



# Morecambe Offshore Windfarm: Generation Assets Development Consent Order Documents

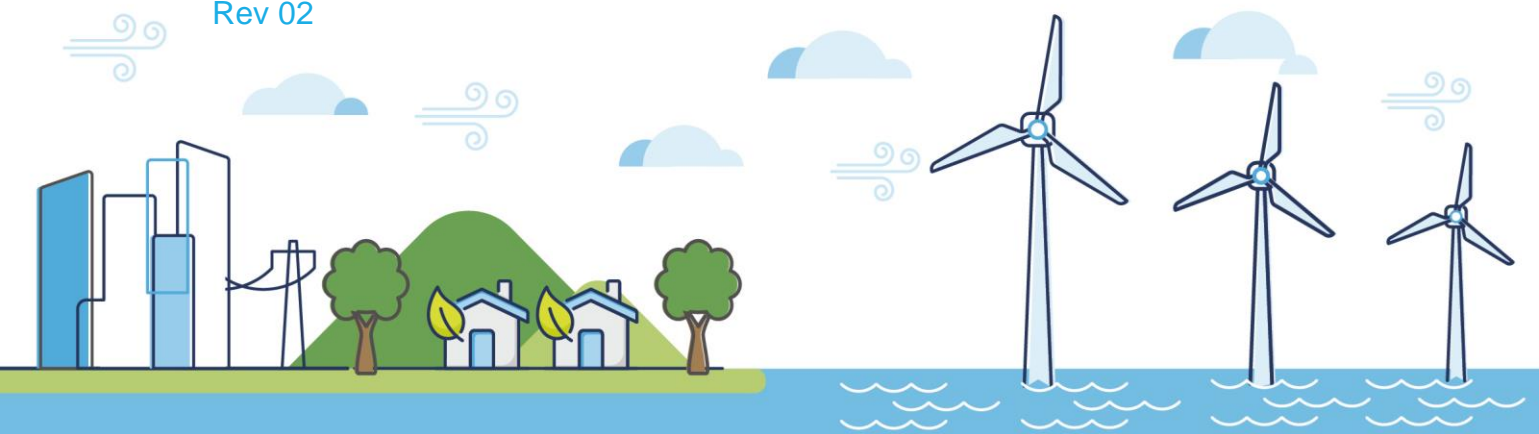
## Volume 6

## Outline Offshore Operation and Maintenance Plan

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## Glossary of Acronyms

AUV	Autonomous Underwater Vehicles
CAA	Civil Aviation Authority
CTV	Crew Transfer Vessel
DCO	Development Consent Order
DoB	Depth of Burial
DP	Dynamic positioning
DML	Deemed Marine Licence
ES	Environmental Statement
GBS	Gravity Base Structure
MBES	Multibeam-Echo Sounder
MMO	Marine Management Organisation
O&M	Operation and Maintenance
OOMP	Offshore Operation and Maintenance Plan
OSP	Offshore substation platform
PEMP	Project Environmental Management Plan
PINS	Planning Inspectorate
ROV	Remotely Operated Vehicle
SCADA	Supervisory Control and Data Acquisition
SOV	Service Operations Vessel
SSS	Side Scan Sonar
UPS	Uninterruptible Power Supply
UXO	Unexploded Ordnance
WTG	Wind turbine generator

## Glossary of Unit Terms

km	kilometre
km <sup>2</sup>	square kilometre
MW	Megawatt
m <sup>2</sup>	square metre

## Glossary of Terminology

Applicant	Morecambe Offshore Windfarm Ltd
Application	This refers to the Applicant's application for a Development Consent Order (DCO). An application consists of a series of documents and plans which are published on the Planning Inspectorate's (PINS) website.
Generation Assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s).
Inter-array cables	Cables which link the WTG(s) to each other and the OSP(s).
Nacelle	The part of the turbine that houses all of the generating components.
Offshore substation platform(s)	A fixed structure located within the windfarm site, containing electrical equipment to aggregate the power from the WTGs and convert it into a more suitable form for export to shore.
Platform link cable	An electrical cable which links one or more OSP(s)
Safety Zones	An area around a structure or vessel which should be avoided, as set out in Section 95 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations due to the flow of water.
Wind turbine generator (WTG)	A fixed structure located within the windfarm site that converts the kinetic energy of wind into electrical energy.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables will be present.



