Environmental Impact Assessment Report

NISA

North Irish Sea Array

Volume 2: Introductory Chapters

Chapter 6
Description of the Proposed Development - Offshore

Statkraft

CIP Copenhagen Infrastructure Partners

GoBe APEM Group

ARUP

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6. Description of the Proposed Development - Offshore

6.1 Overview of proposed development

The North Irish Sea Array (NISA) Offshore Wind Farm, located off the coast of counties Dublin, Meath and Louth, hereafter referred to as the proposed development is the subject of this Environmental Impact Assessment Report (EIAR). The proposed development is a combination of offshore infrastructure and onshore infrastructure and is detailed further in Section 1.3 of Volume 2, Chapter 1: Introduction. The proposed development boundary is shown in Volume 7A, Figure 1.1, and outlined in red in Image 6.1 below. The proposed development is being developed by North Irish Sea Array Windfarm Limited (the Developer).

The coordinates of the labelled points in Image 6.1 are set out in Table 6.1.

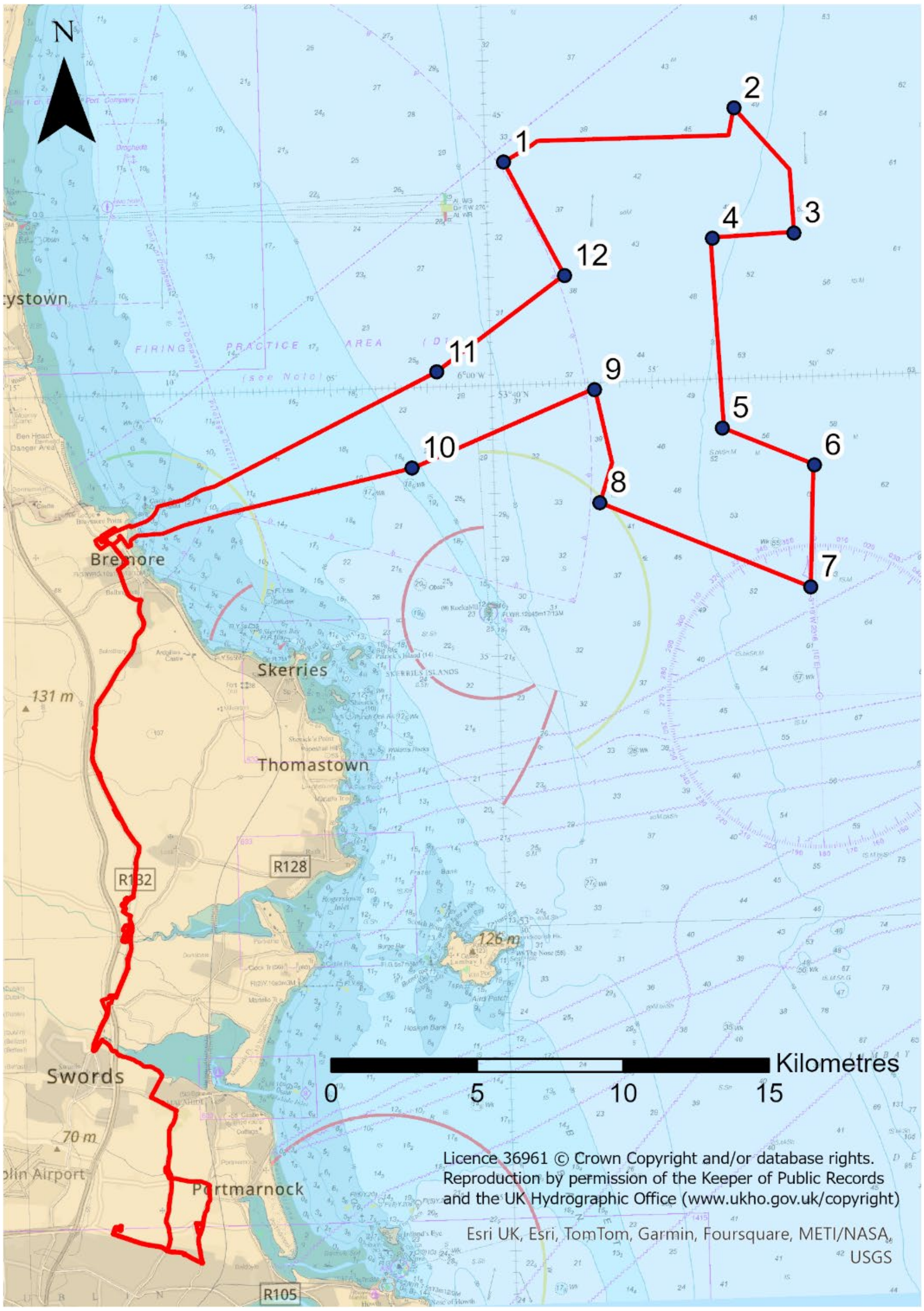

Image 6.1 Location of the proposed development boundary

Table 6.1 Coordinates of offshore development area

ID	System: WGS 84	
	Latitude (Deg Min Sec)	Longitude (Deg Min Sec)
1	53° 44' 7.093" N	5° 59' 25.321" W
2	53° 44' 59.840" N	5° 52' 12.499" W
3	53° 42' 40.327" N	5° 50' 26.646" W
4	53° 42' 36.594" N	5° 53' 2.805" W
5	53° 39' 4.930" N	5° 52' 48.342" W
6	53° 38' 22.396" N	5° 50' 3.801" W
7	53° 36' 6.166" N	5° 50' 15.269" W
8	53° 37' 46.436" N	5° 56' 43.354" W
9	53° 39' 53.427" N	5° 56' 47.162" W
10	53° 38' 30.691" N	6° 2' 30.316" W
11	53° 40' 16.279" N	6° 1' 42.322" W
12	53° 41' 59.806" N	5° 57' 37.617" W

For clarity, while the proposed development is assessed as a whole in this EIAR, the boundary between onshore and offshore infrastructure is the high-water mark (HWM) as defined by Tailte Éireann mapping[1]. Image 6.1 illustrates the offshore and onshore infrastructure of the proposed development and the interface between each.

For the purposes of the EIAR, the proposed development seaward of the HWM (i.e. offshore infrastructure) is described in this chapter. The proposed development landward of the HWM (i.e. onshore infrastructure) is described in Volume 2, Chapter 7: Description of the Proposed Development – Onshore, (hereafter referred to as the Onshore Description chapter). This chapter and the Onshore Description Chapter should be read together for full details on the proposed development. An overview of the infrastructure proposed for both onshore and offshore elements of the proposed development is presented in Image 6.2.

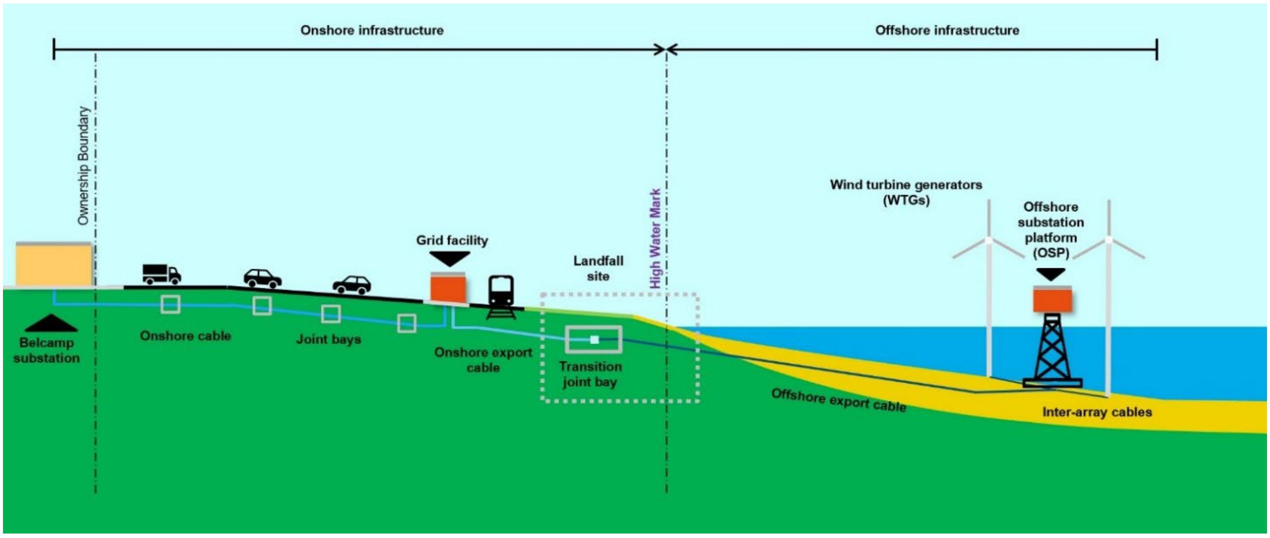

Image 6.2 Infrastructure of the proposed development – not to scale (Source: Arup)

