Awel y Môr Offshore Wind Farm

Category 8: Other Documents

Offshore Operations and Maintenance Plan

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Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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A	April 2022	ES	GoBe Consultants	RWE	RWE

www.awelymor.cymru

RWE Renewables UK
Swindon Limited

Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire SN5 6PB
T +44 (0)8456 720 090
www.rwe.com

Registered office:
RWE Renewables UK
Swindon Limited
Windmill Hill Business Park
Whitehill Way
Swindon

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Glossary of terms

TERM	DEFINITION
Array area	The area where the Wind Turbine Generators (WTGs), Offshore Substation Platforms (OSPs), associated foundations, inter-array cables, inter-platform cables, export cables (including the GyM interlink cable), a meteorological mast (met mast) (or suitable alternative such as floating LiDAR) and Permanent Vessel Moorings (PVMs) may be located.
Array cables	Cables which link wind turbine to wind turbine, and wind turbine to offshore electrical platforms. Cables carrying the electrical current generated

TERM	DEFINITION
	by WTGs which will link WTGs, PVMs and the met mast together and on to an OSP.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS).
Design envelope/ Maximum Design Scenario (MDS)	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to the impacts assessed.
The 'GyM interlink' zone	An area that extends from the AyM array into the GyM array to facilitate connection from one of the AyM OSPs or a WTG to the western GyM OSP.
Inter-platform cables	Offshore cables that link offshore substation platforms within the AyM site.
Marine Licence	A licence under the Marine and Coastal Access Act 2009 for marine works in Welsh waters which is administered by the Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh Ministers.
Offshore export cables	The cables which transmit power from the offshore substation platform to the onshore cable circuits at landfall between Rhyl and Prestatyn.
Offshore Export Cable Corridor (ECC)	The area where the offshore export cables will be installed, bringing power generated to the onshore cable circuits at landfall between Rhyl and Prestatyn.
Offshore substation platform	A fixed structure located within the AyM site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a suitable form for export to shore.

TERM	DEFINITION
Safety zones	An area around a vessel which should be avoided during offshore construction.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.

Abbreviations and acronyms

TERM	DEFINITION
CTV	Crew Transfer Vessel
DCO	Development Consent Order
ECC	Export Cable Corridor
ES	Environmental Statement
JUV	Jack-Up Vessel
MDS	Maximum Design Scenario
MCAA	Marine and Coastal Access Act
NRW	Natural Resources Wales
O&M	Operation and Maintenance
OSP	Offshore Substation Platform
PVM	Permanent Vessel Moorings
SOV	Service Operation Vessel
UPS	Uninterruptible Power Supply
WTGs	Wind Turbine Generators

Units

UNIT	DEFINITION
km	Kilometre
km^2	Square kilometre
m	Metre
m^2	Square metre

1 Introduction

1.1 Overview

1 This document has been prepared on behalf of Awel y Môr Offshore Wind Farm Limited (AyMOWFL) ('the Applicant') in support of the application for the Development Consent Order (DCO) for the Awel y Môr offshore wind farm (hereafter referred to as AyM).

2 As a project that will be situated in Welsh waters, the Applicant also requires a marine licence and is submitting an application for a marine licence under the Marine and Coastal Access Act (MCAA) 2009 in parallel with the application for a DCO.

3 The indicative project programme states that the project will be fully constructed and operational by 2030, and the operational lifetime of the project is anticipated to be approximately 25 years. The overall Operation and Maintenance (O&M) strategy will be finalised once the technical specification is known, including Wind Turbine Generators (WTG) model and final project layout.

1.2 Project Overview

4 The proposed development will be located 11 km north of Llandudno and 10 km off the Welsh coast in the Irish Sea with a total proposed array area of 78 km^2. AyM will consist of both onshore and offshore infrastructure including up to 50 WTGs, export cables to landfall, interlink cables with the existing Gwynt y Môr Offshore Wind Farm (GyM) and connection to the electricity transmission network. Details of the offshore project design can be found in Volume 2: Chapter 1: Offshore Project Description (application ref: 6.2.1).

5 For the offshore aspects of the project, this boundary encompasses:

- **The array area:** the area where the WTGs, Offshore Substation Platforms (OSPs), associated foundations, inter-array cables, inter-platform cables, export cables (including the GyM interlink cable), a meteorological mast (met mast) and Permanent Vessel Moorings (PVMs) may be located;

- **The 'other wind farm infrastructure' zone**: an area to the west of the array area, which will preclude WTGs and OSPs but will allow for a met mast, inter-array cables and PVMs;
- **The Offshore Export Cable Corridor (ECC):** the area where the offshore export cables will be installed, bringing power generated to the onshore cable circuits at landfall between Rhyl and Prestatyn; and
- **The 'GyM interlink' zone:** an area that extends from the AyM array into the GyM array to facilitate connection from one of the AyM OSPs or a WTG to the western GyM OSP; and
- **The 'subsea infrastructure and temporary works' zone:** an area that extends 500 m west of the array boundary in which cables may be located, as well as where temporary works associated with the WTG array may take place (such as jack-up operations).

