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Neart na Gaoithe Offshore Wind Farm

Electricity Act 1989 – Section 36 Consent Variation

Supporting Environmental Information

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1 Introduction

Neart na Gaoithe Offshore Wind Limited (NnGOWL) submitted an application for consent under Section 36 (S36) of the Electricity Act 1989 and for associated marine licences under the Marine (Scotland) Act 2010 for the Neart na Gaoithe (NnG) offshore wind farm in July 2012. The application was supported by an Environmental Statement (ES) and subsequently, in June 2013, by an Addendum of Supplementary Environmental Information (hereinafter referred to as the 'Addendum'). Consent and marine licences were awarded by the Scottish Ministers in October 2014.

The S36 Consent permits the development of an Offshore Wind Farm (OWF) in the Firth of Forth, located as shown on Figure A in Appendix I, limited by the following key parameters (relevant in the context of this application to vary the consent):

- A maximum generating capacity of 450MW;
- Up to 75 wind turbines; and
- A rated turbine capacity of up to 6MW.

The consented development is described in Annex 1 of the S36 Consent and is aligned with the project description presented in Chapter 5 of the ES (NnGOWL, July 2012), as supplemented by Technical Appendix 1 of the Addendum of Supplementary Environmental Information (NnGOWL, June 2013a).

NnGOWL has been undertaking further detailed project design work which has resulted in the need to vary some of the consented project parameters listed in Annex 1 of the S36 Consent.

2 Purpose of the Document

In line with the requirements of the Electricity Generating Stations (Applications for Variation of Consent) (Scotland) Regulations 2013 (the "Variation Regulations") and Scottish Government guidance on applying for a S36 Consent variation (Scottish Government, 2013), in submitting an application to vary the consented project parameters, there is a need to consider whether the proposed variations fall within the scope of the existing environmental assessment upon which consent determination was based (i.e. to ensure that the original design envelope (sometimes referred to as the 'Rochdale Envelope') on which consent was determined is not exceeded and the variations would not lead to a greater significance of environmental impact than considered in determining the original consent application).

This document sets out the proposed variations to the S36 Consent and the reasons for the proposed variations, reviews the original Environmental Impact Assessment (EIA) by use of a screening exercise and where determined necessary by that screening, provides additional updated environmental information in order to demonstrate the resulting effects of the variation by comparison to the ES and Addendum. The document is set out as follows:

- Introduction;
- Purpose of this document;
- Need for the proposed variations and details of the variations to the project design;
- Consultation (completed and planned);
- Approach to the assessment of impacts;
- Screening for potential impacts;
- Updated assessments;
- Conclusions; and
- Appendices presenting a figure showing the location of the project, the draft of the revised S36 Consent, and information to support the updated ornithological assessment.

3 Proposed Variations, Updated Project Description and Draft Revised Consent

3.1 Need for the Consent Variations

In addition to being granted S36 consent, NnGOWL has also been awarded a Contract for Difference (CfD). The CfD enables the financial support mechanism that will facilitate NnG OWF to be constructed and was awarded through a competitive process. The award of the CfD is acknowledgement of the crucial role that the NnG offshore wind farm will perform in securing energy supply for both Scotland and the UK.

The CfD includes certain milestones and commits the project to a specific development programme. NnGOWL is fully committed to meeting that programme and project design work is underway. In carrying out this recent project design work a number of essential variations to the originally consented project parameters have been identified.

The project parameters presented in the original application were based on technology commercially available at the time and to be deployed in line with the original project schedule. Due to unforeseen delays to the project, the commercially available technology has evolved to provide turbines directly linked to lowering the levelised cost of energy.

The variations will ensure that the NnG project remains cost effective. The proposed variations provide an opportunity to potentially reduce the environmental effects of the project by permitting a reduced number of turbines to be constructed.

3.2 Updated Project Description

NnGOWL is seeking to vary the S36 Consent by modification of a number of parameters related to the wind turbine generators that may be deployed. Specifically, a variation is being sought to allow:

- An increase in the maximum rated turbine capacity from 6MW to 7MW (the maximum generating capacity of the Development will continue to be limited to 450 MW);
- A change in maximum turbine hub heights from 107.5m to 115m above Lowest Astronomical Tide (LAT); and,
- A change in maximum turbine platform height from 18m to 21m above LAT.

The principal update to the consented project description (as defined in Annex 1 of the S36 Consent), and focus of the application to vary the S36 Consent, is the increase in maximum rated turbine capacity from 6MW up to 7MW. This update in turn results in changes to the consented values in terms of some (but not all) of the specific, associated turbine parameters (such as rotational speed), and also the maximum number of turbines required to be installed across the site to meet the maximum installed capacity of 450MW as permitted by the S36 Consent.

In terms of the other proposed variations, providing additional flexibility around hub height and turbine platform height maxima will enable the use of standard jacket foundations, reducing both design and installation complexity.

Further details on all of the proposed variations to the consented project description are provided in Table 3.1 below (by comparison to the currently consented values).

It is important to note that these variations require no changes to the maximum parameters associated with other components of the project as set out in the S36 Consent or described in the ES or Addendum. There will be no change in the maximum wind farm installed MW capacity, nor in the red line area that defines the boundary of the consented Development, nor in the construction process or operation or decommissioning of the scheme.