[1] The High Water Mark used in this EIAR and planning application is the High Water Mark dataset from Tailte Éireann (formerly Ordnance Survey Ireland), published in May 2022. This High Water Mark digital dataset is derived from relevant 6 inch and 25 inch Ordnance Maps with any alterations in accordance with the Boundary Survey Acts Ireland, approved by the Chief Boundary Surveyor and signed off in Privy Council Orders. The dataset also includes changes to HWM brought about by subsequent Maritime Orders

The construction of the offshore infrastructure is described in Volume 2, Chapter 8: Construction Strategy- Offshore (hereafter referred to as the Offshore Construction chapter) whilst the construction of the onshore infrastructure is described in Volume 2, Chapter 9: Construction Strategy – Onshore (hereafter referred to as the Onshore Construction chapter). The Offshore Construction Chapter and Onshore Construction Chapter should be read together for full details on the construction of the proposed development.

6.2 Overview of Offshore Infrastructure

6.2.1 Introduction

This chapter has been prepared in accordance with Part 1 of Annex IV of the EIA Directive (Directive 2014/52/EU) by providing detail on the design parameters that form the basis of the proposed development consent application and has been structured to describe the location, design, operation, and decommissioning of the offshore infrastructure, with the construction of offshore infrastructure covered in the Offshore Construction Chapter.

The offshore infrastructure is located within the proposed development boundary seaward of the HWM, from the landfall to the furthest extent of the array, covering an area of approximately 125km^2 referred to as the 'offshore development area' and will comprise the following:

- Array area – where the following infrastructure will be located:
  - Offshore Wind Turbine Generators (WTGs)
  - Offshore Substation Platform (OSP)
  - Substructures and associated seabed foundations (for WTGs and OSP)
  - Offshore inter-array cables
  - The array area covers approximately 89km^2 shown in Figure 1.1 in Volume 7A. At its closest point, the array area is located approximately 11.3km from land in water depths of approximately 30m to 63m below lowest astronomical tide (LAT), with the closest WTG situated approximately 12.3km from the coastline.
- Offshore export cable corridor (ECC) – this is located between the OSP and the landfall site where the offshore export cables will be routed from the OSP to landfall. The ECC covers an area of approximately 36km^2 (Figure 1.1 in Volume 7A).
- Landfall site
  - The proposed development at the landfall site traverses the HWM and consists of both onshore and offshore infrastructure. The offshore infrastructure consists of the transition of the two offshore export cables coming ashore to the onshore export cables. This chapter describes the offshore infrastructure at landfall. Refer also to the Onshore Description chapter which describes the onshore infrastructure at landfall. Both chapters should be read together for full details on infrastructure at landfall.
  - The landfall site will be in the townland of Bremore, north of Balbriggan, Dublin.

6.2.2 Design Flexibility Opinion

On 2 February 2024, the Board issued its opinion on design flexibility, signed 30 January 2024 (the "DF Opinion"). This DF Opinion was subsequently clarified by way of letter dated 4 April 2024 and updated by way of decision pursuant to Section 146A of the Planning Acts on 16 April 2024. The DF Opinion was issued pursuant to section 287B of the Planning Acts, following conclusion of the Developer's pre-application consultations with the Board.

The DF Opinion confirms the details of the proposed development which design flexibility has been accepted and may therefore be confirmed after the Developer's proposed application under section 291 has been made. The DF Opinion confirmed flexibility for the following aspects of the proposed development:

- Turbines – model, number and dimensions (tip height, rotor diameter, rotor swept areas, nacelle height and hub heights).
- Turbine foundations – type and pile dimensions.
- Offshore substation platform – foundation types and dimensions (height above sea level, length and width).
- Siting of infrastructure – fixed location with limit of deviation (turbines, foundations, export cable and offshore substation platform location); and
- Offshore cabling – subsea cable size and subsea cable length.

6.2.3 Project Options and Design Flexibility

The proposed development is including two project options for consideration within the planning application and in this EIAR to provide necessary flexibility. Further information on the requirement for flexibility throughout the proposed development is included in Volume 2, Chapter 2: EIA Methodology. At detailed design post-consent stage, just one option will be chosen as the preferred option and subsequently constructed. An overview of the key parameters of the two project options are provided in Table 6.2 and further details are provided in Sections 6.3 to 6.9. The layout for each project option is illustrated in Figure 6.1 (Project Option 1) and Figure 6.2 (Project Option 2) of Volume 7A.

Table 6.2 High Level Overview of the two Project Options for the proposed development.

Parameter	Project Option 1	Project Option 2
Number of WTGs	49	35
WTG tip height (m above LAT)	290	316 outside aviation restricted zone, 311 inside aviation restricted zone*
Rotor Diameter (m)	250	276
Foundation type	Monopiles	Monopiles or multi-leg pin piled jackets (hereafter referred to as 'jackets')
Number of OSPs	1	1
Offshore export cable length (km)	18	18
Inter-array cable length (km)	111	91

*An aviation restricted zone (of 312m LAT) has been identified by the Developer due to the partial overlap of the array area with a Dublin Airport controlled airspace meaning 13 turbines will have a 5m reduction in tip height due to being within the aviation restricted zone. This is further detailed in Volume 3, Chapter 19: Aviation and Radar.

6.3 Offshore Wind Turbine Generators (WTGs)

6.3.1 WTG Characteristics

As detailed above, the two project options are as follows:

- Project Option 1: 49 WTGs with 250m rotor diameter
- Project Option 2: 35 WTGs with 276m rotor diameter

Two unique WTG models are considered within the following section for each project option. For the two models, the WTGs considered will follow the traditional offshore WTG design with three blades and a horizontal rotor axis as shown in Image 6.3. The blades will be connected to a central hub, forming a rotor which turns a shaft connected to the generator or gearbox. These are connected to the nacelle situated adjacent to the rotor hub, supported by a tower structure affixed to the transition piece or foundation. The nacelle will rotate or 'yaw' on the vertical axis in order to face the oncoming wind direction.

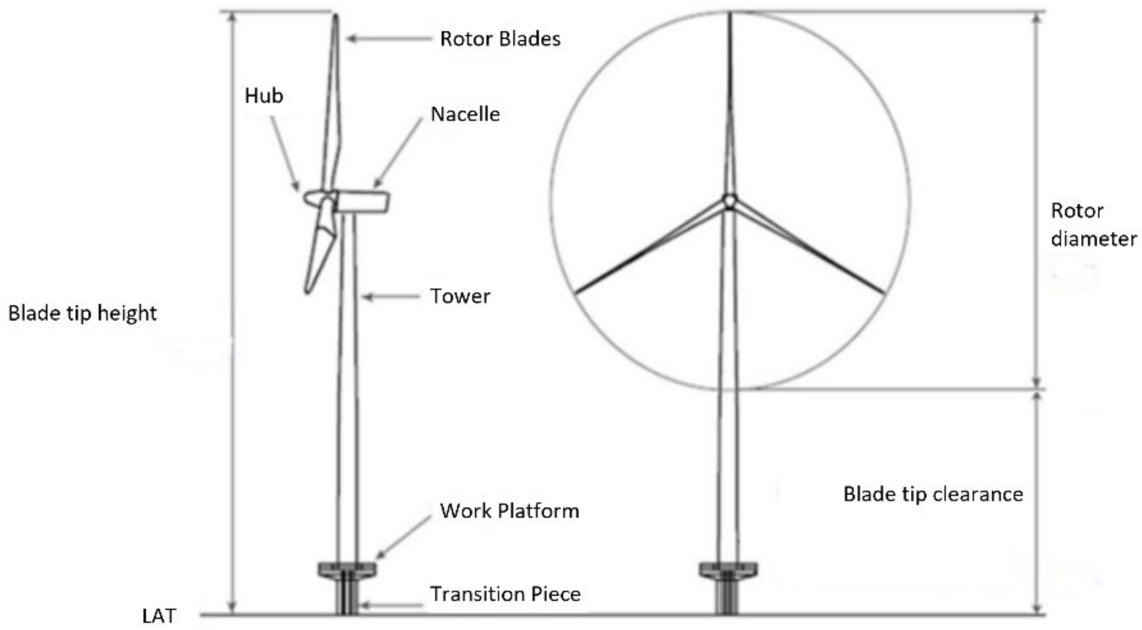

Image 6.3 Typical WTG Components – not to scale (Source: Arup)

The design parameters for the two WTG models discussed in Section 6.2 are outlined in Table 6.3.

