East Anglia ONE North Offshore Windfarm

Outline Offshore Operations and Maintenance Plan (OOMP)

Applicant: East Anglia ONE North Limited
Document Reference: 8.12 (Tracked)
SPR Reference: EA1N-DWF-ENV-REP-IBR-000394 Rev 02
~~Pursuant to APFP Regulation: 5(2)(q)~~

Date: ~~September 2019~~15th December 2020
Revision: Version ~~1~~02
Author: Royal HaskoningDHV

Applicable to
East Anglia ONE North

Revision Summary				
Rev	**Date**	**Prepared by**	**Checked by**	**Approved by**
001	08/10/2019	Paolo Pizzolla	Ian MacKay	Helen Walker
002	15/12/2020	Paolo Pizzolla	Ian MacKay	Rich Morris

Description of Revisions			
Rev	**Page**	**Section**	**Description**
001	n/a	n/a	Final for Application
002	n/a	n/a	Updated for submission at Deadline 3

Table of Contents

The appendix associated with the outline Offshore Operations and Maintenance plan for the proposed East Anglia ONE North project is listed in the below table.

Appendix number	Title
Appendix 1	Operations and Maintenance List

Glossary of Acronyms

AUV	Autonomous Underwater Vehicle
CAA	Civil Aviation Authority
DCO	Development Consent Order
DML	Deemed Marine Licence
DoB	Depth of Burial
EMP	Environmental Management Plan
ES	Environmental Statement
HV	High Voltage
MBES	Multibeam-echo sounder
MMO	Marine Management Organisation
MW	Mega Watt
O&M	Operation and Maintenance
Ofcom	Office of Communications
OOMP	Operations and Maintenance Plan
ROV	Remotely Operated Vehicle
SNCB	Statutory Nature Conservation Body
SPR	ScottishPower Renewables
SSS	Side Scan Sonar
UPS	Uninterruptible Power Supply

Glossary of Terminology

Applicant	East Anglia ONE North Limited
Construction, operation and maintenance platform	A fixed structure required for construction, operation and maintenance personnel and activities.
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
Inter-array cables	Offshore cables which link the wind turbines to each other and the offshore electrical platforms. These cables will include fibre optic cables.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Offshore cable corridor	This is the area which will contain the offshore export cables between offshore electrical platforms and landfall.
Offshore development area	The East Anglia ONE North windfarm site and offshore cable corridor (up to Mean High Water Springs).
Offshore electrical platform	A fixed structure located within the windfarm area, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which would bring electricity from the offshore electrical platforms to the landfall. These cables will include fibre optic cables.
Platform link cable	An electrical cable which links one or more offshore platforms. These cables will include fibre optic cables.
Safety zones	A marine area declared for the purposes of safety around a renewable energy installation or works / construction area under the Energy Act 2004.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water

1 Outline Offshore Operations and Maintenance Plan

1.1 Changes to Previously Submitted Document

1. This outline Offshore Operation and Maintenance Plan (OOMP) is an update of the previous version of the outline OOMP (APP-589) submitted with the Development Consent Order (DCO) application for the East Anglia ONE North project (the Project). The updates within this document take account of comments made by Interested Parties in their Relevant Representations regarding the outline OOMP and other application documents.

~~1.1~~1.2 Purpose of this Document

~~1.~~2. This outline ~~Offshore Operation and Maintenance Plan (~~OOMP~~)~~ has been drafted with specific reference to the interpretation of the definition of "maintain" within the ~~East Anglia ONE North Development Consent Order (~~Project's ~~DCO)~~:

"maintain" includes inspect, upkeep, repair, adjust, and alter and further includes remove, reconstruct and replace (but only in relation to any of the ancillary works in Part 2 of Schedule 1 (ancillary works) and any component part of any wind turbine generator, offshore electrical platform, construction, operation and maintenance platform or meteorological mast described in Part 1 of Schedule 1 (authorised development) not including the alteration, removal or replacement of foundations), to the extent assessed in the environmental statement; and "maintenance" must be construed accordingly;

~~2.~~3. The purpose of this document is to provide an outline of reasonably foreseeable offshore maintenance activities and the broad approach to be taken for each activity.

