FIVE ESTUARIES
OFFSHORE WIND FARM

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10.20.2 TECHNICAL NOTE: OFFSHORE DECOMISSIONING

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In preparation of this document Five Estuaries Wind Farm Ltd has made reasonable efforts to ensure that the content is accurate, up to date and complete for purpose.

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CONTENTS

DEFINITION OF ACRONYMS

Term	Definition
WTG	Wind Turbine Generator
MP	Monopile
TP	Transition Piece
OSS	Offshore Substation
ES	Environmental Statement
EIA	Environmental Impact Assessment

1. BACKGROUND

1.1 PURPOSE OF THIS TECHNICAL NOTE

1.1.1 This technical note is submitted to explain the nature of the decommissioning activities and provide justification for the assumptions that noise created during decommissioning would be comparable or less than construction and installation noise.

1.1.2 Decommissioning is required to be assessed in order that the Examining Authority (ExA) and Secretary of State can have regard to the likely significant effects of the whole project over its lifecycle in making a recommendation and determination. However, given the length of time which would elapse before decommissioning activities take place, an assessment at consent stage can only ever be based on assumptions as to the known requirements and methodologies at this time. The Environmental Statement (ES) for this application accordingly applies an envelope approach to decommissioning, in common with other offshore wind NSIPs.

1.1.3 The approach to decommissioning, will be detailed within the final Decommissioning Programme submitted to the Secretary of State for approval approximately 1-2 years prior to decommissioning commencing. This will be subject to agreement with the relevant authorities based on further and more refined Environmental Impact Assessments (EIA) and surveys performed prior to decommissioning. The approach will be based on an assessment of relative net environmental benefit, taking into consideration the in situ ecological value of the offshore components alongside other factors such as navigational safety, available technology and the feasibility of recycling. Further consents, including marine licensing, will be sought at the time of decommissioning and will factor in these assessments carried out.

1.2 SCOPE OF THE TECHNICAL NOTE

1.2.1 The scope of this technical note is focused on offshore decommissioning activities, including the wind turbine generator (WTG), transition piece (TP), foundation, Offshore Substation (OSS), array cables and offshore export cables. Onshore decommissioning is not included in this technical note.

1.2.2 This note will look primarily at the noise impacts of removal methods for decommissioning and their appropriateness for the Five Estuaries project.

1.2.3 This note is supplementary only and does not supersede the Noise and Vibration, onshore and offshore project description docs summarised below:

Relevant Documents	
APP-091	6.3.9 Airborne Noise and Vibration
APP-122, updated at Deadline 2	6.5.6.2 Underwater Noise Technical Report – Revision B
APP-175	6.6.9.2 Onshore Airborne Noise Construction Sound Power Details

Relevant Documents	
AS-004	6.3.1 Onshore Project Description
APP-069	6.2.1 Offshore Project Description

2. DESCRIPTION OF DECOMMISSIONING METHODS

2.1 DECOMMISSIONING METHODOLOGY

2.1.1 When the offshore wind farm reaches the point of decommissioning, evaluation of the available technologies will be undertaken to select the most suitable methodology and tools. Assessments will be carried out to optimise the vessel and equipment spread that will be used. Surveys will be used to provide an indication of the condition of the infrastructure, the state of the environment. Consideration will also be given to safety when making decisions on the best practicable environmental option.

WIND TURBINE GENERATORS

2.1.2 The first step of the decommissioning process is the removal of the Wind Turbine Generator (WTG). This is done using the same principles of installation, although in reverse. A vessel will arrive at the location and remove each blade individually, lifting them onto the vessel deck and securing in place. Then the nacelle is lifted from the tower, and finally the tower is lifted off the foundation. The components can then be taken back to a port to be recycled, reused or disposed of.