Table 3.1 Proposed updates to the project description (turbine parameters only)

Design element	Parameter	Consented design	Updated design
Turbines	Maximum wind turbine rated capacity	Up to 6MW	Up to 7MW
	Maximum number of turbines	Up to 75	Up to 75 (where 7MW turbines are used, 64 would be installed in order to achieve maximum site capacity of 450MW)
	Maximum hub height (m above LAT)	107.5	115
	Wind turbine rotation speed (rpm)	5 - 11	3.8 - 10.4
	Speed at blade tip (m/s)	80	83.9
	Maximum turbine platform height (m above LAT)	18	21
	Maximum rotor tip height (m above LAT)	197	No change
	Minimum hub height (m above LAT)	93.5	No change
	Air gap (m) clearance to blade tip (minimum of) from LAT	30.5	No change
	Maximum turbine spacing (m)	1805	No change
	Minimum turbine spacing (m)	450	No change
	Position of turbines	Layout C	No change
	Colour scheme	Light grey RAL 7035	No change
	Number of concurrent turbine installations	2	No change

3.3 Proposed Updates to the S36 Consent

It is NnGOWL's view that the process under Section 36C of the Electricity Act is the appropriate mechanism for dealing with the proposed design updates to the consented NnG OWF. It is noted that Paragraph 11 of the Scottish Government Guidance on Section 36 variations states that:

"there are two broad categories of case in which it is likely that Scottish Ministers may consider it appropriate to exercise the power in section 36C – namely, to enable:

- (a) The construction of a generating station or extension (whose construction or extension has either not yet commenced or has not yet been completed) along different lines from those set out in the existing consent;*
- (b) the operation of a generating station (whether or not it is already operational) in a way that is different from that specified in the existing consent (this may sometimes involve making limited physical alterations to a generating station, but should not involve work that could be characterised as an "extension" of an existing generating station which has been granted section 36 consent).*

The guidance goes on to state in Paragraph 12 that:

"Scottish Ministers will exercise judgment on two distinct questions in order to determine that any given variation is "appropriate":

- (a) Whether the change proposed to the generating station (or proposed generating station) concerned is of a kind that it would be reasonable to authorise by means of the variation procedure (regardless of its merits in planning / energy policy terms);*
- (b) if the answer to question(a) is positive, whether (from a planning / energy policy point of view) the variation should in fact be made, thereby authorising whatever development the making of the variation will permit to be carried out.*

It is submitted that the proposed variation falls within paragraph 11(a) as it would permit the construction of a generating station along different lines from those set out in the existing consent. In accordance with paragraph 12, it is submitted that the proposed variation is appropriate as it is of a kind that would be reasonable to authorise by means of the variation procedure and from an energy policy point of view the variation should in fact be made. The guidance sets out some examples of the types of changes that may be suitable for consideration under the variation process and this includes different turbine designs. Since the proposed variation primarily relates to the type of turbine to be used for the project it is proposed that the Section 36C process is the appropriate mechanism under which to apply for the variation.

NnGOWL has included a draft of the variations which it is proposed should be made to the S36 Consent as required by Regulation (1)(d) of the Variation Regulations. It is anticipated that the draft, together with this report, will form the basis of the consultation and will assist the Marine Scotland Licensing and Operations Team (MS-LOT) in considering the application to vary. The proposed revisions are set out and clearly identified in the extract of the draft revised S36 Consent included in Appendix II.

4 Consultation

4.1 Pre-Application Consultation

NnGOWL has undertaken informal pre-application consultation with MS-LOT, Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB) in order to brief consultees on the nature of the proposed S36 Consent variation.

4.2 Post-Application Process

NnGOWL's variation application is submitted to MS-LOT.

Once the application has been accepted, NnGOWL will publish a copy of the application on the project website: <http://www.neartnagaoithe.com>

NnGOWL will also publish notices in local and national newspapers, Lloyd's List and at least one fishing trade journal and invite comments on the application from members of the public and interested parties.

Although the offshore elements of the NnGOWL project lie outside the jurisdiction of any local planning authority, NnGOWL will also serve a copy of the notice and application to the following:

- Angus Council;
- Dundee City Council;
- East Lothian Council;
- Fife Council; and
- Scottish Borders Council.

Following the completion of the formal consultation process, the Scottish Ministers will consider all consultation responses and may request further information from the developer if necessary. On determining the variation application, Scottish Ministers must provide the reasons for their decision (including for any variations not requested by the applicant), and will provide clean and marked-up versions of the varied consent.

5 Approach to Assessment of Environmental Impacts Arising from the Proposed Variations

In considering the proposed variations to the S36 Consent set out in Section 3 above, NnGOWL has considered the potential implications in relation to all of the topics assessed during the original EIA process.

It is noted that the determination of the S36 Consent was made on the basis of a design envelope approach, which is commonly used where an application is made at a time when the final details of a project have not been resolved. The design envelope sets the limiting parameters of the project and the application provides sufficient detail to enable the likely maximum (or worst case) environmental effects of the project, and any required mitigation, to be properly assessed on the basis of a range of development possibilities.

This report does not seek to reassess in detail all potential impacts associated with the already consented project but focusses on those of potential relevance to the proposed variations and the implications of these for the overall environmental impact of the project. The following process has been followed to determine where additional environmental information was required to support this S36 variation application:

Screening of all topics and potential impacts set out in the ES and Addendum against the proposed variations by consideration of the likely environmental effects arising and whether these effects could result in a greater level of impact compared the ES/Addendum.

Screening out of those topics/impacts where it is clear that the significance of the impact would be unchanged or reduced. The outcome of the screening assessment is presented in Section 6.

For screened out issues (where the significance of the impact would be unchanged or reduced) it is considered that the significance of any cumulative impacts would also be unchanged or reduced.

For issues/impacts where further analysis is required to confirm whether the significance of the impact would be unchanged or reduced, updated environmental assessments are completed. These assessments are presented in Section 7.

Where the screening and/or updated assessments confirms that the significance of the impact would be unchanged or reduced, the proposed S36 variations are considered not to result in development that would be fundamentally different in terms of character, scale or environmental impacts from what is authorised by the existing consent.

6 Screening of Potential Impacts

This section considers the environmental receptors that could be affected by the proposed consent variations, and whether the Development (the NnG OWF) as modified by the proposed variations, might result in significant effects on the environment that could reasonably be considered to be potentially greater than the corresponding effects described in the original ES and Addendum and in the light of which the project was originally consented.

The first stage of the screening exercise assessed the project description updates against each topic considered in the original ES and Addendum. This identified whether or not there is the potential for the design updates to result in a change to an existing impact, or for a new impact to arise, and therefore whether any further assessment was required (Table 6.1).

Where no increase in significance of an existing impact on a receptor was predicted, that topic has been screened out of further assessment. The screening out of particular topics is justified in Table 6.2. Where further assessment was required, the results are presented in Section 7.