~~3.~~4. The final OOMP would be prepared following post-consent detailed design as required under the conditions of the Deemed Marine Licences (DMLs) included within the draft DCO ~~Condition~~:

"An offshore operations and maintenance plan, in accordance with the outline offshore operations and maintenance plan, to be submitted to the MMO at least ~~four~~ six months prior to commencement of operation of the licensed activities and to provide for review and resubmission every three years during the operational phase."

~~4.~~5. The OOMP will be developed at least six months prior to operation for each ~~Deemed Marine Licence (~~DML~~)~~, which will include details of the:

- Operation and Maintenance (O&M) requirements of the ~~project~~Project, including all activities, equipment, structures and associated infrastructure, in accordance with design and manufacturer recommendations;
- Operational health, safety and environment management;
- Accessibility and constraints;
- Logistical set up of the O&M base;
- O&M staff requirement, including numbers and skills;
- Spare parts and availability; and
- Planning of scheduled and unscheduled maintenance

~~5.~~6. East Anglia ONE North Limited 'the Applicant' (which is a wholly owned subsidiary of ScottishPower Renewables (SPR) UK Limited) has assessed the following reasonably foreseeable offshore maintenance activities within the Environmental Statement (ES):

- Scheduled Maintenance:
  - Each wind turbine will require regular servicing
  - Scheduled maintenance would be undertaken from vessels (e.g. Service Offshore Vessel, Crew Transfer Vessel etc.) or helicopters.
- Unscheduled Maintenance:
  - During the operational period it is anticipated that unscheduled maintenance activity may be required to deal with fault finding and repairs of the wind turbines, cables and associated offshore infrastructure.
  - Unscheduled maintenance would be undertaken from vessels such as jack-up barges, Service Offshore Vessels, Crew Transfer Vessels etc., or helicopters.

~~6.~~7. ***Appendix 1*** of this document outlines the estimated frequency and seabed footprints of the maintenance activities.

~~7.~~8. The operational impacts are assessed in each offshore technical chapters of the ES; ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ***Chapter 8 Marine Water and Sediment Quality***; ***Chapter 9 Benthic Ecology***; ***Chapter 10 Fish and Shellfish Ecology***; ***Chapter 11 Marine Mammals***; ***Chapter 12 Offshore Ornithology***; ***Chapter 13 Commercial Fisheries***; ***Chapter 14 Shipping and Navigation***; and ***Chapter 17 Infrastructure and Other Users***.

~~1.1.1~~1.2.1 Background

~~8.~~9. The Applicant is seeking a DCO for the ~~proposed East Anglia ONE North p~~Project, an offshore windfarm in the southern North Sea.

9.10. The East Anglia ONE North windfarm site comprises of an area approximately 208km²203.35km², located approximately 36km 37.5km from its nearest point to the port of Lowestoft and 42km from Southwold, within which wind turbines would be located. The proposed East Anglia ONE North project would be connected to the shore by offshore export cables installed within the offshore cable corridor from the windfarm site to a landfall point to the north of Thorpeness, Suffolk. From there, onshore cables would transport power over approximately 9km to the onshore project substation located near to the village of Friston, Suffolk.

10.11. Once built, the proposed East Anglia ONE North pProject would have offshore components comprising:

- Wind turbines;
- Offshore electrical platforms;
- Offshore construction, operation and platform;
- Meteorological masts;
- Measuring equipment (LiDAR and wave buoys);
- Array cables;
- Platform link cables; and
- Export cables.

11.12. Construction of the project Project is anticipated to commence at the earliest in 2023 for the onshore works, and at the earliest around 2026 for the offshore works.

1.21.3 Discharging the Consent Condition

1.2.11.3.1 Activity List during the Operations and Maintenance Phase

12.13. The list of activities to be undertaken during the O&M phase is provided as ***Appendix 1***. This O&M list is a live document which will be updated and agreed with the Marine Management Organisation (MMO) as required.

13.14. For each activity, a 'traffic light system' will be used to provide clarity as to those activities that can be carried out under the existing DMLs.

- **Green** indicates that an additional marine licence is not required, however a subsequent approval from the MMO may be required and/or notification should be provided to the MMO on works being undertaken;
- **Amber** indicates that an additional marine licence may be required if proposed works exceed those assessed within the ES or described within the DCO; or

- **Red** indicates that an additional Marine Licence would likely be required. This would be dependent on the works to be undertaken (e.g. scale and methodology), subject to agreement with the MMO.

