17,839	N/A	No final design, will remain within consented limit
Project spoil volume (m^3)	-	1,721,262 (Based on GBF)	N/A	No final design, will remain within consented limit
Total combined length of inter-array cable (km)	-	450	450	No final design, will remain within consented limit
Seabed Area Affected by inter-array cable protection (m^2)	-	450,000	450,000	No final design, will remain within consented limit
Installation Methods	Jetting, ploughing, trenching, rock-cutting, surface laying, pre-laying works as necessary, and installation of scour protection. Dependent on ground conditions.		N/A	No change
Pile Driving	Up to 2300KJ hammer for the largest monopoles.		N/A	Up to 2300KJ hammer for the largest monopoles.

3.1.1 Turbine Capacity Scenarios for 1,218MW Name Plate Capacity

DONG Energy is not proposing to make any changes to the maximum number of turbines, size of turbines or methods of construction which are consented within the DCO. During the examination for Hornsea Project One, mitigation for the scheme for the impacts on birds was provided through the removal of the 3.6MW turbine from the project design envelope[2]. This resulted in a design envelope comprising turbine ranges from 5 – 8 MW, as such the DCO as consented was based upon assessments of 150 x 8MW and 240 x 5MW WTGs

Although 174 7MW turbines is now the intended scenario that Hornsea Project One will employ, this project design envelope refinement is not part of the DCO amendment. As such if the amendment to increase the name plate capacity is granted it would also permit the use of up to 203 6MW or 154 8MW turbines. To generate a name plate capacity of 1,218MW using 5MW turbines would require a total of 243 turbines, which would exceed the DCO consent of 240 turbines and therefore this option cannot be used to generate a maximum capacity of 1,218MW.

The environmental effects of the use of 6MW, 7MW and 8MW turbines has been considered and assessed within this report to ensure that the increase in capacity would not exceed the worst case scenario assessed in the ES under any consented turbine scenario. Note that the Project One Companies are not considering using a combination of different capacities of turbines to reach the required name plate capacity.

Table 3.2 lists the realistic WTG scenarios which can be implemented to generate a name plate capacity of up to 1,218MW. As noted in Table 3.1, this involves an increase in the maximum permissible number of 6MW, 7MW and 8MW turbines by 3, 3 and 2 respectively, compared to the 1,200MW name plate capacity. The key issue then is whether any of these minor increases has an effect on any worst case scenario in the ES, and if so whether that could justify the change being regarded as material. This is considered in detail in Section 4, where it is concluded that there is no effect on any worst case scenario.

All turbine capacity and numbers of turbines considered are within the headline parameters consented within the DCO. Whilst the analysis in this Statement considers the full permissible range of 5MW to 8MW, the commercial reality is that the chance of DONG Energy constructing anything other than 7MW turbines is extremely remote. This is because, as noted above, it already has a contractual commitment with Siemens to deliver 7MW machines for Hornsea Project One. In addition DONG Energy is required to meet key milestone dates in the construction and commissioning of the project to comply with the Contract for Difference awarded by DECC in 2013, which was and is fundamental to the commercial viability of the project. To change to a different turbine capacity would involve a major delay to the entire project, put the Contract for Difference under threat and incur major expense.

Table 3.2 Capacity and number of turbine to generate a name plate capacity of up to 1,218MW

Capacity of turbine	No of turbines	Name Plate Capacity
6MW	203	1,218MW
7MW	174	1,218MW
8MW	152	1,216MW

[2] This is covered in the Applicant's Ornithological Summary Appendix J to the Response submitted for Deadline VII Application Reference: EN010033

3.2 Internal Wind Farm Area Boundaries Amendment

Hornsea Project One is divided into three distinct Wind Farm Areas. These correspond to 'Work Numbers' within the DCO. Work Numbers are listed in Part 1 of Schedule 1 to the DCO and are defined by reference to the Wind Farm Area in which they are to be situated.

Wind Farm Area 1 (Work No.1) is permitted to comprise up to 80 or, if no part of Wind Farm Area 3 (Work No.3) is constructed, up to 120 WTGs. It also includes a network of inter-array cables between the WTGs and substations and (potentially) an offshore accommodation platform which may be connected to one of the OSSs.

Wind Farm Area 2 (Work No. 2) is permitted to comprise up to 80, or, if no part of Wind Farm Area 3 (Work No.3) is constructed, up to 120 WTGs fixed to the seabed. It also includes a network of inter-array cables between the WTGs and substations and (potentially) an offshore accommodation platform which may be connected to one of the OSSs.

Wind Farm Area 3 (Work No.3) is permitted to comprise up to 80 WTGs. It also includes a network of inter-array cables between the WTGs and substations and (potentially) an offshore accommodation platform which may be connected to one of the OSSs.

Article 3 of the DCO grants development consent to the following undertakers:

- Heron Wind Limited (Heron) to carry out all other authorised works, including the construction, maintenance and operation of Work No. 1;
- Njord Limited (Njord) to construct, maintain and operate Work No. 2; and
- Vi Aura Limited (Vi Aura) to construct, maintain and operate Work No. 3.

DONG Energy is the owner of Njord and Heron (which owns Vi Aura) and so has full control over Hornsea Project One.

Wind Farm Area. 1, 2 and 3 were designed to allow either of the following scenarios in the same overall total sea area:

- Two wind farms (Wind Farm 1 and 2) built up to 120 WTGs in each area; or
- Three wind farms (Wind Farm 1, 2 and 3) built up to 80 WTGs in each area.

The Project One Companies have decided to take forward three wind farm projects.

Through continued development of Hornsea Project One and in finalising the layout for the WTGs it has become apparent that the current internal boundaries of Wind Farm Areas 1, 2 and 3 would lead to the following technical consequences:

1) A suboptimal layout with significant additional geotechnical survey required
2) Three different sized offshore sub stations, requiring the design process to be re-initiated causing significant programme delay.

The Project One Companies propose to amend the limits of deviation for Work Nos. 1, 2 and 3 set out by reference to coordinates in Tables 1, 2 and 3 in Part 1 of Schedule 1 to the DCO. The same amendment would also need to be made to the coordinates set out in Table 1 in Schedule 8, Table 1 in Schedule 9 and Table 1 in Schedule 10 to the Order, which contain the associated Deemed Marine Licences (DML) for Work Nos. 1, 2 and 3. The latter will need to be done through a separate application to the MMO as it is not possible for the DCO amendment regime to amend a DML.

No changes are required to the limits of deviation for Work Nos 4 - 12.

The consented and proposed limits of deviation are given in **Appendix A. Figure 1** illustrates the existing consented and proposed amendments to Wind Farm Areas 1, 2 and 3 boundaries.

Table 3.3 below shows the relative sea areas in km^2 between the Wind Farm Areas under the existing and proposed coordinates.