Table 6.1 Potential for environmental impacts associated with proposed project design updates

Project Description Updates	Topics (as per ES chapters)															
	Geology & Water Quality	Physical Processes	Air Quality	Nature Conservation	Ornithology	Marine mammals	Benthic Ecology	Fish & Shellfish Ecology	Commercial Fisheries	Shipping & Navigation	Military & Aviation	Maritime Archaeology & Cultural Heritage	Ordnance	Seascape, Landscape & Visual Impacts	Other Users	Socioeconomics
Turbine generation capacity	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Number of turbines	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Maximum hub height	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Revolutions per minute	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Speed at blade tip	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Height of platform	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

NO	No additional potential impact on receptor to that already assessed for consented project, no further assessment required
YES	Potential for receptor to be further impacted, or there is a degree of uncertainty, therefore further assessment required

Table 6.2 Rationale for screening out potential impacts and receptors (justification for Table 6.1)

ES Topic	Potential Impacts Screened Out	Rationale	Updated Assessment (Yes / No)
Geology and Water Quality (ES Chapter 8)	All impacts / all project phases	All project design updates relevant to geology and water quality (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in construction and operational seabed footprint. Impact significance will be no greater than that predicted in the ES.	No
Physical Processes (ES Chapter 9)	All impacts / all project phases	All project design updates relevant to physical processes (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in construction and operational seabed footprint. Impact significance will be no greater than that predicted in the ES.	No
Air Quality (ES Chapter 10)	All impacts / all project phases	All project design updates relevant to air quality (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in installation activity. Impact significance will be no greater than that predicted in the ES.	No
Nature Conservation (ES Chapter 11)	Potential impacts on Special Areas of Conservation (SACs)	All project design updates relevant to SACs (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease installation activity and seabed footprint. Impact significance will be no greater than that predicted in the ES. See row below ('Ornithology'). In terms of likely significant effects on Special Protection Areas (SPAs), the proposed update to turbine design parameters has the potential to alter the outcome of the original assessment of bird collision risk, as presented in the ES and updated in the Addendum. Collision Risk Modelling (CRM) undertaken to inform the Addendum did not assess the effects of a 7MW turbine and its associated parameters. In order to confirm that the installation of 7MW turbines will not result in an increase in collision risk, additional CRM has been commissioned by NnGOWL to assess	Yes Information to inform updated assessment of potential impacts on SPAs to be provided (see updated ornithology assessment in Section 7)

ES Topic	Potential Impacts Screened Out	Rationale	Updated Assessment (Yes / No)
		the effects of the updates to project design, namely the change in number of turbines, change in turbine hub height and change in turbine rotational speed. The results of the modelling are presented in Section 7 below, and compared to the outcomes of the original assessments within the ES and Addendum.	
Ornithology (ES Chapter 12, Addendum of Supplementary Environmental Information Ornithology Appendices 1 - 3)	<ul style="list-style-type: none"> Disturbance and displacement Direct habitat loss Indirect habitat loss Barrier effects Indirect effects resulting from changes to prey 	<p>The proposed update to turbine design parameters has the potential to alter the outcome of the original assessment of bird collision risk, as presented in the ES and updated in the Addendum. CRM undertaken to inform the Addendum did not assess the effects of a 7MW turbine and its associated parameters. In order to confirm that the installation of 7MW turbines will not result in an increase in collision risk, additional CRM has been commissioned by NnGOWL to assess the effects of the updates to project design, namely the change in number of turbines, change in turbine hub height and change in turbine rotational speed. The results of the modelling are presented in Section 7 below, and compared to the outcomes of the original assessments within the ES and Addendum.</p> <p>It is considered that where the maximum number of turbines is reduced from 75 to 64, the magnitude of the 'screened out' impacts bulleted to the left will be either reduced or remain as predicted in the original assessments.</p>	<p>Yes</p> <p>See Section 7 for updated assessment of bird collision risk</p>
Marine Mammals (ES Chapter 13, Addendum of Supplementary Environmental Information Marine Mammals Appendix 1)	All impacts / all project phases	<p>All project design updates relevant to marine mammals (i.e. number of turbines) fall within the consented design envelope.</p> <p>Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in installation (piling) activity. Impact significance will be no greater than that predicted in the ES.</p>	No
Benthic Ecology (ES Chapter 14)	All impacts / all project phases	<p>All project design updates relevant to benthic ecology (i.e. number of turbines) fall within the consented design envelope.</p> <p>Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in construction and operational seabed footprint. Impact significance will be no greater than that predicted in the ES.</p>	No

ES Topic	Potential Impacts Screened Out	Rationale	Updated Assessment (Yes / No)
Fish and Shellfish Ecology (ES Chapter 15, Addendum of Supplementary Environmental Information Fish and Shellfish Appendices 1 and 2)	All impacts / all project phases	All project design updates relevant to fish and shellfish ecology (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in installation (piling) activity. Impact significance will be no greater than that predicted in the ES.	No
Commercial Fisheries (ES Chapter 16)	All impacts / all project phases	All project design updates relevant to commercial fisheries (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated reduction in installation activity and number of installed offshore structures. Impact significance will be no greater than that predicted in the ES.	No
Shipping and Navigation (ES Chapter 17)	All impacts / all project phases	All project design updates relevant to shipping and navigation (i.e. number of turbines) fall within the consented design envelope. Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated reduction in installation activity and number of installed offshore structures. Impact significance will be no greater than that predicted in the ES.	No
Military and Aviation (ES Chapter 18, Addendum of Supplementary Environmental Information Military Aviation Appendix 1)	All impacts / all project phases	The ES and Addendum assessed several 'maximum effect' design scenarios, one of which was the installation of 64 x 7MW turbines with a maximum blade tip height of 197m. The original assessment for the consented project therefore already captures any potential effects associated with the project design updates. Impact significance will be no greater than that predicted in the ES. The ES notes that platform height (i.e. the height of the junction between the foundation and the turbine tower) may have an influence on navigation and communications systems used by surface vessels in the immediate vicinity of the wind farm because different tower and foundation types reflect signals in different ways. The consented project design assumed that platform height would be 18m LAT whilst the design updates mean that platform height could be up to 21m LAT. It is considered that the potential 3m variation between the consented project design and updated project design would not	No

