



KINCARDINE OFFSHORE
WINDFARM PROJECT

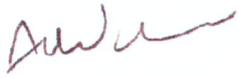
DECOMMISSIONING PROGRAM -
WITHOUT BUDGET
(UNRESTRICTED DISTRIBUTION)

Doc No:

KOWL-PL-0004-012

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**DECOMMISSIONING PROGRAM - WITHOUT BUDGET
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KINCARDINE OFFSHORE WINDFARM PROJECT**

Prepared	Checked	Reviewed	Approved
13/06/2018	13/06/2018	13/06/2018	13/06/2018
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1. INTRODUCTION

1.1. Purpose of the Document

This document has been authored to satisfy Condition 3 of the Section 36 Consent issued to Kincardine Offshore Windfarm Ltd (KOWL) for the Kincardine Offshore Windfarm (the Project). This document provides the Decommissioning Plan (DP) for the Project, (see Section 1.5 for the wording of the condition).

1.2. Scope of the Document

This document outlines the decommissioning requirements and subsequent DP for the Project in line with relevant guidelines which is required under Section 105(2) and (5) of the Energy Act 2004.

1.3. Project Overview

The Project is considered a commercial demonstrator site, which will utilise floating foundation technology, and is the second floating wind turbine farm array. It has been included within the Survey, Deploy and Monitoring scheme for offshore renewable systems (similar to wave and tidal devices).

The Project is located south-east of Aberdeen approximately 8nm (15km) from the Scottish coastline, in a location that provides suitable water depth for a floating offshore wind demonstrator development (approximately 60-80m) (Figure 1-1).

The project is split into the following areas:

- The Development Area – the wind farm area including the Wind Turbine Generators (WTG) and inter-array cables.
- The Offshore Export Cable Corridor – the area within which the proposed export cables will be laid, from the perimeter of the Development Area to the onshore area at Mean High Water Spring (MHWS).
- The Onshore Area – the onshore area above Mean High Water Spring (MHWS) including the underground cables connecting to the onshore substation at Redmoss.

This DP focuses on the offshore elements only as per Section 36 Consent and Marine Licence granted.

In April 2016 KOWL submitted applications for consent to construct and operate the Project, which included the Original ES. In September 2016 an addendum (referred to as the ES Addendum), of additional environmental information to the Original ES, was also submitted. In March 2017 consent under Section 36 and Section 36A of the Electricity Act 1989 was granted.

Since consent was granted, there have been several necessary changes to the Project. Therefore, an application for a variation of the Section 36 consent granted by the Scottish Ministers under S36C of the Electricity Act 1989 was applied for in December 2017 (the 'Variation Application').

The table below outlines the application dates, relevant ES Documents and the components of the Project as were included in the Original Application and the Variation Application.

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Table 1-1 Summary of document timelines

Original Documents	Addendums	Variation
Date Submitted: March 2016	Date Submitted: September 2016	Date Submitted: November 2017
Original Application	Original Application	S36C Variation Application
Kincardine Offshore Windfarm ES (Original ES)	ES Additional Information Addendum (ES Addendum)	Section 36C Variation ES (Variation ES)
Maximum generation capacity: 50MW	Maximum generation capacity: 50MW	Maximum generation capacity: 50MW
WTGs: 8 x 6MW	WTGs: 8 x 6MW	WTGs: 1 x 2MW and 6 x 8.4MW
Substructures: semi-submersible	Substructures: semi-spar	Substructures: combination of semi-submersible and semi-spar
Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables

Project Components

As noted in the table above, the maximum generation capacity of the windfarm is capped at 50MW, the main difference between the various stages of the applications have been the number and size of the turbines, and the substructure type.

As applied for in the Variation Application, the Project will now consist of the following offshore components:

- WTGs: 1 x 2MW and 6 x 8.4MW
- Substructures: semi-submersible Windfloat™ design
- 33kv inter-array and two export cables

Onshore, the following construction activities will also take place (under permissions granted by Aberdeen City Council):

- Onshore substation
- Horizontal Directional Drilling landfall and onshore cable route

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Construction Programme Overview

The construction of the Project is anticipated to occur in 'Tranches' in-line with the indicative Programme outlined below. A final Construction Programme for each tranche will be provided to Scottish Ministers prior to commencement of the construction as a requirement of the consent conditions.

