MORAY EAST
OFFSHORE WINDFARM

Decommissioning Programme

Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure

August 2021

Moray Offshore Windfarm (East) Limited

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Review / Approval

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AC	Alternating Current
ADR	Air Defence Radar
AIS	Automatic Identification System
ASACS	Air Surveillance and Control Systems
ATC	Air Traffic Control
BATNEEC	Best Available Technique not Entailing Excessive Cost
BEIS	Department of Business, Energy and Industrial Strategy
BPEO	Best Practicable Environmental Option
CaP	Cable Plan
CD	Chart Datum
CDM	Construction (Design and Management)
CfD	Contract for Difference
CFE	Controlled Flow Evacuation
CLV	Cable Lay Vessel
CPI	Consumer Price index
DECC	Department of Energy and Climate Change
DP	Decommissioning Programme
DSLP	Development Specification and Layout Plan
EDA	Eastern Development Area
EIA	Environmental Impact Assessment
ES	Environmental Statement
HAP	Helicopter Approach Procedures
HAT	Highest Astronomical Tide
HDD	Horizontally Drilled Ducts
HIAL	Highlands and Islands Airports Ltd
HMR	Helicopter Main Routes
HSSE	Health, Safety, Security and Environment
HVDC	High Voltage Direct Current
HyPE-ST	Hydraulic Pile Extraction Scale Tests
IMO	International Maritime Organisation
LAT	Lowest Astronomical Tide
LCCC	Low Carbon Contracts Company
LiDAR	Light Detection and Ranging device
LoC	Letter of Credit
MAIB	Maritime Accident Investigation Branch
MARP	Marine Archaeology Reporting Protocol

MCA	Maritime and Coastguard Agency
MoD	Ministry of Defence
MORL	Moray Offshore Renewables Limited
MPA	Marine Protected Area
MSA	Minimum Safe Altitude
MSL	Mean Sea Level
MS-LOT	Marine Scotland Licensing Operations Team
MW	Megawatt
NRA	Navigational Risk Assessment
NLB	Northern Lighthouse Board
NtM	Notices to Mariners
O&M	Operation and Maintenance
OfTI	Offshore Transmission Infrastructure
OFTO	Offshore Transmission Operator
OREI	Offshore Renewables Energy Installation
OSP	Offshore Substation Platform
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OWF	Offshore Wind Farm
PAM	Passive Acoustic Monitoring
PEXA	Practice and Exercise Area
PMF	Priority Marine Feature
PSR	Primary Surveillance Radar
RNLI	Royal National Lifeboat Institute
RAF	Royal Air Force
RAG	Red Amber Green assessment
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SHET	Scottish Hydro Electric Transmission plc
SLVIA	Seascape, Landscape and Visual Impact Assessment
SoS	Secretary of State
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
t	Tonne
TI	Transmission Infrastructure
TJB	Transition Joint Bay
UKHO	United Kingdom Hydrographic Office

UNCLOS	United Nations Law of the Sea
WMP	Waste Management Plan
WTG	Wind Turbine Generator

Definitions

The following definitions have been used throughout this document with respect to the company, the consented wind farms and how these definitions have changed since submission of the Moray East Environmental Statement (ES) in 2012 and the Moray East Modified Transmission Infrastructure ES in 2014 and the Moray East Offshore Substation Platform (OSP) Environmental Report in 2017.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited)** – the entity submitting this Decommissioning Programme (DP);
- **Moray East Offshore Wind Farm** - the wind farm to be developed in the Moray East site (also referred as the Wind Farm);
- **The Moray East site** - – the area in which the Moray East Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licences to develop and operate up to three generating stations on the Moray East site were granted in March 2014. At that time the Moray East site was known as the "Eastern Development Area" (EDA) and was made up of three sites known as the Telford, Stevenson and MacColl Offshore Wind Farm sites. The Section 36 Consents and Marine Licences were subsequently varied in March 2018 with the Marine Licences additionally varied in July 2019 and April 2020, October 2020 (MacColl) and November 2020 (Telford and Stevenson);
- **Telford, Stevenson and MacColl wind farms** – these names refer to the three consented offshore wind farm sites located within the Moray East site;
- **Transmission Infrastructure (TI)** - includes both offshore and onshore electricity transmission infrastructure for the consented Telford, Stevenson and MacColl wind farms. Includes connection to the national electricity transmission system near New Deer in Aberdeenshire encompassing Alternating Current (AC) Offshore Substation Platforms (OSPs), AC OSP interconnector cables, AC export cables offshore to landfall point at Inverboyndie continuing onshore to the AC collector station (onshore substation) and the additional regional transmission operator substation near New Deer. A Marine Licence for the offshore TI was granted in September 2014 (Modified Offshore Transmission Infrastructure (OfTI) Licence) and varied in 2019. A further Marine Licence for two additional distributed OSPs was granted in September 2017 and subsequently varied in July 2019. The onshore TI was granted Planning Permission in Principle in September 2014 by Aberdeenshire Council and a Planning Permission in Principle under Section 42 in June 2015. In June 2018 Aberdeenshire Council granted Approval of Matters Specified in Conditions for both the cable route and substation;
- **Offshore Transmission Infrastructure (OfTI)** – the offshore elements of the transmission infrastructure, comprising AC OSPs, OSP interconnector cables and AC export cables offshore to landfall (for the avoidance of doubts some elements of the OfTI will be installed in the Moray East site);
- **Moray East ES 2012** – The ES for the Telford, Stevenson and MacColl wind farms and Associated Transmission Infrastructure, submitted August 2012;
- **Moray East Modified TI ES 2014** – the ES for the TI works in respect to the Telford, Stevenson and MacColl wind farms, submitted June 2014;
- **Moray East OSP Environmental Report 2017** – the environmental report comprising of the "Statement Regarding Implications for the Modified TI ES 2014 and HRA". The report was produced in support of the application submitted in May 2017 for the Moray East OSP Marine Licence;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);

- The Applications (1) the Application letters and ES submitted to the Scottish Ministers on behalf of Telford Offshore Windfarm Limited, Stevenson Offshore Wind Farm Limited and MacColl Offshore Wind Farm Limited, on 2 August 2012 and the Additional Ornithology Information submitted to the Scottish Ministers by Moray Offshore Renewables Limited on the 17 June 2013; (2) the Section 36 Consents Variation Application Report for Telford, Stevenson, and MacColl Offshore Wind Farms dated December 2017 and (3) the Marine Licence Applications and associated documents submitted for the OfTI and OSP Marine Licences in April 2014 and May 2017 respectively;
- **Design Envelope** - the range of design parameters used to inform the assessment of impacts; and
- **OfTI Corridor** – the export cable route corridor, i.e. the OfTI area as assessed in the Moray East Modified TI ES 2014 excluding the Moray East site.

- **Moray East Offshore Wind Farm Consents** – are comprised of the following:

  Section 36 Consents:

  - Section 36 consent for the Telford Offshore Wind Farm (as varied on 22 March 2018) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Telford Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the Stevenson Offshore Wind Farm (as varied on 22 March 2018) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the Stevenson Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the MacColl Offshore Wind Farm (as varied on 22 March 2018) – consent under Section 36 of the Electricity Act 1989 for the construction and operation of the MacColl Offshore Wind Farm assigned to Moray East on 19 June 2018.

  Marine Licences

  - Marine Licence for the Telford Offshore Wind Farm (as varied) – Licence Number: MS-00009051 (formally 04629/20/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the Stevenson Offshore Wind Farm (as varied) – Licence Number: Ms-00008985 (formally 04627/20/0) – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the MacColl Offshore Wind Farm (as varied) – Licence Number: MS-00008972 (formally 04628/20/0) - granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for Moray Offshore Windfarm (East) Limited – Licence Number: MS-00009022 (formally 07086/20/1)– granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009 (as amended), Part 4 Marine Licensing to deposit, backfill of seabed depressions within the Scottish Marine Area and the United Kingdom Marine Licensing Area.

- **OfTI Licences** – are comprised of the following:

  - Marine Licence for the Offshore Transmission infrastructure (as varied on 19 July 2019) – Licence Number: MS-00008919 (formally 05340/19/0) –_granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OfTI Marine Licence").
  - Marine Licence for two additional distributed OSPs (as varied on 19 July 2019) – Licence Number 06347/19/0 – granted under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction, operation and maintenance works and the deposit of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OSP Marine Licence").

Executive Summary

This Decommissioning Programme (DP) has been prepared by Moray Offshore Windfarm (East) Limited (Moray East) to inform Marine Scotland and relevant stakeholders of the proposed scope of the Moray East Offshore Wind Farm (comprised of the Telford, Stevenson and MacColl Offshore Wind Farm sites) and associated Offshore Transmission Infrastructure (OfTI).

The generating capacity of the Moray East Offshore Wind Farm will be 952.5 MW. The total generating capacity of the Wind Farm will be constrained by a transmission entry capacity of 900 MW.

Moray East seeks agreement that the information provided meets the requirements of Condition 3 of the Section 36 Consents and Condition 3.2.2.2 of both the OfTI and OSP Marine Licences (as varied).

The Development elements that are to be decommissioned include 100 wind turbine generators (WTGs), three OSPs, WTG and OSP supporting substructures, inter-array cables, interconnector and AC export cables.

The proposed measures set out in this DP adhere to the existing UK and international legislation and guidance and consider relevant best practice. Methods are described based on currently available technology. It is expected that by the time of decommissioning, significant technological changes may result in different approaches to decommissioning activities and such changes will be reflected in future revisions of the DP.

This DP has been prepared taking into account the information presented within the Environmental Statement (ES) produced for the Wind Farm (Moray East ES 2012), associated OfTI (Moray East Modified TI ES 2014) and the Moray East OSP Environmental Report 2017. The ESs provided detailed descriptions of the environmental baseline conditions (physical, biological and human) and provide an assessment of effects of the Development taking into account decommissioning provisions that are consistent with the information presented in this document. The Moray East ES 2012 contained a draft Decommissioning Plan (Technical Appendix 1.3E) to inform the determination of the Moray East Applications.

This document has been updated to take into account feedback received following consultation on an initial version of the document (version 1) and to reflect the most recently published guidance on decommissioning of offshore renewable energy installations under the Energy Act 2004 (BEIS, 2019) and will be subjected to a further round of consultation.

In advance of decommissioning the Environmental Impact Assessment (EIA) will be reviewed to assess the potential impacts that may arise and were not covered in the initial EIA process and subsequent reviews.

1 Introduction

1.1 Background

Moray East Offshore Wind Farm (the 'Wind Farm') is a 950 MW offshore wind farm located 22 km from the Caithness Coast on the Smith Bank in the outer Moray Firth. The Moray East site covers 296 km^2. It is located next to the Beatrice Offshore Wind Farm (OWF) and immediately adjacent to the Moray West OWF. The Wind Farm itself is outside the 12 nautical mile limit but within the Renewable Energy Zone within which the UK has sovereign rights for the economic exploitation of the zone for the production of wind energy.

Scottish Hydro Electric Transmission plc (SHET) is the onshore transmission licensee, and the Moray East Transmission Assets will connect to the 275/400 kV New Deer substation in Aberdeenshire Scotland.

The Wind Farm will comprise 100 Wind Turbine Generators (WTG) V164-9.5 MW supplied by MHI Vestas. The WTG will be supported by three-legged jacket foundations which will be between a water depth of 39 m and 53 m below Lowest Astronomical Tide (LAT).

The WTG will be connected via 66 kV array cables in strings of maximum seven WTG to three Offshore Substation Platforms (OSP). These OSPs, connected to each other via 66 kV interlinks to ensure redundancy, will be linked to shore by three 220 kV AC offshore export cables to connect to three onshore export cables at Inverboyndie beach which then connect to the onshore substation in New Deer, Aberdeenshire. The offshore section of the cables are between 56 and 64 km long and the onshore cables c.35 km. The total Transmission Entry Capacity (TEC) is 900 MW.

The Moray East Wind Farm is currently under construction and due to be fully operational and commissioned in 2022.

An overview of the Moray East Development is presented in Section 2 of this document.

Moray East is currently a joint venture partnership between OceanWinds Offshore (OW), Diamond Generating Europe and China Three Gorges. It has been established to develop, finance, construct, operate, maintain and decommission the Moray East Offshore Wind Farm.

Ocean Winds is the result of a 2020 joint venture by EDPR and ENGIE. Both companies share the vision in which renewables, particularly offshore wind, play a key role in the global energy transition.

The purpose of this DP is to satisfy the requirement for a programme for decommissioning to be submitted to the Scottish Ministers for approval and for consultation with relevant stakeholders, and in accordance with the requirements of the Energy Act 2004. This document has now been updated to consider consultation feedback received from stakeholders and to reflect the most recently published guidance on decommissioning of offshore renewable energy installations under the Energy Act 2004 (BEIS, 2019) published after version 1 was issued for consultation in 2018.

1.2 Consent Conditions

On 15 October 2014 notices were issued to Telford Offshore Windfarm Limited, Stevenson Offshore Windfarm Limited and MacColl Offshore Windfarm Limited on behalf of the Secretary of State (SoS) for Department of Energy and Climate Change (DECC) (now renamed as the Department of Business, Energy and Industrial Strategy (BEIS)) in exercise of his powers under Section 105(2) of the Energy Act 2004 requiring, prior to the commencement of construction, the submission of a programme for decommissioning the relevant objects specified in Schedule 1 of the notice, namely:

> *"Renewable energy installation, including foundations, pipelines, any electric lines and cables (including those between the installation and the Mean Low Water Mark), installed specifically for use with or connected to use with the Telford Offshore Windfarm, Stevenson Offshore Windfarm and MacColl Offshore Windfarm electricity generating station."*

This DP has been produced in accordance with the Section 105(2) notices.[1]

The relevant Section 36 Consent and Marine Licence conditions require submission of this DP to be submitted for the approval by the SoS for DECC. Since consents were awarded, this function has been transferred to the Scottish Ministers and will be administered by Marine Scotland[2]. Approval of this document satisfies the requirements of condition 3 of the Section 36 Consent and conditions 3.2.2.2 of the Offshore Transmission Infrastructure (OfTI) and OSP Marine Licences, as set out in Table 1-1.