~~1.3~~1.4 Appendix 1: Operations and Maintenance List

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Wind turbines (topside)						
Annual wind turbine maintenance (including 'Hot Work'[1])	Gen	Yes	Assessed in the ES within the assumed maintenance activities per annum for scheduled and unscheduled maintenance, for which as a worst case it was assumed that up to 647 maintenance vessel trips per annum would be required. There are a number of potential maintenance strategies for the proposed East Anglia ONE North project which will be determined by the final design of the windfarm and procurement of the maintenance contractors. The windfarm could be maintained from shore using a number of varying O&M vessels (e.g. crew transfer vessels, supply vessels) possibly supported by helicopters. Alternatively, the windfarm could be maintained primarily from an offshore base (e.g. a fixed offshore construction, operation and maintenance platform), with transfer	ES ***Chapter 6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 8 Marine water and sediment quality*** ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal***;	No	No
Wind turbine troubleshooting	Gen	Yes			No	No
Wind turbine repair	Gen	Yes			No	No
Blade inspection	Gen	Yes			No	No
Blade and hub repair	Gen	Yes			No	No
Blade replacement	Gen	Yes			No	No
Transition piece repair	Gen	Yes			No	No

[1] The term 'Hot Work' relates to all work that uses equipment which produces heat or a source of potential ignition and fire i.e. welding operations. This activity relates to 'minor repairs' relating to like-for-like replacement or repair to similar condition to the original. Such operations will include mending defective welds, affixing like-for like replacements on the transition piece or performing any necessary cutting on site / decommissioning on site.

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Transition piece maintenance	Gen	Yes	vessels or helicopters also used to transfer personnel to or from turbines and the construction, operation and maintenance platform. Typical maintenance activities would include; general servicing; oil sampling / change; UPS (uninterruptible power supply)-battery change; service and inspections of wind turbine safety equipment, nacelle crane, service lift, high voltage (HV) system, blades. Although it is not anticipated that large components (e.g. wind turbine blades or substation transformers) would frequently require replacement during the operational phase, the failure of these components is possible. Should this be required, large jack-up vessels may need to operate continuously for significant periods to carry out these major maintenance activities. A separate row regarding groundwork activities to facilitate jack-up vessel leg placement is provided below under 'Other' activities. Up to 647 vessel movements per year during operation. These trips primarily relate to Crew Transfer Vessels which would not routinely / ever anchor. A maximum of one location visited by one jack-up vessel (counted as a single movement) to the East Anglia ONE North site every two years. Jack up vessel with a footprint of 3,000m^2 which would lead	ES ***Chapter 12 Offshore Ornithology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.	No	No
Transformer replacement	Gen	Yes			No	No
Gearbox repair and replacement	Gen	Yes			No	No
Generator replacement	Gen	Yes			No	No
Paint and repair	Gen	Yes			No	No
J-Tube and ladder cleaning	Gen	Yes			No	No

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
			to a total area of up to 112,500m^2 per year (assumes large jack up with up to six legs).			
Removal of organic material	Gen	No	Marine growth/guano will accumulate on the offshore infrastructure, this must be regularly removed to protect the exterior parts of the wind turbines.	N/A	No	Yes
Cables (inter array, platform link and export)						
Additional cable laying	Gen & Trans	Yes	During the life of the project, cable repairs may be required, and periodic inspections, including through the use of geophysical surveys, will be undertaken. Periodic surveys would also be required to ensure the cables remain buried and if they do become exposed, re-burial works would be undertaken. In most cases a failure would lead to the following operations: • Vessel anchor placement;	ES ***Chapter 6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***;	~~No~~Potentially	~~Yes~~Potentially
Cable inspection	Gen & Trans	Yes			No	No

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Addition to cable protection in ~~the~~ different locations to cable protection installed during construction	Gen & Trans	Yes[2] ~~No~~	• Exposing / unburying the damaged part of the cable, assumed to be approximately 300m length of an export cable or platform link cable or the whole length of an inter-array cable (up to 4km length) subject to the nature of the repair; • Cutting the cable; • For array cables it may be preferable to lift a whole length of a cable between two turbines, of up to approximately 4km length although this would be a rare occurrence; • Lifting the cable ends to the repair vessel; • Jointing a new segment of cable to the old cable; • Lowering the cable (and joints) back to the sea bed; and • Cable burial, where possible. Worst case assumes a maximum of five maintenance activities requiring the use of a cable laying vessel per year for all cables.	ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.	No[3]	Yes
Replacement or addition to cable protection in the same locations as cable protection installed during construction	Gen & Trans	Yes			No	Yes
Cable re-burial	Gen & Trans	Yes			No	Yes

[2] Up to 452,030m^2 of cable protection has been assessed in the ES. Unless the area of cable protection installed exceeds this then no additional marine licence is required.
[3] Approval will be required under condition 24 of the Generation DML and condition 20 of the Transmission DML prior to the installation of additional cable protection in different locations.