Table 6.3 WTG Design Parameters

Parameter	Project Option 1	Project Option 2
Number of WTG	49	35
WTG tip height (m above lowest astronomical tide (LAT))	290	316* or 311**
Hub height (m above LAT)	165	178
Rotor diameter (m)	250	276
Blade tip clearance (m above LAT)	40	40* or 35**
Blade Width (m)	7	7.5
Pitch (degrees)	3.6-5.6	3.6-5.6
Operational time	95%	95%
Total swept area (m^2)	49,087	59,828
Nacelle and Hub		
Length (m)	31	35
Breadth (m)	15	18
Height (m)	15	18
Tower Diameter (m)	9	10
Rotor rotational speed (rpm)	3 – 8.3	3 – 7.5
Foundation type (See Section 6.5 below for further details)	Monopiles	Monopiles or jackets

*When located outside the aviation restricted zone

**When located inside the aviation restricted zone

The options described in this chapter do not refer directly to capacities of individual WTGs, but rather their number and physical dimensions. In recent years, the capacity of the current generation of WTGs has become more flexible and may be different depending on the environmental conditions at a particular site; therefore, it is not considered appropriate to constrain the proposed development based on WTG capacity. It should be noted that the specialist environmental assessments presented in subsequent chapters of this EIAR are not linked to or affected by WTG capacity but are based upon and driven by the specific physical design parameters such as blade tip height, rotor diameter, and height of nacelle.

6.3.2 Layout

The location of the WTGs for each of the two project options is illustrated in Figure 6.1 for Project Option 1 and Figure 6.2 for Project Option 2. Extensive preliminary surveys and engineering design have been conducted to inform the siting of WTGs within a 500m limit of deviation. The final siting of the WTGs within the limit of deviation will be confirmed through further detailed site investigations, detailed design and consultations with various stakeholders which will inform the final layout design.

The factors which have informed the WTG layout, and will be further investigated to subsequently determine the final siting include:

- The wind regime i.e., prevailing wind direction and speed.
- Operational characteristics of the selected WTG model
- Distance between adjacent WTG to minimise wake losses to ensure efficient and optimal wind yield.
- Meteorological and oceanographic (Metocean) conditions.
- Geological conditions
- Seabed bathymetry
- Seabed obstructions (micro–siting constraint)
- Physical and spatial constraints; and
- Environmental considerations)

Accounting for the proposed 500m limit of deviation in the final siting of the WTG, the nearest WTG from shore is 13km for Project Option 1 and 12.3km for Project Option 2.

The proposed development is committed to a Structure Exclusion Zone within the southern portion of the array area where no WTG will be sited. The Structure Exclusion Zone has been established to ensure a 3nm gap between Rockabill Island and the nearest WTG within the offshore development area. The Structure Exclusion Zone was determined through consultation with Drogheda Port and is established for navigational purposes. Further information on the Structure Exclusion Zone is available in Volume 3, Chapter 17: Shipping and Navigation.

6.3.3 Control Systems

Each WTG is designed to operate within a range of parameters and relies on a control system to carry out functions like yaw control and ramp down in high wind speeds to protect the assets when conditions are outside of the design range. A typical cut-off speed to ensure safe and reliable operations of WTGs is 25 m/s.

Each WTG is also monitored and controlled remotely by a central Supervisory Control and Data Acquisition (SCADA) system which allows functions such as remote WTG shutdown if faults occur. The SCADA communication system works via fibre optic cables, microwave, or satellite links from an onshore maintenance facility (as described in Section 7.7.4 of the Onshore Description Chapter) to the WTGs. Individual WTGs can also be controlled manually offshore from within the WTG nacelle or tower base to control the WTG for commissioning or maintenance works.

6.3.4 Oils, Fluids and Gases

Each WTG will contain components that require lubricating oils, hydraulic oils, and coolants for operations such as grease, synthetic oil, nitrogen, transformer oil, sulphur hexafluoride and glycerol.

The volume of oils and fluids will vary depending on WTG design; however, WTGs are equipped with sensors to enable early detection of loss of fluids and leaks. In the unlikely event of a leak, bunding and spill kits are located on each WTG to contain any fluids which will minimise the impact and reduce the risk of spillage into the marine environment.

6.3.5 Corrosion Protection

Corrosion in the steel foundations, will be controlled through several techniques. The foundations will include a corrosion allowance in the design, corrosion protection systems and the use of protective coating paint. Steelwork in the splash zone requires coating due to the high corrosion rate in that zone. The splash zone is above the mean high-water level and is the most severely attacked region of the foundation due to continuous contact with highly aerated sea water and the cyclical effects of spray, waves and tidal actions. Permanently submerged steelwork can also be coated to reduce the amount of additional protection required.

Cathodic Protection (CP) in the form of sacrificial anodes or impressed current cathodic protection (ICCP) prevention systems are added to the foundation to minimise corrosion caused by sea water and oxygen. Sacrificial anodes are made of zinc or aluminium and are placed around the submerged part of the foundation. The size and requirement to replenish the sacrificial anodes varies depending on manufacturer and design of the CP system. ICCP are increasingly used in the marine environment below the water line of each foundation. ICCP are small appendages of varying sizes and design life depending on their manufacturer’s technology. These appendages are induced with electrical current which then leads to an electrochemical reaction in the water. This prevents corrosion of the primary steel of the substructure. Both systems are contained within the footprint of the foundation.

Above the waterline WTGs, foundations, transition pieces and towers are coated to restrict corrosion and marine growth. The foundation and transition piece are coating yellow whereas the tower, blades and nacelle are coloured light grey.

6.3.6 Access

The WTG can be accessed via a boat landing, walk to work gangway or helicopter. A platform crane will be located on the WTG platform for hoisting of equipment and an additional means of rescue in an emergency. Within the WTG tower are internal ladders and lifts which will allow personnel and equipment to reach the Rotor-Nacelle Assembly.

6.4 Offshore Substation Platform (OSP)

An OSP, as shown in Image 6.4 and Image 6.5, is a hub where all the energy produced by the WTGs is brought together via 66kV or 132kV inter-array cables and stepped up by transformers to a high voltage transmission of 220kV High Voltage Alternating Current (HVAC) for export onshore via the offshore export cables.

The location of the OSP for each of the two project options is illustrated in Figure 6.1 for Project Option 1 and Figure 6.2 for Project Option 2 of Volume 7A. Planning drawings detailing the two project options are also provided in Appendix 7.1. As with the final siting of the WTGs (described in Section 6.3.2), the final siting of the OSP will also be within a 500m limit of deviation. Accounting for the proposed limit of deviation in the final siting of the OSP, the closest it will be from shore is 14.8km for Project Option 1 and 14.4km for Project Option 2.

The OSP is typically unmanned, however it will be designed for temporary refuge with an emergency shelter.

6.4.1 OSP Characteristics

The OSP comprises of a topside which is a steel platform with multiple levels in a series of modular units and will house transformers, switchgear, back-up diesel generators and auxiliary power supply for lights, safety systems and data and control system.

Decks will be either open with modular equipment or the structure may be fully clad. All weather sensitive equipment will be placed in environmentally controlled areas.

The OSP will include modular units and decks to accommodate the following plant and equipment:

- Auxiliary transformer
- High Voltage (HV) Gas Insulated Switchgear (GIS)
- HV Control and Protection Cabinets
- Direct Current (DC) Distribution Boards, Battery Chargers and Enclosures
- Low Voltage (LV) Distribution Board
- Communications Mast and Equipment
- Battery Cells (220VDC, 48VDC and 24VDC)
- Temporary Refuge (incl. emergency food and water store)
- Medium Voltage (MV) Switchgear
- Power transformers
- LV Control and Protection, Battery, Distribution and Communication requirements
- Emergency diesel generators
- Heating, Ventilating and Air-Conditioning system.
- Fire suppression system; and
- Storage area for portable devices and small spares shall be considered (e.g., trolleys, lifting frames, sulphur hexafluoride gas handling trucks etc).