Table 1-1: Relevant Section 36 Consent and OfTI Marine Licence Consent Conditions

Consent Document	Condition Reference	Condition Text
Section 36 Consents	Condition 3	"Where the Secretary of State has, following consultation with the Scottish Ministers, given notice requiring the Company to submit to the Secretary of State a Decommissioning Programme, 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 Secretary of State a Decommissioning Programme in compliance with that notice. Reason: To ensure that a decommissioning plan is submitted to the Secretary of State where the Secretary of State has, following consultation with the Scottish Ministers, so required before any construction commences."
OfTI Marine Licence	Condition 3.2.2.2	"Where the Secretary of State has, following consultation with the Licensing Authority, given notice requiring the Licensee to submit to the Secretary of State a DP, pursuant to section 105(2) and (5) of the Energy Act 2004, then construction may not begin on the Site of the Works until after the Licensee has submitted to the Secretary of State a DP in compliance with that notice."
OSP Marine Licence	Condition 3.2.2.2	"Where the appropriate authority has, following consultation with the Licensing Authority, given notice requiring the Licensee to submit to the appropriate authority a Decommissioning Programme ("DP"), pursuant to section 105(2) and (5) of the Energy Act 2004, then construction of the Works may not begin until after the Licensee has submitted to the appropriate authority a DP in compliance with that notice".

1.3 Structure of this Decommissioning Programme

This document is divided into the sections summarised in Table 1-2 and follows the structure set out in the BEIS Guidance (BEIS, 2019).

[1] It is important to note, however, as detailed in Section 3.2.5, that the Moray East AC export cables at landfall will be installed within three Horizontally Drilled Ducts (HDD) routed under the nearshore area to onshore transition bays. Therefore, Mean Low Water Mark is not relevant in the context of cables installed through HDD.

[2] As detailed in the letter dated 31 March 2017 to Moray Offshore Windfarm Limited on the transfer of Decommissioning Responsibilities and Powers for Offshore Renewables Energy Installations (OREIs) from the UK Government to Scottish Government, as part of The (Scotland) Act 2016, Section 62 which came into effect on 1 April 2017.

Table 1-2: Summary of DP Contents

Section		Summary of Contents
1	Introduction	Background to the Development including the companies that are party to the programme and their ownership status, and consent requirements relevant to this DP.
2	Background Information	Relevant background information including the layout of the Development and confirmation of items to be decommissioned; and, a summary of environmental conditions across the site.
3	Description of the Items to be Decommissioned	A full description of all items associated with the Development to be decommissioned.
4	Description of Proposed Decommissioning Measures	An overview of the proposed approach to decommissioning the Development, including: an overview of the process; details of items to be left in situ; and, waste management.
5	Environmental Impact Assessment	Details of the EIA that was prepared for the Development and its consideration of decommissioning activities.
6	Consultation with Interest Parties	The consultation process undertaken to support development and finalisation of the DP.
7	Costs	An overall cost estimate of the proposed decommissioning measures.
8	Financial Security	Details of the financial security which the companies that are party to the programme propose to provide.
9	Schedule	Details of the proposed decommissioning time-scale.
10	Project Management and Verification	Information on how Moray East will manage the implementation of the DP.
11	Site Remediation and Seabed Clearance	Description of how Moray East intends to restore the site as far as reasonably practicable, to the condition that it was in prior to construction of the installation.
12	Post-Decommissioning Monitoring Maintenance and Management of the Site	Details of the post decommissioning monitoring/activities that will be required, given that Moray East is not proposing to fully remove all infrastructure.
13	Supporting Studies	Details of supporting studies that have been used to inform the DP.

2 Background Information

2.1 The Development

The Moray East site is located on the Smith Bank in the outer Moray Firth. It is located 12 nautical miles (approximately 22 km) from the Caithness Coast, covers an area of 86 square nautical miles or 295 km^2, and ranges from 37-57 m in water depth.

During development of the Moray East Offshore Wind Farm, the Moray East site was split into three wind farm sites as shown in Figure 2-1. However, the Moray East site is now being constructed to consist of a single offshore wind farm, with the WTGs spread across the Telford, Stevenson and MacColl wind farm sites.

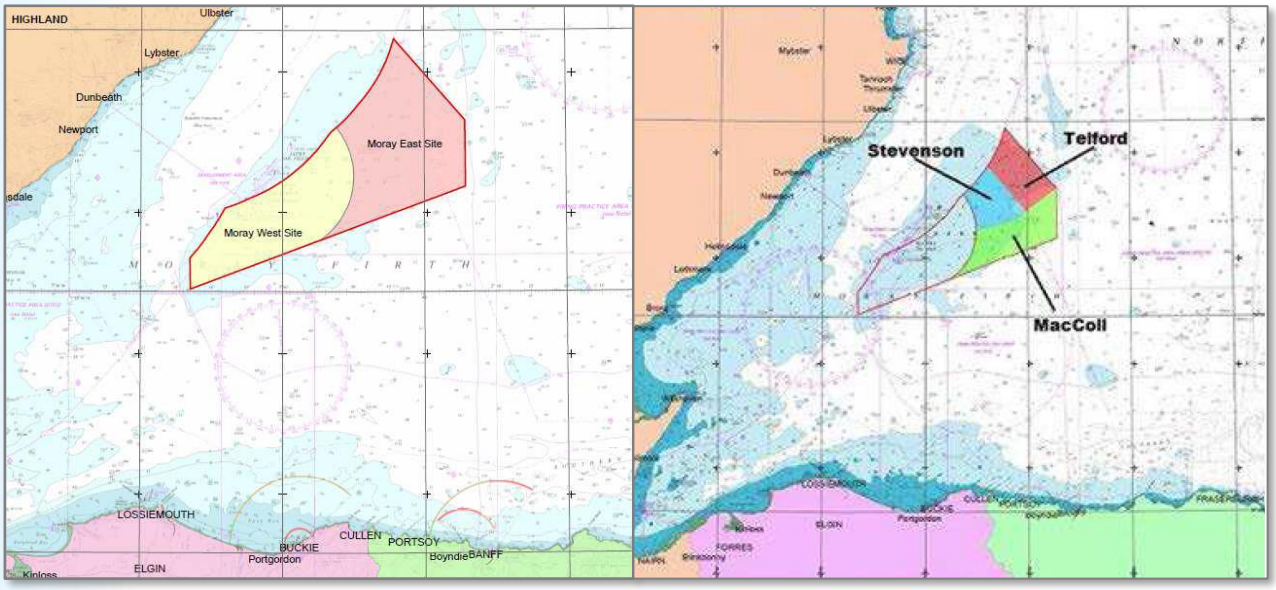

Figure 2-1: Moray Firth Offshore Wind Zone outlined in red and the Telford, Stevenson and MacColl Offshore Wind Farm Sites

The Development commenced offshore construction in 2019.

The Development will comprise of 100 WTGs. The substructure for the WTGs comprise a jacket made up of a tubular steel lattice structure with three legs. Each substructure is fixed to the seabed using three pin piled foundations.

Three AC OSPs, will collect the generated electricity and convert the electricity from 66 kV to 220 kV. The support structures for the OSPs will be similar to those used for the WTGs.

An anticipated 156 km (indicative as noted in the Moray East Wind Farm Cable Plan) network of buried 66 kV inter-array subsea cables will connect strings of WTGs together and will connect the WTGs to the OSPs; two interconnector cables will connect the three OSPs. Three AC export cables connect the OSPs to the onshore transmission works at the landfall point at Inverboyndie on the Aberdeenshire coastline. Further details are provided within Moray East's Development Specification and Layout Plan (DSLP).

No further offshore meteorological monitoring masts (met masts) are planned to be installed beyond the existing met mast which is licensed under a separate Marine Licence to the Wind Farm and OfTI. Accordingly, the existing met mast, and indeed any potential additional met mast, have not be considered as part of this decommissioning plan and will be decommissioned under a separate Marine Licence.

The Moray East site location and OfTI Corridor to shore are shown in Figure 2-2 below.

Figure 2-2: Moray East Wind Farm Location and OfTI Corridor (i.e. the Development)

2.2 Site Characteristics

In conducting an impact assessment of the likely effects on the environment arising from the construction, operation and decommissioning phases of the Development, EIAs gathered and collated a significant baseline dataset that has been used to describe the key characteristics of the Development. The EIA for the Moray East Wind Farm is set out in the Moray East ES 2012. The EIA for the OfTI as consented in 2014 is contained in the Modified OfTI ES 2014.

The following section summarises baseline information for the Moray East site and OfTI Corridor in the context of the Decommissioning Programme. The requirement for an EIA will be undertaken prior to decommissioning the Development as required. If an EIA is required, it will build on the baseline conditions outlined in the original EIAs in conjunction with information available at the time of writing.

2.2.1 Physical Environment

2.2.1.1 Bathymetry

The Moray East site encompasses part of the summit and the eastern flank of Smith Bank, a morphological high point in the outer Moray Firth. The site measures approximately 35 km long from south-west to north-east and it is 20 km wide (295 km^2). Water depths in this area range from approximately 37 to 57 mCD (below Chart Datum). Along the OfTI Corridor, water depths are highly variable ranging from < 10 m mean sea level (MSL) at landfall to approximately 80 m MSL in the Southern Trench.

Official estimates of the effects of global climate change suggest that by 2050 relative sea level in the Moray Firth will have risen between 0.22 and 0.35 m above 1990 levels. The EIAs reported minor impacts on physical processes due to scour around the foundation bases, and therefore it is anticipated that bathymetry conditions at the time of decommissioning will be similar to those reported in the EIA baseline.

2.2.1.2 Geology

Smith Bank is a geologically constrained feature, i.e. it is a raised hard rock feature, overlain by a relatively thin veneer of more recently deposited marine sediments. Geophysical surveys commissioned by Moray East and undertaken in 2010 and 2011 indicate that within the Moray East site, the thickness of marine sediments is highly variable, between 5 and 150 m, and may become absent near to the crest of Smith Bank. Along the export cable route surficial sediment layers are variable, with most of the OfTI Corridor with sediment thickness of around 70 m. Geological conditions at the time of decommissioning are expected to be unchanged from those reported in the EIA baseline.

2.2.1.3 Wind Climate

In situ wind measurements have been gathered since 2006 from the Beatrice Alpha oil platform and Met Office hindcast data covering the Moray East site are available. In 2011 a Light Detection and Ranging (LiDAR) device was installed on the Ithaca owned Jacky platform and it was replaced in 2015 for a newer version. In 2014 an offshore met mast was installed in the Moray East site. The LiDAR still supplys wind data for Moray East's wind analysis. In addition to the wind measurements, the wind analysis is complemented by ten VORTEX mesoscale hindcast data sets located within the Moray East site.

The area is dominated by westerly flow giving windy and unsettled weather with frontal passages most of the year. The dominant wind direction is south-westerly with a secondary flow coming from south-east. Average free wind speed is 10.8 m/s. 42% of the time the wind speed ranges between 10 m/s to 12 m/s and only infrequently (about 3% of time) exceeds 22 m/s. During extreme events wind speeds might peak as high as 32.3 m/s (1-year return period) or 44.7 m/s (50-year return period).

2.2.1.4 Tidal and Wave Regime

The Moray East site is subject to a mean spring tidal range of just under 3 m and a maximum range (Highest Astronomical Tide (HAT) to LAT) of approximately 4 m. The mean spring range of the OfTI Corridor is approximately 3 m.

Storm surges may cause short term modification to predicted water levels and under an extreme (1 in 50-year return period) storm surge, water levels may be up to 1.25 m above predicted levels.

Climate change may be expected to slightly increase the mean water level over the lifetime of the Development; however, the tidal range about the new mean level will likely remain not measurably affected.

Information available on the strength of tidal currents in this region shows that recorded (depth-averaged) peak spring current speeds are around 0.45-0.5 m/s, with the fastest speeds recorded in the north of the Moray East site. Current speeds decrease with distance into the Moray Firth.

Along most of the OfTI Corridor, peak current speeds are typically less than 0.5 m/s.

Both storm waves and storm surges may cause short term modification of astronomically driven tidal currents. During a 1:1 year storm event, orbital currents are likely to approach 1.0 m/s in the relatively shallow water over the crest of Smith Bank. Currents of this magnitude are considerably greater than that observed during peak spring tidal flows. Similarly, under an extreme (1 in 50-year return period) storm surge, current speeds may be more than twice that encountered under normal peak spring tide conditions.

Residual tidal currents (over a period of days to weeks) are directed into the Moray Firth.

The wave regime in the outer Moray Firth includes both swell waves generated elsewhere in the North Sea and locally generated wind waves. The offshore export cable route is likely to be exposed to waves of equal or larger size than the wind farm itself from exposed offshore sectors.

Wave conditions naturally vary from calm conditions to maximum wave heights of 4 to 9 m depending upon the return period and direction; further natural variability in the order of 10% is also expected based on historical trends and the generally predicted effects of climate change.

The EIAs predicted that the construction and operation of the Development would result in negligible impacts on wave and tidal conditions; therefore, conditions at the time of decommissioning are expected to be similar to those outlined above. However, conditions may differ depending on the magnitude of effects as a result of climate change and will be considered at the time of decommissioning.