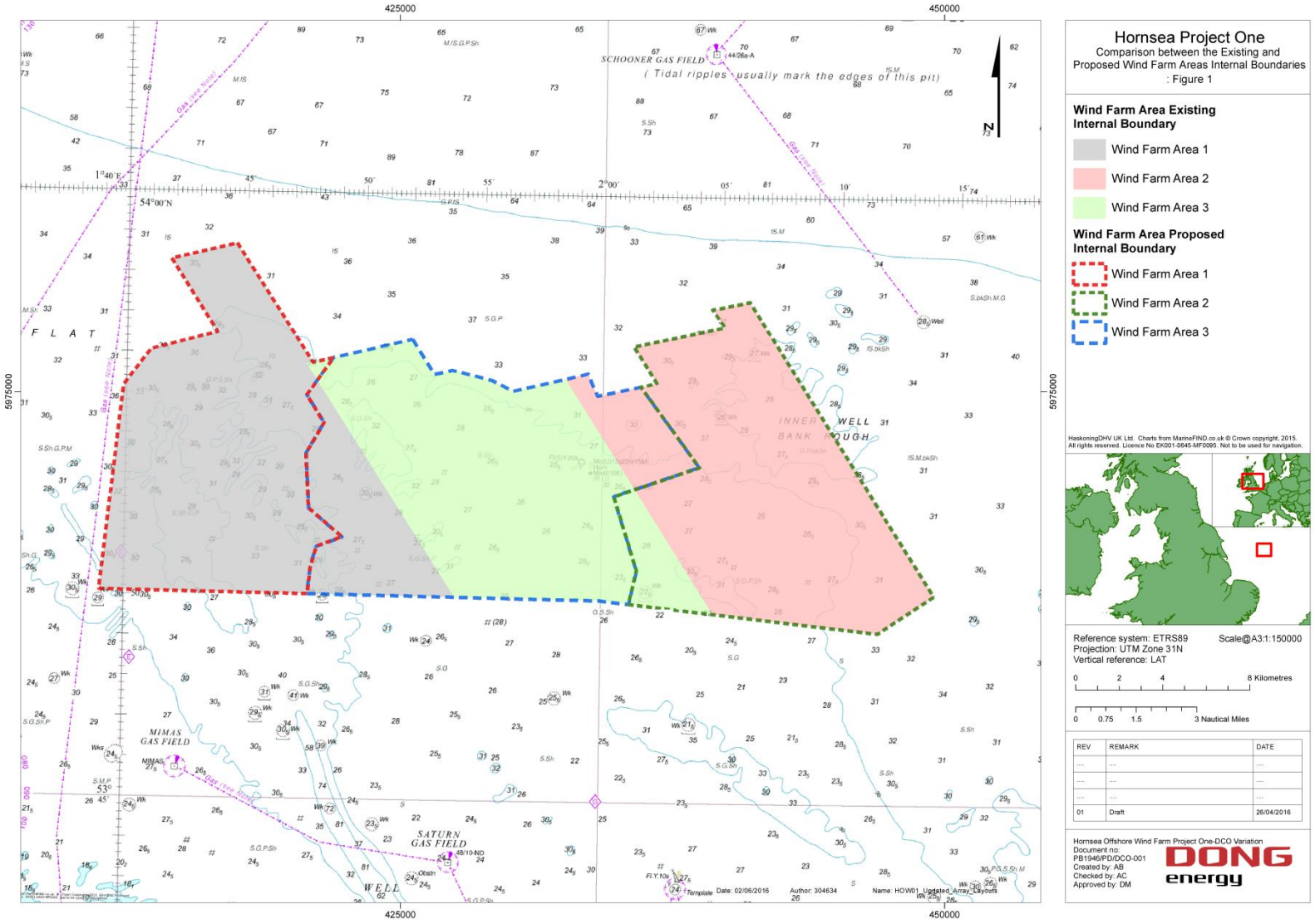
Table 3.3 Relative km^2 sea bed areas for the current and proposed limits of deviation for Wind Farm Areas 1, 2 and 3.

Wind Farm Areas	Existing relative sea areas (km^2)	Proposed relative sea areas (km^2)
Wind Farm Area 1	150.95	119.14
Wind Farm Area 2	132.67	129.34
Wind Farm Area 3	123.71	158.85
Total	407.33	407.33

The number and distribution of WTGs within the three Wind Farm Areas will remain as consented within the DCO.

Based on the project's decision to use 174 7MW turbines it is intended that each Wind Farm Area will contain up to 58 WTGs in each area. However, this project envelope refinement is not part of the DCO amendment because these numbers are within what is already permitted by the DCO.

All other parameters with the ES and DCO are unaffected by the changes to the limits of deviation of the Wind Farm Areas which demarcated the internal boundaries between the Wind Farm Areas. As such no further assessment of the changes of the internal boundaries of the Wind Farm Areas is required.


425000
450000
5975000
SCHOONER GAS FIELD
(Tidal ripples usually mark the edges of this pit)
54°00'N
1°40'E
2°00'
F L A T
INNER BANK
WELL
MIMAS GAS FIELD
SATURN GAS FIELD
Hornsea Project One
Comparison between the Existing and Proposed Wind Farm Areas Internal Boundaries : Figure 1
Wind Farm Area Existing Internal Boundary
Wind Farm Area 1
Wind Farm Area 2
Wind Farm Area 3
Wind Farm Area Proposed Internal Boundary
Wind Farm Area 1
Wind Farm Area 2
Wind Farm Area 3
HaskoningDHV UK Ltd. Charts from MarineFIND.co.uk © Crown copyright, 2015. All rights reserved. Licence No EK001-0645-MF0095. Not to be used for navigation.
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Projection: UTM Zone 31N
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Hornsea Offshore Wind Farm Project One-DCO Variation
Document no: PB1946/PD/DCO-001
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Checked by: AC
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DONG energy

4. Materiality of Changes

There is no statutory definition of what constitutes a material or non-material amendment for the purposes of Schedule 6 of the Planning Act 2008 and Part 1 of the 2011 Regulations.

However, the Government has recently issued guidance on this point. Criteria for determining whether an amendment should be material or non-material is outlined in the Department for Communities and Local Government (DCLG's) "Planning Act 2008: Guidance on Changes to Development Consent Orders" (December 2015). Paragraphs 9 -16 of this document sets out the four characteristics which act to provide an indication on whether a proposed change is material or non-material. The following characteristics are stated to indicate that an amendment is more likely to be considered 'material'.

1) *A change should be treated as material if it would require an updated Environmental Statement (from that at the time the original DCO was made) to take account of new, or materially different, likely significant effects on the environment).*
2) *A change is likely to be material if it would invoke a need for a Habitats Regulations Assessment. Similarly, the need for a new or additional licence in respect of European Protected Species is also likely to be indicative of a material change.*
3) *A change should be treated as material that would authorise the compulsory acquisition of any land, or an interest in or rights over land that was not authorised through the existing DCO.*
4) *The potential impact of the proposed changes on local people will also be a consideration in determining whether a change is material.*

The proposed amendment to the DCO in relation to the change to the name plate capacity has been considered in light of these four characteristics as presented in the following **Sections 4.1.1** to **4.1.4**.

4.1 Materiality of Change to Name Plate Capacity

4.1.1 EIA considerations

1) A change should be treated as material if it would require an updated Environmental Statement (from that at the time the original DCO was made) to take account of new, or materially different, likely significant effects on the environment.).

Table 4.1 compares the environmental topics and the potential effects and impacts that were identified within the Hornsea Project One ES with the proposed increase to the name plate capacity within the DCO. Consideration has been given to the effects of the proposed change and whether these changes could result in impacts of significance (in EIA terms) or greater significance to those identified in the existing assessment as submitted to the Secretary of State in July 2013.