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Cable repair	Gen & Trans	Yes	Cables can become exposed due to moving sand waves but also sometimes due to erosion of other soft / mobile sediment (not just sand waves). During the life of the project, periodic geophysical surveys would be required to ensure the cables remain buried and if they do become exposed, re-burial works would be undertaken. Post construction surveys in the initial 3-5 years are often dictated by the deemed marine licence. The worst case scenario for inter-array, platform link and export cable re-burial is based on an estimate of 10% of the cable every 5 years although the aim would be to avoid requirement for re-burial by using sand wave levelling / pre-sweeping.		No	Yes
Cable inspection including geophysical surveys (Multibeam-echo sounder (MBES), magnetometer, side scan sonar (SSS)) and Depth of Burial (DoB) surveys to inspect subsea assets.	Gen & Trans	Yes			No	Yes
Sub-bottom profiling (i.e. chirp or pinger)	Gen & Trans	Yes			No	No
Geotechnical survey	Gen & Trans	Yes			No	No
Cable burial using surface protection	Gen & Trans	Yes			No	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Wind Turbine and Meteorological Mast Foundations						
Foundation inspection	Gen	Yes	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above.	ES ***Chapter 6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.	No	No
Foundation repair	Gen	Yes			No	No
Foundation replacement	Gen	N/A	Replacement of a failed foundation is considered to be a highly unlikely event. Should such an occurrence take place then consent for the replacement of the failed foundation would be obtained from the MMO prior to commencement.	N/A	Yes	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
~~Additional~~ Replacement or addition to scour protection installed during construction around foundations	Gen	Yes	*Wind Turbine Foundations* Scour protection is included in the worst case scenario of 100% foundations requiring scour protection. Installation of the following areas of scour protection for the worst case number of wind turbines associated with the respective foundation type would be permitted (note that the benthic assessment considered gravity-base foundations as the worst case because they have the largest footprint): • Monopile and scour protection footprints together are calculated as 234,146.83m^2 per foundation • Gravity-base foundation and scour protection footprints together are calculated as 1,348,685.73m^2 per foundation. • Jacket on pin piles and scour protection footprints together are calculated as 290,953.67m^2 • Jacket on suction caissons and scour protection footprints together are calculated as 664,832m^2 per foundation • Suction caisson and scour protection footprints together are calculated as 203,967.90m^2 per foundation	Maximum parameters included in construction phase: ES ***Chapter6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 8 Marine Water and Sediment Quality***; ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***.	No	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
			Met Mast There would be one met mast. The following areas of scour protection per foundation type would be permitted. • Monopile and scour protection footprints together are calculated as 1,256.64m^2 • Gravity-base structure and scour protection footprints together are calculated as 2,827.43m^2 • Jacket on pin piles and scour protection footprints together are calculated as 900m^2 • Jacket on suction caissons and scour protection footprints together are calculated as 2,450.25m^2 • Suction caisson and scour protection footprints together are calculated as 706.86m^2~~In the ES the worst case has been based on a sea bed footprint from scour protection and 53 x 300m wind turbine gravity base structure (GBS) foundations totalling 1,348,685.73m^2.~~ • ~~The equivalent sea bed footprint for the met mast = 2,827.43m^2.~~			

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Installation of scour protection in different locations to scour protection installed during construction	Gen	Yes[4]	The maximum footprint of scour protection (including the foundation area) for each of the foundation type options for wind turbines and the met mast are as stated in the above cell.	N/A	No[5]	Yes
Addition of antifouling devices	Gen	No	Anti-fouling devices such as passive bird scarers and bird spikes can be used on the offshore infrastructure to discourage birds and other animals from establishing themselves on or soiling the external surfaces. Such devices are required to ensure safe access and functionality of the infrastructure. It is important to note that the devices are not designed to actively or passively harm wildlife	N/A	No	No
Offshore Electrical Platforms and Construction, Operation and Maintenance Platform						
Inspections including geophysical surveys (MBES, magnetometer,	Gen & Trans	Yes		ES ***Chapter 6 Project Description***;	No	No

[4] Unless the total area of scour protection installed for the chosen foundation type exceeds that assessed in the ES then no additional marine licence is required.
[5] Approval will be required under condition 24 of the Generation DML and condition 20 of the Transmission DML prior to the installation of additional scour protection in different locations.