2.2.1.5 Sedimentary and Coastal Processes

Seabed sediments across the application site generally consist of Holocene gravelly sand and sand; fine (silt and clay sized) particles are largely absent. The proportion of shell in sediment samples from and nearby to the application site are frequently in excess of 50%. Across much of the area of the Moray East site, surficial marine sediments are generally thin (~0.5 m) with the underlying glacial till very close to the surface.

Seabed sediments along the OfTI Corridor are variable. Both at the northern end of the cable route and in the vicinity of the landfall, sediments generally consist of gravelly sands and sandy gravel. Seabed sediments become progressively finer in deeper water along the route, becoming relatively muddy in the deepest parts.

The available evidence suggests that (bedload) material is travelling into the Firth from the north, passing along the Caithness coast and towards the inner Moray Firth.

Sediment transport is considered unlikely to be driven by normal tidal currents alone and is expected to be dominated by less frequent but more energetic storm events via wave action at the seabed.

During calm conditions, suspended sediment concentrations are typically very low (approximately < 5 mg/l). However, during storm events, near bed current speeds can be significantly increased due to the influence of waves stirring of the seabed, causing a short term increase in suspended sediment concentration, theoretically in the order of 1000s to 10,000s of mg/l very close to the seabed, 100s or 1000s mg/l in the lower water column but probably only 10s of mg/l in the upper water column.

The EIAs predicted the potential for a minor impact on seabed sediments due to the presence of turbine and OSP foundations. Beyond this, impacts on sedimentary and coastal processes were predicted to be negligible. Therefore, it is anticipated that the baseline conditions reported in the EIA will be largely similar at the time of decommissioning.

2.2.2 Biological Environment

2.2.2.1 Designated Sites

The Moray East site and OfTI are not located within any nature conservation sites designated under European Directives and/or implemented through British legislation. However, many parts of the adjacent coastline do have some form of conservation status.

Statutory protected sites (Special Protection Areas (SPAs); Special Areas of Conservation (SACs), Ramsar sites, Sites of Special Scientific Interest (SSSI)) within the vicinity of the Moray East site and OfTI are listed in Appendix 1, for information. Activities related to decommissioning will include removal of infrastructure and the presence of offshore construction vessels. Decommissioning activities and the impact of removing infrastructure will be considered against the context of designated nature conservation sites, conservation targets site management measures and guidance at the time of decommissioning.

2.2.2.2 Benthic Ecology

Moray East commissioned benthic surveys (grab sampling, video survey, beam trawls) of the wind farm site and offshore transmission cable study area, which were completed in 2010 and 2014.

Within the Moray East site, the survey results were consistent with those of previous studies and showed that dominant seabed sediment habitat type was slightly gravelly sand with patches of shelly gravelly sand, sandy gravel and gravel. The benthic communities associated with these seabed habitat types were found to be rich and diverse, though none of the habitats encountered were considered to be geographically restricted or rare and were well represented within and around the Moray East site.

Along the offshore cable route, the offshore portion of the study area was dominated by sedimentary seabed habitats including muddy sands, fine sandy mud and mixed sandy gravels. Further inshore, the seabed was dominated by comparatively coarser and more mixed sediment types, including areas of cobbles, boulders and exposed bedrock. Overlying these coarser and rockier seabed habitat types was patches of clean, mobile fine sand in varying thicknesses creating a complex mosaic of habitats.

The following describes benthic features of potential nature conservation importance identified within the cable route study area:

- The extensive presence of the biotope SS.SMu.CFiMu.SpnMeg Seapens and burrowing megafauna in circalittoral fine mud along the OfTI Corridor indicated the presence of the Priority Marine Feature (PMF) burrowed mud across the survey are. This habitat is also captured by the Scottish biodiversity list (under Scotland's Biodiversity strategy) as 'Mud habitats in deep water'.
- In the inshore area the rock biotope CR.MCR.EcCr.FaAlCr.Pom Faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock was encountered and is illustrative of the Annex I (Habitats Directive) Reef.
- The presence of what appears to be the burrowing anemone *Arachnanthus sarsi* was also noted. This species is on the Scottish biodiversity list and has been recommended as a PMF.

Levels of sediment contaminants were below guideline levels at most locations sampled. Concentrations of arsenic and chromium along the OfTI Corridor, however, exceeded Cefas / Marine Scotland values for Action Level 1, relating to the disposal of dredged materials to sea, but fell below the more stringent Action Level 2 values. The seabed video survey did not show any significant habitat and community difference or denuded areas associated with sediments with elevated chromium and arsenic levels suggesting no significant effects of current contaminant levels on benthic ecology

The EIAs predicted minor impacts to benthic habitats and communities as a result of the operation of the Development. It is anticipated that benthic communities at the time of decommissioning would be broadly similar to those reported within the EIA baseline.

2.2.2.3 Fish and Shellfish Ecology

The Moray Firth supports several commercial fish and shellfish species. Haddock, herring, monks and whiting account for the majority of the fish landings whilst the principal shellfish species landed are king scallops, *Nephrops*, edible crab and squid.

Spawning and nursery grounds have been defined for cod, herring, plaice, sandeel and whiting within and in the immediate vicinity of the Moray East site and the OfTI. King scallops and squid may also use the Moray Firth for spawning and as nursery grounds.

Important prey species include sandeel, herring and sprat. Sandeels are most commonly preyed upon when they are in transit to or feeding in the water column. They are a key component of the diet of many birds (kittiwakes, razorbills, puffins, common terns, etc), piscean predators such as herring, salmon, sea trout, cod and haddock and marine mammals such as grey seals, harbour porpoises and minke whales. A sandeel survey was completed by Moray East in 2012. Its findings are reported in the Moray East ES (2012), though in summary, survey indicated that sandeel are present in low numbers across the wind farm site. Herring is fed upon by several fish species (e.g. salmon, sea trout, whiting, cod, etc) seabirds and several marine mammals such as harbour porpoises, bottlenose dolphins, grey seals and common seals. Similarly, sprat is also fed upon by several fish species, sea birds and marine mammals.

Several species of conservation importance have been identified as potentially present in areas relevant to the Moray East site and the OfTI. These include diadromous migratory species, (those using the marine and freshwater environments during their life cycle) elasmobranchs (sharks and rays) and commercial fish species.

Updated baseline fish surveys will provide information that will be used to inform the understanding of specific fish sensitivities in the Moray East site (including sandeel and cod surveys carried out in 2019 pre-construction and to be carried out post-construction, and the wider Moray Firth Tracking Project). These surveys will be used to inform baseline conditions at the time of decommissioning.

The EIAs predicted that in the absence of detailed decommissioning schedules and methodologies, it is assumed that the likely effects during this phase will be, at worst, as those assessed for the construction phase. Note that as piling is not envisaged to be required during the decommissioning phase, effects associated to noise during this phase will likely be significantly smaller than those assessed for the construction phase.

2.2.2.4 Marine Mammals

The Moray Firth is an important area for marine mammals, with at least 14 species of cetacean having been recorded in and around the Firth. In addition, populations of both grey and harbour seal are also present within the Firth. The populations of bottlenose dolphin and the harbour seal population are considered nationally and internationally important, with SACs for both species designated within the inner waters Moray East has commissioned several studies to better understand marine mammal distribution, abundance and behaviour within and around the wind farm site. These include:

- Two years of boat-based marine mammal survey within the proposed sites;
- Harbour seal telemetry and habitat association modelling;
- Harbour seal abundance at haul-out sites and at sea;
- Grey Seal telemetry;
- Passive acoustic monitoring (PAM) to examine cetacean spatial and temporal variation across the Moray Firth;
- Cetacean habitat association modelling;

- Estimation of harbour porpoise density; and
- Estimation of bottlenose dolphin density.

The most abundant species found within the study areas were harbour seal, grey seal, harbour porpoise, bottlenose dolphin and minke whale. Further information relating to the most commonly recorded marine mammal species is provided in the 2012 ES.

It would be expected that at the time of decommissioning these species will still be the most common species within the Moray Firth.

It is likely that the decommissioning of an OWF with piled foundations will involve the use of cutting tools. No data is currently available on noise levels produced by cutting mechanisms; however, the EIAs predicted that the noise levels produced by cutting mechanisms underwater would be expected to be lower or equivalent to the noise levels created during the installation of the OWF, in particular noise generated during piling. The EIAs concluded that decommissioning would be of medium duration and of minor significance to the marine mammals within the Moray Firth at the time.

2.2.2.5 Ornithology

The Moray Firth area holds internationally important numbers of breeding seabirds and overwintering waterbirds (e.g. ducks, divers, grebes and waders). In addition, this area is also important during the spring and autumn migration periods as a migratory route and feeding area for migratory species. Within the vicinity of the Moray Firth are several sites designated for ornithological interests.

Moray East commissioned a series of studies to better understand the abundance, distribution and behaviour of bird species within and around the proposed sites, and to understand where birds using the site originate from. Detailed records of the surveys performed are presented in the 2012 ES. Studies included:

- Two years of boat-based bird survey within the proposed sites;
- Aerial surveys of the proposed sites and adjacent waters;
- Seabird tracking of birds at Berriedale Cliffs SSSI within the East Caithness Cliffs SPA; and
- Boat and shore-based migration surveys during spring and autumn periods.

The seabird species recorded most frequently during surveys were fulmar, kittiwake, guillemot, razorbill and puffin. Migratory species observed during survey includes Whooper swan, Pink-footed goose, Greylag goose and Barnacle goose.

Ornithology surveys undertaken prior to commencement of construction and planned post construction of the Moray East OWF will be used to further inform the baseline at the time of decommissioning. It is anticipated that the removal of infrastructure would have little or no negative impact on ornithology receptors; however, this will be considered further at the time of decommissioning.

The EIA predicted that during decommissioning activities, effects are predicted to be limited to disturbance, arising from WTG removal and associated vessel traffic, along with indirect effects on prey species. The assessment on each relevant ornithological receptor ranged from no risk (certain) to minor risk (certain; short-term, temporary), with no significant effects predicted.

2.2.3 Human Environment

2.2.3.1 Commercial Fisheries

Records of fisheries catches from the area within which the Moray East site are located records landings values that are of moderate importance on a national and regional scale. Boat dredging for scallops (king scallops) accounts for the majority of landings values (57%) with otter trawling for Nephrops constituting 14%. Scottish seining or demersal trawling for whitefish (haddock, monks and cod) and demersal trawling for squid principally constitute the remainder. Landings values for all species are broadly highest between

May and September, although there are also relatively moderate landings recorded in April and October. The majority of landings are into ports in the Moray Firth area. Fraserburgh is the principal port. The majority of vessels operating in the area are over 15 m in length.

The OfTI Corridor passes through area which record landings of regional importance for Nephrops, scallops, squid and crustaceans. The cable route passes through an area that records high landings values of Nephrops. Cod and haddock fishing is limited within the vicinity of the OfTI Corridor.

Interactions with the local fishing community will be a key consideration when planning decommissioning activities.

The EIAs predicted that during the decommissioning phase, the likely significant effects will be no greater, and probably considerably less, significance than those of the construction phase. The assessment of the effects identified during the construction phase of the Development, therefore, applies.

2.2.3.2 Ports and Harbours

There are several ports and harbours located within the Moray Firth and surrounding area. These include the important fishing ports of Wick off the north east coast and Buckie Harbour on the south coast and the sheltered deepwater commercial ports and harbours of Inverness and the Cromarty Firth located at the head of the Moray Firth.

There are also several smaller, former fishing harbours, that have been redeveloped as small marinas and these include Banff, Whitehills, Lossiemouth and Findhorn on the south coast of the Moray Firth and Helmsdale on the north coast. The area has direct links with the Caledonian Canal (Inverness). The UK offshore industry is currently supporting the growth of harbours and ports around the UK and changes in baseline conditions will be considered at the time of decommissioning.

2.2.3.3 Shipping and Navigation

Work undertaken as part of the Navigational Risk Assessment (NRA) has identified baseline vessel activity and navigational features in the vicinity of the Moray East site and export cable route.

The main data sources used in assessing the existing shipping activities are listed below:

- Automatic Identification System (AIS) and radar survey data for Moray Firth Round 3 Zone from survey vessels operating during spring/summer (April-July 2010) and winter (November-January 2010/11);
- AIS data for the Moray East site and a 5 nm buffer of the OfTI Corridor from summer (July 2013) and winter (December 2013);
- Fishing surveillance satellite data (2009) and over flight data (2005-09);
- Maritime incident data from the Maritime Accident Investigation Branch (MAIB) (2001-2010) and Royal National Lifeboat Institute (RNLI) 2001-10;
- UK Admiralty Charts; and
- Admiralty Sailing Directions, North Coast of Scotland Pilot (NP 52).

From a commercial vessel perspective, the Moray Firth is generally not a busy area. The main commercial shipping routes in the region are either headed into the Moray Firth and Inverness (e.g. shuttle tankers to the Nigg terminal or coastal shipping to Inverness) or using routes off Rattray Head bound for Pentland Firth and the Northern Isles (e.g. Northlink ferries to both Shetland and Orkney from Aberdeen). Other routes crossing the Moray East site and OfTI Corridor consist of fishing vessels (fishing and steaming) and tankers travelling to local fishing ports and Inverness/Cromarty Firth. There is also some vessel traffic associated with support of the Beatrice Oil Field and Jacky Oil Field (however these will be decommissioned by the time of the Development decommissioning).

There is the potential for maritime activity to change by the time of decommissioning, changes in baseline conditions will be considered at the time of decommissioning.