Table 4.1: Assessment of the increase in the Hornsea Project One name plate capacity from 1,200MW to 1,218MW and effect on EIA topic impact significance

EIA Topic	Changes in Effect	Change in Impact Significance
Marine Processes	Effects identified on marine processes associated with the construction, operation and decommissioning of Hornsea Project One within the ES included: • increased suspended sediment concentrations and deposition of material on the seabed; • changes to seabed morphology hydrodynamics and sediment regime, and • changes to tidal and wave regime The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. As there will be a reduction in the infrastructure required (e.g. 174 7MW WTGs) the numerical values associated with the effects (e.g. volume of suspended sediment) would therefore decrease from the maxima predicted in the ES. However, this is not considered to change the assessed magnitude of effect from low.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather, the impacts identified on marine processes are caused by the number, physical footprint and installation methods of the WTGs and their associated infrastructure. All turbine scenarios are within the consented case in terms of the number of WTGs (save that for the 6MW, 7MW and 8MW WTGs, more turbines could be constructed as indicated below) and their physical footprint as demonstrated below. Installation methods will remain as consented. **<u>Number of WTG's</u>** **Consented maximum = 240** (NB 240 5MW turbines is 1,200) 6MW turbine scenario = 203 (being 3 more than with the 1,200MW limit) 7MW turbine scenario = 174 (being 3 more than with the 1,200MW limit) 8MW turbine scenario = 152 (being 2 more than with the 1,200MW limit) **<u>Sea bed footprint</u>** **Consented maximum for WTG monopile foundations = 340,0560m^2 (size per foundation =1,419m^2)** 6MW turbine scenario = 288,057m^2 7MW turbine scenario = 246,906m^2 8MW turbine scenario = 215,688m^2 **Consented maximum for WTG jacket foundations (driven/drilled piles)= 169,680m^2 (size per foundation = 7,07m^2)** 6MW turbine scenario = 143,521m^2 7MW turbine scenario = 123,018m^2 8MW turbine scenario = 107,464m^2 **Consented maximum for WTG jacket foundations (suction piles) = 1,526,880m^2 (size per foundation = 6,362m^2)** 6MW turbine scenario = 1,291,486m^2 7MW turbine scenario = 1,106,988 m^2

EIA Topic	Changes in Effect	Change in Impact Significance
		8MW turbine scenario = 967,024m^2 **Consented maximum for WTG gravity base foundations = 1,526,880m^2 (size per foundation = 6,362m^2)** 6MW turbine scenario = 1,291,486m^2 7MW turbine scenario = 1,106,988 m^2 8MW turbine scenario = 967,024m^2 **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Benthic Subtidal and Intertidal Ecology	Effects identified on benthic subtidal and intertidal ecology associated with the construction, operation and decommissioning of Hornsea Project One within the ES included: • increased suspended sediment concentrations and deposition; • temporary habitat disturbance and loss; • long term habitat loss; • electric and magnetic field emissions (EMF) from subsea cables • introduction of new habitat, and • habitat disturbance via scour and vessel activities during operation. The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. The decreases in numerical values associated with the effects (e.g. habitat loss, disturbance) are not considered to change the assessed magnitude of effects from the range of negligible to low. The worst case scenario for EMF effects relates to the	All turbine scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. **There will therefore be no change in impact significance from the proposed name plate capacity change.**

EIA Topic	Changes in Effect	Change in Impact Significance
	level of current passing through the cables. For offshore aspects the inter-array cables was considered to be 70kV and for the export cables it was considered at 400kV. For onshore cables the worst case was based on an assumption of 400kV for the substation, 2,000A (two trenches with two cables in each - HVDC) and 680kV (three trenches with three cables in each - HVAC). It has been confirmed by DONG Energy engineers that these values will not change.	
Fish and Shellfish Ecology	Effects identified on fish and shellfish ecology associated with the construction, operation and decommissioning of Hornsea Project One within the ES included: • underwater noise; • increased suspended sediment concentrations; • sediment deposition; • temporary habitat disturbance; • long term habitat loss; • EMF emissions from subsea cables; • Underwater noise from foundation piling and other construction activities; • introduction of new habitat, and • potential for reduced fishing pressure during operation. The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. EMF is discussed in full for Benthic Subtidal and Intertidal Ecology. The decreases in numerical values associated with the	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts identified on fish and shellfish ecology are associated with the number and physical presence of the WTG and piling associated with the number of foundations, the below sea level infrastructure (namely the foundations) and the piling activities required to install these foundations. All WTG scenarios are within the consented case in terms of the number of WTGSand their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. The Project One Companies are currently in discussions with the MMO and Natural England to increase the maximum piling hammer energy employed from 2,300KJ to 3,000KJ. The re-modelling has demonstrated that there is no alteration in the potential disturbance ranges due to underwater noise compared to the original ES. This is assessment is detailed in **Appendix B**. The change in name plate capacity will not alter the assessment in relation to the piling and hammer energies or the assessments undertaken as part of the ES as the potential numbers of WTGs that could be installed to obtain the required name plate capacity is below the consented envelope for Hornsea Project One. **There will therefore be no change in impact significance from the proposed name plate capacity change.**

EIA Topic	Changes in Effect	Change in Impact Significance
	effects (e.g. underwater noise, sediment deposition, habitat loss) are not considered to change the assessed magnitude of effects from the range of negligible to low.	
Marine Mammals	Effects identified on marine mammals associated with the construction, operation and decommissioning of Hornsea Project One within the ES included: • underwater noise; • increased vessel traffic; • increased suspended sediments; • changes to prey resources; • EMF emissions from subsea cables; • Underwater noise from foundation piling and other construction activities, and • accidental release of contaminants and electric and magnetic effects from subsea cables. The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. EMF is discussed in full for Benthic Subtidal and Intertidal Ecology. The decreases in numerical values associated with the effects (e.g. underwater noise, increased suspended sediments) are not considered to change the assessed magnitude of effects from the range of negligible to medium.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts identified on marine mammals are associated with the number and physical presence of the WTGs, the below sea level infrastructure (namely the foundations), and the piling activities required to install these foundations. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. The change in name plate capacity will not alter the assessment in relation to the piling and hammer energies or the assessments undertaken as part of the ES as the potential numbers of turbines that could be installed to obtain the required name plate capacity is below the consented envelope for Hornsea Project One. This assessment is detailed in **Appendix B**. **There will therefore be no change in impact significance from the proposed name plate capacity change.** Consideration is given in **Section 4.1.2.2** to the potential effects on the Southern North Sea potential SAC (pSAC) which was not considered during the original assessment for Hornsea Project One because it was not known about at that time.
Ornithology	Effects identified on ornithology associated with the construction, operation and decommissioning of Hornsea Project One within the ES included:	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts identified on ornithology are associated with the number and physical presence of the WTGs, i.e. the above sea level and below sea level infrastructure (e.g. indirect impacts on prey species).

EIA Topic	Changes in Effect	Change in Impact Significance
	• disturbance-displacement impacts; • habitat loss; • collision mortality; • barrier effects, and • indirect effects associated with impacts on prey items The assessment was based upon a worst case of 332 WTGs of a generating capacity of 3.6MW and 8MW and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. The decreases in numerical values associated with the effects (e.g. barrier effects, collision mortality) are not considered to change the assessed magnitude of effects from the range of negligible to medium.	Collision risk impacts were assessed against a 240 WTG scenario, which was not considered to have a significant impact on birds. The number of WTGs required has been reduced substantially because the WTGs to be used will have a generating capacity of at least 6MW, so that the name plate capacity is attained from fewer than 240 WTGs. For scenarios involving 6MW, 7MW or 8MW WTGs (and using the most up-to-date WTG parameters available for each), the proposed name plate capacity DCO amendment has a virtually no effect on the collision risk estimates when compared against the 1,200MW scenario. The collision estimates associated with the name plate capacity DCO amendment remain well within the consented worst case collision estimates (based on a 240 5MW WTG scenario), and do not affect the conclusions of the Hornsea Project One EIA or Habitat Regulations Assessment (HRA). This is demonstrated through collision risk modelling for kittiwake and gannet, which represent the two species considered most sensitive to collision impacts from the Project, and which are also qualifying features of the Flamborough Head and Filey Coast proposed SPA. The collision risk modelling demonstrates that under the name plate capacity DCO amendment, collision estimates for gannet are 17 - 90% lower than the consented worst case scenario, whilst those for kittiwake are 90 - 100% lower than the consented worst case scenario when based upon WTGs with a 7MW generating capacity (i.e. the most likely scenario). If the alternative scenarios of WTGs with either the 6MW or 8MW generating capacities are considered, reductions in collision estimates compared to the consented worst case are 8 – 53% for gannet and 10 – 54% for kittiwake. (Note, the range in the percentage reductions in the collision estimates is due to differences in the outputs from the four different collision model options – Band 2012). The calculations demonstrating this reduction in the collision risk for birds is shown in **Appendix C.** **There will therefore be no change in impact significance.** Consideration is given in **Section 3.3.2.1** to the potential effects on the Greater Wash potential SPA (pSPA), which was not considered during the original assessment for Hornsea Project One because it was not known about at that time.
Nature Conservation	The construction, operation, and decommissioning phases of Project One were predicted to result in no significant effects on any UK designated sites with benthic ecology, fish and shellfish, marine mammal or ornithological features within the Hornsea Project One ES. The assessment was based upon a worst case of 332	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on the nature conservation sites and their interest features are associated with the number, physical presence of the WTGs and their installation. All turbine scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. **There will therefore be no change in impact significance.**