6 Within these offshore areas, AyM will be comprised of WTGs and all associated infrastructure required to transmit the electricity generated to shore, where it will then be transmitted by the onshore infrastructure to the National Grid network via the grid connection at Bodelwyddan, as well as all infrastructure required to operate and maintain the wind farm.

1.3 Purpose of this Outline Offshore Operations and Maintenance Plan

7 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. This document provides the O&M requirements for the O&M of both the generation and transmission assets. The respective asset requirements are clearly described such that in the event separate marine licences are granted, the respective O&M requirements will be clearly discernible for transfer to asset-specific O&M licences.

8 The Offshore O&M Plan will be developed for each Marine Licence, which is anticipated to include all activities, equipment, structures, and associated infrastructure, in accordance with design and manufacturer's recommendations, which are as follows;

- Operational health, safety and environment management;
- Accessibility and constraints;

- Logistical set up of the O&M base (any O&M port that requires licencing is not included in this O&M plan or DCO/ marine licence applications);
- O&M staff requirement, including numbers and skills;
- Spare parts and availability; and
- Planning of scheduled and unscheduled maintenance

2 Offshore Maintenance Activities

2.1 Offshore Maintenance Activities Assessed in the ES

9 Maintenance activities fall into two categories: preventative and corrective. Preventative maintenance is carried out according to regular scheduled services, whereas corrective maintenance covers unexpected repairs, component replacement, retrofit campaigns and breakdowns. In recent years, the offshore wind industry has developed a better of preventative maintenance for operational wind farms.

10 For cables in particular, AyM will be designed to require no routine cable maintenance or re-burial as these events are disruptive and costly, however, the option is retained for flexibility in the event of unforeseen circumstances. Options for cable maintenance work include cable re-burial via jetting, or placement of cable protection.

11 In the context of the two categories of maintenance activities, the Applicant has assessed the following reasonably foreseeable offshore maintenance activities in the Environmental Statement (ES):

- Scheduled maintenance:
  - Each WTG will require regular servicing
  - Scheduled maintenance would be undertaken from vessels (e.g. Service Operation Vessel (SOV), Crew Transfer Vessel (CTV) etc.) or helicopters.
- Unscheduled maintenance:
  - During the operational period it is anticipated that unscheduled maintenance activity may be required to facilitate fault-finding and repairs of the wind turbines, cables and associated offshore infrastructure; this includes remedial works during the initial construction and operation phases.
  - Unscheduled maintenance would be undertaken from vessels such as lift vessels, jack-up barges, SOVs, CTVs etc., or helicopters.

12 The design envelope for these O&M works is described in Table 1.

Table 1: Design envelope for O&M activities based on a Maximum Design Scenario (MDS).

PARAMETER	DESIGN ENVELOPE	
	LARGER WTGS	SMALLER WTGS
O&M strategy		
Project lifetime (years)	25	25
Surface infrastructure (WTGs, OSPs and met mast)		
Number of major component replacements requiring Jack-Up Vessels (JUVs) over project lifetime	138	180
Maximum seabed disturbance from JUV footprints (m^2) per year	5,940	7,920
Array cables		
Length of cable requiring remedial works (km)	5	5
Number of array cable repairs over project lifetime	5	5
Seabed disturbance per array cable repair event (m^2)	6,000	6,000
Total seabed disturbance for array cables over project lifetime (m^2)	30000	30,000
Offshore export cables		
Length of cable requiring remedial works (km)	5	5

PARAMETER	DESIGN ENVELOPE	
	LARGER WTGS	SMALLER WTGS
Number of offshore export cable repairs over project lifetime	4	4
Seabed disturbance per offshore export cable repair event (m^2)	6,000	6,000
Total seabed disturbance for offshore export cables over project lifetime (m^2)	24,000	24,000

13 The general O&M strategy will rely on an onshore (harbour-based) operation and maintenance base, CTVs, SOVs, offshore accommodation vessels, supply vessels, cable and remedial protection vessels and helicopters for the operation and maintenance services that will be performed at AyM. The final O&M strategy chosen may be a combination of the above solutions.