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# 1 Background

1. This Outline Offshore Operation and Maintenance Plan (OOMP) forms part of a set of documents that supports the Development Consent Order (DCO) Application submitted by Morecambe Offshore Windfarm Ltd (the Applicant) for the Morecambe Offshore Windfarm Generation Assets (the Project).
2. The Applicant is seeking a DCO for the proposed Project, located in the Eastern Irish Sea approximately 30km off the Lancashire, with an expected nominal capacity of 480 megawatts (MW).
3. The Project includes the generation assets to be located within the windfarm site (wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s)). All the infrastructure will be within the windfarm site. WTGs and OSP(s) will be fixed to the seabed with foundation structures. The windfarm site will cover an area of approximately 87km<sup>2</sup>.
4. The detailed design of the Project (e.g. number of WTGs, OSP(s), layout configuration, foundation type and requirement for scour protection) will be determined post-consent. **Chapter 5 Project Description** of the Environmental Statement (ES) (Document Reference 5.1.5) provides a description of the key components of the Project, as well as details of how the Project will be constructed, operated, maintained and decommissioned.

# 2 Purpose of this document

5. The purpose of this document is to provide an outline of reasonably foreseeable offshore operation and maintenance (O&M) activities and the broad approach to be taken for each activity.
6. Within the draft DCO, “maintain” includes inspect, maintain, repair, adjust and alter, and further includes remove, reconstruct and replace any of the ancillary works (also outlined in draft DCO) and any component part of any WTG or OSP and associated cables described in the draft DCO (but not including the alteration, removal or replacement of foundations) to the extent assessed in the ES; and “maintenance” shall be construed accordingly.
7. The final OOMP would be prepared following post-consent detailed design as required under the relevant conditions of the Deemed Marine Licence (DML).
8. The OOMP will be developed at least 4 months prior to operation, which will include details of the:
  - O&M requirements of the Project, including all activities, equipment, structures and associated infrastructure, in accordance with design and manufacturer recommendations

- Operational health, safety and environmental management
  - Accessibility and constraints
  - Logistical set up of the O&M base
  - O&M staff requirement, including numbers and skills
  - Spare parts and availability
  - Planning of scheduled and unscheduled maintenance
9. The Applicant has assessed the following reasonably foreseeable scheduled and unscheduled offshore maintenance activities within the ES:
- Scheduled maintenance:
    - Each WTG will require regular servicing
    - Regular inspections of WTGs and OSP(s), their foundations and associated cables
    - Scheduled maintenance would be undertaken from vessels such as jack-up barges, Service Operations Vessel (SOV), Crew Transfer Vessel (CTV) etc.
    - Helicopters are anticipated to be used only in exceptional circumstances during the O&M phase
  - 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 WTGs, OSP(s), cables and associated offshore infrastructure
    - Unscheduled maintenance would be undertaken from vessels such as jack-up barges, Service Operations Vessels, Crew Transfer Vessels etc.
    - Helicopters are anticipated to be used only in exceptional circumstances during the O&M phase
10. Maintenance works include but are not limited to:
- Geophysical survey, usually of foundations and subsea cables for asset integrity purposes, typically using Multibeam-Echo Sounder (MBES) and/or Side Scan Sonar (SSS), potentially using Remotely Operated Vehicles (ROVs), Autonomous Surface Vessels (ASVs) and Autonomous Underwater Vessels (AUVs)
  - WTG servicing
  - Oil sampling and/or change
  - Uninterruptible Power Supply (UPS) battery change