EIA Topic	Changes in Effect	Change in Impact Significance
	WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. The decreases in numerical values associated with the effects (e.g. temporary habitat loss and disturbance, increased suspended sediments) are not considered to change the assessed magnitude of effects from the range of negligible to low.	Nature Conservation Designations not known about at the time of the original assessment for Hornsea Project One, and therefore was not considered during the Hornsea Project One examination or in the Secretary of State's Appropriate Assessment for Hornsea Project One are considered in detail in **Section 4.1.2**.
Commercial Fisheries	Effects identified on commercial fisheries associated with the construction, operation and decommissioning of Hornsea Project One within the ES included: • exclusion from fishing grounds; • displacement; • EMF emissions from subsea cables • gear snagging, and • ecological effects upon targets species. The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. EMF is discussed in full for Benthic Subtidal and Intertidal Ecology. The decreases in numerical values associated with the effects (e.g. vessel traffic, displacement from fishing grounds) are not considered to change the assessed magnitude of effects from the range of low to medium.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on commercial fisheries are associated with the number and physical presence of the WTGs. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Shipping and Navigation	Effects identified on shipping and navigation associated with the construction, operation and decommissioning	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on shipping and navigation are associated

EIA Topic	Changes in Effect	Change in Impact Significance
	of Hornsea Project One within the ES included: • displacement of commercial shipping, fishing vessels and recreational vessels leading to an increased vessel to vessel collision risk. The reduction in the infrastructure required within the site is not considered to change the assessed magnitude of effects from the range of negligible to high.	with the number, physical presence and spatial layout of the WTGs. All WTG scenarios are within the consented case in terms of the number of WTGs, as demonstrated above for **Marine Processes**. The red line boundary will not alter and final layout will be agreed with the relevant stakeholders in accordance with the DCO/DML. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Aviation, Military and Communications	Effects identified on aviation, military and communications associated with the construction, operation and decommissioning of Hornsea Project Onewithin the ES included: • interference with operations within MOD Danger Areas; • disruption to Helicopter Main Routes (HMR); • disruption to cross-zone transit helicopter traffic; • disruption of instrument approach procedures and Missed Approach Procedures (MAPs) to and from, offshore oil and gas platforms; • disruption to civil and military radar cover; obstruction to Search And Rescue helicopter operations, and • interference with microwave and other communication links. The reduction in the infrastructure required within the site is not considered to change the assessed magnitude of effects from the range of negligible to medium.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on aviation, military and communications are associated with the number and physical presence and spatial layout of the WTG. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. The red line boundary will not alter and final layout will be agreed with the relevant stakeholders in accordance with the DCO/DML. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Marine Archaeology and Ordinance	Effects identified on marine archaeology and ordnance with the construction, operation and decommissioning of Hornsea Project One within the ES included:	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on marine archaeology and ordinance are associated with the number, physical presence and the below sea level infrastructure of the WTGs.

EIA Topic	Changes in Effect	Change in Impact Significance
	• removal or disturbance of sediments of geoarchaeological significance or the disturbance, and • destruction of wrecks and/or crashed aircraft The assessment was based upon a worst case of 332 WTGs and 450km of inter-array cable. The DCO subsequently consented 240 WTGs. Foundations required for the WTGs remain within the maxima consented. The decreases in numerical values associated with the effects (e.g. destruction of wrecks) are not considered to change the assessed magnitude of effects from the range of negligible to low.	All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Seascape and Visual Resources	Effects identified on seascape and visual resources, operation and decommissioning of Hornsea Project One within the ES included: • a change to the existing present day seascape character and Historic Seascape Character (HSC), and • a change to the current visual and night-time scenario experienced by visual receptors Whilst there would be a reduction in the number of WTGs as originally assessed this is not considered to change the assessed magnitude of effects from the range of negligible to large.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on seascape and visual resources are associated with the number, physical presence and spatial layout of the WTGs. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. The red line boundary will not alter and final layout will be agreed with the relevant stakeholders in accordance with the DCO/DML. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Infrastructure and Other Uses	Effects identified on infrastructure and other uses with the construction, operation and decommissioning of Hornsea Project One within the ES included: • displacement of recreational vessels; • disturbance to cables and pipelines and	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on infrastructure and other uses are associated with the number, physical presence and spatial layout of the WTGs. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented.

EIA Topic	Changes in Effect	Change in Impact Significance
	aggregate areas; • disruption to oil and gas operations including the interference with Radar Early Warning Systems (REWS) on gas platforms, and • increase in airborne noise. There will be a reduction in the infrastructure required, however this will all be within the area of the windfarm itself. Therefore it is not considered that there will be any change to the assessed magnitude of effects from the range of no change to high.	The red line boundary will not alter and final layout will be agreed with the relevant stakeholders in accordance with the DCO/DML. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Air Quality and Waste Management	Effects identified on air quality and waste management with the construction, operation and decommissioning of Hornsea Project One within the ES included • release of atmospheric contaminants; • the accidental release of non-hazardous and hazardous materials, and • an increase in pressure upon onshore waste receiving facilities. As there will be a reduction in the infrastructure required there would be consequent reductions in emissions and waste produced. These decreases in numerical values associated with the effects (e.g. release of atmospheric contaminants) are not considered to change the assessed magnitude of effects from the existing range of low to high.	The name plate capacity of the wind farm is not referred to in the worst case in the assessment undertaken within this chapter of the ES. Rather the impacts on air quality and waste management are associated with the number and physical presence of the WTG. All WTG scenarios are within the consented case in terms of the number of WTGs and their physical footprint as demonstrated above for **Marine Processes**. Installation methods will remain as consented. The red line boundary will not alter and final layout will be agreed with the relevant stakeholders in accordance with the DCO/DML. **There will therefore be no change in impact significance from the proposed name plate capacity change.**
Inter-Related Effects (Offshore)	Given that the magnitudes of effect for receptor topics is unchanged, there would be no change to any inter-related effects	There is no change in the impact significance of any parameter within the ES topic chapters and therefore there are no changes to any inter-related effects. **There will therefore be no change in impact significance.**

Table 4.1 concludes that the potential impacts associated with the proposed change to the name plate capacity are of no greater significance than those identified in the original Hornsea Project One ES.

4.1.2 HRA and EPS considerations

2) A change is likely to be material if it would invoke a need for a Habitats Regulations Assessment. Similarly, the need for a new or additional licence in respect of European Protected Species is also likely to be indicative of a material change.

As stated in Section 3.1.1 DONG Energy is not proposing to make any changes to any of the parameters that form the basis of any impact assessment associated with the consented project. Changes to the name plate capacity have been demonstrated to result in no more than a clerical change to the DCO.

As such the changes to the name plate capacity will not introduce the need for a new HRA or change the position with regard to EPS licensing. This flows from the same rationale presented above for the conclusion that there is no change to the EIA impact significance (see **Table 4.1**) in relation to ornithology and marine mammals. The change gives rise to no additional impact in HRA or EPS terms.