ES Topic	Potential Impacts Screened Out	Rationale	Updated Assessment (Yes / No)
		result in any change to the impact significance presented in the ES.	
Maritime Archaeology and Cultural Heritage (ES Chapter 19)	All impacts / all project phases	<p>The ES assessed the potential impacts on cultural heritage assets resulting from the construction and operation of a worst case project design scenario (i.e. maximum physical footprint on the seabed and maximum visual impact).</p> <p>Where 7MW turbines are installed, there will be fewer of them (64 as opposed to 75 x 6MW), with an associated decrease in construction and operational seabed footprint and reduced risk of disturbance of heritage assets.</p> <p>The seascape, landscape and visual impact assessment assessed a 'maximum effect' design scenario and considered the effects of installing up to 90 turbines with a hub height of 115m above LAT and therefore the original assessment already captures the potential effects on the setting of assets.</p> <p>Impact significance will be no greater than that predicted in the ES.</p>	No
Ordnance (ES Chapter 20)	N/A	Updates to project design do not alter the approach to managing the risk associated with any unexploded ordnance that may be present across the site.	No
Seascape, Landscape and Visual Impacts (ES Chapter 21, Addendum of Supplementary Environmental Information SLVIA Appendices 1 2)	All impacts / all project phases	<p>The ES and Addendum assessed a 'maximum effect' design scenario and considered the effects of installing up to 90 turbines with a hub height of 115m above LAT.</p> <p>The original assessment for the consented project therefore already captures any potential effects associated with the project design updates.</p> <p>Impact significance will be no greater than that predicted in the ES.</p>	No
Other Users (ES Chapter 22)	All impacts / all project phases	<p>The assessment of effects on other users of the marine environment was based primarily upon the outcomes of the shipping and navigation impact assessment (see relevant row of table above).</p> <p>Impact significance will be no greater than that predicted in the ES.</p>	No
Socioeconomics (ES Chapter 23)	All impacts / all project phases	<p>The original assessment of effects on socioeconomics is based upon an assumed pattern of expenditure by NnGOWL, which is then converted to Gross Value Added and employment.</p> <p>The updates to the project design do not alter the impact significance predicted in the original ES.</p> <p>The positive impacts of the project will remain as predicted in the ES.</p>	No

7 Updated Assessment

7.1 Introduction

The screening process identified that the updates to project design may have implications for bird collision risk. Section 7.2 presents updated information regarding bird collision risk based on the proposed design changes.

7.2 Ornithology – Collision Risk

7.2.1 Introduction

This section examines the potential for change to collision risk (from the original consented application) that may result from the installation of 7MW turbines.

Screening identified the following design parameter updates, which are parameters that feed in to bird Collision Risk Modelling (CRM):

- Maximum number of turbines;
- Maximum hub height; and
- Turbine rotational speed (rpm) and speed at blade tip.

In the assessment that follows, forecast changes in collision resulting from the design updates are compared to the data presented in the original assessment for the consented project design to establish whether, and to what extent, collision impacts will be altered.

7.2.2 Assessment Methodology

7.2.2.1 Collision Risk Modelling

To inform this document, NnGOWL commissioned Bureau Waardenburg to undertake additional CRM and Cork Ecology to provide an updated assessment of potential collision impacts based on the updated design scenario.

Band Model Options

As per the CRM undertaken to inform the ES and Addendum, and the subsequent Appropriate Assessment of the NnG consent application published by MS-LOT (MS-LOT, July 2014), CRM was undertaken to inform this report using the 'Band' model published by The Crown Estate Strategic Ornithological Support Services (SOSS) group in 2012 (Band, 2012).

The Band model has evolved since its publication in 2012 and is available in both a basic form (referred to as Options 1 and 2), and an extended form (referred to as Options 3 and 4). The publication of the Band model was accompanied by a report providing data on the flight heights of marine birds specifically for use in the extended Band model (Cook *et al.* 2012). In 2013, further figures for flight heights of marine birds were made available and subsequently published by Johnston *et al.* (2014a). In 2014, corrected figures were made available and subsequently published (Johnston *et al.* 2014b).

In undertaking the Appropriate Assessment of the NnG consent application, Marine Scotland Science (MSS) applied the Band Option 3 model and advised that this extended model should be applied in preference over

the basic model where appropriate flight height data allow, adding that Option 3 provides ‘the most realistic evidence base’ (MS-LOT, July 2014).

To allow for a comparison between the collision estimates presented in the Appropriate Assessment for the consented project design, and the revised modelling undertaken to inform this document, collision estimates presented below are based on Option 3 of the Band model and the corrected flight heights in Johnston *et al.* (2014b). CRM outputs based on Option 3 are presented in full in Appendix III-A.

CRM outputs for Option 1 are also presented in full in Appendix III-B to allow for comparison with the ES and Addendum.

Avoidance Rates

The collision estimates presented within this document are based on both 95% and 98% avoidance rates in line with the avoidance assumptions presented in the Appropriate Assessment of the NnG consent application (MS-LOT, July 2014). In the Appropriate Assessment MSS considered the use of 98% avoidance rate to be most appropriate. However, in order to add ‘additional precaution to the assessment and allow conclusions to be made on the impacts from collision risk where no reasonable scientific doubt remains’ they also presented results for Band Option 3 assuming an avoidance rate of 95%.

Modelled Species and Design Scenario

CRM has been undertaken for two key species; gannet and kittiwake. Previous modelling indicated a low risk of collision for other key species (herring gull and lesser black-backed gull) so no additional modelling has been undertaken for these.

CRM undertaken to inform this document was based upon the proposed project design variations. The number of 7MW turbines installed across the site would be limited by the consented maximum site capacity of 450MW; a scenario of 64 x 7MW turbines has therefore been modelled. Full details of the bird and project design parameters input to the model are presented in Appendix III-A.

7.2.2.2 Desk-based Review

The assessment revisits the results of CRM presented in several documents that underpinned the original impact assessment and informed the consent determination process through desk-based review, as follows:

- NnG ES Chapter 12 Ornithology (NnGOWL, July 2012);
- NnG ES Ornithology Appendices 12.1 and 12.2 (Natural Research Projects and Cork Ecology, June 2012; Bureau Waardenburg bv., June 2012);
- NnG Addendum of Supplementary Environmental Information (NnGOWL, June 2013a);
- NnG Addendum of Supplementary Environmental Information Ornithology Appendices 1 – 3 (Cork Ecology, 2013; NnGOWL, June 2013b; Bureau Waardenburg bv, June 2013); and
- Marine Scotland Appropriate Assessment for the NnG Consent Application (MS-LOT, July 2014).