The EIAs predicted that the effects associated with decommissioning the Development are anticipated to be similar in nature and extent to those identified during the construction phase. The effects on shipping and navigation include the consideration of a scenario where during the decommissioning process an obstruction is left on site on a temporary basis, which could be considered a danger to navigation. Such temporary obstructions may require to be appropriately marked until such time as it is either removed or no longer considered a danger to shipping and navigation.

2.2.3.4 Aviation

Studies and consultation undertaken to inform EIAs have identified the following aviation receptors that may interact with wind farm development:

- NERL - Allanshill Primary Surveillance Radar (PSR) supporting Civil Air Traffic Control (ATC) and En-route operations;
- MOD ATC – Lossiemouth PSR used to provide navigational services to aircraft inbound to and outbound from the airfield, to military aircraft operating over the Moray Firth;
- Highlands and Islands Airports Ltd (HIAL) Wick Airport regarding potential effects on aircraft flight patterns and procedures;
- Helicopter Main Routes (HMR) – HMR X-Ray used by helicopters transiting between Aberdeen, via Wick to the Atlantic Rim offshore installations west of the Shetland Islands;
- Helicopter Approach Procedures (HAP) to offshore platforms; and
- Minimum Safe Altitude (MSA), which is the lowest altitude set in areas to ensure separation between aircraft and known obstacles.

By its nature, the removal of infrastructure during decommissioning would be expected to have limited impact on aviation receptors.

The EIAs concluded that WTG decommissioning will have no significant effect on the NERL Allanshill PSR system, Buchan ADR system, and Lossiemouth PSR system. During lift operations, crane tips could temporarily exceed turbine tip heights. However, the current MSA of 1,800 ft will continue to provide well in excess of the required minimum 1,000 ft vertical separation over the WTG and construction infrastructure. Consequently, the decommissioning infrastructure will have no effect on Wick Airport instrument flight procedures; therefore, this effect is assessed as not significant.

Turbine decommissioning infrastructure will present a physical obstruction for helicopters operating on the section of HMR X-Ray between Aberdeen and Wick Airports. The EIA assessed that the magnitude of effect is categorised as medium and sensitivity of this receptor is high. The above effect is, therefore, assessed as significant.

The assessment made on helicopter approach procedure was assessed to be significant. Helicopter operations in the area are well understood. Therefore, there is a low uncertainty in this assessment. However, the effect is highly unlikely to occur.

With regards to the MSA, this will be raised from the point of the first turbine being installed and as such the effect will continue to be significant until the last WTG has been decommissioned.

2.2.3.5 Military

Military Practice and Exercise Area (PEXA) charts, produced by the UK Hydrographic Office, identify the military activity zones within the Moray Firth area. PEXAs are used for various military practice activities by the Royal Navy, the Army, the Royal Air Force (RAF) and the Ministry of Defence (MoD). Any relevant changes to PEXA locations or extent will be considered at the time of decommissioning.

During the EIA process, consultation with the MoD has not highlighted any concerns with regard to danger area D809 and, therefore, both the sensitivity of the receptor and the magnitude of the effect are considered negligible and there will be no significant effect.

2.2.3.6 Seascape, Landscape and Visual Receptors

The Development EIAs have been informed by a Seascape, Landscape and Visual Impact Assessment (SLVIA) for the Moray East OWF. The SLVIA has been undertaken within a 50 km radius study area of the Moray East site.

The Moray East site is located approximately 22 km from Caithness, at its closest point. The study area includes the Caithness coast between Duncansby Head and Brora and extends up to approximately 30 km inland. The choice of study area has been influenced by the landscape character types identified in the Caithness Landscape Character Area. It encompasses the Flat Peatlands and the Moorland Slopes and Hills types, which define the inland extent of visibility of the sea. The Caithness coastline is within National Seascape Unit 7 - East Caithness and Sutherland and is defined mainly by Seascape Character Type 2: Rocky Coastline with Open Sea Views, with smaller sections of Type 1: Remote High Cliffs and Type 3: Deposition Coastline with Open Sea Views. The 50 km study area includes the North Aberdeenshire / Morayshire coast between Lossiemouth and Banff and is within the North Aberdeenshire / Morayshire Coast National Seascape Unit 5. This coastline is defined mainly by National Seascape Character Type 2: Rocky Coastline with Open Sea Views and Type 3: Deposition Coastline with Open Sea Views. The Moray coast is located approximately 40 km from the Moray East site, at its closest point.

The SLVIA baseline conditions may change during the operational life of the Moray East Windfarm, although given the nature of the coastline, it would be expected to remain largely similar. The SLVIA baseline would be considered at the time of decommissioning, however, the removal of infrastructure would not be anticipated to have a negative impact on SLVIA receptors.

2.2.3.7 Archaeology

The archaeological potential of the Moray East site and OfTI Corridor has been described following a desk-based review of existing data sources and archaeological assessment of marine geophysical and geotechnical data acquired by Moray East.

Within the Moray East site there is no designated wrecks or other cultural heritage assets with legal designations. Desk-based review identified six recorded wrecks in the study area, four of which are located inside the wind farm sites and two wrecks within a 1 km buffer zone. A further two United Kingdom Hydrographic Office (UKHO) obstructions have been identified, one within the Moray East site and one in the 1 km buffer zone. The archaeological geophysical assessment undertaken for Moray East identified three anomalies of high archaeological potential that have been positively identified as wrecks and 16 anomalies of medium potential within the Moray East site and 1 km buffer zone.

The archaeology and cultural heritage desk-based study provided within the Modified OfTI ES 2014 has identified eight documented wrecks and an aircraft loss within the OfTI Corridor. Further analysis of the archaeology and cultural heritage potential along the OfTI Corridor has been provided within the Marine Archaeology Reporting Protocol (MARP) based on the geophysical and geotechnical data collected pre-construction.

The identification of archaeological interest features has been completed prior to construction and will be updated during construction and operational phases if any new archaeological interest features are discovered. It is not anticipated that the baseline at the time of decommissioning would be significantly different. Physical effects arising from the decommissioning of the Development are considered to be analogous to those arising in the construction phase and are not discussed further. The effects of decommissioning on the setting of cultural heritage assets will essentially be reversed and are therefore considered to be negligible and not significant.

2.2.3.8 Offshore Wind Farms

The Beatrice OWF site is adjacent to the northern boundary of the Moray East site with an export cable route offset to the west. Additionally, to the west of the site lie the two existing Beatrice demonstrator turbines. The Beatrice complex is linked to the mainland via a 132/33 kV seabed power cable making

landfall at Dunbeath. Decommissioning activities of Beatrice will be considered at the time of decommissioning if relevant.

2.2.3.9 Oil and Gas Exploration and Related Activities

There are two producing oil fields, named 'Beatrice' and 'Jacky', located to the west of the Moray East site. The key structures within these areas include the Beatrice Alpha, Bravo and Charlie platforms and the Jacky platform. Oil is exported via a 66 km long 16 inch (0.4 m) pipeline from the Beatrice Alpha complex to a shore terminal at Nigg in the Cromarty Firth. It is anticipated that some of this infrastructure may have been removed / decommissioned at the time of decommissioning. The EIA process predicted that likely effects on oil and gas receptors are deemed to be of no to minor adverse significance.

2.2.3.10 Subsea Cables

The SHEFA-2 fibre-optic telecommunications cable runs from the Faroe Islands to Banff in Moray. It runs north to south, to the east of the Moray East site. No cable crossings are planned; however, a proximity agreement is in place which allows a mechanism to perform works (including during decommissioning) by both SHEFA and Moray East.

The SHET Caithness-Moray High Voltage Direct Current (HVDC) Link cable runs from the Caithness coast at Noss Head along the Moray Firth to the east of the Moray East site to an area west of Portgordon in Moray. The threeAC export cables cross the Caithness-Moray HVDC Link cable to the south of the Moray East site.

3 Description of Items to be Decommissioned

3.1 Introduction

The elements of the Development described in the following sections will be decommissioned at the end of the operational life and consented period and information on relevant licences is provided upfront within the 'Definitions' Section. Further details of the decommissioning process, including the decommissioning method for each of the major components, are set out in Section 4.3.

It should be noted that the ownership of the relevant OfTI assets will be transferred to an Offshore Transmission Operator (OFTO) following the commissioning and, therefore, the decommissioning responsibilities will also be transferred.

3.2 Development Components to be Decommissioned

3.2.1 WTGs

Horizontal axis WTGs will be used, which are made up of three main external components:

- Rotor – comprised of the blades, hub, spinner and spinner bracket;
- Nacelle – housing the electrical generator, the control electronics and gearbox; and
- Structural Support – includes the tower (which houses electrical equipment such as transformer/switchgear) and rotor yaw mechanism which allows the wind turbine rotor to turn against the wind.

The main components of the WTGs to be decommissioned are summarised in Table 3-1. Further information on the specific components (e.g. key dimensions) is provided as part of the DSLP (document produced as part of the Section 36 Consents condition 12, OfTI and OSP Marine Licences conditions 3.2.2.6 and 3.2.2.7 respectively).

Table 3-1: Summary of WTG Components to be Decommissioned

Component	Number	Key Dimensions / Weights
Tower Sections	100 towers, each in 3 sections	Dimensions: Complete towers will consist of 3 sections with bolted flange connection totaling a length of 87 m. 6.5 m diameter (tapered). Weight: approximately 291 t (shells and flanges and not internals).
Nacelle	100 MHI Vestas V164 nacelles	Dimensions: 9.3 m x 8.8 m x 20.7 m (including hub). Weight: approximately 375 t.
Blades	100 x 3 rotor blades	Dimensions: 80 m in length. Weight: approximately 35 t, each.

3.2.2 WTG Support Structures (Foundations and Substructures)

The WTGs will be supported by substructures and foundations which hold the equipment in place on the seabed. There will be an access platform between the substructure and the WTG to allow personnel access into the WTG tower.

Each WTG support structure will be composed of a three-legged tubular steel lattice jacket substructure. The foundations will be comprised of three steel pin piles per structure, which will be attached by grouted connection to the jacket substructure. Transition pieces will be mounted on the jacket substructures during fabrication and will form the point of connection between the WTG tower to the support structure.

The main components to be decommissioned are summarised in Table 3-2.

Table 3-2: Summary of WTG Support Structure Components to be Decommissioned

Component	Number	Key Dimensions / Weights
Foundation piles[3]	100 x 3 pin piles	Dimensions: 2.4 m diameter, up to 62 m total length (up to 60 m penetration). Weight: up to 200 t per pile.
Jacket Substructure (including tower flange / transition piece connection)	100 three leg jacket structures	Dimensions: up to 77 m in height (without stabbing pin of grouted connection) and 30 m jacket base width. Weight: up to 1,000 t per jacket (including transition piece and secondary steel).
Grouted Pile Connections	100 x 3 connections (jacket leg to pin pile foundation)	Length: up to 7 m. Nominal grout thickness: up to 300 mm.
Scour Protection	See Section 3.2.6	

3.2.3 Offshore Substation Platforms and Support Structures

Three OSPs will be installed to collect the generated electricity and convert the electricity from 66 kV to 220 kV for transmission to shore by the three AC export cables.

[3] The proposed approach to the decommissioning of foundation piles is to use the 'subsea cutting' method. Further details are provided in Section 4.3.3

Each of the OSPs is comprised of two main elements: the topside and the support structure. The main components to be decommissioned are summarised in Table 3-3. The OSP support structures will be as described for the WTGs above and summarised in Table 3-4.

Table 3-3: Summary of OSP Components to be Decommissioned

Component	Number	Key Dimensions / Weights
OSP	3 OSPs each comprising: • OSP topsides • Substructures (see Table 3-4) • Foundations (see Table 3-4)	OSP topside dimensions: 33.0 m (length) x 30.7 m (width) x 26.9 m (height). OSP topside weight: approximately 1,300 t.

Table 3-4: Summary of OSP Support Structure Components to be Decommissioned

Component	Number	Key Dimensions / Weights
Foundation piles[3]	3 x 3 pin piles	Dimensions: 2.4 m diameter, up to 62 m total length (up to 60 m penetration). Weight: up to 200 t per pile.
Jacket Substructure	3 x three leg jacket structures	Dimensions: up to 70 m in height (without stabbing pin of grouted connection) and 30 m jacket base width. Weight: up to 1,400 t per jacket (including secondary steel).
Grouted Pile Connections	3 x 3 connections (jacket leg to pin pile foundation)	Length: up to 7 m. Nominal grout thickness: up to 300 mm.
Scour Protection	See Section 3.2.6	

3.2.4 Inter-Array and OSP Interconnector Cables

A network of circa 156 km of inter-array cabling will connect each of the WTGs to each other and to the OSPs. For the Development, the layout consists of single chains or strings of cabling linking the WTGs together, with the final cable connecting the WTGs back to the OSP. Interconnector cables will also be installed between the OSPs, totalling approximately 19.6 km in length.

A cable protection system will be adopted at the base of the WTG / OSP substructures to mechanically protect the cable between the J-tube bellmouth exit until the point where the cable is adequately buried or protected by rock placement. Further away from the substructures, if there are any locations where a sufficient level of protection cannot be achieved by trenching and burial during installation, alternative protection methods such as rock placement or concrete mattresses will be used. Further information on cable burial and protection is provided in the Wind Farm Cable Plan, produced as required by condition 18 of the Section 36 Consents and condition 3.2.2.10 of the OfTI Marine Licence.

The main components to be decommissioned are summarised in Table 3-5.