However since the Hornsea Project One was granted consent two additional European sites are now being progressed for designation which were not considered at the time of the original submission. It is submitted that the guidance cannot have had in mind an HRA triggered only by newly proposed designations when considering whether an amendment application is material. As explained below the change to name plate capacity sought would not in itself alter the judgment as to whether an HRA would be required. It is not the change sought which is invoking the possible need for an HRA, it is the newly proposed designations. It is noted that this was the view DECC took on the proposed amendment to the East Anglia ONE DCO (paragraph 7(b) of the decision letter dated 24 March 2016). Accordingly, it would not be appropriate to regard the change proposed as material for this reason.

The May 2016 DECC "Guidance on when new marine Natura 2000 sites should be taken into account in offshore renewable energy consents and licences" (DECC, 2016) states that as a matter of government policy where an amendment is sought to a DCO, pSPAs and pSACs should be considered as if they are designated/classified and *"any possible likely significant effects (and adverse effects on integrity) of the proposed changes in the variation or amendment would need to be considered."* It is clear from the Guidance that it is the likely significant effect (LSE) of the variation or amendment to the DCO that need only be considered and not the LSE of the DCO as consented. An assessment of the LSE of the DCO as consented will be undertaken in due course through the DECC review of consents process.

4.1.2.1 Implications of the name plate capacity DCO amendment for the potential impacts on the Greater Wash potential SPA

The Greater Wash proposed SPA (pSPA) was not known about at the time of the original assessment for Hornsea Project One, and therefore was not considered during the Hornsea Project One examination or in the Secretary of State's Appropriate Assessment for Hornsea Project One.

On the basis of the information available for this pSPA, the site is being considered to protect non-breeding populations of red-throated diver, common scoter and little gull, as well as foraging areas for breeding populations of Sandwich, common and little tern that are associated with existing breeding-colony SPAs (Natural England 2015).

As demonstrated within **Table 4.1** (summarising the detailed assessment in **Appendix C**) the change to name plate capacity does not:

- change any of the parameters associated with the construction, maintenance or operation of Hornsea Project One as consented;
- increase the significance of any impact from Hornsea Project One as consented on ornithology; or
- result in any additional impacts on ornithology.

There is therefore no pathway for the change to name plate capacity to generate a LSE on the Greater Wash pSPA, and therefore no trigger for the requirement for an Appropriate Assessment (AA).

4.1.2.2 Southern North Sea Harbour Porpoise pSAC

Since Hornsea Project One was consented, a possible SAC (pSAC) for harbour porpoise has been proposed for the Southern North Sea, and the consultation closed on 3 May 2016. This pSAC was not known about at the time of the original assessment for Hornsea Project One, and therefore was not considered during the examination or in the Secretary of State's Appropriate Assessment. The Southern North Sea pSAC covers an area of 36,958km^2 and covers winter and summer habitat for harbour porpoise. The northern section of the site, which is in the area of the Hornsea Zone and Hornsea Project One overlaps slightly with, is considered to be important during the summer season.

As demonstrated within **Table 4.1** (summarising the detailed assessment in **Appendix B**) the change to name plate capacity does not:

- change any of the parameters associated with the construction, maintenance or operation of from Hornsea Project One as consented;
- increase the significance of any impact from Hornsea Project One as consented on marine mammals; or
- result in any additional impacts on marine mammals.

There is therefore no pathway for the change to name plate capacity to generate a LSE on the Southern North Sea pSAC, and therefore no trigger for the requirement for an AA.

4.1.3 Compulsory Acquisition

3) A change should be treated as material that would authorise the compulsory acquisition of any land, or an interest in or rights over land that was not authorised through the existing DCO.

The proposed change applies to activities being undertaken within the existing DCO Order limits and on land that will be leased to the project by The Crown Estate. As such, the possible requirement for compulsory acquisition does not arise.

4.1.4 Local Population

4) The potential impact of the proposed changes on local people will also be a consideration in determining whether a change is material.

The proposed amendment to the name plate capacity will have no effect on the local population, given the distance of the project from shore.

4.2 Materiality of Changes to Internal Boundary Changes of Wind Farm Areas

4.2.1 EIA

The below considers the proposed amendment to the limits of deviation of Wind Farm Areas 1,2 and 3 in terms of the four characteristics which would indicate that an amendment is more likely to be considered 'material'.

1) A change should be treated as material if it would require an updated Environmental Statement (from that at the time the original DCO was made) to take account of new, or materially different, likely significant effects on the environment).

The internal Wind Farm Area boundary changes will not result in a change to any assessed environmental parameter. This is because altered Wind Farm Area available for each wind farm do not prevent the construction of any permutation of infrastructure which has already been assessed under the ES. Whilst the total sea area for each Wind Farm Area will be different, this does not impact on the constraints arising from any of the other parameters within the DCO. For example, the layout of the turbines could be identical under the existing or newly proposed Wind Farm Areas. The methodology followed and the assessment of the worst case effects arising from the various project parameters listed in Table 3.1 do not alter. Accordingly, there is no new or materially different likely significant effect on the environment.

4.2.2 HRA and EPS

2) A change is likely to be material if it would invoke a need for a Habitats Regulations Assessment. Similarly, the need for a new or additional licence in respect of European Protected Species is also likely to be indicative of a material change.

For those reasons set out in Section 4.1.2 above the changes to the internal boundaries of wind farm areas do not introduce the need for a new HRA or a change to the position with regard to EPS licensing ie the changes do not result in:

- a change to any of the parameters associated with the construction, maintenance or operation of from Hornsea Project One as consented;
- an increase in the significance of any impact from Hornsea Project One as consented on ornithology or marine mammals; or
- any additional impacts on ornithology or marine mammals.

There is therefore no pathway for the change to the internal Wind farm Area boundaries to generate a LSE on the Greater Wash pSPA or the Southern North Sea pSAC, and therefore no trigger for the requirement for an AA.

4.2.3 Compulsory Acquisition

3) *A change should be treated as material that would authorise the compulsory acquisition of any land, or an interest in or rights over land that was not authorised through the existing DCO*.

The division of Wind Farm Areas is entirely within the red line boundary of the offshore area. The proposed change applies to activities being undertaken within the existing DCO Order limits and on land that will be leased to the project by The Crown Estate. As such, the possible requirement for compulsory acquisition does not arise.

4.2.4 Local Population

4) *The potential impact of the proposed changes on local people will also be a consideration in determining whether a change is material*.

The proposed amendment to the internal Wind Farm Area boundaries will have no impact on the local population as the project is too far from the shore and, to all intents and purposes, the same projects could be built under either scenario. It is only the commercial position which is different.

5. Cumulative Impacts with Subsequent Non- Material DCO amendment

An application was made by DONG Energy on 30th October 2015 for a non- material amendment to the Hornsea Project One DCO for a change to increase the permitted length and area of the offshore high voltage alternating current (HVAC) offshore collector substation (OSS) platform, and the length and width of the offshore HVAC Reactive Compensation Substation (RCS) platform. The non-material change application also included an application to correct a previously undiscovered clerical error in Requirement 10. Requirement 10 on the decommissioning programme requirements of the DCO requires that no part of the authorised development below mean high water springs (MHWS) should commence without an approved decommissioning programme. In order to ensure consistency with the requirements of Section 105 of the Energy Act and DECC guidance for industry on the decommissioning of offshore wind farms, the Applicant has requested that the reference should be amended so that it refers to the mean low water mark

The Secretary of State (SoS) was satisfied that the changes were not material changes to the DCO, and decided under paragraph 2(1) of Schedule 6 to the 2008 Act to make a non-material change to the 2014 Order so as to authorise the changes detailed in the application. This was enshrined in the Hornsea Project One DCO on 31st March 2016.

The small increases to the above sea level offshore substation platform length, width and area will not have a cumulative impact with the increase in the name plate capacity. The increase to the name plate capacity does not result in a change to the worst case of any parameters and will therefore not affect the cumulative impacts assessed in the 1,200MW consented case result in any

additional cumulative impacts from 1,200MW consented case.