The assessment then places the results of the CRM undertaken to inform this document in the context of the original assessment, more specifically the Appropriate Assessment, to identify the extent of any changes to collision risk as a result of the design updates.

7.2.3 Summary of Previous Collision Risk Modelling

Table 7.1 below identifies the approach to CRM applied in each document listed under Section 7.2.2.2 above. The approach has varied to take account of evolution of the Band model and of proposed NnG design scenarios. Bureau Waardenburg have undertaken all CRM in support of the documents listed below, with the exception of the Appropriate Assessment prepared by MS-LOT.

Within the NnG documents, CRM was undertaken for those species found to commonly occur within the project area, based on baseline survey data.

Table 7.1 CRM Reference Documents

Date	Document	Approach to CRM	
		Band Model Options	Design Scenarios
2012	NnG Environmental Statement	Option 1 Flight heights as per Cook et al. (2012)	4 scenarios: 128 x 3.6MW WTGs 109 x 4.135MW WTGs 75 x 6MW WTGs 64 x 7MW WTGs
2013	NnG Addendum of Supplementary Environmental Information	Option 1 Flight heights as per Cook et al. (2012)	4 scenarios: 90 x 5MW WTGs 75 x 6MW WTGs 73 x 6.15(A) WTGs 73 x 6.15(B) WTGs
2014	Marine Scotland Appropriate Assessment	Option 3 Flight heights as per Johnston et al. (2014b)	75 x 6MW WTGs

The results of CRM, based upon Band Option 3 and using Johnston *et al.* (2014b) flight height figures are summarised below.

7.2.3.1 Gannet

CRM estimated the number of potential gannet collisions per breeding season and annually for various project design scenarios. Table 7.2 below shows estimated gannet collisions for the consented 75 x 6MW design scenario.

Table 7.2 Estimated number of gannet collisions (all birds) – 75 x 6MW turbines

Gannet	Band Option 3 / Johnston <i>et al.</i> (2014)	
	95%	98%
Breeding season	262	104
Annual	318	127

Within the Addendum it was concluded that for all design scenarios considered, collision for gannet is an effect of negligible magnitude that is temporally long-term and reversible. It was concluded that the effects of collision on the regional gannet population in the breeding and non-breeding periods are not significant (Cork Ecology, 2013).

The Marine Scotland Appropriate Assessment concluded that ‘the Forth and Tay offshore wind farm proposals’ (i.e. NnG in addition to the Inch Cape, Seagreen Alpha and Seagreen Bravo projects) will not

adversely affect the site integrity of the Forth Islands SPA with respect to gannet, either alone or in combination with the recently consented Aberdeen Offshore Wind Farm, Blyth Offshore Wind Demonstrator and the constructed Blyth and Teesside Offshore Wind Farm developments' (MS-LOT, 2014).

7.2.3.2 Kittiwake

CRM estimated the number of potential kittiwake collisions per season and annually for various project design scenarios. The results are summarised in Table 7.3 below shows estimated kittiwake collisions for the consented 75 x 6MW design scenario.

Table 7.3 Estimated number of kittiwake collisions (all birds) – 75 x 6MW turbines

Kittiwake	Band Option 3 / Johnston <i>et al.</i> (2014)	
	95%	98%
Breeding season	23	10
Annual	74	29

Within the Addendum it was stated that for all design scenarios, collision mortality for kittiwake is an effect of negligible magnitude that is temporally long-term and reversible. It was concluded that the effects of collision mortality on kittiwakes from the regional population in the breeding and non-breeding periods are not significant (Cork Ecology, 2013).

The Marine Scotland Appropriate Assessment concluded that 'the Forth and Tay offshore wind farm proposals will not adversely affect the site integrity of the Buchan Ness to Collieston Coast, Fowlsheugh, Forth Islands and St. Abb's Head to Fast Castle SPAs with respect to kittiwake, provided that the conditions included in 3d are complied with' (MS-LOT, 2014).

7.2.4 Updated Assessment

The results of the updated assessment based upon CRM undertaken to inform this document are presented below.

7.2.4.1 Gannet

CRM outputs for the proposed variation to project design are presented in Table 7.4 below. For gannet, the estimated number of collisions per year for the 64 x 7MW scenario is considerably lower than the 75 x 6MW scenarios, with an estimated total of 79 collisions, compared to 127 collisions based on Band Option 3 (using Johnston *et al.*, 2014b), and an avoidance rate of 98% (Table 7.4). Using an avoidance rate of 95%, the estimated number of annual collisions for the 64 x 7MW turbine scenario is 198 birds, compared to 318 collisions for the 75 x 6MW scenario.

In the breeding season, the estimated number of collisions for the 64 x 7MW turbine scenario is 65 birds, compared to 104 collisions for the 75 x 6MW scenario based on Band Option 3 (using Johnston *et al.*, 2014b), and an avoidance rate of 98%. Using an avoidance rate of 95%, the estimated number of collisions in the breeding season for the 64 x 7MW turbine scenario is 162 birds, compared to 262 collisions for the 75 x 6MW scenario.

Table 7.4 Estimated number of gannet collisions (all birds)

Gannet	Band Option 3 / Johnston <i>et al.</i> (2014)	
	75 x 6MW	64 x 7MW
Breeding season		
98%	104	65
95%	262	162
Annual		
98%	127	79
95%	318	198

Baseline surveys within the Neart na Gaoithe Study Area between April and September recorded the age of a total of 33,764 gannets, with 877 (2.6%) immature (non-breeding) birds and 32,887 (97.4%) adults recorded (Cork Ecology, 2013). Based on this ratio and using an avoidance rate of 98%, the predicted number of adult gannet collisions in the breeding season for the 64 x 7MW turbine layout is 63 birds, compared with 101 birds for the 75 x 6MW scenario.