The topside which will be supported by either a jacket, or by one or two monopiles. Substructures and foundations are described in Section 6.5.

Image 6.4 Typical OSP on monopile foundation (Source: Arup)

Image 6.5 Typical OSP on jacket foundation (Source: CIP – Veja Mate)

The dimensions of the OSP topside and substructures are listed in Table 6.4. Each project option could have any of the three OSP foundation options.

Table 6.4 OSP Design Parameters for Project Option 1 and Project Option 2

Item	Parameter
Number of OSP (s)	1
Height of Topside above sea level (m above lowest astronomical tide)	47
Height of Communications Mast above sea level (m above lowest astronomical tide)	67
Topside dimensions (m)	45 x 45
Foundation Option 1: Jacket	
Number of Jacket Legs	4
Jacket Footprint, centre distance between legs at seabed level (m)	40 x 40
Number of Piles per Jacket	4
Pile Diameter (m)	6
Seabed Penetration (m)	60
Foundation Option 2: Two Monopile	
Number of Monopiles	2
Pile Diameter (m)	12.5
Seabed Penetration (m)	60
Foundation Option 3: One Monopile	
Number of Monopiles	1
Pile Diameter (m)	12.5
Seabed Penetration (m)	60

6.4.2 Oils and Fluids

The OSP will contain diesel for the emergency diesel generators contained in tanks, oil for transformers, deionised water for cooling systems, glycol, lead acid for uninterruptible power supply and batteries, engine oil and sulphur hexafluoride.

All hazardous substances used on the platform will be managed and contained using standard control and monitoring systems. The type of standard control and monitoring systems chosen will depend on the OSP design and operational requirements. Depending on the nature of the equipment, suitable containment systems (gas), level switches and separator tanks (oil) will be installed to contain leaks as per relevant European agreements and standards.

Storage of hazardous substances will be confined to areas suitably located on the OSP. These areas will be segregated at a safe distance from occupant areas, escape routes and sources of ignition.

Both oil waste and other wastes (wastewater etc.) will be brought to shore in a secure container and disposed according to industry best practice procedures.

6.4.3 Access

The OSP can be accessed predominately via a boat landing and walk to work gangway or helicopter winch area to winch personnel on or off in the event of an emergency. Located on the platform decks and topside will be platform cranes for hoisting of equipment and an additional means of rescue in an emergency. Within the topside are internal stairs and walkways to allow personnel to move between floors.

6.5 Substructures and Foundations

Foundations are required to support WTGs and the OSP. These structures are fixed to the seabed and are required to withstand wave and wind forces and a wide range of meteorological conditions in the offshore environment.

The foundation types that are being considered include:

- WTG foundations:
  - Project Option 1: monopiles; and
  - Project Option 2: monopiles or jacket foundations (three or four leg configurations, with pin piles).
- OSP foundations (for Project Option 1 and 2):
  - A four-legged jacket foundation with pin piles.
  - One monopile; and
  - Two monopiles.

As determined in the DF Opinion, the final selection of foundation type will depend on detailed design.

Prior to installation of foundation structures, seabed preparation activities as described in the Offshore Construction chapter will be necessary, with post-installation scour protection potentially required irrespective of foundation type.

A description of each foundation type is provided herein. Details of methods of installation can be found in the Offshore Construction chapter.

6.5.1 Monopile

A monopile typically consists of a single tubular steel column (pile) driven or drilled into the seabed. A monopile comprises a single tubular steel section which is typically driven into the seabed via a hammer or drilling or a combination of both. A monopile comprises of a series of rolled stell sections that are circumferentially welded together to form a tubular steel pile. They are the predominant foundation type for offshore wind farms and can be installed by either of driving into the seabed or drilling.

A tubular steel transition piece (TP) of similar diameter is fitted on to the pile and secured mechanically (e.g., bolts) or by a grouted interface. See Image 6.6 indicating how a WTG on a monopile presents above the water line. The TP typically includes integrated ancillary components, such as boat landing, working platform with handrails and gates, etc., as well as providing the connection to the WTG tower and allowing for adjustments to vertical tolerances. A TP-less monopile may also be considered. In this concept, as the name suggests, a separate TP component is not required as the flange connection interface with the WTG tower is integrated directly into the top of the monopile.

Image 6.6 Typical WTG on a Monopile foundation (Source: CIP)

The dimensions of the monopile substructures can be seen in Table 6.5. The number of WTG monopiles vary between Project Options 1 and 2. The monopile diameter, sub-seabed penetration and bedrock penetration parameters are the same for both Project Options.

Table 6.5 Monopile Design Parameters

Item	Parameter	
	Project Option 1	Project Option 2
Number of WTG Monopiles	49	35
Number of OSP Monopiles	1 or 2	1 or 2
Monopile Diameter (m)	12.5	
Seabed Penetration (m) (WTG)	50	
Seabed Penetration (m) (OSP)	60	
Scour Protection diameter (m) (WTG)	56.25	56.25
Scour Protection diameter (m) (OSP)	78	78

Indicative material quantities associated with the monopile, secondary steel, grouting, etc. for the entire proposed development for each project option are provided in Table 6.6.

Table 6.6 Indicative Material Quantities with Monopiles and TP

	Project Option 1	Project Option 2
WTG		
Primary Steel (tonnes (t)) for WTG Monopiles	130,000	120,000
Secondary Steel (t) (access platforms, boat landing platforms, ladders, J-tubes) for WTG Monopiles	115	115

	Project Option 1	Project Option 2
Grout Volume (m3) for Monopile-TP connection	2,000	1,900
Grout Volume (m3) for Monopiles to the bedrock	11,760	8,400
OSP		
Primary Steel (t) for OSP with one Monopile	2,500	2,500
Primary Steel (t) for OSP with two Monopile	5,000	5,000
Grout Volume (m3) for the OSP monopile to the bedrock	240	240
Grout Volume (m3) for two OSP monopiles to the bedrock	480	480

6.5.2 Jacket

Jacket foundations are being considered for Project Option 2 only for WTG and for both project options for OSP foundations. Jacket foundations typically consist of three or four main legs, connected to a lattice structure with welded tubular steel cross-braces. See Image 6.7 indicating how a WTG on a jacket presents above the water line. Unlike the monopile foundation, the tubular steel TP is integrated into the jacket design. Each leg is secured to the sea floor using a driven or drilled pin-pile.

Jacket substructures are grouted to the pile foundation and are described in Offshore Construction chapter.

Image 6.7 Typical WTG on a Jacket foundation (Source: CIP)

The dimensions of the jacket substructures with piled foundations are included in Table 6.7.

Table 6.7 Jacket Design Parameters (Applicable to Project Option 2 only for WTG and both project options for OSP)

Item	WTG Parameter	OSP Parameter
Number of Jackets	35	1
Number of Legs per Jacket	3 or 4	4
Jacket Footprint, centre distance between legs at seabed level (m)	40 x 40	40 x 40
Number of Piles per Jacket	3 or 4	4
Pile Diameter (m)	6	6
Sub-Seabed Penetration (m)	60	60
Scour protection diameter (m)	77	78

Indicative material quantities associated with the pin piles, jackets, secondary steel, grouting, etc. for the entire proposed development for each project option are provided in Table 6.8.

Table 6.8 Indicative Material Quantities with Jackets and TP

	Project Option 1	Project Option 2
WTG		
Primary Steel (t) for WTG Jackets	NA	125,000
Secondary Steel (t) (access platforms, boat landing platforms, ladders, J-tubes) for WTG Jackets	NA	100
Grout Volume (m^3) for WTG Jackets to pin pile connection	NA	7,700
Grout Volume (m^3) for WTG jacket pin piles to the bedrock	NA	8,050
OSP		
Primary Steel (t) for OSP with Jackets	3,000	3,000
Grout Volume (m^3) for OSP jacket pin piles to the bedrock	230	230

6.5.3 Corrosion Protection

Above the water line, foundations, and the tubular steel transition piece are typically painted traffic light yellow (typically RAL 1023) so that the vessels operating near them can clearly see them. It also helps protect the steel work in the more corrosive ‘splash zone’.

Cathodic Protection or Impressed Current corrosion prevention systems are added to the foundation to minimise corrosion from the sea water and oxygen. Both systems are regularly used in the marine environment and are small appendages, below the water line of each foundation.