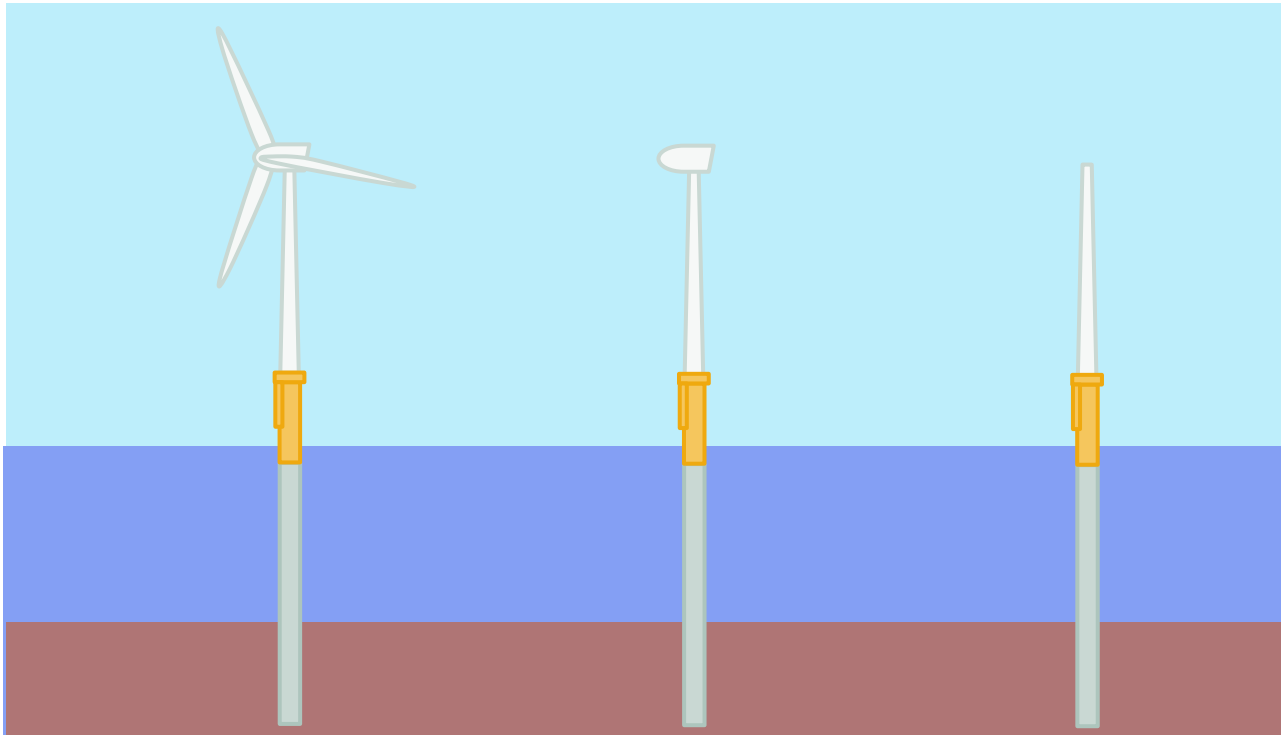
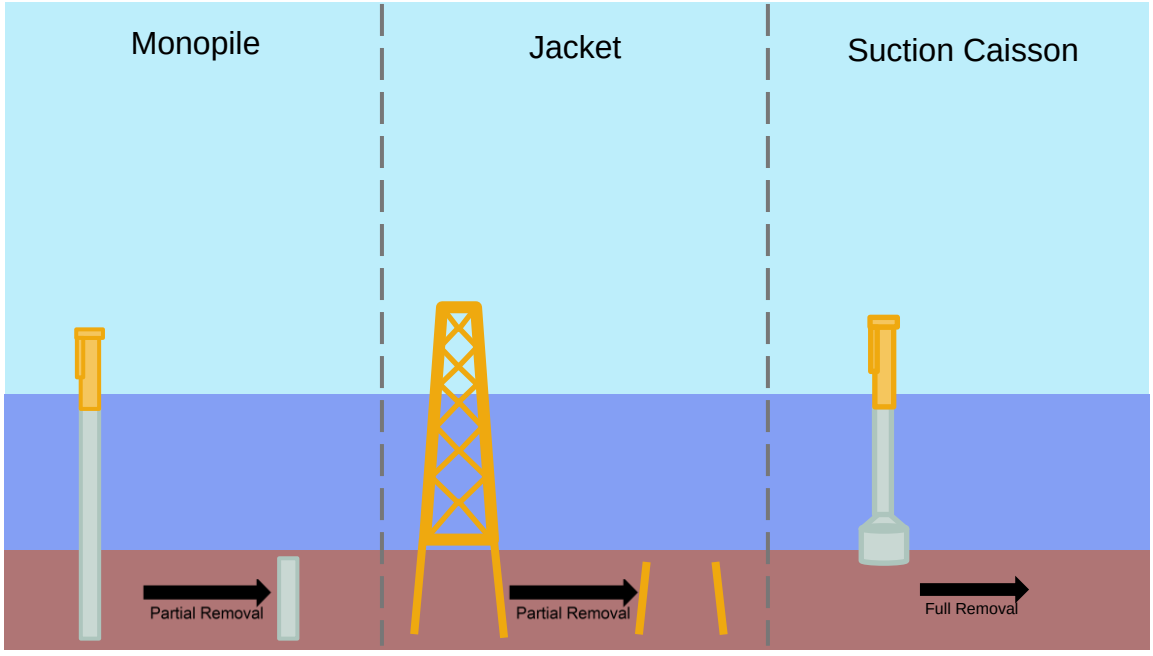


Figure 1: Disassembly sequence of Wind Turbine Generator

STEEL FOUNDATIONS

2.1.3 Monopile and jacket foundations are steel structures which are driven or drilled into the seabed. The ground conditions in the Five Estuaries project site are anticipated to be suitable for driving (piling) the foundations. At the point of decommissioning, it is likely that the elements above the seabed will need to be removed. Piles would be cut at or below the seabed. There are a variety of cutting tools including diamond wire cutting tool and abrasive water jet cutting tool. The noise emitted during the soil excavation, steel cutting and lifting of the partial monopile is significantly lower than what is emitted during installation of the foundations during piling.