Table 1-2 Indicative construction programme

Tranche	Activities	Indicative Start Dates
Tranche 1	Onshore works and HDD drilling	March 2018
	Mooring installation Turbine Location 1	May 2018
	Export Cable 1 installation	May 2018
	Installation of 2MW turbine to Location 1	June 2018
Tranche 2	Export Cable 2 installation	April 2019
	Mooring installation Turbine Locations 5-7	April 2019
	Installation of inter-array cables Locations 5-7	Aug 2019
	Installation of turbines to Locations 5-7	Aug 2019
Tranche 3	Mooring installation Turbine Locations 1-3	March 2020
	Installation of inter-array cables Locations 1-3 and 8	June 2020
	Move 2MW to Location 8 (dependent on recertification and consultation as noted above)	June 2020
	Installation of turbines to Locations 1-3	June 2020

Please note, Export Cable 2 may be installed as part of Tranche 1; however, at the time of writing this Decommissioning Programme the timing was still to be decided. This will be confirmed in due course, and this document updated if required as per Section 1.4 below.

The Design Life of the Project is 25 years.

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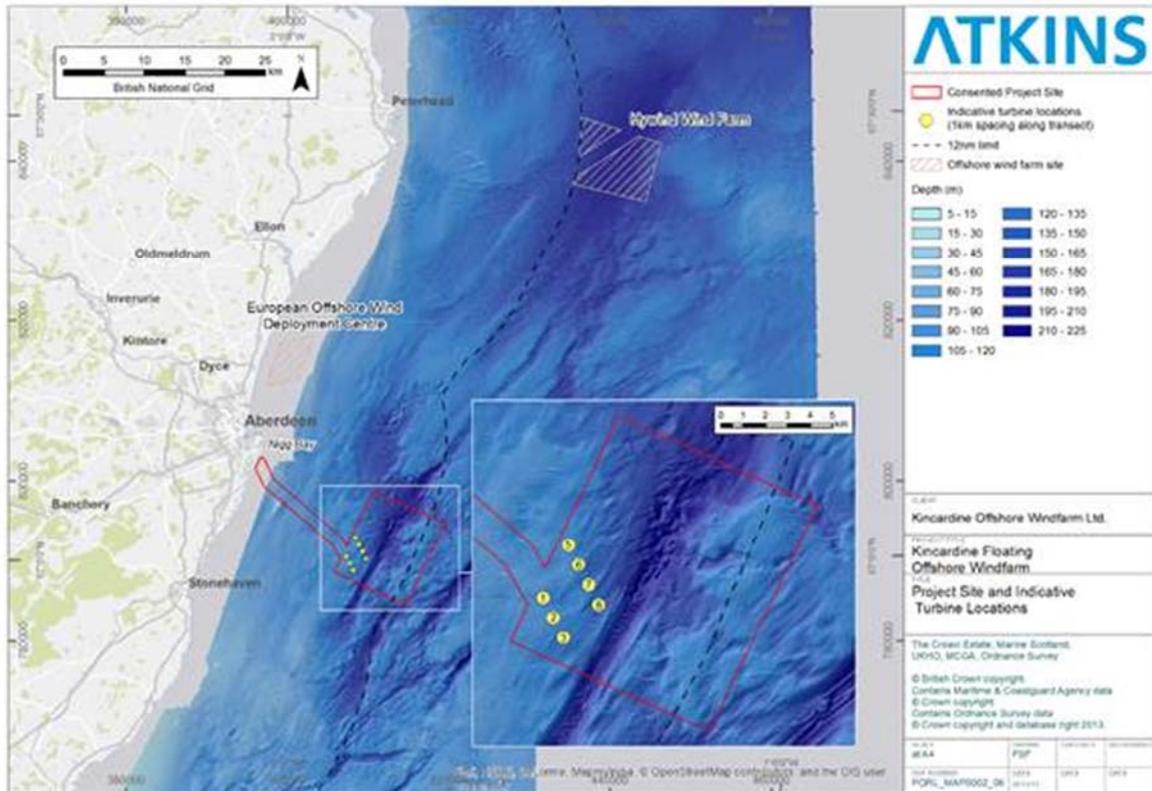


Figure 1-1 Project site and indicative turbine locations

1.4. Approach to Amending and Updating this Decommissioning Plan

This is the first iteration of the Decommissioning Programme (submitted pre-installation of the 2MW WTG and substructure). The nature of the construction process proposed for the Project, see Section 1.3 for details) means that updates to this document may be required as the Project progresses.