There a no cumulative impacts associated with the amendments to the internal Wind Farm Area in boundary co-ordinates as the changes have no impact on any environmental assessment parameter.

6. Pre- Submission Stakeholder Consultation

Consultation has been undertaken with the following statutory consultees:

- Marine Management Organisation (MMO);
- Natural England (NE).
- Maritime and Coastguard Agency (MCA);
- Trinity House (TH); and
- The Civil Aviation Authority (CAA)

Their responses are summarized in Table 6.1.

Table 6.1 Summary of pre submission consultation responses

Consultee	Date of consultation response	Consultation response	Action by DONG Energy to address comment
Marine Management Organisation (MMO)	21st June 2016 (Lisa Southwood)	No comments aside from recognizing that the maximum hammer energy increase to 3000kj is under discussion with the MMO separately. As the nameplate capacity is only stated in the DCO the variation request to the MMO should only deal with the amendments to the coordinates of the DMLS, to amend the boundaries between the three windfarms. In order to avoid any confusion, please make clear in the cover letter and/or details of the proposed change(s) which amendments relate to which DdML	The consultation letter to the MMO will make it clear that they are only being consulted on the change to the name plate capacity and there is no requirement for the MMO to vary the dMLs with respect to this change. The application letter to the MMO to vary the dMLs will make it clear that it is only to cover changes to the Wind Farm Area coordinates, relating to dMLs 1,2 and 3.
Natural England (NE)	27th June 2016 (Tom Manning)	1) Based on the updated collision risk modelling, it is NE opinion that none of the scenarios (203x 6MW; 174x 7MW or 152x 8MW) would exceed the worst case scenario considered in the Hornsea P1 Examination which was the 240x 5MW configuration. Although only gannet and kittiwake were modelled, the CRM results would also apply to other species. 2) Appendix C table headers in Table 1.1 should reflect the different Band Models – 1 to 4. 3) Information in Table 3.1 within the main report is confusing. For example, Table 3.1 states: • that the “DCO minimum DCO Maximum” number of WTGs was 240 and that “Proposed change from consented parameters” is no change. But if they are using 7MW turbines then the maximum number is not 240 – it is 174; • “Hub height” “DCO minimum DCO Maximum” is 82 with “no change” proposed – But the HUB height for the 7MW turbine is 113.99;	1) No action required 2) Table 1.1 in Appendix C updated accordingly 3) Although 174 7MW turbines within a hub height minimum of 113.99m is now the intended scenario that Hornsea Project One will employ, this project design envelope refinement is not part of the DCO amendment. The proposed amendment is only to increase the name plate capacity of the DCO from 1200 MW to 1218 MW. If the amendment to increase the name plate capacity is granted it would also permit the use of up to 203 6MW or 154 8MW turbines. The environmental effects of the use of 6MW, 7MW and 8MW turbines has been considered and assessed within this report to

Consultee	Date of consultation response	Consultation response	Action by DONG Energy to address comment
			ensure that the increase in capacity would not exceed the worst case scenario assessed in the ES under any consented turbine scenario. The key issue is whether any of these minor increases has an effect on any worst case scenario in the ES, and if so whether that could justify the change being regarded as material. This is considered in detail in Section 4, where it is concluded that there is no effect in any worst case scenario.
		4) Although the total capacity constrains the number of turbines of each size we consider that Table 3.1 needs to be made clearer – along the lines of Table 3.2 to state what precise turbine combinations and specifications are covered by the existing DCO and what are being proposed – and what the maximum allowable numbers and specifications for the different capacity turbines might be – or at least make this clearer. As far as NE is aware the existing DCO was based on assessments of a 150x 8MW or 240 x5MW configuration only. It is unclear if there was ever any analysis of 6MW or 7MW turbines – so being clear about the turbine specifications/numbers of the 6MW and 7MW (and 8MW) options in the main document would be useful.	4) Headings in Table 3.1 and text in Section 3.1.1 amended to provide clarity.
		5) It is noted that the applicant also requires NE comments in relation to impacts on new Natura 2000 designations (i. e. Southern North Sea pSAC and the Greater Wash SPA). While formal consultation on the latter designation has not yet commenced the current advice, specifically on the harbour porpoise pSAC designation, is that all issues will need to be captured in the DECC review of consents so it is premature to comment on the matter at this stage.	5) Noted and no action required
Maritime and Coastguard Agency (MCA)	15th June 2016 (Nick Salter)	No concerns.	No action required
Trinity House (TH)	8th June 2016 (Stephen Vanstone)	No concerns.	No action required
Civil Aviation Authority	21st June 2016 (Mark Deakin)	No concerns	No action required.

Consultee	Date of consultation response	Consultation response	Action by DONG Energy to address comment
(CAA)			

7. Conclusion

Taking into account the above responses to the four tests, as set out in the DCLG document, it is the opinion of the Hornsea Project One Companies that both proposed change to the DCO in relation to the name plate capacity and changes to internal boundaries of Wind Farm Areas should be regarded as a non-material amendments.

8. References

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Hornsea
Offshore Wind Farm Project One

REPORT

HORNSEA PROJECT ONE – NAME PLATE CAPACITY AND LIMIT OF DEVIATION WORK AREA DCO AMENDMENTS

Supporting Statement

Appendix A

Prepared	Ashley Carton & Murray Grant (RHDHV), 3 June 2016
Checked	
Accepted	Paolo Pizzolla (RHDHV), 3 June 2016
Approved	Bronagh Byrne (BRYBR), 8 July 2016

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Consented and Proposed Limits of Deviation Coordinates for Wind Farm Areas 1, 2 and 3

Consented

Table 1 Co-ordinates for Wind Farm Area 1 (limits of deviation for Work No. 1)

Point	Latitude	Longitude
1	53° 58′ 42.179″ N	1° 44′ 31.880″ E
2	53° 55′ 46.445″ N	1° 47′ 47.796″ E
3	53° 56′ 22.870″ N	1° 51′ 57.409″ E
4	53° 55′ 31.318″ N	1° 52′ 54.282″ E
5	53° 49′ 58.944″ N	1° 58′ 59.804″ E
6	53° 50′ 5.118″ N	1° 38′ 58.430″ E
7	53° 55′ 9.293″ N	1° 39′ 52.024″ E
8	53° 56′ 3.228″ N	1° 41′ 0.143″ E
9	53° 56′ 29.670″ N	1° 43′ 45.592″ E
10	53° 58′ 17.828″ N	1° 41′ 46.795″ E

Table 2: Co-ordinates for Wind Farm Area 2 (limits of deviation for Work No. 2)

Point	Latitude	Longitude
1	53° 55′ 31.318″ N	1° 52′ 54.282″ E
2	53° 55′ 37.592″ N	1° 53′ 38.108″ E
3	53° 55′ 23.329″ N	1° 55′ 20.262″ E
4	53° 55′ 8.162″ N	1° 56′ 10.619″ E
5	53° 55′ 35.429″ N	1° 59′ 20.944″ E
6	53° 55′ 2.525″ N	1° 59′ 45.776″ E
7	53° 55′ 22.663″ N	2° 2′ 14.219″ E
8	53° 56′ 16.303″ N	2° 1′ 15.269″ E
9	53° 56′ 46.586″ N	2° 5′ 4.031″ E
10	53° 57′ 12.481″ N	2° 4′ 32.376″ E
11	53° 57′ 24.509″ N	2° 6′ 6.700″ E
12	53° 50′ 10.018″ N	2° 13′ 57.158″ E
13	53° 49′ 14.297″ N	2° 11′36.820″ E
14	53° 49′ 58.584″ N	1° 59′ 54.762″ E
15	53° 49′ 58.944″ N	1° 58′ 59.804″ E