6.5.4 Scour Protection

If left unprotected, scouring of the seabed may occur which can reduce the effectiveness of the foundation. To prevent scouring of the seabed, scour protection may be required to be installed around the base of the foundation.

After a thorough examination of various factors such as geotechnical data, metocean and oceanographic data, water depth, foundation type, maintenance strategy, and cost, the scour protection solution will be determined and finalised. This decision will be made in conjunction with the detailed design of the foundation structure. The scour protection being considered for the purposes of the EIAR is detailed below.

The scour protection solution aims to safeguard the foundation structure against potential scouring. By carefully considering the aforementioned factors, the chosen scour protection solution is tailored to its specific requirements.

Scour protection is laid around the base typically in the form of rock, with a filter layer of smaller graded rocks sometimes placed underneath, to reduce any seabed erosion caused as water current passes around the foundation structure. Whilst rock is the most common form of scour protection, concrete mattresses can also be used. A description of the two types of scour protection being considered for both project options is provided below:

- Rock placement: This would comprise a single layer or double layer of graded stone placed on and/or around structures to inhibit erosion. Alternatively, rock filled mesh fibre bags may be used which adopt the shape of the seabed/structure as they are lowered on to it.
- Concrete mattresses: These are typically several metres wide and long and comprise of articulated concrete blocks which are linked by a polypropylene rope lattice. These prefabricated components are then placed on and/or around structures to stabilise the seabed and inhibit erosion.

The scour protection diameter varies by foundation type. For monopiles, a diameter of 44m will be required, and 77m will be required for jacket foundations for WTG and 78m diameter for the OSP.

Table 6.9 provides the assumed scour protection requirements for the various foundation types. The volumes presented which are assumed to be installed during initial construction and expected to be sufficient to last for the operational phase of the proposed development.

Table 6.9 Indicative Scour Protection Area/Volumes

	WTG		OSP		
	WTG Monopile	WTG Piled Jacket	OSP Piled Jacket	OSP with 1 Monopile	OSP with 2 Monopiles
Scour protection per location (m^2)	2,362	4,657	4,778	4,778	4,778
Scour protection (all foundations) (m^2) – Project Option 1	115,754	N/A	4,778	4,778	4,778
Scour protection (all foundations) (m^2) – Project Option 2	82,682	162,982	4,778	4,778	4,778

6.6 Offshore Inter-Array Cables

In order to carry the electricity generated by the WTGs, subsea inter-array cables will link a group of WTGs together into strings within the array area and connect these strings to the central OSP. Inter-array cables will have a nominal operating voltage of between 66kV and 132kV between WTGs.

6.6.1 Cable Configuration

The inter-array cables consist of a number of power conductor cores, made of copper or aluminium, with an integrated fibre optic communication cable and are wrapped in layers of insulating material and protective armour. A trefoil subsea cable will be used for the inter-array cables with each cable comprising of a triple conductor core, with each core consisting of a cross sectional area of up to $1200mm^2$, as shown in Image 6.8.

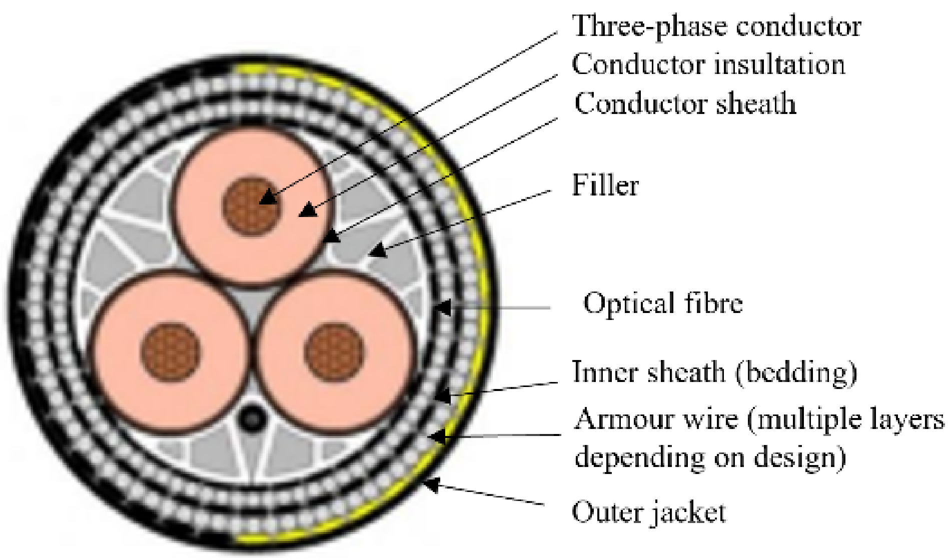

Image 6.8 Indicative Inter-Array Cable Cross-Section (Source: CIP)

In total, the inter-array cables are 111km in length for Project Option 1 and 91km for Project Option 2 and will link the WTGs within the array area in strings with connect with the OSP.

6.6.2 Cable Protection

Cables will be buried in a trench, where practicable, to protect them. Burial depth will be determined on a risk-based approach using a Cable Burial Risk Assessment which will be available post consent once detailed cable routes are known. Assumed burial depths are between 1 and 3m. Further information on cable installation can be found in Section 8.3 of the Offshore Construction chapter.

Where burial is not practicable additional cable protection techniques will be used, such as concrete mattressing (Image 6.9) and/or rock armour protection. It is anticipated that approximately 20% of the cable may require additional cable protection while the rest will be buried to the design burial depth or deeper. Cable protection will be 5m wide and 2m high, with a sloped profile across the seabed. Assumed rock size of 450mm is anticipated in the instances where rock armour protection is utilised.

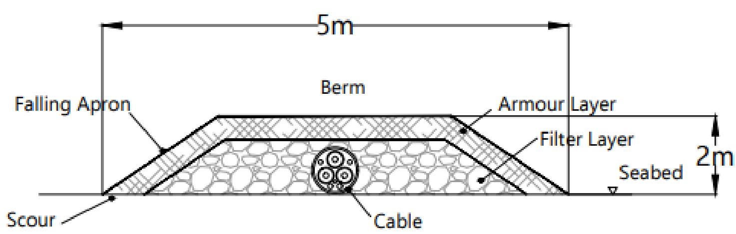

Image 6.1 Typical Mattress Cable Protection - not to scale (Source: NISA)

No third-party cabling or pipelines are charted or identified within the offshore development area in the surveys conducted to date. The inter-array cable layout will be designed to avoid cable crossing where practicable. However, if inter-array cable crossing is unavoidable, cable protection measures similar to those described above will be implemented. Cable crossing protection will involve the use of a pre-lay and post lay berms. It is likely that a berm of rock or mattressing will be placed over one of the cables for protection, known as a pre-lay berm, or separation layer. The pre-lay berm will be 5m wide, 15m in length and 0.5m in depth. The cable to cross will then be laid across this, at an angle of 90 degrees. This cable will then be covered by a second post lay berm of 5m width and 2m height, over a length of 100m. The post lay berm ensures that the cable remains protected and in place.

The inter-array cables will transition from the buried trench to WTG and OSP foundations via J-Tubes or I-Tubes (hollow steel tubes that hang from the substructures in the shape of a "J" or "I") or an aperture in the monopile wall and an assortment of bend stiffeners, outer shells known as a Cable Protection System. The Cable Protection System may be supported with additional placement of rock to protect and support the system and prevent against cable movement and potential damage.

Table 6.10 provides indicative rock/concrete protection volumes for inter-array cables in both project options.

Table 6.10 Cable protection volumes (rock/concrete mattress)

Inter-Array Cables	Cable Protection Volumes
Cable protection volume (m^3) Project Option 1 (111km of inter-array cabling)	133,200
Cable protection volume (m^3) Project Option 2 (91km of inter-array cabling)	109,200
Cable protection crossing volume (m^3), Project Option 1	5,188
Cable protection crossing volume (m^3), Project Option 2	5,188

6.7 Offshore Export Cables

In order to bring electricity ashore, two 220kV HVAC offshore export cables will be routed from the OSP to the landfall site. Each export cable will comprise an electrical 'circuit'.

The offshore export cables will be located within the ECC as shown on Figure 1.1. The cables will be brought to the shoreline at the landfall site where they will connect to the onshore export cables at the Transition Joint Bays (TJBs). The flexibility in the cable size, route of these offshore export cables within the ECC is part of the DF Opinion from An Bord Pleanála as described in Section 6.2.2.