Where the need for an update or amendment is identified following approval from Marine Scotland Licensing Operations Team (MS-LOT) of the DP, either through a consultation response, or due to practicalities arising as the Project progresses, KOWL will communicate the suggested update/amendment to MS-LOT prior to editing the approved document. If the suggested change is accepted by MS-LOT, the Decommissioning Programme will be redrafted, and submitted for re-approval.

It is anticipated that this DP will be reviewed at least at the following times:

- Where a significant change to the Project occurs (e.g. early removal of a WTG);
- At least one year before the start of the financial security provision period (end of operational year 12);
- Mid-point of the period of financial security (five years prior to decommissioning); and
- One year before the commencement of decommissioning at site.

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1.5. Consent Conditions

The following consent condition is taken from the S36 Consent which forms the requirements for this Decommissioning Programme. The submission of this DP is in line with this condition.

Table 1-3 Licence conditions linked to the Decommissioning Programme

Licence	Condition Number	Name	Details
S36	3	Decommissioning	Where the Company has been given notice requiring them to submit to the appropriate authority, as defined in the Energy Act 2004, a Decommissioning Programme ("DP"), pursuant to Section 105(2) and (5) of the Energy Act 2004, then construction may not begin on the site of the Development until after the Company has submitted to the appropriate authority a DP in compliance with that notice.

Links to Other Consent Plans

The following consent condition is taken from the Marine Licence with which this DP has linkages to.

Table 1-4 Licence conditions linked to the Decommissioning Plan.

Licence	Condition Number	Name	Details
Marine Licence	3.2.4.8	Decommissioning	This Licence does not permit the Decommissioning of the Works, for which a separate marine Licence is required.

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2. DECOMMISSIONING BACKGROUND INFORMATION

2.1. Review of Decommissioning Guidelines

The decommissioning assessment is based on the following guidance:

- a. IMO 'Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone'¹.
- b. Government (UK) guidance notes for decommissioning offshore oil and gas installations² in compliance with OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic Decision 98/3;
- c. OSPAR guidance documents on offshore wind farms³;
- d. The concept of Best Practicable Environmental Option (BPEO), that is the option which provides the most benefit or least damage to the environment, at an acceptable cost, in both the long and short term^{4 5}.

The guidance generally recommends the complete removal of all installations and structures from a development area, with some exception, for example, buried export cables which been protected by rock dumping. The removal of offshore installations should include the removal and subsequent full recycling process considering the Waste Hierarchy Framework of with reuse, recycling, incineration with energy recovery or disposal at a licensed site.

2.2. Decommissioning Programme Process

The DP process is outlined within Appendix D of the decommissioning guidance note⁶; Figure 2-1 summarises this process in a flow diagram (extracted from reference 6, Appendix D). The stages are also outlined in Table 2-1 with further explanatory notes below of how KOWL have progressed though the stages to date.

¹ Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, IMO, 19 October 1989, http://www.imo.org/Newsroom/contents.asp?doc_id=628&topic_id=227

² Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998 <https://www.og.decc.gov.uk/regulation/guidance/decommission.htm>

³ Guidance on Environmental Considerations for Offshore Wind Farm Development (Ref 2008-3), OSPAR, March 2008

⁴ Guidelines for Environmental Risk Assessment and Management, Defra, September 2002, <http://www.defra.gov.uk/environment/quality/risk/eramguide/08.htm>

⁵ The concept of BPEO is similar to that of BATNEEC - Best Available Technique not Entailing Excessive Cost – in that both criteria involve balancing the reduction in environmental risk with the practicability and cost of reducing the risk