Table 3-5: Summary of Inter-Array Cable and Interconnector Components to be Decommissioned

Component	Number	Key Dimensions / Weights
Inter-Array Cabling	3-core 66 kV armoured submarine cable (aluminium conductors)	Dimensions: 130 mm and 156 mm of overall diameter, approximately 156 km of overall length. Weight: 21.2 kg/m of weight in air, 9.8 kg/m weight in water and 30.2 kg/m of weight in air, 13.4 kg/m weight in water
OSP Interconnector Cabling	3-core 66 kV armoured submarine cable (aluminium conductors)	Dimensions: 143 mm of overall diameter, approximately 19.6 km of overall length. Weight: 35 kg/m of weight in air, 21 kg/m weight in water.

3.2.5 Export Cables

Three AC export cables (each approximately 56-64 km in length) will connect the OSPs to the onshore transmission works at the landfall point at Inverboyndie on the Aberdeenshire coastline where they will connect with the onshore transmission works.

Where the required level of protection cannot be achieved by trenching and burial during installation, alternative protection methods such as rock placement or concrete mattresses will be used. Further information on cable burial and protection is provided in the OfTI Cable Plan, produced as required by the OfTI Marine Licence condition 3.2.2.10.

Close to the point of landfall the AC export cables are installed within three Horizontally Drilled Ducts (HDD) routed under the nearshore area to onshore transition joint bays (TJBs) at Inverboyndie. Each of the three AC export cables will be joined individually to the onshore cables within the TJBs.

The main components to be decommissioned are summarised in Table 3-6.

Table 3-6: Summary of AC Export Cable Components to be Decommissioned

Component	Number	Key Dimensions / Weights
Export Cabling	From offshore array to landfall (approximately 56 – 64 km): • Single armoured submarine 3-core 220 kV cable per circuit (three circuits), consisting of aluminium conductors with an overall cross-sectional area of 1200 mm^2. At landfall, under beach (approximately 1 km length): • Double armoured submarine 3-core 220 kV cable per circuit (three circuits), consisting of aluminium conductors, with an overall cross-sectional area of 1200 mm^2.	Dimensions: 240 mm of overall diameter, approximately 56 – 64 km in length (each export cable). Weight: 74 kg/m of weight in air, 42 kg/m weight in water

3.2.6 Scour Protection

The base case design for the WTG jacket substructures will consider the likely scour over the lifetime of the structures and, therefore, avoid the need to install scour protection. However, if during detailed

design construction / operation there is a requirement for scour protection, scour mats, rock or similar may be installed around the jacket legs.

It is likely that the OSP jackets will include scour protection in the form of rock deposits on the seabed around the piles to mitigate scour effects. The scour protection area will be approximately 1,700 m^2 per foundation as the worst case scenario. Further information on the scour protection design is provided within the Moray East DSLP.

4 Description of Proposed Decommissioning Measures

4.1 Overview

This section provides an overview of the proposed decommissioning method for the key components of the Development described in Section 3, which have been summarised with reference to the guiding principles set out below in order to justify the proposed approach.

4.2 Guiding Principles

In accordance with BEIS Guidance (BEIS, 2019), it is expected that "*all installations and structures will be fully removed at the end of their operational life to minimise residual liabilities and that approval of the decommissioning programme will be based on this assumption*." This is the stance Moray East is taking on the decommissioning of the Development. If it is not possible to fully remove a structure, Moray East will follow the guidance provided by BEIS and the International Maritime Organisation (IMO) in providing compelling evidence to demonstrate full removal is not an option.

BEIS will consider exceptions from full removal only on presentation of compelling evidence that removal will create unacceptable risks to personnel or the marine environment, be technically unfeasible or involve extreme costs. Exceptions will be considered on a case by case basis prior to decommissioning, taking on board environmental conditions, the balance of risk, cost and technological capabilities at that time. Further considerations are provided in Section 4.3.

BEIS Guidance (BEIS, 2019) also states that the standards for removal of offshore infrastructure should not fall below those set by the IMO (1989). IMO standards states that "*the coastal State may determine that the structure may be left if:*

- *it will serve a new use (such as enhancement of a living resource);*
- *it can be left without causing unjustifiable interference with other uses of the sea; and*
- *the entire removal is not technically feasible or would involve extreme cost, or an unacceptable risk to personnel or the marine environment.*"

If full removal of the item to be decommissioned is not possible, alternative solutions will be provided along with sufficient evidence, taking into account the following points:

- Arguments should be tailored to the individual site and should set out whether the risks of buried cables etc are equal across all parts of the site (for example, are some areas of the site more prone to sediment shift?);
- Arguments should be relative to the effect of conducting the activity during construction;
- The IMO exception for 'extreme cost' is not normally expected to be accepted where it is the sole reason being cited for partial decommissioning;
- Where safety concerns are being cited, this is likely to be given greater weight if written evidence from a third party (such as the Health and Safety Executive or a known decommissioning contractor) can be provided;
- The developer/owner is encouraged to consider using the 'Comparative Assessment Framework' set out in decommissioning guidance for the Oil and Gas sector when determining and setting out their position.

When considering the different options for the decommissioning of the Development, any decision made will be in line with the following set of guiding principles:

- Best Practicable Environmental Option (BPEO) – the option that has the greatest benefit or least damage to the environment. The BPEO balances the reduction of environmental risk with practicability and the cost of reducing the risk;

- Rights and needs of other users of the sea at the time of decommissioning;
- Navigational safety; and
- Health, Safety, Security and Environment (HSSE) considerations.

In accordance with BEIS Guidance (BEIS, 2019) the choice of BPEO should be informed by an EIA. The EIA used to inform this DP is the one prepared in support of Applications for consents, which is reported in the 2012 and 2014 ESs and the 2017 OSP Environmental Report. The information relating to decommissioning in the ESs will be reviewed against the final decommissioning methods, programme and best practice guidance at the time of decommissioning. If necessary, a more detailed assessment will be undertaken to accompany the application(s) for Marine Licence(s) which will be required for the decommissioning of the Development. Consultation on the final EIA will also be carried out prior to decommissioning taking place (at least three years prior to decommissioning in line with the current BEIS guidance).

In considering the proposed DP for the Development, Moray East will seek solutions for each offshore element of the Development to follow the guiding principles listed in Table 4-1.

Table 4-1: Guiding principles in considering the proposed Decommissioning Programme

Guiding Principle	Comments
No harm to people	Adhering to the highest standards of health and safety throughout the lifecycle of the Development. Moray East seeks to promote safe practices and minimise risk in the Development and implementation of decommissioning solutions.
Consider the rights and needs of legitimate users of the sea	Respecting the rights and needs of other legitimate users of the sea. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear, open communication.
Minimise environmental impact	The BPEO, at the time of considering the precise decommissioning procedure, will be chosen in order to minimise impact on the environment at an acceptable cost.
Promote sustainable development	In decommissioning, Moray East will seek to ensure that, as far as is reasonably practicable, future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources.
Adhere to the Polluter Pays Principle	Moray East's decommissioning and waste management provisions acknowledge our responsibility to incur the costs associated with our impact on the environment.
Maximise re-use of materials	Moray East is committed to maximising the re-use of waste materials and pays full regard to the 'waste hierarchy'.
Ensure commercial viability	In order that commercial viability is maintained, the BATNEEC (Best Available Technique Not Entailing Excessive Cost) decommissioning solutions will be sought.
Ensure practical integrity	Solutions that are necessary to achieve one or more of the above objectives must be practicable.

Taking into account the UK's commitments under the United Nations Law of the Sea (UNCLOS); IMO standards and the work of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the base case assumption in establishing the decommissioning requirements has been complete removal of all offshore components to shore for reuse, recycling or incineration with energy recovery or disposal at a licensed site. This assumption has been assessed for all components against the key principles presented above. In some instances, this option has not been considered to be appropriate and alternative options have been considered. These alternatives have also been assessed according to the above principles and the optimum solution selected. Updated policies relating to waste, recycling and re-use of offshore components will be considered at the time of decommissioning.

The following sections on the approach to decommissioning identify those parts of the Development where Moray East propose that the infrastructure will be left in situ, and provides an assessment of the decommissioning options in relation to the guiding principles set out in above, specifically in relation to:

- WTG and OSP foundations;
- Exceptions to sections of the export cables; and
- Scour protection.

All work will follow the recommendations and requirements of the Construction (Design and Management) (CDM) Regulations 2015 (or applicable regulations at the time the work starts).

4.3 Proposed Measures for Decommissioning

4.3.1 Overview

The proposed decommissioning approach for each component are based on current technology and best practices. The final details of the DP will be reviewed and confirmed prior to decommissioning of the Development to consider any changes in legislation, guidance, technology and best practice.

Although at this time the DP includes the removal of cables, we fully expect that over the lifetime of the Development that data will become available to fully support the cables being fully or partially left in situ; therefore, the DP, will be subject to periodic review. The review process shall be supported by regulators and stakeholders to ensure a safe and protected marine environment, as well as a cost-effective solution to decommissioning.

Proposed decommissioning measures for each infrastructure component are discussed in more detail below. In broad terms, decommissioning will involve the removal of non-buried infrastructure (e.g. WTGs and OSPs), while buried components (e.g. foundations) may be left in situ or removed depending upon regulatory and the Development's aims at the time of decommissioning. Advances in technology may also allow consideration of alternative decommissioning measures.

The decommissioning measures that Moray East currently considers represent the best practicable environmental options are summarised in Table 4-2.

Table 4-2: Summary of Proposed Decommissioning Measures

Items to be Decommissioned	Decommissioning Proposal
Wind Turbine Generators (WTGs)	Complete removal from site.
Offshore Substation Platforms (OSPs)	Complete removal from site.
Substructures and Foundations (WTGs and OSPs)	Cut-off below, seabed and removed.
Inter-Array Cables (including trial cable)	Complete removal from site where it is possible to do so safely and through the use of existing technology.
OSP Interconnector Cables	Complete removal from site where it is possible to do so safely and through the use of existing technology.
AC Export Cables	Complete removal from site where it is possible to do so safely and through the use of existing technology. Sections at landfall to remain within HDD in the substrata.
Scour Protection (if applicable)	Left in situ

4.3.2 Wind Turbine Generators

The WTGs will be fully removed from site. The removal of WTG components including blades, nacelle, and tower will be a reversal of the installation process.

The general methodology for carrying out WTG decommissioning will be:

- De-energise WTGs and isolate from the grid;
- Mobilise suitable heavy lift vessels to site;
- Remove WTG blades;
- Removal of all tower/nacelle internal cables that connect the generator as well as related control and communication cables;
- Remove nacelle including the gearbox and generator;
- Dismantle and remove WTG tower; and
- Transportation of all components to an onshore facility for processing.

Once onshore, components are likely to be processed as follows:

- All hazardous substances and fluids will be removed from the WTGs (such as oil reservoirs and any hazardous materials and components). These will be disposed of in accordance with relevant regulations at the time of disposal. All components with hazardous fluids will be treated with care to minimise the risk of spillage;
- All steel components will be sold for scrap to be recycled. This forms the bulk of the WTG structures; and
- The WTG blades (made predominantly of fibreglass) will be disposed of in accordance with the relevant regulations in force at the time of decommissioning.

The port/harbour to which the infrastructure would be removed would be chosen depending on available facilities and the location of the appropriate onshore facility to which the materials were being taken.

Table 4-3 below provides an assessment of the WTG decommissioning process against the guiding principles outlined in Table 4-1 above.

Table 4-3: Assessment of proposed WTG decommissioning process against guiding principles

Guiding Principle	Comments
No harm to people	Safest option, involving standard procedures and minimal work offshore.
Consider the rights and needs of legitimate users of the sea	Complete removal of the WTGs is considered the best long term solution. Appropriate notification and consultation prior to temporary works to minimise disruption.
Minimise environmental impact	Risk of spillage minimal as a result of all potential pollutants being fully contained within the nacelle and nacelle being removed in a single lift. All subsequent dismantling takes place onshore thereby minimising potential for pollution incidents.
Promote sustainable development	WTGs and support structures completely removed from site ensures no ongoing environmental impacts and no restriction on future use of marine resources.
Adhere to the Polluter Pays Principle	Entirely consistent with this principle – full removal and disposal.
Maximise re-use of materials	All dismantling of individual major components (i.e. nacelle) to take place onshore. Maximum potential for re-use or recycling.

Guiding Principle	Comments
Ensure commercial viability	Most commercially viable solution – minimal works offshore and maximum potential for re-sale/re-use value from WTG components with minimum residual risk.
Ensure practical integrity	Known/tried and tested procedures and reduced risks due to minimising of offshore activity.

4.3.3 Support Structures – Foundations and Substructures

An independent study of different techniques for full removal of the jacket pin piles was carried out by Arup (2020). A summary of the study has been included within this section and conclusions reached as to the feasibility of decommissioning the pin piles.

There are a range of current and possible future technologies for foundation decommissioning (with a combination of existing methodologies), although there are limited examples of those that would be most applicable to the removal of some of the piles completely at the Moray East site.

In addition to the review of pile removal techniques, Arup's study contained a high level assessment of ground conditions throughout the OWF site. These were defined into four site-wide profiles: locations that are predominantly clay (1) or sand (4), those that have significant depth to Lower Cretaceous layer (2) within 10 m or 20 m of the seabed and those where the top of the Lower Cretaceous sand and clay layers are relatively shallow (3). Piles that are installed in areas with Lower Cretaceous layers are likely to have the greatest resistance to extraction due to the high strength of the materials (i.e. clays) that form this stratum.

Of all the techniques reviewed by Arup, the following were deemed most suitable for the piles at the Moray East site:

- Subsea cutting;
- Vibration;
- Pull out via jacking; and
- Pile pressurisation.

A summary of each method is provided below.