For the purposes of the EIAR, it is assumed that the two offshore export cables will be co-located with an assumed separation distance of between 50m and 200m, but the ultimate route may be anywhere within the ECC. The proposed offshore export cable infrastructure centreline is shown on the planning drawings (included in Appendix 7.1) but remains subject to the final permitted location of other infrastructure and to the tolerance for immaterial deviation from the location shown. The location for cable infrastructure indicated may change within the proposed development boundary of the ECC.

6.7.1 Cable Configuration

The two HVAC 220kV offshore export cables will be approximately 270mm outside diameter consisting of a triple core cable i.e., three electrical conductors within the one cable, to ease installation. The cable will also contain one or two fibre optic cables. The separation distance between the two offshore cables is assumed to be between 50m and 200m.

The length of offshore export cables from the OSP to the landfall site is 18km for both project options, depending on final installation methodology and cable lay vessel capability. Offshore cable joints may be utilized, further information on offshore export cable joints is provided in the Offshore Construction Chapter.

6.7.2 Cable Protection

As with the inter-array cables discussed in Section 6.6, the offshore export cables will be buried where practicable, to protect them. The offshore export cables are buried in a trench with a design burial depth between 1 to 3m. As each cable is an independent electrical 'circuit', one cable will be buried in its own individual trench, i.e., two trenches in total with an assumed separation distance of between 50m and 200m between trenches.

When burial is not practicable, additional cable protection techniques will be applied, similar to those described in Section 6.6.2.

No third-party cabling, pipelines or subsea infrastructure are charted or identified within the offshore development area in the surveys conducted to date. Therefore, no crossing of third-party assets is anticipated. However, if cable crossing is unavoidable, cable protection measures as described above in Section 6.6.2 will be implemented. For both project options, approximately 43,200m^3 of cable protection will be required for the offshore export cables.

6.8 Navigation, Colour, Marking and Lighting

The proposed development will be designed and constructed as per International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), Irish Aviation Authority (IAA), Commissioners of Irish Lights (CIL) (in line with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)) and Irish Coastguard requirements. These will consist of navigation aids such as buoys, markers, navigation lights and sound signals in addition to aviation warning and search and rescue (SAR) lights.

Navigation for marine traffic will be permitted across the offshore development area with 50m safety zones around fixed assets.

During the construction phase, temporary lighting will be used to mark any sea surface piercing structures and will have a 2.5 second yellow flash visible for at least 2 nautical miles with a 360-degree visibility. It is expected that CIL will require construction buoyage during the construction phase. An assumed 12 buoys will be deployed to mark the construction area. The buoyage shall remain in place until the operational marking requirements have been installed, then inspected and passed by CIL. Precise buoyage locations will be as directed by CIL.

The colour scheme for nacelles, blades and towers is generally RAL 7035 (light grey) or similar and foundation steelwork is generally in RAL 1023 (traffic light yellow) or similar above the waterline. Each asset will be marked with a unique ID and will correspond to Marine Notices. All structures will also be equipped with relevant aviation SAR lights and blade markings.

Lighting will comply with the requirements of the authorities named above. During operation, lighting on the WTG and OSP will be installed for use when personnel need to access the WTG in low light conditions. When not being accessed, the only lights visible will be navigation lights. The lighting regime will vary depending on the location of periphery structures in line with IALA and IAA guidelines.

All structures will also be equipped with relevant aviation Search and Rescue lights and blade markings. Further information on the Lighting and Marking Plan for the proposed development is provided in Appendix 17.3 of Volume 9.

6.9 Landfall Site

6.9.1 Landfall Location and Context

The landfall site is located north of Balbriggan and immediately south of Bremore Point in the townland of Bremore in North County Dublin. The landfall site encompasses Bremore Beach, agricultural fields behind, a section of the Dublin to Belfast railway line and the R132. Bremore Beach, approximately centred on Ordnance Survey Ireland (OSI) Grid Reference N265264, E319623 is located immediately east of the R132.

6.9.2 Landfall - Offshore Infrastructure

The proposed development at the landfall site traverses the HWM and consists of both onshore and offshore infrastructure. This chapter describes the offshore infrastructure at landfall which includes the offshore export cable from the horizontal directional drilling (HDD) exit pit offshore, to the HWM. The offshore export cables will be routed via HDD to a TJB located landward of the HWM. Refer also to the Onshore Description chapter which describes the onshore infrastructure at landfall. Both chapters should be read together for full details on infrastructure at landfall.

The cable landfall will be constructed by HDD which involves drilling holes from the landward side of the landfall to a point where cable installation vessels can operate.

Ducts or pipes are installed in the drilled holes and the cables are then pulled into the ducts. The preferred method of construction at the landfall is described in the Offshore Construction chapter. The offshore export cable components are described above in Section 6.7.

The DF Opinion accounts for flexibility in the final siting of the offshore export cables to ensure that any obstacles/constraints identified during detailed design stage can be avoided. For the purposes of the EIAR, it is assumed that the location of the two HDD exit pits will be located within the ECC seaward of the Low Water Mark (LWM). The proposed offshore export cable infrastructure centreline is shown on the planning drawings but remains subject to the final permitted location of other infrastructure and to the tolerance for immaterial deviation from the location shown. The location for cable infrastructure indicated at landfall may change within the proposed development boundary.

Further information on the requirement for flexibility throughout the proposed development is included in Volume 2, Chapter 2: EIA Methodology.

6.10 Operation and Maintenance

6.10.1 Operation and Maintenance Strategy

The Operation and Maintenance strategy will commence following commissioning. It is proposed that the proposed development will be managed from a local onshore operation and maintenance facility for the lifecycle of the proposed development (refer to Section 6.10.2 for details of the operation and maintenance facility).

The operational lifespan of the proposed development is anticipated to be 35 years. Asset condition and operation will be monitored remotely from the control room at the operation and maintenance facility via the SCADA and condition monitoring systems. The SCADA system will enable the remote control of individual WTGs, the offshore infrastructure in general, as well as remote interrogation, information transfer, storage and the shutdown or restart of any WTG if required. The operation and maintenance facility will also provide a base for parts, storage, and crew transfer for maintenance activities.

The operation and maintenance strategy proposes the following types of maintenance:

- Regularly scheduled monitoring and maintenance: The inspection, testing, investigation, and rectification of any minor faults to prevent major faults. This primarily applies to inspection and work on parts susceptible to failure or deterioration in between scheduled system overhauls. Scheduled maintenance is likely to occur annually, bi-annually, or quarterly as necessary.
- Scheduled system overhauls: These are carried out in accordance with the WTG manufacturer’s instructions or warranties. They are scheduled in advance and planned for appropriate periods of the year primarily during suitable weather conditions such as the summer months.
- Unscheduled maintenance: Works required outside of the planned maintenance strategy, in response to unforeseen issues or breakdowns. These maintenance activities can range from small defects to the replacement of major components.

The overall operation and maintenance strategy will be finalised once the onshore operation and maintenance facility location and technical specifications of components are known, such as WTG model and number, foundation type, cable type and final layout.

It should be noted that once operational, it is anticipated that the inter-array and export cables will require minimal maintenance, if any. As with any offshore wind farm, unplanned remedial works (e.g. cable repairs) are sometimes required in the event of a unforeseen fault or defect in components. If a cable defect were to occur, the cable would be cut at an isolated portion, lifted to the surface for repair, and replaced in or on the seabed. Reburial is the preferred option once repaired, but placement of cable protection materials (e.g. rock armour) would be used where burial is not practicable. Operation and maintenance activities will require similar vessels and machinery to that used for the installation works.

Table 6.11 provides estimated vessel movements for operations and maintenance vessels.