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Table 2-1 Decommissioning Programme Process

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8
Preliminary discussion with MS by developer	Issue of notice by the Scottish Ministers requiring a decommissioning programme	Detailed discussions: submission and consideration of a draft programme (including proposed financial security measures)	Consultation with interested parties and MS conducts decommissioning Appropriate Assessment.	Formal submission of a programme and approval under the Energy Act	Reviews and modifications of decommissioning programme (and any financial security); review or conduct of decommissioning Appropriate Assessment	Undertake approved decommissioning programme	Monitoring of site

Stage 1 - Preliminary Discussions:

KOWL have been in discussions with MS-LOT (rather than BEIS, as the Scottish Ministers are now responsible for Decommissioning within Scottish waters since 2017) regarding the DP, and have been working together to understand the decommissioning obligations. Identification of the decommissioning liabilities for the Project have been discussed, including financial security provision options for the decommissioning.

Stage 2 – Issue of Decommissioning Notice:

KOWL received the notice of requirement for this DP as part of the Consent granted in March 2017.

Stage 3 – Detailed Discussions for Draft Decommissioning Programme:

KOWL have continued to have discussions with the MSLOT whilst preparing this DP including the options for the financial security provision. This DP has been created in line with these discussions, and sets out the Environmental Impact Assessment (EIA) which assesses the potential impacts for decommissioning the Project (Sections 4), which makes reference to the wider EIA undertaken for consent application, and the financial security provision to be made by KOWL (Section 7 and Appendix A).

Stage 4 – Consultation with Interested Parties:

This draft DP has been submitted, and will now enter Stage 4.

For information on subsequent stages please review the Decommissioning of offshore renewable energy installations under the Energy Act 2004⁶. As this document is progressed, additional information will be added to this section as applicable.

⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47997/file35754.pdf

Decommissioning programme process: key activities

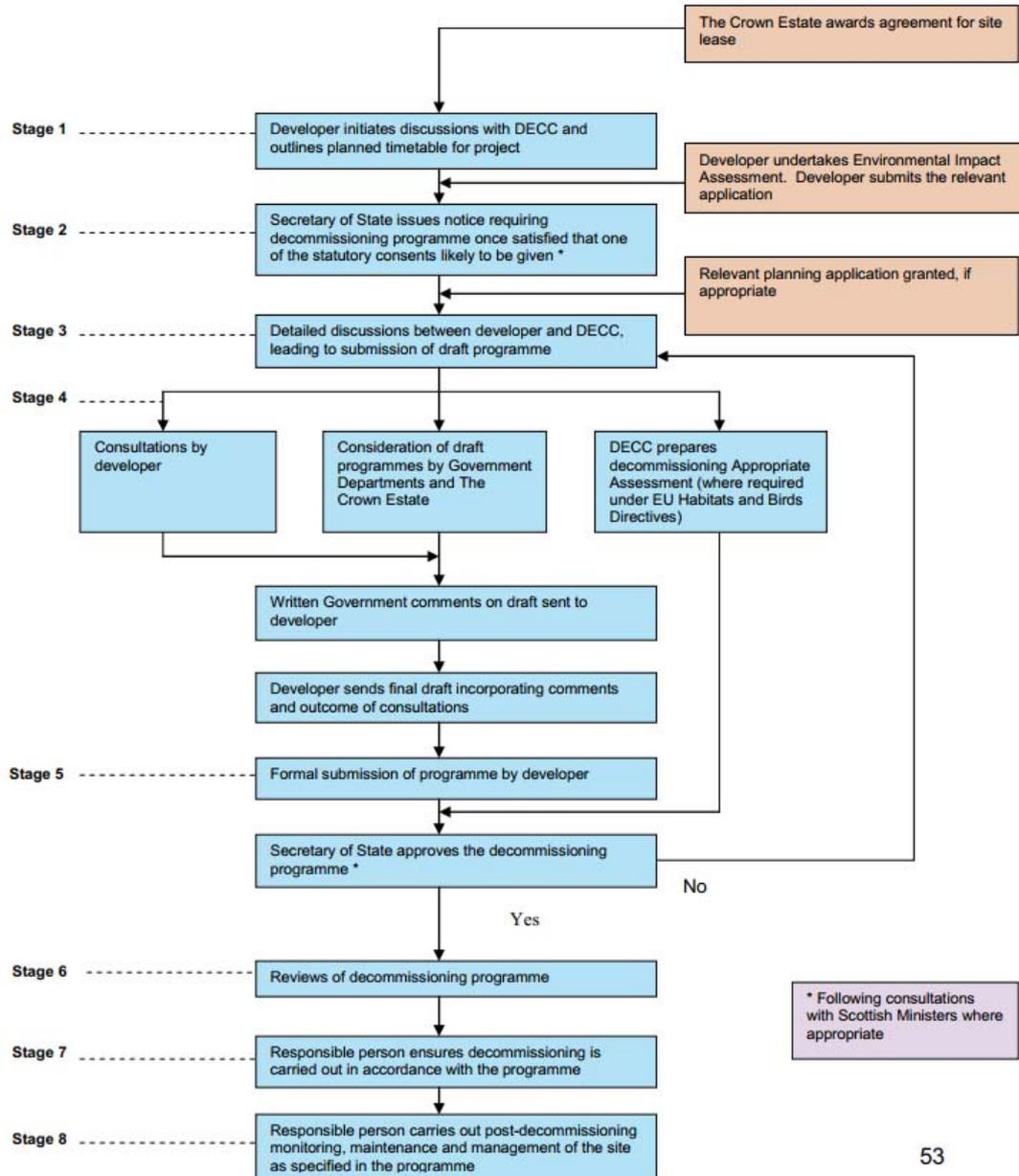


Figure 2-1 Decommissioning Programme Process (extracted from reference 6, Appendix D) (Note DECC has now been replaced by Marine Scotland for Scottish the marine sector).

3. COMPONENTS TO BE DECOMMISSIONED AND PROCESS

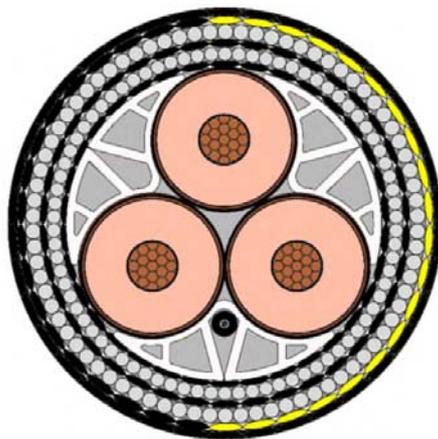
The Project consists of the following components:

- Two export cables (HDD drilled at the shore end and connected to either the turbine in location 1 or location 5 (see Figure 1-1);
- 22 mooring lines and anchors (six turbines with three anchors and one turbine with four anchors);
- Six large windfloat substructures with 8.4MW turbines;
- One small windfloat substructure with a 2MW turbine; and
- Six inter-array cables.

3.1. Export and Interarray Cables & Associated Deposits

The total length of the export cables is approximately 35.6km, including approximately 400m of dynamic sections connecting to the turbine in location 1 or location 5. The total length of the inter-array cables is approximately 9km.

Both the export cables and the inter-array cables are the same internal design, both are AC and have a cross-section as illustrated below. The cable is a 19/33(36) rated voltage with a 500mm² core area. The outside diameter is nominally 170mm and it has a weight of 57kg/m in air with an estimated weight in seawater of 35kg/m. This is compliant with the type of cable assessed in the Original ES, ES Addendum and Variation ES where applicable.



Description	Details
Conductor	Stranded, round and compacted copper, longitudinally water blocked
Conductor screen	Extruded bonded semi conductive compound
Insulation	EPR
Insulation screen	Extruded bonded semi conductive compound
Screen bedding	Semi conductive screen bedding
Metal screen	Individual Copper Braid screen on each phase
Sheath bedding	Sheath bedding tapes
Power core sheath	Polyethylene sheath
Fillers	Extruded shaped fillers
Binder tape	Synthetic tape for bounding the assembled cores.
1 st Armour bedding	Polypropylene Yarns bedding
1 st Armouring	One layer of galvanized steel wires, filled with Bitumen.
2 nd Armour bedding	Polyester tape + Polypropylene Yarns bedding
2 nd Armouring	One layer of galvanized steel wires, filled with Bitumen.
Serving	Polyester tape + Polypropylene Yarns + Polyethylene sheath
OF cable	1 x Optical Fiber Cable with 20SM+4MM fibers, 4SM + 2MM as contingency

Figure 3-1 Cross section of the 33kv export and inter-array cables.