The estimated number of collisions associated with the proposed variation to project design (64 x 7MW) are lower than those associated with the consented project design (75 x 6MW), as modelled for both the NnGOWL Addendum and Marine Scotland Appropriate Assessment.

7.2.4.2 Kittiwake

The estimated number of collisions associated with the proposed variation to project design are presented in Table 7.5 below. For kittiwake, the estimated number of collisions for the 64 x 7MW scenario is lower than the 75 x 6MW turbine scenario. There are an estimated total of 20 collisions per annum, compared to 29 collisions per annum based on Band Option 3 (using Johnston *et al.*, 2014b), and an avoidance rate of 98% (Table 7.5). Using an avoidance rate of 95%, 49 collisions per year are predicted for the 64 x 7MW scenario, compared to 74 collisions per year for the 75 x 6MW scenario.

In the breeding season, six collisions are estimated for the 64 x 7MW scenario, compared to 10 collisions for the 75 x 6MW scenario, based on an avoidance rate of 98%. Using an avoidance rate of 95%, the estimated number of collisions in the breeding season for the 64 x 7MW turbine scenario is 15 birds, compared to 23 collisions for the 75 x 6MW scenario.

Table 7.5 Estimated number of kittiwake collisions (all birds)

Kittiwake	Band Option 3 / Johnston <i>et al.</i> (2014)	
	75 x 6MW	64 x 7MW
Breeding season		
98%	10	6
95%	23	15
Annual		
98%	29	20
95%	74	49

Baseline surveys within the Neart na Gaoithe Study Area between April and August recorded the age for a total of 3,536 kittiwakes, with 227 immature (non-breeding) birds (6.4%) and 3,309 adults (93.6%) (Cork Ecology, 2013). Based on this ratio and using an avoidance rate of 98%, the predicted number of adult kittiwake collisions in the breeding season for the 64 x 7MW turbine layout remains as six birds. In comparison, the predicted number of adult kittiwake collisions in the breeding season for the 75 x 6MW turbine layout is nine birds.

The estimated number of collisions associated with the proposed variation to project design (64 x 7MW) are lower than those associated with the consented project design (75 x 6MW), as modelled for both the NnGOWL Addendum and Marine Scotland Appropriate Assessment.

7.2.5 Summary

Since the submission of the NnG ES in 2012, NnGOWL has undertaken extensive studies and revised its project design in order to reduce the risk of collision. Following submission of the ES, NnGOWL gathered a further 12 months of bird survey data in order to gain a better understanding of distribution and behaviour within the NnG project sites and the surrounding 8 km survey buffer. The results of these additional surveys and revised collision risk modelling were presented in the NnG Addendum of Supplementary Information in 2013. At this time, NnGOWL also committed to increasing the minimum turbine rotor tip height to 30.5m and reduced the proposed number of turbines across the site from a maximum of 125 to 90. In 2014, NnGOWL committed to reducing the number of turbines still further, to no more than 75. The Appropriate Assessment of the NnG consent application (MS-LOT, July 2014) was based on this revised design scenario of 75 x 6MW turbines and indicated a further decrease in the estimated number of collisions for gannets and kittiwakes.

CRM results indicate that the current proposed variation to the project design further reduces collision risk. The results indicate a decrease in the number of collisions of kittiwake and gannet compared to the numbers predicted in the original consent application and as presented in the Appropriate Assessment undertaken by Marine Scotland. It is concluded that the effects of the proposed variation in project design, alone or in combination, on collision risk for gannets and kittiwakes are of a lower magnitude than those associated with the consented project design.

8 Conclusions

NnGOWL is seeking to vary the existing S36 Consent for the NnG offshore wind farm to include an option to install turbines with a rated capacity of up to 7MW.

This Supporting Environmental Information Report has been submitted in support of the application to vary the S36 Consent under Section 36C of the Electricity Act 1989. It has provided an overview of the potential environmental impacts of the updated project design by comparison with the consented project design.

In line with the requirements of the guidance on S36 Consent variation, it has been demonstrated that the potential impacts associated with the proposed variation will be no greater than those previously assessed for the consented project.

9 References

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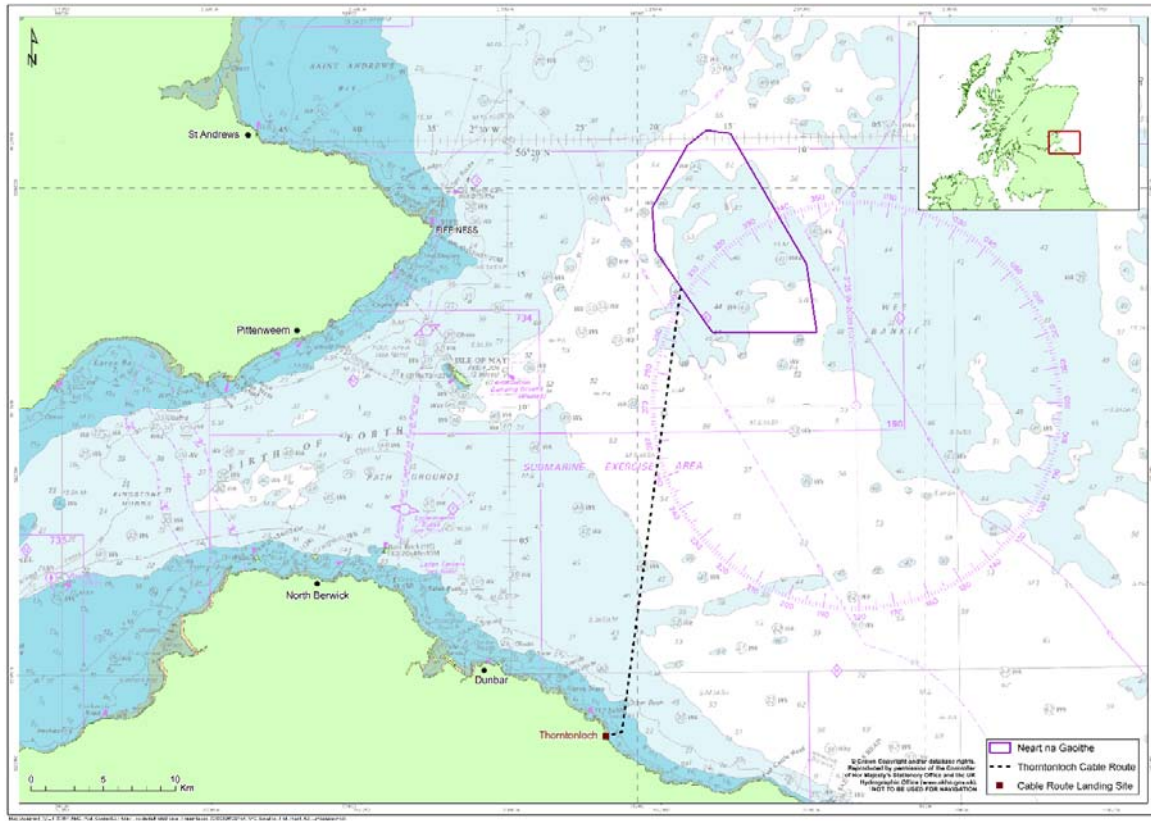
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Appendix I – Location of the Project