- Service and inspections of WTG safety equipment, nacelle crane, service lift, high voltage system, blades
  - Painting and applying other coatings to supporting structures, e.g. access ladders, walkways etc.
  - WTG/OSP foundation corrosion protection system maintenance, e.g., sacrificial anode replacement J-tube repair/replacement
  - Foundation (including scour protection) inspection and repair
  - Bird waste and marine growth removal
  - Access ladder and boat landing replacement
  - Cable inspection and repair, including cable protection and cable crossings
  - Cable repairs and replacement
  - Cable remedial burial
  - Replacement of scour protection
  - Major WTG component or OSP(s) replacement - Large components (e.g. WTG blades or OSP transformers) are not expected to need frequent replacement during the operational phase, although failure of these components is possible. In this event, a jack-up vessel may be required to operate continuously for significant periods to carry out major maintenance activities of this type.
11. **Annex 1 Operation and maintenance activities** of this document outlines the estimated frequency and seabed footprints of the maintenance activities.
12. The operational impacts are assessed in each offshore technical chapters of the ES; **Chapter 7 Marine Geology, Oceanography and Physical Processes** (Document Reference 5.1.7); **Chapter 8 Marine Sediment and Water Quality** (Document Reference 5.1.8); **Chapter 9 Benthic Ecology** (Document Reference 5.1.9); **Chapter 10 Fish and Shellfish Ecology** (Document Reference 5.1.10); **Chapter 11 Marine Mammals** (Document Reference 5.1.11); **Chapter 12 Offshore Ornithology** (Document Reference 5.1.12); **Chapter 13 Commercial Fisheries** (Document Reference 5.1.13); **Chapter 14 Shipping and Navigation** (Document Reference 5.1.14); **Chapter 15 Marine Archaeology and Cultural Heritage** (Document Reference 5.1.15); **Chapter 16 Civil and Military Aviation and Radar** (Document Reference 5.1.16); **Chapter 17 Infrastructure and Other Users** (Document Reference 5.1.17); **Chapter 18 Seascape, Landscape and Visual Impact Assessment** (Document Reference 5.1.18); **Chapter 19 Human Health** (Document Reference 5.1.19); **Chapter 20 Socio-economics Tourism and Recreation** (Document Reference 5.1.20) and **Chapter 21 Climate Change** (Document Reference 5.1.21).

### 3 Discharging the consent condition

13. The list of activities to be undertaken during the O&M phase is provided as **Annex 1 Operation and maintenance activities**. This O&M list is a live document which will be updated and agreed with the Marine Management Organisation (MMO) as required.
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 DML:
  - **Green** indicates that an additional marine licence is not required, however 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 a certain time period (10 years) after construction has elapsed
  - **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
15. Additional activities not outlined in this schedule (including **Annex 1 Operation and maintenance activities**) may, if relevant, require future consents such as a marine licence under the Marine and Coastal Access Act 2009. Such activities would be discussed with the MMO prior to being undertaken, as appropriate.

## 4 Annex 1 Operation and maintenance activities

Table 4.1 O&M phase activity list

Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
<b>WTGs (topside)</b>					
Geophysical/inspection survey	Yes	<p>During the operational lifetime of the Project, O&amp;M activities will be required. All offshore infrastructure including WTGs, OSP(s), foundations and cables would be monitored and maintained during this period to maximise efficiency.</p> <p>These O&amp;M activities can be split into three main categories as follows:</p> <ul style="list-style-type: none"> <li>Scheduled maintenance (such as repair and service work such as regular WTG servicing)</li> <li>Unscheduled maintenance (such as fault finding and repairs to WTGs, OSP(s) and cables)</li> <li>Emergency/special maintenance (in the event of major equipment breakdown and repairs)</li> </ul> <p>The Project will be maintained from shore using a number of varying O&amp;M vessels (e.g. crew transfer vessels, supply vessels) and/or helicopters<sup>2</sup>. An offshore base, for example a mother ship (a large offshore service vessel) could also be used. Control of the Project would also be managed onshore using a Supervisory Control and Data Acquisition (SCADA) system.</p> <p>Given the design life of the offshore components, some refurbishment or replacement would be required during the lifetime of the Project.</p> <p>The strategy for O&amp;M will be finalised based on the location of a suitable port/harbour which is yet to be defined, however typical activities are described below.</p> <p>A number of vessel visits to each WTG and OSP would be required each year to allow for scheduled and unscheduled maintenance.</p>	<p><b>ES Chapter 5 Project Description.</b> Activities described or covered off in more generalised activities. Vessel numbers calculated considering listed activities.</p> <p><b>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</b> Considers disturbance caused by activities that interact with the seabed.</p> <p><b>ES Chapter 8 Marine Sediment and Water Quality</b> Considers disturbance caused by activities that interact with the seabed as well as activities (e.g. cleaning) where there is a potential source to affect water quality.</p> <p><b>ES Chapter 9 Benthic Ecology</b> Considers disturbance caused by activities that interact with the seabed.</p> <p><b>ES Chapter 10 Fish and Shellfish Ecology</b> Considers disturbance caused by activities that interact with the seabed and considers indirect effects to benthic and water quality features.</p> <p><b>ES Chapter 11 Marine Mammals</b> Considers disturbance caused by activities that interact with the seabed and considers indirect effects as well as vessel disturbance.</p> <p><b>ES Chapter 12 Offshore Ornithology</b> Considers disturbance caused by activities that interact with the seabed and considers indirect effects as well as vessel disturbance.</p> <p><b>ES Chapter 13 Commercial Fisheries</b></p>	No	No
Annual WTG maintenance (including 'Hot Work' <sup>3</sup> )	Yes			No	No
WTG troubleshooting	Yes			No	No
WTG repair	Yes			No	No
Blade inspection	Yes			No	No
Blade and hub repair	Yes			No	No
Blade replacement	Yes			No	No
Transition piece repair	Yes			No	No
Transition piece maintenance	Yes			No	No
Transformer replacement	Yes			No	No
Gearbox repair and replacement	Yes			No	No
Generator replacement	Yes			No	No
Paint and repair	Yes			No	No
J-Tube and ladder inspection and cleaning	Yes			No	No