The static export cables have an outer layer of polypropylene yarn, where-as the dynamic sections have an additional extruded polyethylene sheath on top of the yarn.

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3.2. Moorings/Anchors

There are three mooring lines and anchors for the larger substructures. The semi-submersible substructure that will be used for the 2MW turbine will have four mooring lines and anchors. This results in a total of 22 mooring lines and anchors for the Project.

The mooring line lengths range up to approximately 500m (dependent on water depth at each turbine location) and will be offshore grade studless mooring chains. The dimensions of the chain are between 3" and 6.5" dependent on section of mooring system.

The anchors will be commonly used drag embedment anchors (approximate weight 12 tonnes). All anchors will now be buried as part of the installation process, rather than previously noted as worst case as being partially buried.

3.3. Substructures

2MW Vestas V80 Substructure

The 2MW Vestas V80 wind turbine will be installed on a WindFloat semi-submersible type substructure. The substructure is 55m wide and has a draft of approximately 13m. The substructure is made of steel and will be partly filled ballast water to maintain stability.

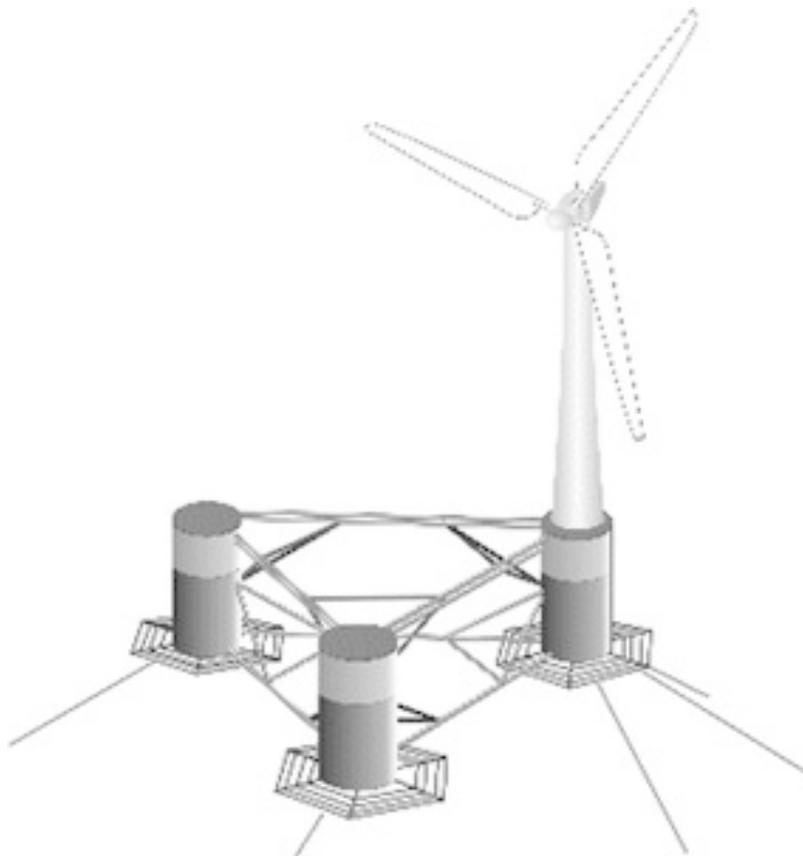


Figure 3-2 Schematic of the configuration of turbine, substructure and mooring lines to be used for the installation of the 2MW Vestas V80 turbine

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8.4MW Vestas 164 Substructures

The 8.4MW Vestas 164 turbines will be installed on a larger WindFloat semi-substructure. The substructures will be 70m wide and have a draft of approximately 13m. The substructure will be made of steel and will be partly filled ballast water to maintain stability.