Figure 2: Removal outcomes of foundations types based on current technology



2.1.4 Vibro extraction can be considered in certain ground conditions as an alternative solution where the pile may be fully or partially removed. This utilises a similar process to vibro-piling where vibrations allow the soil around the pile to experience a temporary reduction in soil resistance. Within current and foreseeable technological limits, vibro-piling is not typically suited to stiff clays such as London Clay. Vibro-piling noise is considered to have a different type of noise than impact piling, and it is described as non-impulsive [APP-122 1.2.29]. This category of noise is considered to have lower impact than the level of impulsive noise associated with piling, hence the decommissioning will have less impact than the installation.

SUCTION CAISSONS

2.1.5 Suction caissons are fixed to the seabed by the use of negative pressure inside the caisson. During installation the suction caissons are placed into position and the water inside the caisson is pumped out. When suction caissons are removed, this procedure can be carried out in reverse by pumping water into the caisson.

2.1.6 The maximum design scenario in relation to noise is governed by piling, the noise created by installation or removal of a suction caisson would be less than for piling, hence the removal of suction caisson would be within the assessed reasonable worst case.

CONCRETE FOUNDATIONS

2.1.7 Gravity Based Structures (GBS) are concrete structures which are installed by floating the structures to the locations and ballasting in situ. During decommissioning, the reverse can be carried out, the structure is de-ballasted and lifted or floated away from location. The structure will not be broken underwater.

2.1.8 Nonetheless, Five Estuaries has removed Gravity Based Structures (GBS) from the dDCO [REP1-008] and no other concrete based foundations will be used for the project. Concrete is not used in any other foundation type.

OFFSHORE SUBSTATIONS

2.1.9 Offshore substations are disassembled from the top down and components taken onshore for recycling. The foundations are then removed using methodologies described above, for the chosen foundation type.

Figure 3: Installation of RWE's Nordsee Ost Platform

SUBSEA CABLES

2.1.10 Depending on the marine habitat, environmental assessment and consenting regimes at the time of decommissioning, cables may be left in situ or removed. If removed, the removal method would be dependent on ground conditions and burial depth. Cables would be disconnected from both the offshore substation and landfall, then removed from the seabed and either wound onto drums or cut into sections on the decommissioning vessel. Any noise created during cable installation is negligible, the primary impact is sediment dispersal and disturbance associated with trenching and cable installation. As no trenching is required for decommissioning, the removal of cables will not result in the level of seabed disturbance experienced during installation. Hence cable decommissioning has a lower impact than installation

2.2 CUMULATIVE IMPACTS

2.2.1 Offshore wind farm projects which are installed at a similar time to Five Estuaries may also be decommissioning at a similar time. This is dependent on the planned lifetime, potential lifetime extension, and whether projects are able to install according to currently planned programmes.

2.2.2 It should be noted that under the terms of the Energy Act 2004, Offshore Renewable Energy Installations are required to prepare and carry out a decommissioning programme planning exercise at regular intervals.

2.2.3 This exercise seeks to ensure that decommissioning solutions properly consider environment, safety and engineering impacts. The decommissioning programme is submitted to the Department for Energy Security and Net Zero. .

2.2.4 The programme is modified and reviewed regularly throughout the project lifecycle, noting the considerable time elapsed between the initial approval and the final approval shortly before decommissioning is carried out.

2.2.5 If there is need for cumulative impacts of decommissioning to be assessed, it is reasonable to consider this will be in the environmental assessment produced for the final decommissioning plan. It is not expected that the cumulative impacts of decommissioning would exceed the cumulative impacts of installation as the noise and disturbance impacts of decommissioning would not be greater than those of installation in each case, so the cumulative impact could not exceed that assessed for construction.

3. REFERENCES

BVG Associates on behalf of The Crown Estate and ORE Catapult. (2019). *Guide to an offshore wind farm.* BVG Associates Limited.

DECOMMISSIONING OF OFFSHORE RENEWABLE ENERGY INSTALLATIONS UNDER THE ENERGY ACT 2004 Guidance notes for industry (England and Wales) 2019

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