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
SSS) to inspect subsea assets.			Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above. Offshore electrical platforms would typically require an average of 1 visit / week although this may be more during unscheduled maintenance.	ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 8 Marine Water and Sediment Quality*** ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.		
Sub-bottom profiling (i.e. chirp or pinger)	Gen & Trans	Yes			No	No
General maintenance work, e.g. oil replacement, mechanical works, external surface preparation and protective coating repair / re-painting.	Gen & Trans	Yes			No	No
Switchgear replacement	Gen & Trans	Yes			No	No
Foundation inspection	Gen & Trans	Yes	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above.	ES ***Chapter 6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 9 Benthic Ecology***;	No	No
Foundation repair	Gen & Trans	Yes			No	No

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
				ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.		
Foundation replacement	Gen & Trans	N/A	Replacement of a failed foundation is considered to be a highly unlikely event. Should such an occurrence take place then consent for the replacement of the failed foundation would be obtained from the MMO prior to commencement.	N/A	Yes	Yes
Replacement or ~~A~~addition to~~al~~ scour protection around foundations installed during construction	Gen & Trans	Yes	Installation of the following areas of scour protection per foundation type would be permitted for each individual offshore electrical or construction operation and maintenance platform of which there would be up to four and one respectively (note that the benthic assessment considered jackets on suction caissons as the worst case because they have the largest footprint): • Jacket on pin piles and scour protection footprints together are calculated as 26,651.55m^2	Maximum parameters included in construction phase: ES ***Chapter6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***;	No	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
			• Jacket on suction caisson and scour protection footprints together are calculated as 76,380m^2 • Gravity-base structure and scour protection footprints together are calculated as 60,000m^2 • Monopiles and scour protection footprints together are calculated as 22,089.3m^2~~Scour protection is included in the worst case scenario of 100% foundations requiring scour protection. A sea bed footprint of 186,560m^2 for five offshore platforms has been assessed in the ES.~~	ES ***Chapter 8 Marine Water and Sediment Quality***; ES ***Chapter 9 Benthic Ecology***; ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***.		
Installation of scour protection in different locations to scour protection installed during construction	Gen	Yes[6]	The maximum footprint of scour protection (including the foundation area) for each of the foundation type options for wind turbines and the met mast are as stated in the above cell.	N/A	No[7]	Yes
Removal of organic material	Gen & Trans	No	Marine growth / guano will accumulate on the offshore infrastructure, this must be regularly removed to protect the exterior parts of the	N/A	No	Yes

[6] Unless the total area of scour protection installed for the chosen foundation type exceeds that assessed in the ES then no additional marine licence is required.
[7] Approval will be required under condition 24 of the Generation DML and condition 20 of the Transmission DML prior to the installation of additional scour protection in different locations.

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
			offshore electrical platforms and the construction, operation and maintenance platform~~WTGs~~.			
Addition of antifouling devices	Gen & Trans	No	Anti-fouling devices such as passive bird scarers and bird spikes can be used on the offshore infrastructure to discourage birds and other animals from establishing themselves on or soiling the external surfaces. Such devices are required to ensure safe access and functionality of the infrastructure. It is important to note that the devices are not designed to actively or passively harm wildlife	N/A	No	Yes
Other						
Davit crane inspection	Gen & Trans	Yes	Within the assumed maintenance activities per annum as described above.	ES ***Chapter 6 Project Description***; ES ***Chapter 7 Marine Geology, Oceanography and Physical Processes***; ES ***Chapter 9 Benthic Ecology***;	No	No
Fuel replenishment to crew transfer vessel	Gen & Trans	Yes			No	No
Re-fuelling of generator on the offshore electrical platforms	Gen & Trans	Yes			No	No
Grout and corrosion works (including	Gen & Trans	Yes			No	No