4. DECOMMISSIONING PROCESS

The decommissioning of the Project is planned to be undertaken over a nine-month campaign in 2043. All items not buried will be removed from the Development Area, including the inter-array cables, moorings and anchors.

KOWL's decommissioning methodology will likely be based on the reverse of installation method and is significantly less complicated than fixed offshore wind installations. The current base case follows the process described in Table 5-1 below. In summary, the decommissioning process will start with the disconnection of the turbines from their cables and mooring ready for tow to a suitable port or sheltered location for removal of the wind turbine and tower. The sub-structure may then optionally be towed to a suitable port for removal of smaller items and preparation for decommissioning.

In parallel the mooring lines and anchors will be recovered onto an Anchor Handling Vessel and returned to shore. The inter-array cables will be recovered onto a Construction Vessel, including all buoyancy modules and ancillary items. The export cables will be recovered up to the point of burial whereupon they will be cut on the seabed. The short remaining cable end out of the seabed will be either buried below the seabed or rock dumped.

All elements of the material returned to shore will be processed as per the relevant regulations at the time of decommissioning, but where possible all items will be recycled or reused.

Table 4-1 Anticipated decommissioning process to be undertaken by KOWL.

Process	Operation	Vessel types to be used
1	Remove all floating units from site and return to port.	Tow vessels and anchor handling tug vessel
2	Recover all mooring lines and anchor to port.	Anchor handling vessel
3	Recover all interarray cables to ship and any additional marine deposits laid on the seabed (including concrete mats).	Cable laying vessel / supply vessel with ROV
4	Cut, disconnect and retrieve dynamic cable ends of export cables.	Cable laying vessel / supply vessel with ROV
5	Rock dumping or burying the end sections of the export cable.	Rock dumping vessel or Cable laying vessel

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All decommissioned elements will be delivered to a certified waste handling facility for recycling, in the event of no possible repowering or reuse is identified. If reuse or recycling is not possible, incineration with energy recovery will be considered, with disposal being the final option. Where prudent and technically possible, all oils/liquids will be removed from the structures prior to tow back to port. However, it is noted that this may not be possible and may have to be done in a port as a more controlled environment.

Marine growth will be assessed throughout the life of the sub-structures due to impacts on performance. These assessments will be used to assess the best practical environmental option (BPEO) for the removal of marine growth, and also assess potential disposal options once onshore, if this option is selected.

It is currently assumed that the export cables will be left in place with the unburied sections cut and recovered. The removal of the buried export cables is not currently considered to be commercially and technically viable, will involve high costs, and there are also HSE risks to be considered. However, this position will be reviewed in the future (Stage 6 in Table 2-1) to conclude whether or not to remove the export cables. In the meantime, the export cables will be assessed for the potential for exposure/scour erosion as part of the monitoring undertaken during the operational phase of the Project. The data collected from this will inform a more detailed assessment of the long-term burial risk for the export cables which will be utilised as part of the Stage 6 assessment.

At this time KOWL will assess the most appropriate method for decommissioning, utilising the BPEO, international standards, other sea users, along with due consideration of the most suitable technical, commercial, environmental and health and safety risks. When making a decision on the decommissioning option, this will be based on tests set out by international conventions (IMO standards) and involve at least one of the five situations:

- The installation or structure will serve a new use;
- Entire removal would involve extreme cost;
- Entire removal would involve an unacceptable risk to personnel;
- Entire removal would involve an unacceptable risk to the marine environment; and
- The installation or structure weights more than 4000 tonnes in air or is standing in more than 100m of water and could be left wholly or partially in place without causing unjustifiable interference with other users of the sea.

There is possible re-powering of the export cable with another offshore renewable development being installed at the site following the decommissioning of the Project, and this would be the preferred option if available at the time of decommissioning in 2043. However, if this is not possible or practical the abandonment of the export cable and burial is not considered to have a negative impact on fisheries as the cut ends would be buried to the required burial depth. It is also noted that the initial 10km of the export cable routes within the Offshore Export Cable Corridor is used for potting activities rather than scalloping which further reduced the potential impacts to fisheries.