4.3.3.1 Subsea Cutting

Subsea cutting is a proven offshore technique, where a jacket leg, pile, or jacket-pile connection is cut to allow the jacket to be lifted away. Decommissioning of the jacket substructure will involve the use of a decommissioning vessel capable of supporting a jacket and recovering it to shore. The process is anticipated to be the reverse of the installation process and will follow removal of the turbines and disconnection of the export and array cables. Following the separation of the jacket from the piles, the jacket will be recovered by the decommissioning vessel and taken ashore for re-use or scrap recycling.

Decommissioning of the pin pile foundations and jacket substructure, is anticipated to proceed as follows:

- The decommissioning vessel is mobilised to the site;
- Remotely Operated Vehicle (ROVs) are deployed to inspect each pile footing if necessary;
- Any scour protection that has been placed around the base of the support structures is moved where it is obstructing the cutting process;
- Remove any secondary steel appurtenances detrimental to the main lift operations;

- Depending upon the cutting techniques to be employed, material within and/or around the piles will be excavated to below the cutting depth (excavated material will be placed on the seabed adjacent to the piles);
- Support the jacket in preparation for the cutting operation;
- The cutting sequence will depend on the structural integrity of the substructure for the lifting operation, but will either be:
    - piles are cut below the natural level of the seabed and the jacket and section of pile are lifted; or
    - the jacket legs are cut, and the jacket is recovered. Then the piles are cut below the natural level of the seabed and recovered.
- The seabed is inspected for debris and any found is subsequently removed;
- The decommissioning vessel would continue to the next location or transit back to shore either by lifting the substructures on to the deck of the vessel, jack-up, barge or by buoyant tow; and
- The pile sections, jacket and transition piece would be offloaded onshore and then be cut up and the steel could be recycled.

The cutting methods are yet to be confirmed but external cutting tools such as a diamond wire cutter or an internal cutting tool such as a high-pressure water jetting tool could be used.

Accordingly, the proposed approach to the decommissioning of the pin pile foundations is to cut off the piles below the natural level of the seabed to such a depth to ensure that the remains are unlikely to become uncovered. The appropriate depth for cutting the piles and any backfill requirements will depend on the seabed conditions, presence of scour protection, site characteristics and vessels used at the time of decommissioning.

4.3.3.2 Vibration

Vibration is an established onshore technique, using a vibro-hammer to reduce skin friction/resistance by disturbing the contact between the pile and the surrounding soil. There are limited examples of full-scale removal of piles offshore, along with no data of removal in predominately clay areas. In most cases, the vibration method has been favourable to extracting piles in areas that are predominately sandy. Therefore, it is considered that it may be possible to remove some piles from areas of the Moray East site that have predominately sandy profiles (Soil Profile 4) shown in Arup's study. The Moray East site has a mix of soil profiles with varying percentages of clay and currently there are no successful, large-scale, offshore examples that have used this technique in areas with such profiles. Further research is required of this method's success in clay profiles.

The main potential environmental impact connected to vibration is noise disturbance to the local marine environment, particularly to noise sensitive species of marine mammals and fish. Although it is expected that the noise associated with vibration removal would be significantly lower than pile driving. If this technique is considered, further assessment of expectant sound levels should be quantified to determine the associated environmental impacts.

4.3.3.3 Pull Out via Jacking

Pull out via jacking is a future technique with the application of current technology. Significant force is required to pull a pile out of the seabed, this in turn releases energy that could cause considerable damage to those involved in the procedure and deemed unsafe (Federation of Piling Specialists; Health and Safety Executive, 2010). However, by developing the jacking method it could be possible to safely apply tensile force to the pile head, using either jacking rig or seabed frame (could be limited by available bearing area).

Arup also undertook a preliminary analysis of pile extraction resistance for each of the defined soil profiles with and without coring/plugs removed to determine which is more feasible for the pull out via jacking

technique at the Moray East site. It was concluded that piles that are not cored will have greater extraction resistance than those that have been cored out/plugs removed. Arup's study found that this method would only be feasible in Soil Profile 4 and possibly the shortest piles in Soil Profile 3 at the Moray East site. It should be noted that the success of extraction via this method will depend on location specific ground conditions that may change over the lifetime of the wind farm. There are no examples of this method being used to remove piles to date; however, this may change and as technologies develop over time, it may prove to be a feasible option in suitable soil profiles.

There are potential environmental impacts with the removal of piles via jacking including seabed disturbance with the placement of the rig and seabed frames, atmospheric emissions associated with power generation of the rig and discharge of chemicals such as hydraulic fluid. It is expected that these would have a reasonably low environmental impact; however, further assessment to determine their significance would be required.

4.3.3.4 Pile Pressurisation

Pile pressurisation is a technique that is currently being lab tested (Hydraulic Pile Extraction Scale Tests (HyPE-ST)) on a reduced scale to determine its feasibility to remove monopiles completely, and with the aim to provide an economic method. This is achieved by creating a seal/adding a lid above the sediment in the pile, filling the void between lid with pressurised liquid (seawater) resulting increased pressure driving the pile upwards. During this process, sediment within the pile would be distributed locally as the pile removed.

There are numerous challenges associated with pile pressurisation, from ensuring adequate pressure at the base of the pile to maintain the structure of the soil plug upon extraction, to not generating enough force in areas where extraction resistance is strong due to the presence of clays. The method is still in adolescence and current studies have focused primarily on monopiles; however, if the technique develops over the life of the wind farm, it may be a feasible option to completely remove some of the piles at the Moray East site.

The potential environmental impacts that are likely to accompany the pile pressurisation method are expected to be less than those identified from vibration and pull out via jacking. There is likely to be an increase in noise levels, along with seabed disturbance and atmospheric emissions than those from present during wind farm operations.

4.3.3.5 Summary and Conclusions

Table 4-4 shows a high level Red-Amber-Green (RAG) assessment on the risks associated with each of the above identified extraction methods. This is based on Arup's study which also produced a high level RAG assessment for each of the methods on their ability of use, complexity of method, environmental implications, technology maturity, safety implications and possible faults in use at the Moray East site.

Table 4-4: RAG summary of estimated risks for the most applicable extraction methodologies

Risk Area	Subsea Cutting	Vibration	Pull-Out	Pressurisation
Ability to overcome extraction resistance site wide	N/A	RED	RED	AMBER
Ability to overcome extraction resistance in locations with piles in sand	N/A	AMBER	AMBER	RED
Industry experience	GREEN	AMBER	AMBER	RED
Technology maturity	GREEN	GREEN	AMBER	RED
Complexity of method of attachment to cut in-situ pile	GREEN	GREEN	AMBER	RED

In order to achieve sufficient structural capacity, the pin pile foundations will have been embedded into the seabed to a depth of around 40-60 m. Currently, there are no proven methods available that could successfully remove all piles from the Moray East site, due to the variability of sediment structure across the site. According to IMO standards, structures may be left in situ if "*the entire removal is not technically feasible or would involve extreme cost, or an unacceptable risk to personnel or the marine environment.*" The removal of pin piles is considered to be both technically unfeasible and would involve extreme cost (see Appendix 2) and an unacceptable risk to the marine environment.

Until technology matures, becomes practical, robust, safe and economically feasible, complete removal of the piles below the seabed is considered neither practical nor environmentally desirable for the time being.

Therefore, the proposed approach to the decommissioning of foundations and substructures is using the 'subsea cutting' method. This approach to decommissioning is in line with the IMO standards and BEIS Guidelines (BEIS, 2019) as complete removal of the piles would likely involve an unacceptable risk to the marine environment, is likely to involve extreme high cost, and is not technically feasible.

Table 4-5 and Table 4-6 below provide assessments of the jacket substructure and pin pile foundation decommissioning processes, respectively, against the guiding principles outlined in Table 4-1. Further details are also provided in Section 4.3.7 below.

Table 4-5: Assessment of proposed jacket substructure decommissioning process against guiding principles

Guiding Principle	Comments
No harm to people	Heavy lift and removal to shore for disassembly minimises the amount of work offshore.
Consider the rights and needs of legitimate users of the sea	Complete removal of structure considered best long term solution. Appropriate notification and consultation prior to temporary works to minimise disruption.
Minimise environmental impact	Minimal risk of environmental impact arising from jacket lifting and removal; subsequent dismantling or cutting would take place onshore thereby minimising potential for environmental impacts at sea.
Promote sustainable development	Jacket substructures completely removed from site, ensuring no ongoing environmental impacts and no restriction on the future use of marine resources.
Adhere to the Polluter Pays Principle	Entirely consistent with this principle – complete removal and disposal.
Maximise re-use of materials	Any dismantling to take place onshore. Maximum potential for re-use and/or recycling.
Ensure commercial viability	Most commercially viable solution – minimal offshore works and maximise potential for re-sale/re-use value with minimum residual risk.
Ensure practical integrity	Known, tried and tested, procedures and reduced risks due to minimising of offshore activity.

Table 4-6: Assessment of proposed pin pile foundation decommissioning process against guiding principles

Guiding Principle	Comments	
	Complete removal of piled foundations	**Cutting of piled foundations at or below seabed level**
No harm to people	Significant excavation required to remove seabed material prior to pile recovery. Excavation would likely involve	Fewer activities to be undertaken over a shorter time period offshore, minimising risk to personnel. Post decommissioning

Guiding Principle	Comments	
	Complete removal of piled foundations	**Cutting of piled foundations at or below seabed level**
	the use of divers and hazards to dive teams would be significant due to the nature of the work involved and duration of operations.	site monitoring will identify any unlikely exposure with the result that safety risk is insignificant.
Consider the rights and needs of legitimate users of the sea	Disadvantages to other users of the marine environment include disruption over a longer time period whilst the works are undertaken, and remaining scour holes associated with excavation.	Negligible risk presented providing adequate consultation and notification, cutting is to a sufficient depth, site is monitored post decommissioning and any unlikely exposure identified.
Minimise environmental impact	Excavation pits over a wide area causing potentially significant impact to marine environment. Associated dumping of excessive volume of excavated waste material may be required. Disturbance would take place over long time period.	Considerably reduced works footprint relative to complete removal. Works would take place over reduced time period and involve less equipment. Seabed recovery time shorter than complete removal scenario.
Promote sustainable development	In the long term complete removal affords maximum flexibility over use of seabed, though considerable impacts are likely over the whole site in short to medium term.	Providing remaining structures do not become exposed most future activities will not be affected. Seabed recovery is considered highly likely.
Adhere to the Polluter Pays Principle	Consistent in principle, assuming a suitable disposal solution can be found for the excavated waste material and that the seabed can be restored.	Consistent as far as is reasonably practicable, all remains of piled foundations to be suitably buried.
Maximise re-use of materials	Maximum amount of piled foundations potentially available for re-use.	Less foundation material available for re-use relative to complete removal.
Ensure commercial viability	Not considered commercially viable - excavation and extreme lifting involves major equipment requirements over longer periods of time.	Less expensive alternative to complete removal, involving minimal excavation and minimising environmental impacts.
Ensure practical integrity	Currently no proven methods available that could successfully remove all piles from the site. Not a practical solution: Significant risk associated with heavy lift, considerable excavation needed with associated storage or disposal of large volume of waste.	Standard procedures and equipment.

4.3.4 Offshore Substation Platform

The decommissioning of the OSPs and associated support structures will follow a similar method to that described for the WTGs.

The OSP topside modules will be lifted from the support structures either as a single piece or in parts and taken by a suitable vessel to an onshore facility where the equipment and structure will be dismantled, and the constituent parts processed for re-use, recycling and/or disposal. Further details of the likely onshore processing for steel components and any hazardous substances is given in Section 4.3.2.

Following the separation of the pin pile foundations and the jacket substructure, the jacket will be lifted off the pin piles and recovered to land for re-use or recycling as scrap.

Decommissioning of the pin piles will involve cutting off the foundations below the natural seabed level. The material cut off from the pin piles will be recovered to land for recycling as scrap.

4.3.5 Inter-Array, OSP Interconnector and Export Cables

The proposed approach to the decommissioning of the buried, subsea Inter-Array and AC export cables, Interconnector cables, and trial inter array cable is to remove the infrastructure completely. Although at this time the DP includes the removal of cables, we fully expect that over the lifetime of the Development that data will become available to fully support the cables being fully or partially left in situ; therefore, the DP, will be subject to periodic review. The review process shall be supported by regulators and stakeholders to ensure a safe and protected marine environment, as well as a cost-effective solution to decommissioning.

Currently there are a number of Cable Lay Vessels (CLVs) which would be capable of performing the cable recovery activities. It is expected that these vessels would also be available at the time of decommissioning.

Figure 4-1: Example CLV which could be used to recover the Moray East AC export cable. The large cable carousel can be seen in the middle of the vessel.

Specific consideration would need to be given to decommissioning of the following sections:

- Caithness Moray HVDC Link (and any future) 3rd Party Cable Crossings
- Cable contained within the HDD
- Cable contained within the OSP J-Tube

4.3.5.1 Inter-Array, OSP Interconnector and Export Cable Removal Method

The cables would be recovered in a reverse installation process. First the cables would be cut at each end, e.g. at the WTG Substructures and the OSP. A short section of the cable would then be dredged by Controlled Flow Evacuation (CFE), suction dredging or similar to expose the cable end. Suitable rigging would then be used to recover the cable end to the cable recovery vessel. The cable would be secured on a tensioner and pulled into the onboard cable carousel.

Cable loads would be monitored during the recovery process so as to ensure loads remained within design specification. Where required, localised dredging/soil removal may be required to reduce the recovery loads in order not to overstress the cable and allow the recovery process to proceed in an uninterrupted manner.

Once recovered the cable would be transported to a suitable onshore facility for recycling.