Figure A – Location of the NnG Project



Appendix II – Draft revised S36 Consent

(Proposed changes to consent text are shown in red and struck through / underlined as appropriate)

ANNEX 1

Description of the Development

An offshore wind turbine generating station, located as shown in Figure 1 below, with a gross electrical output capacity of up to 450 MW comprising:

1. not more than 75 three-bladed horizontal axis wind turbines each with a maximum blade tip height of up to 197 metres ~~and a maximum rated capacity of up to 6MW¹~~;
2. for each WTG, a jacket or gravity base foundation;
3. for each WTG, a transition piece (including access ladders / fences and landing platforms), turbine tower, blades and nacelle; and
4. inter array cabling between the turbines and the offshore substation platforms,

and, except to the extent modified by the foregoing, all as specified in the application letter, ~~and~~ the project description contained in the accompanying Environmental Statement (Chapter 5 of the ES as supplemented by Technical Appendix 1 of the SEIS) ~~and the Section 36 Consent Variation: Supporting Environmental Information~~ but subject always to the conditions specified in Annex 2 of this consent.

ANNEX 2

Condition 7

The Development must be constructed and operated in accordance with the terms of the Application and related documents, including the accompanying ES, the SEIS, ~~the Section 36 Consent Variation: Supporting Environmental Information~~ and Annex 1 of this letter, except in so far as amended by the terms of this section 36 consent.

Reason: To ensure that the Development is carried out in accordance with the Application documentation.

ANNEX 3

DEFINITIONS AND GLOSSARY OF TERMS

¹ Note for Scottish Ministers: The Applicant submits that the amended text is appropriate in that it does not permit more than 64 x 7 MW turbines as there is an overarching limit on total generating capacity of 450 MW in place which will prevent any more than 64 x 7 MW turbines being constructed. The reference to the maximum number of 75 turbines should remain to cover the scenario where 6MW turbines are installed instead of 7MW turbines. Not referring to a maximum rated capacity in the description of the Development is the approach that was taken in the Section 36 consents for Inch Cape Offshore Wind Farm, Seagreen Alpha Offshore Wind Farm and Seagreen Bravo Offshore Wind Farm and in the marine licence for the NNG OWF. It is also the approach that has been taken in Section 36 consents for tidal projects such as the MeyGen Tidal Energy project. There is therefore plenty of precedent for such drafting in a Section 36 consent. In addition to the controls noted above, there are also additional safeguards in place within the Consent to ensure that the development is constructed in accordance with the ES, SEIS and Variation Supporting Environmental Information (i.e. Condition 7).

In this decision letter and in Annex 1 and 2:

[...]

“the Application” means the Application letters and Environmental Statement submitted to the Scottish Ministers, by the Company on 13 July 2012 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 15 April 2013 for consent under section 36 of the Electricity Act for the construction and operation of Neart na Gaoithe Offshore Wind Farm in the Firth of Forth with a maximum generating capacity of 450 megawatts and the Section 36 Consent Variation: Supporting Environmental Information submitted to the Scottish Ministers, by the Company under section 36C of the Electricity Act on [] 2015;

[...]

Appendix III – Collision Risk Modelling

Appendix III (A) – Band Option 3 CRM inputs and outputs for the consented project design scenario (75 x 6MW) and the proposed variation to the project design scenario (64 x 7MW)

Parameters and results for 75 x 6MW Scenario using Band Option 3

Bird parameters

Species	Length (m)	Wingspan (m)	Flight speed (m/s)	Flapping (0) or gliding (1)	Nocturnal activity factor (1-5)	Proportion at rotor height
Gannet	0.935	1.725	14.9	0	2	0.07
Kittiwake	0.39	1.075	13.1	0	3	0.06

Monthly density (birds/km²)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.08	1.33	2.36	1.24	4.41	3.42	5.12	4.17	4.74	2.27	0.29	0.03
Kittiwake	0.15	0.04	0.19	0.21	0.62	0.23	0.94	0.17	0.65	0.80	0.76	3.36

Turbine parameters

Turbine model	No of blades	Rotation speed (rpm)	Rotor radius (m)	Minimum rotor height (m)	Hub height (m)	Maximum blade width (m)	Pitch (°)	No of turbines	Width of wind farm	Latitude
6MW	3	8	77	24.85	101.85	5	15	75	8.22	56.27

Proportion of time in operation per month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.885	0.864	0.871	0.855	0.858	0.847	0.842	0.824	0.858	0.866	0.889	0.857

Results of collision rate modelling using the SOSS Band model, extended model option 3, using data accompanying Johnston et al. (2014b), for Gannet and 75 x 6MW turbine scenario at Neart na Gaoithe

75 x 6MW													
Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly total
0.95	1	10	23	13	53	41	62	46	47	21	2	0	318
0.98	0	4	9	5	21	16	25	18	19	8	1	0	127

Results of collision rate modelling using the SOSS Band model, extended model option 3, using data accompanying Johnston et al. (2014b), for Kittiwake and 75 x 6MW turbine scenario at Neart na Gaoithe

75 x 6MW													
<i>Avoidance rate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly total
0,95	1	0	2	2	7	2	10	2	6	7	7	27	74
0,98	1	0	1	1	3	1	4	1	2	3	3	11	29