If it is determined that the export cables are to be left in situ, relevant notifications will be issued to mariners noting the location of the cable during the decommissioning process, and remain marked on navigational charts.

5. ENVIRONMENTAL IMPACT ASSESSMENT

As part of the Original ES, the potential significant impacts from the decommissioning process were reviewed. No significant impacts were identified as part of the assessment. The decommissioning process described in Section 3.4 is compliant with this assessment undertaken in the Original ES, thus KOWL still consider that there are no likely significant environmental impacts associated with decommissioning.

However, when the Project nears the end of the Design Life and the decommissioning process re-considered, a more detailed EIA will be undertaken as part of the application for a licence to undertake the decommissioning.

6. CONSULTATION

Consultation has been key part of the consenting process for the Project and KOWL recognise it is required for the success of the Project going forward and through the construction phase and into the operational phase. Throughout the consenting process KOWL have been in active discussions with all relevant stakeholders especially during the Variation Application and planning the monitoring requirements. KOWL have reviewed the relevant previous decommissioning programmes submitted for floating offshore wind farms to ensure that this document complies with the comments raised during consultation on those.

KOWL will continue to undertake regular consultation throughout the operational phase of the Project, especially as we work through the remainder of the decommissioning programme stages.

7. COSTS AND FINANCIAL SECURITY (Appendix A – Confidential)

This has been removed in the public consultation document as it is confidential.

8. SCHEDULE

A full decommissioning schedule will be provided prior to decommissioning activities taking place; at this time only an indicative schedule has been provided in Figure 7-1 below.

The Project is expected to be operational in early Quarter 3 2018 and has a design life of 25 years. Therefore, decommissioning is planned to be undertaken in 2043, the works will require a separate Marine Licence. An indicative schedule for decommissioning is given in Figure 7-1. The onshore decommissioning of the marine elements will be continued beyond onsite decommissioning and the full recycling process will extend beyond the schedule noted below.

Indicative Schedule for decommissioning	April	May	June	July	August	September
1 Disconnect machine and tow to port						
2 Recover all mooring lines and anchors						
3 Recover all interarray cables						
4 Retrieve dynamic cable ends of export cables						
5 Burying the end sections of the export cable						

Figure 8-1 Indicative decommissioning programme for 2043

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9. PROJECT MANAGEMENT AND VERIFICATION

Currently there is limited information to add to this section of the DP and this will be further expanded towards the final stages of the Project (2042).

Project decommissioning programme reviews will be undertaken at the following times:

- Where a significant change to the Project occurs (e.g. early removal of a WTG).
- At least one year before the start of the financial security provision period (end of operational year 12).
- Mid-point of the period of financial security (five years prior to decommissioning).
- One year before the commencement of decommissioning at site.

10. SEABED CLEARANCE

As noted above KOWL will remove all components of the Project from within the Development Area as part of decommissioning process to ensure the seabed is cleared of Project related material. As part of the process, once all the components have been removed a seabed survey will be undertaken to confirm that all Project related material, including any debris, within a 200m radius (rather than the standard oil and gas 500m radius) of each structure has been removed. The route of the unburied cables, mooring lines and anchor locations will also be surveyed visually. The survey data will be submitted to the relevant licencing authority for approval and signoff.

If at the time of decommissioning any exposure of the export cables has been identified, additional rock dumping or concrete mattresses will be installed to ensure continued burial of the export cables post decommissioning.

11. RESTORATION OF THE SITE

The Development Area will be restored, as far as practical, to its pre-construction state. Further details on how the site will be restored will be provided when this DP is updated prior to decommissioning commencing.

12. POST-DECOMMISSIONING MONITORING, MAINTENANCE AND MANAGEMENT OF SITE

As KOWL proposed to remove all elements of the Project infrastructure (apart from the buried export cables), there will be a limited requirement to undertake post decommissioning activities. However, it is recognised that the seabed is potentially mobile across the Offshore Export Cable Corridor, which will be monitored throughout the operational phase of the Project, to determine whether the cable is buried below the mobile layers into the harder substrate. This data will inform any post decommissioning survey requirements in consultation with the relevant authorities and consultees prior to decommissioning commencing.