<sup>1</sup> Prior to undertaking the specified works.

<sup>2</sup> Helicopters are anticipated to be used only in exceptional circumstances during the O&M phase. In this event, helicopters would most likely come from Blackpool or Liverpool, however this is indicative at this stage and subject to change.

<sup>3</sup> 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	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
		<p>The maximum number of support vessels expected on site at any one time during a standard year is up to three vessels, with up to ten expected on site during a 'heavy maintenance' year. A further one jack-up barge may also be required biennially (once every other year) with a seabed footprint of 1,500m<sup>2</sup>. Overall, a maximum of 384 return vessel trips during a standard year and 832 return vessel trips during a heavy maintenance year (expected to be every 5<sup>th</sup> year) are expected annually, including operational support vessels and those supporting maintenance activities.</p> <p>Although it is not anticipated that large components would require replacement during the operational phase, it is a possibility. Should this be required, large jack-up vessels may need to operate continuously for significant periods to carry out these major maintenance activities. Replacement of a foundation or whole length of cable would require a separate marine licence. An average footprint of seabed disturbance for cable repair/replacement is 2,000m<sup>2</sup> and for cable remedial burial is 1,000m<sup>2</sup>.</p> <p>Operational cleaning of offshore infrastructure would consist of jet washing with seawater, no chemicals would be used in this process.</p> <p>During O&amp;M activities, the Applicant would seek to agree appropriate safety zones with the Maritime and Coastguard Agency around WTGs and work areas to be applied.</p>	<p>Considers disturbance caused by activities that interact with the seabed and considers indirect effects as well as vessel disturbance.</p> <p><b>ES Chapter 14 Shipping and Navigation</b> Considers interactions with vessels.</p> <p><b>ES Chapter 15 Marine Archaeology and Cultural Heritage</b> Considers disturbance caused by activities that interact with the seabed.</p> <p><b>ES Chapter 16 Military Aviation and Radar</b> Considers helicopter operations during maintenance and cranes.</p> <p><b>ES Chapter 18 Seascape, Landscape and Visual Impact Assessment</b> Considers vessel movements.</p> <p><b>ES Chapter 19 Human Health</b> Considers indirect effects from other chapters.</p> <p><b>ES Chapter 20 Socio-economics, Tourism and Recreation</b> Considers employment associated with operation activities.</p> <p><b>ES Chapter 21 Climate Change</b> Considers vessel movements.</p>		
Marine growth survey and removal of organic material	No	Marine growth/guano <sup>4</sup> will accumulate on the offshore infrastructure. This must be regularly removed to protect the exterior parts of the transition piece and WTG towers.	N/A	No	Yes
Addition of bird deterrent devices	No	<p>Bird deterrent devices such as passive bird scarers and bird spikes can be used on the offshore infrastructure to discourage birds and other animals from roosting and colonising the structure or soiling the external surfaces. Such devices are required to ensure safe access and functionality of the infrastructure.</p> <p>It is important to note that the devices are not designed to actively or passively harm wildlife.</p>	N/A	No	No
General maintenance work, e.g. oil replacement, mechanical works, external surface preparation and protective coating repair/re-painting, navigational aids	Yes	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above.	N/A	No	No

<sup>4</sup> The accumulated excrement of seabirds or bats.

Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
<b>Cables (inter-array and platform link)</b>					
Cable inspection	Yes	<p>Cable exposure may be identified during regular inspection, maintenance or repair regimes, or by cable monitoring systems. Cables can become exposed due to moving sandwaves but also sometimes due to erosion of other soft/mobile sediment (not just sandwaves). During the lifetime of the Project, periodic geophysical surveys would be required to ensure the cables remain buried and if they do become exposed, reburial works would be undertaken. Post construction surveys in the initial three to five years are often dictated by the DML.</p> <p>As per initial burial, reburial can be achieved via a number of techniques such as jetting, ploughing, mechanical cutting and dredging undertaken from a vessel using dynamic positioning (DP). An average cable reburial length of up to 100m<sup>5</sup> has been assumed with a 10m disturbance width and 3m maximum depth for a box-shaped trench. This results in an average footprint of seabed disturbance of up to 1,000m<sup>2</sup> per year and average volume of sediment of up to 3,000m<sup>3</sup> per year.</p> <p>It is also possible that during the operational lifetime of the cables, they will become damaged and non-operational. This will require fault location, de-burial, retrieval, repair and/or replacement of the cable on the seabed and re-burial. An average<sup>5</sup> cable repair/replacement length of up to 200m has been assumed with a 10m disturbance width and 3m maximum depth for a box-shaped trench. This results in an average footprint of seabed disturbance of up to 2,000m<sup>2</sup> per year and average volume of sediment of up to 6,000m<sup>3</sup> per year.</p> <p>For cable repair/replacement and/or reburial, it is assumed that a dynamically positioned vessel would be used, however a worst-case of one jack-up visit biennially has been accounted for.</p> <p>The worst-case for jack-up vessel deployments assumes the use of one jack-up vessel every other year, with a seabed footprint of 1,500m<sup>2</sup> (up to six legs, each with a footprint of up to 250m<sup>2</sup>). Anchoring could be required on average once a year, with a seabed footprint of 720m<sup>2</sup> (including resetting).</p>	<p>ES Chapter 5 Project Description</p> <p>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</p> <p>ES Chapter 8 Marine Sediment and Water Quality</p> <p>ES Chapter 9 Benthic Ecology</p> <p>ES Chapter 10 Fish and Shellfish Ecology</p> <p>ES Chapter 11 Marine Mammals</p> <p>ES Chapter 13 Commercial Fisheries</p> <p>ES Chapter 14 Shipping and Navigation</p>	No	No
Replacement or addition to external cable protection in the same locations as external cable protection installed during construction	Yes			No	No
Deployment of new area of cable protection within 10 years from the start of operations.	Yes			No	No
Deployment of new area of cable protection beyond 10 years from the start of operations.	Yes			Yes	Yes
Cable reburial	Yes			No	No
Cable repair	Yes			No	No
Cable inspection including geophysical surveys MBES, magnetometer, SSS and Depth of Burial (DoB) surveys to inspect subsea assets.	Yes			No	No
Sub-bottom profiling (i.e. chirp or pinger)	Yes			No (marine licence or marine licence exemption notification would be required, as necessary)	No
Geotechnical survey	No			No	No

<sup>5</sup> It is noted that the total footprint and volume over the 35-year operational period is based on yearly averages and thus assesses for example that there may be no cable repair in one year and then longer lengths of cable repair/replacement and/or reburial in other years.

Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
		<p>Tables 5.20 and 5.21 in <b>Chapter 5 Project Description</b> of the ES provide parameters for cable repair/replacement and reburial, and anchoring.</p> <p>It is assumed that up to 10% of the total cable protection material installed during construction will be required to be replaced or replenished during the O&amp;M phase. It is assumed that all replacement cable protection material will replace/replenish material where it has been dislodged/moved or scoured, hence re-establishing design conditions.</p> <p>Installation of the following amounts of replacement cable protection for inter-array and platform link cables (including protection due to ground conditions, and for crossings and at entry to WTGs/OSP(s)) would be permitted:</p> <ul style="list-style-type: none"> <li>▪ Footprint: 21,625m<sup>2</sup></li> <li>▪ Volume: 25,970m<sup>3</sup></li> </ul> <p>Table 5.22 of the ES <b>Chapter 5 Project Description</b> provides O&amp;M parameters for replacement cable protection material.</p>			
<b>WTGs/OSP(s) (foundation)</b>					
Foundation inspection	Yes	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above.	<b>ES Chapter 5 Project Description</b>	No	No
General maintenance work	Yes			No	No
Foundation repair	Yes			No	No
Foundation replacement	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 addition to scour protection installed during construction around foundations	Yes	<p>Scour protection is included in the worst-case scenario of 100% foundations requiring scour protection. It is assumed that up to 10% of the total scour protection material installed during construction will be required to be replaced or replenished during the O&amp;M phase. It is assumed that all replacement scour protection material will replace/replenish material where it has been dislodged/moved or scoured, hence re-establishing design conditions.</p> <p>Installation of the following areas of replacement scour protection for the worst-case number of WTGs associated with the respective foundation type would be permitted (note that the physical processes and benthic ecology assessment considered gravity-base foundations as the worst-case because they have the largest footprint):</p>	<b>ES Chapter 5 Project Description</b> <b>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</b> <b>ES Chapter 8 Marine Sediment and Water Quality</b> <b>ES Chapter 9 Benthic Ecology</b> <b>ES Chapter 10 Fish and Shellfish Ecology</b> <b>ES Chapter 11 Marine Mammals</b> <b>ES Chapter 13 Commercial Fisheries</b>	No	No



Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
		<p><b>Footprint</b></p> <ul style="list-style-type: none"> <li>Gravity Based Structure (GBS): 13,195m<sup>2</sup></li> <li>Multi-legged pin-pile jacket: 3,465m<sup>2</sup></li> <li>Monopile: 11,874m<sup>2</sup></li> <li>Multi-legged suction bucket jacket: 9,898m<sup>2</sup></li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>GBS: 26,390m<sup>2</sup></li> <li>Multi-legged pin-pile jacket: 6,930m<sup>2</sup></li> <li>Monopile: 23,748m<sup>2</sup></li> <li>Multi-legged suction bucket jacket: 19,796m<sup>2</sup></li> </ul> <p>Table 5.22 of the ES <b>Chapter 5 Project Description</b> provides O&amp;M parameters for replacement scour protection material.</p>			
<b>OSP(s)</b>					
Inspections including geophysical surveys (MBES, magnetometer, SSS) to inspect subsea assets.	Yes	<p>Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance as described above.</p> <p>OSP(s) could typically require an average of 2 visits per week although this may be more during unscheduled maintenance.</p>	<p>ES Chapter 5 Project Description</p> <p>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</p> <p>ES Chapter 9 Benthic Ecology</p> <p>ES Chapter 10 Fish and Shellfish Ecology</p> <p>ES Chapter 11 Marine Mammals</p> <p>ES Chapter 13 Commercial Fisheries</p> <p>ES Chapter 14 Shipping and Navigation</p>	No	No
Sub-bottom profiling (i.e. chirp or pinger)	Yes			No (marine licence or marine licence exemption notification would be required, as necessary)	No
General maintenance work, e.g. oil replacement, mechanical works, external surface preparation and protective coating repair/re-painting, navigational aids	Yes			No	No
Switchgear replacement	Yes			No	No
Foundation inspection	Yes			No	No
Foundation repair	Yes			No	No
Foundation replacement	No	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	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
Replacement or addition to scour protection around foundations installed during construction <sup>6</sup>	Yes	<p>Installation of the following amounts of replacement scour protection for the worst-case number of OSP(s) associated with the respective foundation type would be permitted (note that the physical processes and benthic ecology assessment considered gravity-base foundations as the worst-case because they have the largest footprint):</p> <p><b>Footprint</b></p> <ul style="list-style-type: none"> <li>GBS: 754m<sup>2</sup></li> <li>Multi-legged pin-pile jacket: 198m<sup>2</sup></li> <li>Monopile: 792m<sup>2</sup></li> <li>Multi-legged suction bucket jacket: 566m<sup>2</sup></li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>GBS: 1,508m<sup>2</sup></li> <li>Multi-legged pin-pile jacket: 396m<sup>2</sup></li> <li>Monopile: 1,583m<sup>2</sup></li> <li>Multi-legged suction bucket jacket: 1,131m<sup>2</sup></li> </ul> <p>Table 5.22 of the ES <b>Chapter 5 Project Description</b> provides O&amp;M parameters for replacement scour protection material.</p>	<p>ES Chapter 5 Project Description</p> <p>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</p> <p>ES Chapter 8 Marine Sediment and Water Quality</p> <p>ES Chapter 9 Benthic Ecology</p> <p>ES Chapter 9 Fish and Shellfish Ecology</p> <p>ES Chapter 11 Marine Mammals</p> <p>ES Chapter 12 Offshore Ornithology</p> <p>ES Chapter 13 Commercial Fisheries</p> <p>ES Chapter 14 Shipping and Navigation</p> <p>ES Chapter 17 Infrastructure and Other Users</p>	No	Yes
Marine growth survey and removal of organic material	No	Marine growth/guano will accumulate on the offshore infrastructure. This must be regularly removed to protect the exterior parts of the OSP(s).	N/A	No	Yes
Addition of antifouling devices	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
<b>Other</b>					
Davit crane inspection	Yes	Within the assumed maintenance activities per annum as described above.	<p>ES Chapter 5 Project Description</p> <p>ES Chapter 7 Marine Geology, Oceanography and Physical Processes</p> <p>ES Chapter 8 Marine Sediment and Water Quality</p>	No	No
Fuel replenishment to crew transfer vessel (CTV)	Yes			No	No
Re-fuelling of generator on the OSP(s)	Yes			No	No