4.3.5.2 3rd Party Crossings

The three AC export cables cross the Caithness-Moray HVDC Link cable to the south of the Moray East site. For 3rd party crossings, it is generally preferable to leave the cable in situ until the 3rd party asset requires decommissioning. This is to ensure that the 3rd party asset is not accidentally damaged during the removal of the Moray East AC export cables. However, Moray East understand that it is a requirement for this DP to account for the full removal of cables to satisfy the requirements of the Energy Act 2004. Although at this time the DP includes the removal of cables, we fully expect that in future iterations of this document, closer to the time of decommissioning, that this approach will be revisited to allow the deferral of the 3rd party crossings.

The SHET Caithness Moray HVDC Link cable is a large reinforcement of the transmission system in the far north of Scotland. It provides additional transmission capacity to export power from the expected increase in onshore renewable generation in the Caithness area, as well as new generation located on the Shetland and Orkney islands. It is part of the Critical National Infrastructure sector (Energy) as a high-capacity transmission asset. The cable delivers an additional 795 MW of transmission capacity across the transmission system. The additional capacity allows around 1.2 GW of renewable generation to connect.

The crossing agreement with SHET allows for decommissioning of the Moray East AC export cables. In order to remove the Moray East AC export cables in this area, it is assumed that some dredging works would be required to expose the cables in this section to reduce the recovery loads which mitigates the risk of the cable breaking during recovery. The cable would then be removed in the same manner as described in Section 4.3.5.1. Dredging over a live cable is unadvisable and would likely not be feasible under the Transmission Operator's operational safety rules. Any works would need to take place during a pre-planned outage. It is assumed that the Caithness Moray HVDC Link cable has a very high uptime with a very small number of days annually for maintenance, which will be during periods of lower demand when the remaining network can cope with the required transmission capacity. As the utilisation of the Caithness Moray HVDC Link cable increases, it is likely that several generators may require to be switched off. Therefore, it will be necessary for Moray East to agree with the asset owner on works in this area which could disturb their asset, align installation and outage schedules and combine the decommissioning and any required re-instatement works during an outage period combined with the required weather workability.

4.3.5.3 Export Cable within Horizontally Drilled Duct

The HDDs contain approximately 3 x 1000 m of AC export cable sealed in a plastic lined duct with bentonite grout. It is expected that this section of cable will be recovered from the onshore transition joint bays and that the HDD plastic liner will be left in situ with no risk to the environment. During the construction of the HDDs, 3No. borings were drilled from shore to the seaward pop-out and then a single piece of plastic liner pipe pulled through afterwards. A small intermittent gap is formed between the bored duct and plastic liner. Over the 25-year operational period of the Wind Farm, as water flows into the HDD the gap between the bored duct and plastic liner can reasonably be expected to fill with silt and fine materials. This is expected to create a frictional resistance when the plastic liner is attempted to be removed, and it has been calculated that the recovery loads required to overcome the frictional resistance to remove the plastic liner will exceed the breaking strength of the plastic. Therefore, it is highly unlikely that the plastic liner can be removed due to it being technically unfeasible. The condition of the plastic liner will be properly evaluated closer to the time of decommissioning.

4.3.5.4 Export Cable within the OSP J-Tube

As the cable protection system typically maintains a fixed structural interface to the substructure J-tubes, it is not planned to remove the cable sections or cable protection system from the substructures prior to recovery of the structure. Therefore, the short section of cable contained within the OSP J-Tube will be removed in conjunction with removal of the jacket after being cut at the bell mouth entry.

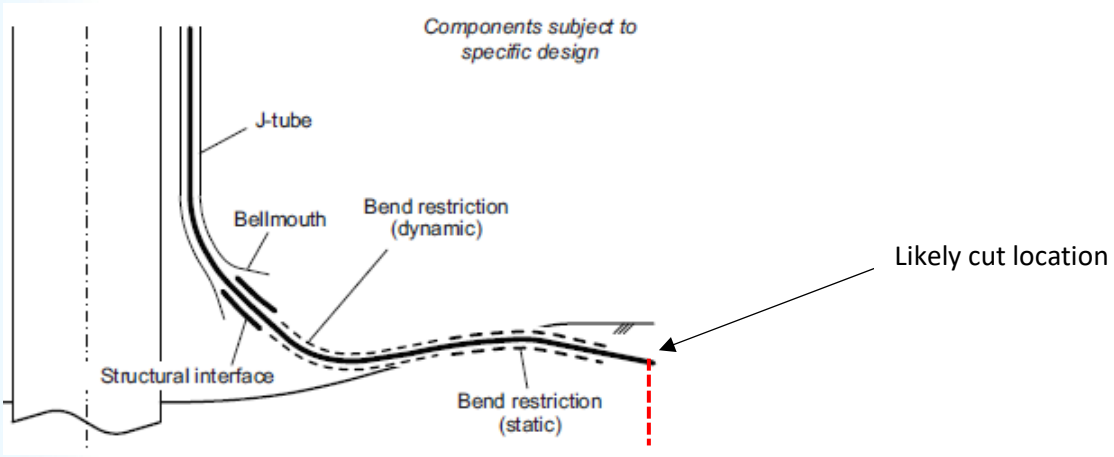

Figure 4-2: Typical cable connection and interface with foundation

The decommissioning of the cables is likely to form part of the foundation / substructure jacket removal process and could proceed as follows:

Stage 1:

- A jack-up barge or heavy lift vessel is mobilised to the site.
- ROV to inspect each of the cable connections into the J-tubes bellmouths.
- Identify exposed cable protection system sections on the seabed surface for cutting.
- Complete cutting or shearing operation of the cable / cable protection sections.
- Recovery of cable protection sections and cable ends fixed to the foundation as part of the main foundation recovery lift.
- Removal and re-cycle of the cables from the foundation J-tubes are part of the overall foundation re-use strategy.

4.3.5.5 Summary

The removal techniques proposed above have been executed on similar projects for similar reasons and are, therefore, considered credible methods of decommissioning for the Inter-Array, Interconnector and AC export cables. It would be envisaged that an as-left survey or similar would be conducted to demonstrate the as-left seabed status.

Table 4-7 below provides a general assessment of the subsea cable decommissioning options against the guiding principles outlined in Table 4-1.

Table 4-7: Assessment of proposed inter-array, OSP interconnector and export cable decommissioning process against guiding principles

Guiding Principle	Comments
No harm to people	Risk to personnel not considered excessive.
Consider the rights and needs of legitimate users of the sea	Removal affords maximum flexibility over use of the seabed.
Minimise environmental impact	It is recognised that the considerable length of cable and the need for jetting techniques, removal would cause disruption to the seabed and benthic habitats. However, impacts will be comparable to those reported in the Moray East ES 2012 and Modified OfTI ES 2014. As no infrastructure will be left in situ permanently, there will be no lasting impact on the environment.
Promote sustainable development	Disturbance of the seabed in the short-medium term, although complete removal would allow flexibility over use of seabed in the longer term.
Adhere to the Polluter Pays Principle	Consistent, assuming suitable disposal option is found for surplus cable components.
Maximise re-use of materials	Maximum material, e.g. aluminium, potentially available for re-use.
Ensure commercial viability	Cost of removal high when compared to the burial of cable ends after cutting and leaving in situ.
Ensure practical integrity	Removal is possible via exposure and recovery.

4.3.6 Scour Protection

Where cable or scour protection is required during the construction or operational phase of the Development, a determination of the decommissioning procedure will be presented in the final approved DP. For the purposes of this DP and in recognition of BEIS Guidance (BEIS, 2019) and IMO standards, any protection installed around foundations or protecting cables will be left in situ to preserve the marine habitat that will have established over the life of the Wind Farm. IMO standards state that a structure may be left in situ if:

- *it can be left without causing unjustifiable interference with other uses of the sea; and*
- *the entire removal is not technically feasible or would involve extreme cost, or an unacceptable risk to personnel or the marine environment.*

Leaving the scour protection in situ will not cause interference with the safety of navigation and other users of the sea. In addition, leaving the scour protection will also not have a detrimental impact on the environment and its conservation aims. The section below discusses the environmental benefits of leaving the scour protection in situ.

4.3.6.1 Environmental Considerations

As the Development area consists of Holocene gravelly sand and sand (Section 2.2.1.5), the introduction of artificial structures in such areas increases habitat availability resulting in locally altered biodiversity (Birchenough and Degraer, 2020; Coolen et al, 2020). Scour protection can resemble protected rocky reef habitats forming complex habitats that allow a diverse range of typically hard substrate epibenthic species to find shelter in crevices and/or colonise on the differently orientated and sized surfaces in areas that were previously hostile (Fowler et al, 2020; Birchenough and Degraer, 2020; Coolen et al., 2018; De Mesel et al., 2013).

Once colonised with initial sessile suspension feeders, their presence attracts various mobile species such as crustaceans and non-migratory reef fish. In turn, species of higher trophic levels and protected status are drawn to the area with fish, seabirds pinnipeds and cetaceans being observed in higher densities than those in the open sea (Birchenough and Degraer, 2020; van der Molen et al., 2018). Strong residency has also been observed in gadoid species to such artificial reefs (Reubens et al, 2014; Fowler et al., 2020). Despite their mobility, they remain within the vicinity of the artificial reefs for extended periods, suggesting that there is abundant food available and likely to benefit from this (Fowler et al., 2020). There is also evidence that such structures may function as spawning sites for associated fish and invertebrates as opposed to simply acting as sites of attraction attributing to indirect evidence of productivity (Fowler et al., 2020; Todd et al, 2018).

These ecosystems/habitats act as "stepping stones" not only to pelagic larval dispersal settling in areas that would have previously been out of reach, but also provide refuge and opportunities to feed for mobile species (Wright et al., 2020), particularly where structures are placed near the border or distribution limits of species (Fowler et al., 2020). Allowing native and non-native species (including rare species) from natural rocky reef habitats that have historically been unconnected, e.g. coastal habitats and offshore marine protected areas (MPAs), to migrate to between each other (Coolen et al., 2020; Fowler et al., 2020; Birchenough and Degraer, 2020).

4.3.6.2 Summary

The environmental considerations suggest that leaving the scour protection in situ is preferable to removal as removal may constitute an "unacceptable risk to the environment". The final Decommissioning Programme will carry out a study of the marine ecology environment at the time of decommissioning as well as reviewing the type of cable protection installed, for example, concrete kennels, rock placement or rock/concrete bags, and the available technology at the time and will update the proposed decommissioning procedures accordingly based on best industry practice and applicable guidance at that time. Any options would be subject to assessment as undertaken for the other wind farm components.

4.3.7 Summary of Proposed Decommissioning Measures

Sections 4.3.2 to 4.3.6 above provides an overview of the proposed decommissioning measures for the Development. As highlighted, complete removal of WTGs, OSP topsides, jacket substructures, and cables (inter-array, OSP interconnector and AC export cables) is proposed (with some exceptions to the AC export cables as previously detailed). The foundation piles are proposed to be cut-off at or below seabed and scour protection is proposed to be left in situ.

This approach is in line with the current BEIS Guidelines (2019). As highlighted in Section 4.2 above, Section 7.2 of the Guidance states that there are several reasons why assets may be left '*in-situ*'. The following considerations are considered:

"removal would create unacceptable risks to personnel or to the marine environment, be technically unfeasible or involve extreme costs."

Costs

With regards to the guidance above, Moray East have consulted with the supply chain and have undertaken a review of the recently published report on "*Cost Estimation and Liabilities in Decommissioning Offshore Wind Installations*" commissioned by the BEIS (Arup, 2018). The report states that "*if a complete removal of monopiles or jacket foundation piles was required this would mean significant excavation around the foundation, or the development of new removal techniques...*" and that "*these options are considered technologically and economically challenging…" and there is a high degree of uncertainty as how complete foundation removal could be achieved in practice*".

A detailed description of the decommissioning costs for the Moray East OWF and associated OfTI is provided within Appendix 2, including an estimate of costs for full cable removal (noting that full

decommissioning of inter-array, interconnector and export cable is being proposed). No costs are provided for full pile removal given the significant technical challenges noted in Section 4.3.3 and, therefore, the difficulty in providing a reasonable cost estimative for their removal.

4.4 Waste Management and Residual Value of Recovered Materials

Moray East is committed to maximising the re-use of waste materials and will give full regard to the 'waste hierarchy' which suggests that re-use should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal. In any event, waste management will be carried out in accordance with all relevant legislation at the time of decommissioning. It is intended that the majority of Wind Farm components will be taken back to land for re-use and recycling and any necessary disposal taking place at licensed facilities.

The proposed approach to dispose of the main components of the Wind Farm is set out in Table 4-8 below but is subject to evolution of technology, change in regulations and demand for materials over the lifetime of the Development.

Table 4-8: Proposed Disposal for Main Wind Farm Components

Waster Material	Pre-Treatment	Re-use / Recycle / Disposal
WTG support structures (jacket substructures and pin piled foundations)	Establish available design life.	Re-use by repowering with new/superior WTGs or other renewable generation technology or dismantle and recycle the recovered material as much as possible.
Steel from WTG tower and nacelle removed to shore	Break down into transportable size.	Recycle.
Aluminium from any recovered sections of power cables	Strip cable from power cables	Recycle.
Glass-fibre Reinforced Epoxy (GRE) from WTG blades	Break down into transportable size.	Disposal or recycle where facilities exist.
Used lubricants from WTG	Filter.	Recycle.
Non-recyclable materials and fluids	None.	Incineration with energy recovery or disposal via landfill.

The final details of the DP will be confirmed prior to decommissioning to accommodate changes in legislation, guidance and technology. As part of this process, appropriate waste management regulations and guidelines will be reviewed. A Waste Management Plan (WMP) will be prepared in advance of the commencement of decommissioning to ensure that adequate time is allowed for the necessary provisions to be made with regards to waste management.