Parameters and results for 64 x 7MW Scenario using Band Option 3

Bird parameters

Species	Length (m)	Wingspan (m)	Flight speed (m/s)	Flapping (0) or gliding (1)	Nocturnal activity factor (1-5)	Proportion at rotor height
Gannet	0.935	1.725	14.9	0	2	0.031
Kittiwake	0.39	1.075	13.1	0	3	0.041

Monthly density (birds/km²)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.08	1.33	2.36	1.24	4.41	3.42	5.12	4.17	4.74	2.27	0.29	0.03
Kittiwake	0.15	0.04	0.19	0.21	0.62	0.23	0.94	0.17	0.65	0.80	0.76	3.36

Turbine parameters

Turbine model	No of blades	Rotation speed (rpm)	Rotor radius (m)	Minimum rotor height (m)	Hub height (m)	Maximum blade width (m)	Pitch (°)	No of turbines	Width of wind farm	Latitude
7MW	3	10.4	77	30.5	107.5	5	17.5	64	8.22	56.27

Proportion of time in operation per month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.885	0.864	0.871	0.855	0.858	0.847	0.842	0.824	0.858	0.866	0.889	0.857

Results of collision rate modelling using the SOSS Band model, extended model option 3, using data accompanying Johnston et al. (2014b), for Gannet and 64 x 7MW turbine scenario at Neart na Gaoithe

64 x 7MW													
<i>Avoidance rate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearlytotal
0,95	0	6	14	8	33	25	38	28	29	13	1	0	198
0,98	0	3	6	3	13	10	15	11	12	5	1	0	79

Results of collision rate modelling using the SOSS Band model, extended model option 3, using data accompanying Johnston et al. (2014b), for Kittiwake and 64 x 7MW turbine scenario at Neart na Gaoithe

64 x 7MW													
<i>Avoidance rate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearlytotal
0,95	1	0	1	1	4	2	7	1	4	5	4	18	49
0,98	0	0	0	1	2	1	3	0	2	2	2	7	20

Appendix III (B) – Band Option 1 CRM inputs and outputs for the consented project design scenario (75 x 6MW) and the proposed variation to the project design scenario (64 x 7MW)
Parameters and results for 75 x 6MW Scenario using Band Option 1
Bird parameters

Species	Length (m)	Wingspan (m)	Flight speed (m/s)	Flapping (0) or gliding (1)	Nocturnal activity factor (1-5)	Proportion at rotor height
Gannet	0.935	1.725	14.9	0	2	0.047
Kittiwake	0.39	1.075	13.1	0	3	0.042

Monthly density (birds/km²)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.08	1.33	2.36	1.24	4.41	3.42	5.12	4.17	4.74	2.27	0.29	0.03
Kittiwake	0.15	0.04	0.19	0.21	0.62	0.23	0.94	0.17	0.65	0.80	0.76	3.36

Turbine parameters

Turbine model	No of blades	Rotation speed (rpm)	Rotor radius (m)	Minimum rotor height (m)	Hub height (m)	Maximum blade width (m)	Pitch (°)	No of turbines	Width of wind farm	Latitude
6MW	3	8	77	27.5	101.85	5	15	75	8.22	56.27

Proportion of time in operation per month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.885	0.864	0.871	0.855	0.858	0.847	0.842	0.824	0.858	0.866	0.889	0.857

Results of collision rate modelling using the SOSS Band model, basic model option 1, using 3 years mean density data between November 2009 and October 2012, for Gannet and 75 x 6MW turbine scenario at Neart na Gaoithe

75 x 6MW													
Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly total
0,95	2	33	73	41	164	128	193	143	147	65	7	1	998
0,98	1	13	29	16	66	51	77	57	59	26	3	0	399

Results of collision rate modelling using the SOSS Band model, basic model option 1, using 3 years mean density data between November 2009 and October 2012, for Kittiwake and 75 x 6MW turbine scenario at Neart na Gaoithe

75 x 6MW													
<i>Avoidance rate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly total
0,95	3	1	5	5	16	6	25	4	15	18	16	69	184
0,98	1	0	2	2	7	2	10	2	6	7	7	27	74

Parameters and results for 64 x 7MW Scenario using Band Option 1

Bird parameters

Species	Length (m)	Wingspan (m)	Flight speed (m/s)	Flapping (0) or gliding (1)	Nocturnal activity factor (1-5)	Proportion at rotor height
Gannet	0.935	1.725	14.9	0	2	0.05
Kittiwake	0.39	1.075	13.1	0	3	0.04

Monthly density (birds/km²)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gannet	0.08	1.33	2.36	1.24	4.41	3.42	5.12	4.17	4.74	2.27	0.29	0.03
Kittiwake	0.15	0.04	0.19	0.21	0.62	0.23	0.94	0.17	0.65	0.80	0.76	3.36

Turbine parameters

Turbine model	No of blades	Rotation speed (rpm)	Rotor radius (m)	Minimum rotor height (m)	Hub height (m)	Maximum blade width (m)	Pitch (°)	No of turbines	Width of wind farm	Latitude
7MW	3	10.4	77	30.5	107.5	5	17.5	64	8.22	56.27

Proportion of time in operation per month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.885	0.864	0.871	0.855	0.858	0.847	0.842	0.824	0.858	0.866	0.889	0.857

Results of collision rate modelling using the SOSS Band model, basic model option 1, using 3 years mean density data between November 2009 and October 2012, for Gannet and 64 x 7MW turbine scenario at Neart na Gaoithe

64 x 7MW													
<i>Avoidancerate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearlytotal
0,95	2	32	71	40	160	125	188	138	143	63	7	1	968
0,98	1	13	28	16	64	50	75	55	57	25	3	0	387

Results of collision rate modelling using the SOSS Band model, basic model option 1, using 3 years mean density data between November 2009 and October 2012, for Kittiwake and 64 x 7MW turbine scenario at Neart na Gaoithe

64 x 7MW													
<i>Avoidancerate</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearlytotal
0,95	3	1	4	5	16	6	24	4	15	18	16	66	177
0,98	1	0	2	2	6	2	10	2	6	7	6	26	71