Table 3 Co-ordinates for Wind Farm Area 3 (limits of deviation for Work No. 3)

Point	Latitude	Longitude
1	53° 55′ 46.445″ N	1° 47′ 47.796″ E
2	53° 56′ 22.870″ N	1° 51′ 57.409″ E
3	53° 55′ 31.318″ N	1° 52′ 54.282″ E
4	53° 55′ 37.592″ N	1° 53′ 38.108″ E
5	53° 55′ 23.329″ N	1° 55′ 20.262″ E
6	53° 55′ 8.162″ N	1° 56′ 10.619″ E
7	53° 55′ 27.264″ N	1° 58′ 23.884″ E
8	53° 55′ 20.760″ N	1° 58′ 30.994″ E
9	53° 49′ 44.770″ N	2° 4′ 37.254″ E
10	53° 49′ 40.620″ N	2° 4′ 41.765″ E
11	53° 49′ 58.584″ N	1° 59′ 54.762″ E

Point	Latitude	Longitude
12	53° 49′ 58.944″ N	1° 58′ 59.804″ E
13	53° 50′ 0.845″ N	1° 53′ 51.856″ E
14	53° 50′ 1.222″ N	1° 53′ 51.441″ E
15	53° 55′ 44.123″ N	1° 47′ 31.921″ E

Proposed

Table 1 Co-ordinates for Wind Farm Area 1 (limits of deviation for Work No. 1)

Point	Latitude	Longitude
1	53° 58' 42.179" N	1° 44' 31.880" E
2	53° 55' 46.445" N	1° 47' 47.796" E
3	53° 55' 53.992" N	1° 48' 39.422" E
4	53° 54' 58.313" N	1° 47' 32.926" E
5	53° 54' 17.250" N	1° 48' 17.274" E
6	53° 53' 31.505" N	1° 47' 33.690" E
7	53° 52' 9.910" N	1° 47' 42.124" E
8	53° 51' 28.123" N	1° 49' 7.614" E
9	53° 51' 13.307" N	1° 48' 3.216" E
10	53° 50' 42.649" N	1° 47' 48.974" E
11	53° 50' 2.841" N	1° 47' 41.467" E
12	53° 50' 3.890" N	1° 43' 58.211" E
13	53° 50' 5.118" N	1° 38' 58.430" E
14	53° 55' 9.293" N	1° 39' 52.024" E
15	53° 56' 3.228" N	1° 41' 0.143" E
16	53° 56' 23.259" N	1° 43' 5.437" E
17	53° 56' 29.670" N	1° 43' 45.592" E
18	53° 58' 17.828" N	1° 41' 46.795" E
19	53° 58' 42.179" N	1° 44' 31.880" E

Table 2: Co-ordinates for Wind Farm Area 2 (limits of deviation for Work No. 2)

Point	Latitude	Longitude
1	53° 49' 53.896" N	2° 1' 9.958" E
2	53° 50' 43.613" N	2° 1' 29.135" E
3	53° 52' 33.454" N	2° 0' 29.519" E
4	53° 53' 18.324" N	2° 4' 4.112" E
5	53° 55' 17.217" N	2° 1' 34.030" E
6	53° 55' 22.663" N	2° 2' 14.219" E
7	53° 56' 16.303" N	2° 1' 15.269" E
8	53° 56' 46.586" N	2° 5' 4.031" E
9	53° 57' 12.481" N	2° 4' 32.376" E
10	53° 57' 24.509" N	2° 6' 6.700" E
11	53° 50' 10.018" N	2° 13' 57.158" E
12	53° 49' 14.297" N	2° 11' 36.820" E
13	53° 49' 53.896" N	2° 1' 9.958" E

Table 3: Co-ordinates for Wind Farm Area 3 (limits of deviation for Work No. 3)

Point	Latitude	Longitude
1	53° 55' 17.217" N	2° 1' 34.030" E
2	53° 53' 18.324" N	2° 4' 4.112" E

3	53° 52' 33.454" N	2° 0' 29.519" E
4	53° 50' 43.613" N	2° 1' 29.135" E
5	53° 49' 53.896" N	2° 1' 9.958" E
6	53° 49' 58.584" N	1° 59' 54.762" E
7	53° 49' 58.944" N	1° 58' 59.804" E
8	53° 50' 2.841" N	1° 47' 41.467" E
9	53° 50' 42.649" N	1° 47' 48.974" E
10	53° 51' 13.307" N	1° 48' 3.216" E
11	53° 51' 28.123" N	1° 49' 7.614" E
12	53° 52' 9.910" N	1° 47' 42.124" E
13	53° 53' 31.505" N	1° 47' 33.690" E
14	53° 54' 17.250" N	1° 48' 17.274" E
15	53° 54' 58.313" N	1° 47' 32.926" E
16	53° 55' 53.992" N	1° 48' 39.422" E
17	53° 56' 22.870" N	1° 51' 57.409" E
18	53° 55' 31.318" N	1° 52' 54.282" E
19	53° 55' 37.592" N	1° 53' 38.108" E
20	53° 55' 23.329" N	1° 55' 20.262" E
21	53° 55' 8.162" N	1° 56' 10.619" E
22	53° 55' 35.429" N	1° 59' 20.944" E
23	53° 55' 2.525" N	1° 59' 45.776" E
24	53° 55' 17.217" N	2° 1' 34.030" E

Hornsea
Offshore Wind Farm Project One

REPORT

HORNSEA PROJECT ONE – NAME PLATE CAPACITY AND LIMIT OF DEVIATION WORK AREA DCO AMENDMENTS

SUPPORTING STATEMENT
Appendix B

Prepared	Ashley Carton & Murray Grant (RHDHV), 3 June 2016
Checked	
Accepted	Paolo Pizzolla (RHDHV), 3 June 2016
Approved	Bronagh Byrne (BRYBR), 8 July 2016

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Marine Mammal and Fish Hammer Energy Assessment

The worst case scenario for the number of piling events within the ES was based on the following:

- Piling of 341 jacket foundations for up to 332 WTGs (4 x 3m diameter piles per foundation), five offshore HVAC collector substations (8 x 3.5m diameter piles per foundation), two accommodation platforms (8 x 3m diameter piles per foundation) and two offshore HVDC converter stations (18 x 3.5m diameter piles per foundation): the total number of pin piles for all foundations is 1,420. Maximum piling duration of up to seven hours per pile for monopiles and six hours per pile for jackets;

During the examination for Hornsea Project One, mitigation for the scheme for the impacts on birds was provided through the removal of the 3.6MW turbine from the Project design envelope. This resulted in a design envelope comprised of turbine ranges from 5-8MW. The consequence of this project mitigation is a 28% reduction in the overall maximum number of turbines within the Project, from 332 to 240. The result of this on the worst case parameters in relation to underwater noise is a reduction in the overall duration of underwater noise produced due to fewer foundations requiring piling.

As is demonstrated in **Table 1,** the potential number of turbines that could be installed, based on the alteration in the name plate capacity, is below the consented envelope for Hornsea Project One, and therefore the overall duration of underwater noise produced will be less than that assessed in the Environmental Statement as acceptable and that of the consented envelope. Any impacts on marine mammals or fish will be less than original consented.

Table 1 Turbine capacity and duration of piling

Turbine Capacity	Number of turbines	Estimated duration – monopiles (hrs) (based on 7 hours per monopile as provided in ES)	Estimated duration – jacket foundations with pinpiles (hrs) (based on 6 hours per pin)
6MW	203	1637	5088
7MW	174	1434	4392
8MW	152	1280	3824
Consented Case	240	1896	5976

The calculations in **Table 1** are based on the number of turbines plus the addition of 216hrs for the installation on jacket foundations with pin piles of 9 offshore structures, as stipulated within the Hornsea Project One ES.