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
cathodic protection inspection, grouting core samples and re-grouting)				ES ***Chapter 10 Fish and Shellfish Ecology***; ES ***Chapter 11 Marine Mammal Ecology***; ES ***Chapter 13 Commercial Fisheries***; ES ***Chapter 14 Shipping and Navigation***.		
Retro-fitting of cathodic protection	Gen & Trans	No			No	Yes
Crane transfers from vessel to either wind turbines or to quayside O&M Building or vice-versa	Gen & Trans	Yes			No	No
UXO clearance via detonation	Gen & Trans	~~Yes~~No	No UXO clearance events assessed during the operation and maintenance period.~~Up to 80 UXO with a maximum 700kg (net explosive quantities (NEQ))~~	~~ES ***Chapter 11 Marine Mammals***~~N/A	~~No~~Yes	Yes
Marine archaeology	Gen & Trans	Yes	It is assumed that given the pre-construction survey requirement it is unlikely that any new archaeology would be found during operation. All archaeology would have been identified at that stage. There is potential that some identified features avoided during construction may be affected during maintenance activities if the footprint of works is larger (for example isolated features which have potential to be relocated). In this case	ES ***Chapter 16 Marine Archaeology and Cultural Heritage***	No	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
			the Applicant will consult with Historic England and agree any action with the MMO.			
Offshore and nearshore visual inspections	Gen & Trans	No	The use of video recording equipment and photography to record the condition of the subsea assets. Equipment may be mounted to a Remotely Operated Vehicle (ROV) / Autonomous Underwater Vehicles (AUV) or held by a diver	N/A	No	No
Use of artificial lighting	Gen & Trans	No	When natural light is inadequate or not available artificial lighting will be provided to ensure health and safety of work personnel and other site users. Artificial lighting will not impact the visibility or apparent colour of any safety signs or other safety-related items such as fire extinguishers. Artificial lighting also relates to the artificial illumination of emergency escape routes.	N/A	No	No
Installation of moored buoys for environmental monitoring	Gen & Trans	Yes	Requirement for met ocean data on the site so provision of moored buoys to act as remote weather sensors. Communication of data with the base and helicopters will be done using Very High Frequency (VHF) channels for which licenses shall be sought from the Office of Communications (Ofcom).	ES ***Chapter 6 Project Description*** and ***Chapter 9 Benthic Ecology***	No	No
Transport and transfer of individuals and load by air	Gen & Trans	Yes	981 helicopter round trips per year for routine and planned operation and maintenance.	ES ***Chapter 12 Offshore Ornithology***	No	No

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Recovery of dropped objects	Gen & Trans	N/A	Dropped objects will be reported to the MMO using the Dropped Object Procedure Form. On receipt of the Dropped Object Procedure Form, the MMO may require relevant surveys to be carried out if reasonable to do so and the MMO may require obstructions to be removed from the sea bed if reasonable to do so.	N/A	No Dropped objects will be reported to the MMO using the Dropped Object Procedure Form.	No
Rope access	Gen & Trans	N/A	Rope access work could be required to provide access for both routine and extra ordinary operations	N/A	No	No
Use of drones for offshore inspection	Gen & Trans	No	The use of drones for inspections of blades, transition pieces and the splash zone. Drone operation will require permission under the jurisdiction of the Civil Aviation Authority (CAA).	N/A	No	No
Groundwork activities as a result of jack-up operations	Gen & Trans	No	One visit to each wind turbine by a jack-up barge every two years (resulting in 112,500m^2 of disturbance) has been assessed in ***Chapter 9 Benthic Ecology***. ~~Soil~~ Sea bed preparation works for jack-up operations. If a sea bed area has been heavily used by jack-ups and there are several locations where the spud cans have been placed ground works may be necessary.	N/A	~~Yes~~Potentially	Yes

Potential offshore maintenance activity	Relevant DML	Included in the ES?	Realistic Worst Case assessed in the ES (for any activity outside those listed, the MMO should be alerted)	Location in the Application Document	Additional licence likely to be required	Consultation Required with the MMO and relevant SNCB
Water use and discharge	Gen & Trans	No	Cleaning of the wind turbines and offshore platforms and their internal surfaces will be required for general maintenance where controls can be put in place to collect runoff. Run-off water will be collected and will be handled in compliance with the local legislation and site requirements. Any cleaning operations will be compliant with the Project Environmental Management Plan (PEMP).	N/A	No	No