14 The design envelopes for the O&M vessels are presented in Table 2. Helicopters are also considered for crew transfer during unplanned maintenance via heli-hoist winching directly onto WTGs and landing on OSP helidecks. Up to 120 or 200 helicopter return trips per year may be required in the larger and smaller WTG scenarios, respectively, based on a worst-case scenario

Table 2: MDS O&M vessel requirements.

VESSELS	DESIGN ENVELOPE	
	PEAK VESSELS	ANNUAL ROUND TRIPS
JUVs	2	6
SOVs	2	52
CTVs	6	1,095

VESSELS	DESIGN ENVELOPE	
	PEAK VESSELS	ANNUAL ROUND TRIPS
Lift vessels	2	6
Cable maintenance	2	1
Auxiliary vessels	8	48

15 During construction and decommissioning, it is assumed for the purposes of assessment that the Applicant will apply for 500 m safety zones around infrastructure that is under construction. Temporary safety zones of 50 m will be sought for incomplete structures such as installed monopiles without transition pieces, or where construction works are completed but commissioning has yet to be completed.

16 During the O&M phase, the applicant may apply for temporary 500 m safety zones around infrastructure that is undergoing major maintenance (for example a WTG blade replacement).

17 Outside of construction, decommissioning and major maintenance works, the applicant does not intend to apply for permanent safety zones around operational infrastructure.

18 The operational impacts are assessed in each offshore technical chapter of Volume 2 of the ES (application refs: 6.2.2 – 6.2.13).

2.2 Discharging the consent condition

19 The list of activities to be undertaken during the O&M phase is provided as Table 3. This list is considered to be a live document which will be updated and agreed with Natural Resources Wales (NRW) as required, and as the Marine Licence(s) evolve during the licencing process.

20 For each activity, a 'traffic light system' will be used to provide clarity as to those activities that can be carried out under the Marine Licence(s) anticipated to be provided at the point of consent.

- Green indicates that an additional Marine Licence is not required

- Amber indicates that an additional marine licence may be required if proposed works exceed those assessed within the ES or described within the DCO and/or the Marine Licence(s); or
- Red indicates that an additional Marine Licence could be required dependant on the type of works to be undertaken.

21 Additional activities not outlined in this schedule may, if relevant, require future consents such as a Marine Licence under the MCAA 2009. Such activities will be discussed with the NRW prior to undertaking if appropriate.

Table 3: Summary of offshore operational and maintenance plan containing Environmental Statement sections of relevance

POTENTIAL OFFSHORE MAINTENANCE ACTIVITY	RELEVANT MARINE LICENCE, SUBJECT TO AGREED LICENCING STRATEGY WITH NRW	METHOD	REALISTIC WORST CASE ASSESSED IN THE ENVIRONMENTAL STATEMENT	LOCATION IN THE ES	ADDITIONAL LICENCE LIKELY TO BE REQUIRED	CONSULTATION REQUIRED WITH NRW PRIOR TO WORKS
Wind turbines						
Annual wind turbine maintenance	Generation	Vessel and/ or helicopter for technicians, components and consumables	Assessed in the ES within the assumed maintenance activities per annum for scheduled and unscheduled maintenance. There are a number of potential maintenance strategies for the wind farm which will be determined by the final design of the wind farm and procurement of the maintenance contractors. The wind farm 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 wind farm could be maintained primarily from an offshore base (e.g. an accommodation vessel (Service Offshore Vessel) or an OSP), with transfer vessels or helicopters also used to transfer personnel to or from turbines and platforms. Typical maintenance activities would include general wind turbine service; oil sampling / change; UPS (uninterruptible power supply)-battery change; service and inspections of wind turbine safety equipment, nacelle crane, service lift, 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 are possible. Should this be required, large JUVs may need to operate continuously for significant periods to carry out these major maintenance activities. Operational cleaning of offshore infrastructure would consist of jet washing with seawater, no chemicals would be used in this process.	V2 Chapter 1 Project Description; V2 Chapter 2: Marine Geology, Oceanography and Physical Processes; V2 Chapter 3: Marine water and sediment quality; V2 Chapter 4: Offshore Ornithology; V2 Chapter 5: Benthic Ecology; V2 Chapter 7: Marine Mammals; V2 Chapter 8: Commercial Fisheries; V2 Chapter 9: Shipping and Navigation; V2 Chapter 12: Other Marine Users.		No
Wind turbine troubleshooting	Generation	Vessel and helicopter				No
Wind turbine repair	Generation	JUV, vessel, helicopter, and drone				No
Blade inspection	Generation	Vessel, helicopter and drone				No
Blade and hub repair	Generation	Vessel				No
Blade replacement	Generation	JUV and/ or helicopter for technicians, components and consumables				No
Transition piece repair	Generation	Vessel				No
Transition piece maintenance	Generation	Vessel				No
Transformer replacement	Generation	JUV and vessel				No
Gearbox repair and replacement	Generation	JUV				No
Generator repair and replacement	Generation	JUV				No
Paint and paint repair	Generation	Vessel				No