Table 6.11 Anticipated outline of O&M activities

Activity	Description	Methodology	Frequency
WTG Foundations			
Routine Inspections	Inspection of the WTG foundation, including the ancillary structures and transition pieces, both above and below sea level	2-3 technicians accessing the WTG by CTV.	Twice yearly for 2 years then annually for remaining lifetime.
Replacement of corrosion protection anodes	Remove and replace the anodes used for corrosion protection of the foundations	Divers or ROV from support vessel (e.g., DP vessel)	Four per year per windfarm
Modification or replacement of ancillary structures	Remove and replace or modify the ancillary structures, such as J-tubes, ladders etc, where required	Divers or ROV usually deployed from a DP vessel	Once every 5 years
Scour protection repair and maintenance	The repair, maintenance and/or replacement of scour protection, where required	Same as installation methodology	Once every 10 years
Painting	The preparation of the surface and application of coatings (such as paint), to protect the WTG foundation from both internal and external corrosion	2-3 Technicians accessing WTG by CTV	Once every 3 years per WTG
Removal of guano	Removal of guano from the foundation, transition piece, and access ladders	Pressure washer from CTV /support vessel	Every two years per WTG
Removal of marine growth	Removal of marine growth from the foundation, transition piece, and access ladders	Pressure washer from CTV /support vessel	Every two years per WTG
Repairs and/or replacement of navigation equipment	Repairs and/or replacement of the electrical equipment used for navigation, such as transponders, fog horns, and lighting	2-3 Technicians accessing WTG by CTV	Every two years for the proposed development lifecycle
Geophysical surveys	Geophysical survey to monitor the position and condition of the assets and seabed	Survey vessel or Unmanned Surface Vessels	Twice yearly for 1st year then annually for remaining lifetime.
OSP Foundations			
Routine Inspections	Inspection of the OSP foundation, including the ancillary structures and transition pieces, both above and below sea level	2-3 technicians accessing the WTG by CTV.	Twice yearly for 2 years then annually for remaining lifetime.
Replacement of corrosion protection anodes	Remove and replace the anodes used for corrosion protection of the foundations	Divers or ROV usually deployed from a DP vessel	1 every 5 years
Modification or replacement of ancillary structures	Remove and replace or modify the ancillary structures, such as J-tubes, ladders, boat landings etc, where required	Divers or ROV usually deployed from a DP vessel	1 every 5 years
Scour protection repair and maintenance	The repair, maintenance and/or replacement of scour protection, where required	Same as installation methodology	1 every 10 years
Painting	The preparation of the surface and application of coatings (such as paint), to protect the OSP foundation from both internal and external corrosion	2-3 Technicians accessing WTG by CTV	Every year

Activity	Description	Methodology	Frequency
Removal of guano	Removal of guano from the foundation, transition piece, and access ladders	Pressure washer from CTV /support vessel	Every 2 years
Removal of marine growth	Removal of marine growth from the foundation, transition piece, and access ladders	Adhoc pressure washer from CTV/SOV	Estimated removal occurring on every OSP twice over the lifecycle of the project
Geophysical surveys	Geophysical survey to monitor the position and condition of the assets and seabed	Survey vessel or Unmanned Surface Vessels	Twice yearly for 1st years then annually for remaining lifetime.
WTGs			
Routine Inspections	Inspections of the WTGS (both internal and external)	2-3 technicians accessing the WTG by CTV.	Twice yearly per WTG
Minor repairs and replacements	Minor repairs and/or replacements of internal equipment, such as circuit breakers, pumps, fuses etc)	2-3 technicians accessing the WTG by CTV.	Twice yearly per WTG
Major component replacement	Remove and replace the major WTG components, such as the gearbox, blades, yaw rings etc	Jack-Up vessel or floating crane vessel	Once every 5 years per WTG
Painting	The preparation of the surface and application of coatings (such as paint), to protect the WTG from both internal and external corrosion	2-3 technicians accessing the WTG by CTV.	Yearly
Replacement of consumables	The replacement of the consumables used within the WTG, such as oil, lubricants, filters etc	2-3 technicians accessing the WTG by CTV.	Twice yearly per WTG
OSP			
Routine Inspections	Inspections of the OSP (both internal and external)	2-3 technicians accessing the WTG by CTV.	Monthly
Minor repairs and replacements	Minor repairs and/or replacements of internal equipment, such as circuit breakers, pumps, fuses etc	2-3 technicians accessing the WTG by CTV.	4 times per year
Major component replacement	Remove and replace the major OSP components, such as the switchgear, transformers etc	Jack-Up vessel or floating crane vessel	Once every 5 years
Painting	The preparation of the surface and application of coatings (such as paint), to protect the OSP from both internal and external corrosion	2-3 technicians accessing the WTG by CTV.	Once per year
Inter-array cables			
Routine Inspections	Inspections of both the inter-array cables and cable protection including inspection at the J-tube entry point.	Survey vessel or Unmanned Surface Vessels	Annually for first 3 years then every 3 years
Geophysical surveys	Geophysical survey of the inter-array cable, cable protection, and seabed	Survey vessel or Unmanned Surface Vessels	Annually for first 3 years then every 3 years

Activity	Description	Methodology	Frequency
Repair and/or replacement	The repair and/or replacement of the inter-array cable	Cable Vessel	Once every 5 years
Reburial	The reburial of any section of the inter-array cable which has become exposed.	Cable vessel or support vessel	Once every 5 years
Cable protection replacement/reinstatement	The reinstatement and/or replacement of any cable protection that may have been disturbed due to external factors (such as third-party damage, or seabed mobility)	Cable vessel or support vessel	Once every 5 years
Offshore Export Cable			
Routine Inspections	Inspections of both the offshore export cable and cable protection including inspection at the J-tube entry point.	Survey vessel or Unmanned Surface Vessels	Annually for first 3 years then every 3 years
Geophysical surveys	Geophysical survey of the offshore export cable, cable protection, and seabed	Survey vessel or Unmanned Surface Vessels	Annually for first 3 years then every 3 years
Repair and/or replacement	The repair and/or replacement of the offshore export cable	Cable Vessel	Once every 5 years
Reburial	The reburial of any section of the offshore export cable which has become exposed.	Cable vessel or support vessel	Once every 5 years
Cable protection replacement/reinstatement	The reinstatement and/or replacement of any cable protection that may have been disturbed due to external factors (such as third-party damage, or seabed mobility)	Cable vessel or support vessel	Once every 5 years

6.10.2 Operation and Maintenance Facility

An operation and maintenance facility (OMF) will be required to service the proposed development throughout the operational phase of the proposed development. Whilst the OMF will be subject to separate planning/permitting consents and is not included within this planning application for consent, it is considered within the cumulative impact assessment of the EIAR.

The OMF will be located onshore at a suitable location in the vicinity of the proposed development and will comprise an OMF building and associated storage facilities as well as a number of berths, for the vessels required to access the wind farm. Approximately 40 people will be employed at the OMF.

The OMF option being considered, includes the adaption and leasing part of an existing port facility at Greenore. Additional information on the OMF is provided in Section 7.6.4 of the Onshore Description Chapter.

6.10.3 Operation and Maintenance Vessels

A number of vessel visits to each WTG and OSP will be required each year to allow for scheduled and unscheduled maintenance.

CTV can provide daily access from an OMF to the array area. CTVs are quick and agile vessels used to transfer the crew from shore to offshore development area or between vessels. Daily technician transfer will consist of the maintenance technicians deploying on the CTV each morning and transiting from the OMF to the offshore development area.

The CTVs will deposit the technicians at the WTG and remain in situ until the end of the shift when the technicians will be brought ashore. Therefore, CTV movements at the OMF will primarily be during the morning and evening at start/end of shifts. CTVs are approximately 25m in length and can carry around 12 passengers at a speed of up to 25kn. CTV can be used to complete offshore transfers when wave heights are typically below 1.5m, refer to Image 6.10.

Image 6.9 Crew Transfer Vessels (CTV) within the array (Source: Veja Mate - CIP)

Service Operation Vessels (SOVs) can also be used for crew transfers, offshore accommodation, commissioning, and safety monitoring but are more typical for larger, less frequent, maintenance or repair campaigns during operation. SOVs are larger vessels than CTVs that can fulfil a wider range of functions and can operate offshore for weeks rather than a single day.

SOVs are around 80m in length and can carry up to 70 passengers, if needed, at a speed of up to 15kn. The deck area can be up to 900m². SOVs can be used when wave heights are below 2.5m.

They often have a walk to work system onboard which provides a motion compensated walkway from the vessel to the turbine access platform. Refer to Image 6.11.