<sup>6</sup> The scour protection placed during operation cannot exceed the seabed footprint of the scour protection laid at that location during construction.

Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
Grout and corrosion works (including cathodic protection inspection, grouting core samples and re-grouting)	Yes		ES Chapter 9 Benthic Ecology ES Chapter 10 Fish and Shellfish Ecology ES Chapter 11 Marine Mammals ES Chapter 13 Commercial Fisheries ES Chapter 14 Shipping and Navigation	No	No
Retro-fitting of cathodic protection	Yes			No	Yes
Crane transfers of equipment from vessel to either WTGs or to quayside O&M building or vice-versa	Yes			No	No
Unexploded Ordnance (UXO) clearance via detonation	No	No UXO clearance events assessed during the O&M period given that UXO would likely be identified during the construction period.	N/A	Yes	Yes
Marine archaeology	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, the Applicant will consult with Historic England and agree any action with the MMO.	ES Chapter 15 Marine Archaeology and Cultural Heritage	No	Yes
Offshore visual inspections	No	The use of video recording equipment and photography to record the condition of the subsea assets. Equipment may be mounted to a ROV/AUV or held by a diver.	N/A	No	No
Use of artificial lighting	Yes	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.	ES Chapter 11 Offshore Ornithology	No	No
Transport and transfer of individuals and load by air	No	Helicopters are not envisaged as the primary means of access for offshore operations and maintenance activities, however their use during heavy maintenance periods, or for fault clearance is possible.	ES Chapter 5 Project Description All chapters where vessel/helicopter disturbance is considered	No	
Recovery of dropped objects	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 seabed if reasonable to do so.	ES Chapter 13 Commercial Fisheries Activity included in the Outline Project Environmental Management Plan (PEMP) (Document Reference 6.2)	No	No

Potential offshore maintenance activity	Assessed 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 Statutory Nature Conservation Body (SNCB)? <sup>1</sup>
Rope access	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	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
Seabed preparation activities as a result of jack-up operations	Yes	Up to one jack-up vessel visit every other year for the Project (resulting in a maximum 1,500m <sup>2</sup> of disturbance every other year) has been assessed in <b>Chapter 9 Benthic Ecology</b> .	<b>ES Chapter 9 Benthic Ecology.</b>	Yes	Yes
Water use and discharge	No	Cleaning of the WTGs and OSP(s) 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 Outline PEMP.	Activity included in the Outline PEMP.	No	No