J-TUBE AND LADDER CLEANING	GENERATION	VESSEL				No
Cables						
Cable inspection	Generation and Transmission	Vessel and ROV	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 surveys would be required to ensure the cables remain buried and if they do become exposed, re-burial works would be undertaken. The aim would be to avoid requirement for any re- burial by using pre-sweeping. In most cases a failure would lead to the following operations: • Vessel anchor placement (150 m² footprint) • Exposing the damaged part of the cable, assumed to be approximately 300 m 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 2 km length; • 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 seabed; and • Cable burial, where possible.	V2 Chapter 1 Project Description; V2 Chapter 2: Marine Geology, Oceanography and Physical Processes; V2 Chapter 3: Marine water and sediment quality; V2 Chapter 4: Offshore Ornithology; V2 Chapter 5: Benthic Ecology; V2 Chapter 5: Fish and Shellfish; V2 Chapter 7: Marine Mammals; V2 Chapter 8: Commercial Fisheries; V2 Chapter 9: Shipping and Navigation; V2 Chapter 12: other Marine Users.		No
Cable Repair	Generation and Transmission	JUV, vessel, ROV and divers				No
Cable burial using surface protection	Generation and Transmission	JUV, vessel, ROV and divers				No
Cable re-burial	Generation and Transmission	Vessel, ROV				No
Additional cable replacement/ laying	Generation and Transmission	JUV, vessel, ROV and divers				No
Wind Turbine and Met mast						
Foundation inspection	Generation	JUV, vessel and ROV	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance.	V2 Chapter 1 Project Description; V2 Chapter 2: Marine Geology, Oceanography and Physical Processes; Chapter 3: Marine water and sediment quality; V2 Chapter 4: Offshore Ornithology; V2 Chapter 5: Benthic Ecology; V2 Chapter 7: Marine Mammals; V2 Chapter 8: Commercial Fisheries; V2 Chapter 9: Shipping and Navigation; V2 Chapter 12: Other Marine Users.		No
Foundation repair including work on the cathodic protection system	Generation	JUV and vessel				No
Foundation replacement	Generation	JUV, and vessel	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 NRW prior to commencement.	N/A		Yes

Additional scour protection around foundations	Generation, Parameters in the Marine Licence(s) not to be exceeded	JUV and vessel	Scour protection is included in the worst case scenario of 100% foundations requiring scour protection. The values per foundation presented in the Project Description (application ref: 6.2.1) must not be exceeded over the life of the project.	Maximum parameters included in the construction phase: V2 Chapter 2: Marine Geology, Oceanography and Physical Processes Chapter 3: Marine water and sediment quality; V2 Chapter 4: Offshore Ornithology; V2 Chapter 5: Benthic Ecology; V2 Chapter 8: Commercial Fisheries; V2 Chapter 11: Offshore Archaeology; V2 Chapter 12: Other Marine Users.		No
Offshore Substation Platforms (OSPs)						
Foundation inspection	Transmission	JUV, vessel and ROV	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance.	V2 Chapter 1 Project Description; V2 Chapter 2: Marine Geology, Oceanography and Physical Processes; Chapter 3: Marine water and sediment quality; V2 Chapter 4: Offshore Ornithology; V2 Chapter 5: Benthic Ecology; V2 Chapter 7: Marine Mammals; V2 Chapter 8: Commercial Fisheries; V2 Chapter 9: Shipping and Navigation; V2 Chapter 12: Other Marine Users.		No
Foundation repair	Transmission	JUV and vessel				No
Foundation replacement	Transmission	JUV and vessel	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 NRW prior to commencement.			Yes
Inspections/ Yearly service	Transmission	Vessel and/ or helicopter for technicians, components and consumables	Within the assumed maintenance activities per annum for scheduled and unscheduled maintenance. Offshore electrical platforms would typically require an average of 1 visit / week although this may be more during unscheduled maintenance.			No
Regular maintenance/ troubleshooting e.g., oil replacement, mechanical works etc	Transmission	Vessel				No
Bird waste removal	Transmission	Vessel				No
J-Tube and ladder maintenance and cleaning	Transmission	Vessel				No
Switchgear replacement	Transmission	Vessel				No
Cathodic protection replacement	Transmission	Vessel				No

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Swindon
Wiltshire SN5 6PB
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