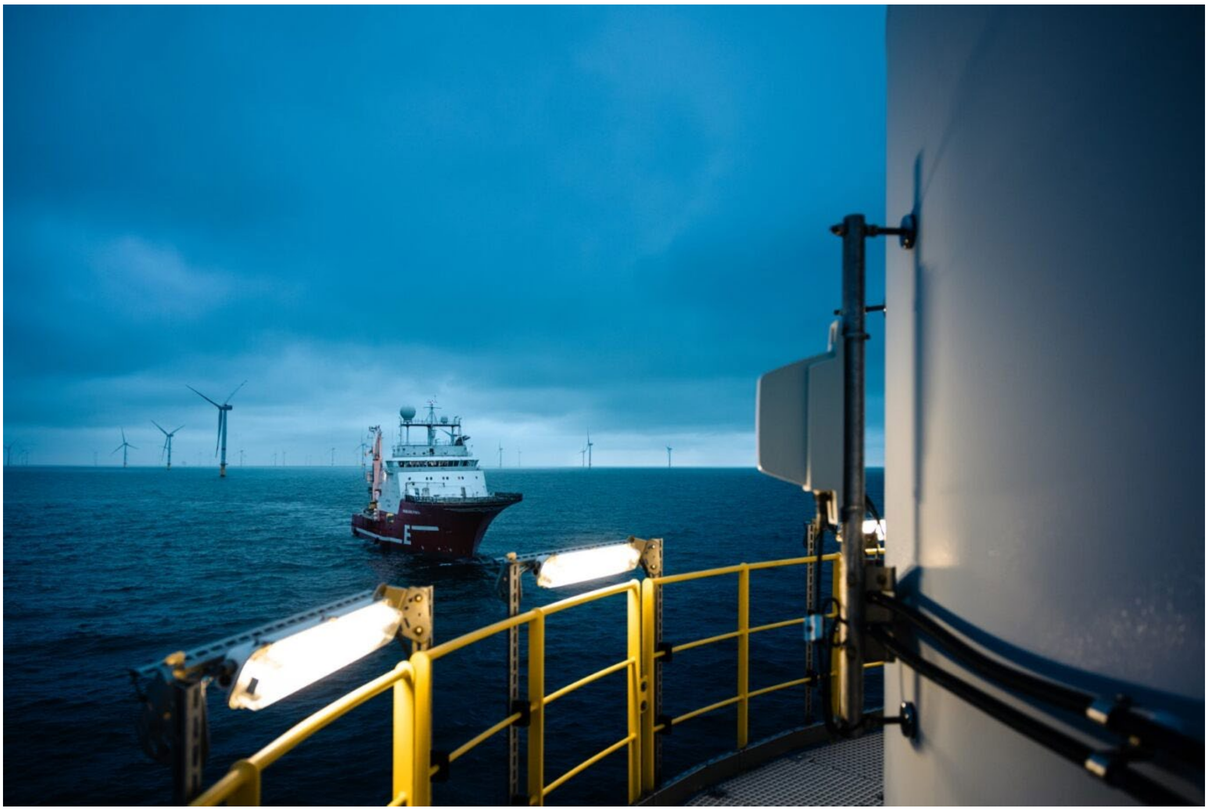

Image 6.10 Service Operation Vessels (SOV) (Source: Veja Mate – CIP)

For major maintenance campaigns or component change-outs such as blades, nacelles, or transformers, which may be required once per WTG throughout the design life of the proposed development, jack-up vessels (JUV) can be used.

JUVs can work in water depths of 60m and have a capacity to lift up to 2,000 tonnes. They are typically the largest vessel on site during the lifetime of the proposed development. Refer to Image 6.12.

Image 6.11 Jack-Up Vessel (Source: CIP)

Helicopters are not required for standard operations and maintenance activities but could be required in the event of an emergency. Drone surveys will also be undertaken for annual blade inspections of each WTG.

Up to three inspections are anticipated as required per year to cover maintenance or major event (i.e., storms) impacts on blades. Three drone surveys are also required within the first 18 months of the OSP as per EirGrid requirements. It is proposed that all drones will be operated from a support vessel within the array area.

6.10.4 Operation and Maintenance Safety Zones

During the operational phase, the proposed development will deploy advisory safety zones around any WTG or OSP to protect technicians, crew, and vessels on-site during any maintenance works. Safety zones are not a statutory requirement in Ireland meaning they are advisory only. However, following UK guidance MGN 654 (Maritime and Coastguard Agency, 2021) to the advisory safety zones will be 500m major maintenance activity. The proposed development will also recommend that advisory clearance distances of up to 500m in radius are observed around cable installation vessels and cable repair vessels. Advisory safety zones will be employed via Notice to Mariners.

6.11 Decommissioning

This section covers the activities involved with the proposed end of life strategies for the proposed development. The Maritime Area Planning Act 2021 sets out an obligation for the holder of a Marine Area Consent[2] (MAC) to decommission or re-use offshore infrastructure as part of its rehabilitation of the maritime area that is the subject of the MAC, once the proposed development has reached the end of its operational life. It is anticipated that all structures above the seabed will be completely removed.

The exact approach to decommissioning will meet any statutory requirements or guidance set out in the forthcoming Maritime Area Planning Act secondary legislation. The approach to decommissioning has been documented in the Rehabilitation Schedule (Appendix 6.2 of Volume 8) which will be subject to consultation with the Maritime Area Regulatory Authority and relevant stakeholders as required. The Rehabilitation Schedule will also form part of the MAC for the proposed development following the grant of development permission. The Rehabilitation Schedule will be prepared taking into consideration the latest technological advances as well as legislative and environmental requirements at the time of decommissioning. The approach to waste management during decommissioning is set out in Volume 5, Chapter 31: Resource and Waste Management.

Any other licences or authorisations that might be required would be identified and obtained prior to decommissioning, including any validation, updating or new submission of an EIAR.

6.11.1 WTGs

WTGs will be removed by reversing the methods used to install them. Decommissioning vessels will be used to remove the rotor blades, nacelle and the tower sections and then transport all the components to a dedicated facility for processing and reuse/recycling/disposal.

6.11.2 Foundations

After decommissioning of the transition piece in monopile and jacket foundations, it is assumed the piled foundations would be cut approximately 1-2m below the seabed and removed, as it may be determined that the removal would result in greater environmental impacts than leaving in-situ. Due consideration seabed level across the array area would be undertaken at the point of decommissioning.

This is achieved by inserting pile cutting devices inside the foundations. Once the piles are cut, the foundations could be lifted and removed from the site. At this time, it is not thought to be reasonably practicable to remove entire piles from the seabed, as this may cause damage to the seabed environment, but endeavours will be made to ensure that the sections of pile that remain in the seabed are fully buried and made safe. It is anticipated that any scour protection will be left in situ.

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[2] the MAC is a State consent which allows the Developer the right to occupy a part of the maritime area and the ability to subsequently apply for development consent within that maritime area

Due to the high recyclability of steel (the dominant substructure material) the foundations will be recycled. The foundations will be removed to a dismantling yard, and recycling and waste facilities, which will be fully licensed for the relevant activities.

6.11.3 Cables

It is envisaged that, where appropriate, buried assets such as cables will be left in situ when the proposed development is decommissioned, as it may be determined that the removal would result in greater environmental impacts than leaving in-situ. Discussions with stakeholders and regulators may identify the need for cables to be wholly or partially removed.

Should cables be removed, this would require the removal of seabed material or cable protection measures to allow access. Using a grapnel, the cables will be raised from the seabed, cable sections cut and recovered to an onshore facility for processing, reuse, recycling and/or disposal. The remaining ends would be weighted and returned to the seabed. The rock protection or concrete mattresses over the cables will only be displaced as much as necessary to remove the cables. The removed cables themselves will be taken to a suitable recycling facility where possible.

At the HDD exit pit, to minimise the environmental disturbance during decommissioning, the offshore export cables will be left in place in the seabed with the cable ends cut, sealed, and securely buried as a precautionary measure. Partial removal of the cable may be achieved by pulling the cables back out of the ducts. This may be preferred to recover and recycle the copper and/or aluminium and steel within them.

6.11.4 Decommissioning Vessels

Decommissioning is currently based on reverse installation and the assumptions about number of vessels and their movements is therefore the same as described for construction of the wind farm as presented in Section 8.4 of the Offshore Construction Chapter.

6.12 References

DNVGL-ST-0126 Support Structures for Wind Turbines

DNVGL-ST-0145 “Offshore Substations”

IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) Recommendation O-139; “The Marking of Man-Made Offshore Structures” December 2013

IMO Regulation “Convention on the International Regulations for Preventing Collisions at Sea”, 1972 (COLREG)

Maritime and Coastguard Agency (2019) MGN 543(M + F). Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response.

ODS-GFS-00-001-R2 Offshore Substations, General Requirements Specification, EirGrid