As a precaution, DONG Energy has also modelled the position with a hammer energy of 3,000kJ (compared to 2,300kJ in the ES) which has also demonstrated that there is no alteration in the potential disturbance ranges due to underwater noise compared to the original ES. Modelling used in the ES was based on sediment and bathymetric data available at the time of ES preparation. Re-modelling using more detailed data (acquired post-consent) which allowed for the assumptions made at the EIA stage to be refined actually show a reduction in the area of ensonification from that predicted for the 2,300kJ hammer energy within the ES, for the majority of outputs.

In conclusion the change in name plate capacity will not alter the assessment in relation to the hammer energy or the assessments undertaken as part of the ES.

Hornsea Project One DCO

Hornsea Project One DCO amendment

Collision risk modelling tables

May 2016

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Contents

1. Overview

The annual numbers of total collisions and of collisions apportioned to the Flamborough and Filey Coast pSPA for gannet and kittiwake, as calculated for the Hornsea Project One consented worst case scenario of 240 5MW turbines is presented in the Table 1.1.

Table 1.1: The annual numbers of total collisions and of collisions apportioned to the Flamborough and Filey Coast pSPA for gannet and kittiwake as calculated for the consented 240 5MW scenario

Species		Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
		98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Gannet	Total	120	60	30	88	44	22	73	36	18	38	19	10
	pSPA birds only	28	14	7	20	10	5	17	8	4	9	4	2
Kittiwake	Total	223	111	56	467	234	117	96	48	24	21	10	5
	pSPA birds only	110	55	28	231	116	58	48	24	12	10	5	3

The tables in the following sections present total collision risk estimates and collision risk estimates apportioned to the Flamborough and Filey Coast potential Special Protection Area (FFC pSPA) for gannet and kittiwake calculated using the Band (2012) collision risk model. Collision risk estimates are presented for 6 MW, 7 MW and 8 MW turbine scenarios for a total wind farm capacity of 1200 MW, 1218 MW for the 6 MW and 7 MW turbines and 1216 MW for the 8 MW turbines.

The turbine parameters used for each of the turbine scenarios in collision risk modelling to support the Development Consent Order (DCO) for Hornsea Project One are presented in Table 1.2 with those used for collision risk modelling incorporated into this report presented in Table 1.3. It is worth noting that the parameters for the 7 MW turbine are representative of the Siemens 7MW turbine which is the chosen turbine for Hornsea Project One whereas those for the 6 MW and 8 MW turbines are generic. To maintain comparability with the collision estimates on which the DCO is based, the apportioning calculations are consistent with those used to support the DCO for Hornsea Project One, whilst recent updates to the collision risk modelling process have not been incorporated into this exercise (e.g. revised flight height data and new recommendations on avoidance rates – Johntson et al. 2014a and 2014b, Cook et al. 2014).

Table 1.2: The three defined turbine scenarios based upon the numbers allowed under the DCO and the parameters that would have been used at the time of the DCO (note, of these options only the 8MW turbine was actually presented for the purposes of the DCO)

Parameter	6 MW	7 MW	8 MW
No. of turbines	200	171	150
Rotation speed (m/s)	11	10.5	10.2
Rotor radius (m)	77	86	89
Hub height (m)	98.45 (HAT)	107.45 (HAT)	110.45 (HAT)
Monthly proportion of time operational (%) (all months)	85	85	85
Blade width (m)	5	5.4	5.4
Pitch (°)	10	3	3

Table 1.3: Updated turbine parameters for the three defined turbine scenarios (bold text indicates where parameters differ from those presented in Table 1.2)

Parameter	6 MW	7 MW	8 MW
No. of turbines with the increase in name plate capacity	**203**	**174**	**152**
Rotation speed (m/s)	11	10.5	10.2
Rotor radius (m)	77	**77**	89
Hub height (m)	**98.35 (HAT)**	**113.99 (HAT)**	**110.35 (HAT)**
Monthly proportion of time operational (%) (all months)	85	85	85
Blade width (m)	5	**5**	5.4
Pitch (°)	**3**	3	3

2. Gannet

Table 2.1: Total annual gannet collision figures and pSPA collision figures for the 6 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	71	36	18	75	38	19	65	32	16	32	16	8
pSPA birds only	16	8	4	17	9	4	15	8	4	7	4	2
Increase in name plate capacity – 1218 MW												
Total	72	36	18	76	38	19	66	33	16	33	16	8
pSPA birds only	17	8	4	18	9	4	15	8	4	8	4	2

Table 2.2: Total annual gannet collision figures and pSPA collision figures for the 7 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	12	6	3	28	14	7	58	29	15	4	2	1
pSPA birds only	3	1	1	6	3	2	13	7	3	1	0	0
Increase in name plate capacity – 1218 MW												
Total	12	6	3	28	14	7	59	30	15	4	2	1
pSPA birds only	3	1	1	7	3	2	14	7	3	1	0	0

Table 2.3: Total annual gannet collision figures and pSPA collision figures for the 8 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3[1] (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	57	29	14	62	31	15	65	32	16	21	11	5
pSPA birds only	13	7	3	14	7	4	15	7	4	5	2	1
Increase in name plate capacity – 1216 MW												
Total	58	29	14	63	31	16	66	33	16	21	11	5
pSPA birds only	13	7	3	14	7	4	15	8	4	5	2	1

3. Kittiwake

Table 3.1: Total annual kittiwake collision figures and pSPA collision figures for the 6 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	128	64	32	394	197	98	78	39	19	17	9	4
pSPA birds only	64	32	16	195	97	49	39	19	10	8	4	2
Increase in name plate capacity – 1218 MW												
Total	130	65	33	399	200	100	79	40	20	17	9	4
pSPA birds only	64	32	16	198	99	49	39	20	10	9	4	2

[1] Note that these results are similar to the 6 MW turbine. This is due to comparable total rotor frontal areas and a relative increase in gannet flight activity at heights commensurate with the hub height of the 8 MW turbine.

Table 3.2: Total annual kittiwake collision figures and pSPA collision figures for the 7 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	13	7	3	37	18	9	8	4	2	2	1	0
pSPA birds only	7	3	2	18	9	5	4	2	1	1	0	0
Increase in name plate capacity – 1218 MW												
Total	13	7	3	37	19	9	8	4	2	2	1	0
pSPA birds only	7	3	2	19	9	5	4	2	1	1	0	0

Table 3.3: Total annual kittiwake collision figures and pSPA collision figures for the 8 MW turbine scenario

Species	Option 1 (Avoidance rate %)			Option 2 (Avoidance rate %)			Option 3 (Avoidance rate %)			Option 4 (Avoidance rate %)		
	98	99	99.5	98	99	99.5	98	99	99.5	98	99	99.5
Base case – 1200 MW												
Total	103	52	26	318	159	80	56	28	14	12	6	3
pSPA birds only	51	26	13	158	79	39	28	14	7	6	3	1
Increase in name plate capacity – 1216 MW												
Total	104	52	26	322	161	81	57	29	14	12	6	3
pSPA birds only	52	26	13	160	80	40	28	14	7	6	3	2

4. Conclusion

In summary, the numbers of collisions for gannet and kittiwake predicted to occur for possible turbine options under the name plate capacity variation are 8 – 90% lower than the consented worst case scenario for gannet and 10 – 100% lower than the consented worst case scenario for kittiwake (with the range in the percentage reductions in the collision estimates being due to differences between the four different collision risk model options). Therefore, the collision estimates for the name plate capacity variation do not affect the conclusions of the Hornsea Project One EIA or HRA for either gannet or kittiwake. The consented worst case scenario was

based upon having 240 5MW turbines. The predicted collisions for the name plate capacity variation represent virtually no change compared to those predicted to occur under these turbine options for the base case (i.e. without the increase in name plate capacity).

5. References

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