4.5 Lighting and Marking

In accordance with the requirements of Section 36 Consents and Marine Licences, the appropriate marks and lights shall be exhibited during the decommissioning of the Development.

In relation to aviation safety, the shape, colour and character of the lighting will be compliant with the Air Navigation Order 2009 (or then current regulation, or as otherwise directed by the Civil Aviation Authority).

In relation to navigational safety, lights and markings will be discussed with the Northern Lighthouse Board (NLB), in consultation with the Maritime and Coastguard Agency (MCA). In particular, the NLB will be consulted prior to decommissioning to specify any obstruction marking that may be required during the removal operations.

If any obstruction is left on site temporarily, that may be considered to present a hazard to navigation the necessary marking specified by NLB will be displayed.

4.6 Potential for Phasing and Integration

It is possible that there may be synergies and interactions between decommissioning activities at the Moray East site. Moray East will promote formal industry collaboration on this issue and, as a minimum, will approach the developers of the Beatrice OWF to consider potential opportunities as part of the ongoing review process for the Moray East OWF DP. However, Moray East's starting assumption is that decommissioning will be undertaken in isolation at the Moray East site in order that the provisions can be fully costed, and sufficient financial security provided.

The status and requirements of surrounding projects will be carefully considered in the planning and execution of the decommissioning process. Any sharing of decommissioning activities would influence the phasing of the works.

4.7 Other Potential Uses for the Infrastructure

Moray East have considered alternative options for the decommissioning of the Development. A summary of the options is set out below. When making a final decision on the approach to decommissioning towards the end of the lifetime of the Development, Moray East will consider BPEO, commercial viability and HSSE risks.

4.7.1.1 Decommissioning and construction of a new wind farm

In this scenario it is assumed that wind energy is still economically attractive after the 25 year design life but the technical integrity of the Wind Farm is declining. If this were the case, installing new and better technology may be more profitable than increasing the Operation and Maintenance (O&M) effort for a few extra years of running time on the existing wind farm. Under such a scenario, the existing Wind Farm would be decommissioned (following the processes set out under Section 4.3 above) and a new wind farm erected (with all appropriate consents having been obtained beforehand).

4.7.1.2 Re-powering

In this scenario it is assumed that wind energy is still economically attractive after the 25 year design life and the technical integrity of the wind turbines is declining, but the electrical infrastructure and possibly the support structures remain sound. If electrical infrastructure is installed properly its lifetime could be up to 50 years, whilst experience from the oil and gas industry indicates that the lifetime of foundations can also be extended outside the design specifications.

By closely monitoring the structural integrity of the asset, it could be possible to re-use these parts of the system in a re-powering of the Wind Farm – that is fitting new wind turbines to the existing foundation and electrical systems. New Section 36 Consents would need to be sought in case of any re-powering.

4.7.1.3 Step-down

This scenario assumes that the wind turbines will continue to perform sufficiently beyond the design lifetime of 25 years and the useable lifetime of the assets can be productively extended as is the case in other industries such as oil and gas. Under this scenario, the wind farm would be decommissioned through a controlled step-down. In this case wind turbines would be gradually shut down as their technical integrity declines. A decommissioning campaign would most likely be undertaken when the complete

Wind Farm was shut down but could also be done stepwise if this was found to be more cost effective or if the prevailing regulatory regime required this approach. This approach would require a variation of the Section 36 Consents.

5 Environmental Impact Assessment

In support of the consent applications Moray East prepared an EIA for the Development as reported in the ES dated August 2012 and the Modified TI ES dated September 2014.

In complying with the requirements of the EIA Directive, a lifecycle approach was taken in assessing the impacts of the Development and in seeking to mitigate and minimise the effect of the works. In all instances a 'worst case' Design Envelope approach was taken to the assessment. The assessment of the impacts included the process of decommissioning so far as it could be predicted at the time.

The information relating to decommissioning within the ES will be reviewed when the final details of the DP are confirmed, and decisions made later if further assessments are required, prior to decommissioning activities taking place. Current BEIS Guidance (2019) states that "*For major infrastructure projects towards the end of their operational life, new surveys and assessments would be expected to inform the process of approving the final version of the approved decommissioning programme and the developer/owner conducting the decommissioning activity*." Subject to the results of this review, and taking account of any changes in legislation, changes in the proposed decommissioning methods or changes in the condition of the baseline environment (beyond those predicted in the ES), the need for undertaking a new EIA prior to decommissioning will be decided at the time.

The consideration of several items of key information will be required to inform the decision as to whether a new or updated EIA is required:

- The baseline condition of the environment just prior to decommissioning activities taking place, to be informed by the findings of the environmental monitoring and asset/engineering monitoring previously completed;
- A review of any relevant new or updated legislation, policy or guidance;
- A review of other marine users (fishing, navigation, etc.) with potential to be affected by decommissioning of the Development;
- Amenities, activities and future uses of the environment;
- Historic environment interests; and
- Seascape and landscape interests.

If required, then the decommissioning EIA would fill any information gaps in relation to these issues and would also describe the measures envisaged to avoid, reduce and, if possible, remedy any likely significant adverse impacts arising from the decommissioning process.

6 Consultation with Interested Parties

Moray East regards effective and open communication and consultation with all stakeholders as essential elements to the successful development of the Moray East Offshore Wind Farm and TI. These principles have been adopted during the development of the Wind Farm and TI and will be continued throughout the ongoing construction phase and during the life of the Development, including the decommissioning phase.

Section 105(7) of the Energy Act 2004 provides that a notice given under Section 105 may require the recipient of the notice to carry out consultation specified in the notice before submitting a decommissioning programme. The Section 105 notice issued to Moray East by DECC sets out those organisations which would have had to be consulted on the first draft DP. This document has been updated to take into account feedback received following consultation on the first version of the document (version 1) and to reflect the most updated guidance on decommissioning of offshore renewable energy installations under the Energy Act 2004 (BEIS, 2019) and will be subjected to a further round of consultation. Moray East also commits to undertaking reviews of the DP, consultation with stakeholders and producing an updated DP in cooperation with interested parties as relevant, at agreed times throughout the lifetime of the Development scheduled in accordance with the current BEIS guidance and future updates of this guidance (including any new guidance published by the Scottish Government). In addition, at least two years prior to decommissioning, a further round of consultation will be carried out prior to producing the final DP.

In addition, and in line with the requirements of the Section 105 notice, Moray East made the DP available by publishing the consultation draft (Version 1) on the Moray East website. This and all further revisions of the DP will be published on the Moray East website. https://www.morayeast.com/document-library.

At the time of decommissioning, Moray East will issue timely and efficient Notices to Mariners (NtMs) and other navigational warnings of the position and nature of the decommissioning activities taking place. Efforts will be made to ensure that this information reaches mariners in the shipping and fishing industry as well as recreational mariners. The UKHO will be notified as appropriate on the progress and completion of the works.

7 Costs

The decommissioning cost information required by BEIS Guidance (BEIS, 2019) has been provided in confidence in Appendix 2.

8 Financial Security

All required financial security information has been provided in confidence in Appendix 2.

9 Schedule

A full decommissioning schedule will be provided closer to the time of decommissioning. The schedule will set out a detailed plan and programme of the proposed decommissioning works for consultation with the relevant authorities and for approval by the Scottish Ministers.

Currently, it is proposed that full decommissioning of the Development will commence 25 years after Final Commissioning of the Development, to coincide with the end of the design life of the WTGs and the consented period.

It is envisaged that offshore decommissioning and onshore dismantling of the decommissioned infrastructure will run in parallel. The duration of the overall decommissioning phase is anticipated to take approximately 12 months to complete; although, the final proposed durations and programme of the decommissioning works will be provided in the final DP prior to the start of decommissioning.

10 Project Management and Verification

Moray East intends to undertake internal reviews of the DP throughout the lifetime of the Development. Reviews will be scheduled in accordance with the current BEIS (2019) guidance and future updates of this guidance (including any new guidance published by the Scottish Government) as relevant. The current BEIS (2019) guidance stipulates reviews should be held with the following frequency as a minimum:

- Post-construction report to be sent within one year of completion of construction;
- A comprehensive review 12 – 18 months before the first security provision is due; and
- From payment of the first security onward the DP should be reviewed annually.

Once the Development is nearing the end of its agreed 25 year consent period, Moray East will initiate a final review of the DP and finalise the detail of the decommissioning provisions. This will include project management arrangements, the schedule, costs and the verification processes to ensure decommissioning is completed. It is anticipated that the development of the final DP will occur in approximately Year 23 after final commissioning of the Development.

Following completion of the decommissioning works, it is anticipated that a Decommissioning Report will be submitted to Scottish Ministers. In accordance with the current BEIS Guidance (BEIS, 2019) the decommissioning report will include:

- Evidence that all infrastructure that was due to be removed according to the DP, has been removed;
- An independent verification that decommissioning took place in accordance with the approved DP and a statement of any variations with justification;
- If required, side-scan sonar surveys to enable identification and subsequent recovery of any debris located on the sea-bed which may have arisen from the activities and which pose a risk to navigation, other users of the sea or the marine environment.
- A compliance statement setting out how relevant regulations have been complied with, and any instances of non-compliance
- A cost breakdown to that reflects the actual cost of decommissioning compared to the predicted cost; and
- For infrastructure left in situ, evidence that it has been cut off, buried, or otherwise made safe and treated in accordance with the DP.

Once the report has been submitted to and approved by Scottish Ministers, Moray East will endeavour to make it publicly available (redacted of any financial details).

11 Site Remediation and Seabed Clearance

In line with the details provided above, Moray East is committed to covering the costs required to decommission the Development and restoring the site, as far as is reasonably practicable, to the condition that it was in prior to construction of the Development. Further details on how the site will be restored will be provided in the updated DP towards the end of the Development's life.

Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

- Ensuring that foundations are cut below the natural level of the seabed (WTGs and OSPs) at such a depth so that the remaining parts do not pose a danger for shipping and navigation or fishing vessels;
- and are made safe and adequately covered; and
- Ensuring that cable ends and sections left in situ, if any or temporarily, are adequately buried, or otherwise protected.

Where necessary, upon completion of the decommissioning works, a survey will be undertaken to ensure that all debris related to the decommissioning works has been removed. The survey will enable identification and recovery of any debris located on the seabed which may have arisen from activities related to the decommissioning process and which may pose a risk to navigation. The process of collecting and presenting evidence that the site is cleared is required by the BEIS Guidance (BEIS, 2019) to be independent of Moray East. Moray East, therefore, proposes that an independent survey company will be commissioned to complete the surveys and that they report in parallel to both Moray East and MS-LOT.

The required survey area would be determined during the decommissioning phase of the Development, taking into account good practice at the time and the views of stakeholders. It is anticipated that the survey area would focus around the renewable energy installations, i.e. the jacket substructure locations, and cable locations.. Moray East is aware of the current 500 m survey radius around any oil and gas installation as set out in best practice guidance for post-decommissioning surveys. However, due to the smaller footprint of the Moray East Offshore Wind Farm installations, Moray East proposes a smaller radius could be used, for example, 100 m (based on the area within which decommissioning of each structure would occur and within which the main vessel would operate).

Analysis of any survey data gathered will also ensure that items for removal and disposal relate only to the Development. Consultation with relevant stakeholders will be conducted by Scottish Ministers in the event that other anomalies of archaeological interest are identified during seabed clearance.

12 Post-decommissioning Monitoring, Maintenance and Management of the Site

Given that Moray East is not proposing to fully remove all of the Development infrastructure, some post-decommissioning activities may be required to identify and mitigate any unexpected risks to navigation or other users of the sea. This could be, for example, as a result of foundations becoming exposed through natural sediment movement. The requirement for monitoring and the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to marine users.

Where considered necessary, post-decommissioning monitoring surveys of the seabed will be carried out following the completion of the decommissioning works.

Surveys are expected to comprise of geophysical survey techniques (such as swath bathymetry, sidescan sonar and magnetometer) and environmental surveys (such as drop down video and benthic core sampling to determine what is currently living there). Surveys will be undertaken in line with the final DP. The results of these surveys will be issued to Scottish Ministers.

If an obstruction appears above the seabed following decommissioning which is attributable to the Development, it will be marked so as not to present a hazard to other sea users. The navigational marking will remain in place until such time as the obstruction is removed or no longer considered a hazard. The monitoring of the obstruction will be built into any monitoring and maintenance programme.

Details of the post-decommissioning monitoring, maintenance and management will be discussed with Scottish Ministers and stakeholders closer to the point of decommissioning and will consider relevant guidelines and industry standard good practice at the time.

13 Supporting Studies

A summary of the surveys and studies and results of the EIA for the Development are presented in the Moray East Environmental Statement (MORL, 2012). Full technical details of the surveys are presented in the MORL Environmental Statement Volume 8 – Technical Reports (MORL, 2012). A further Environmental Statement detailing EIA results for the TI was published in 2014.

Electronic copies of these documents are available from:

- https://www.morayeast.com/document-library

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Appendix 1 Nature Conservation Designations

Table A – Designated Sites Considered in the Moray East EIA

Site	Status	Main Conservation Interest
East Caithness Cliffs	SPA, SSSI	The sea cliffs the comprise East Caithness Cliffs SPA regularly support populations of European importance of a variety of seabird species. Notified interest features: Fulmar, shag, cormorant, peregrine, kittiwake, herring gull, great black-backed gull, guillemot, razorbill, puffin, seabird assemblage.
North Caithness Cliffs	SPA, SSSI	North Caithness Cliffs SPA is of special nature conservation importance for supporting large populations of breeding seabirds. Dunnet Head is an RSPB reserve. Notified interest features: razorbill, peregrine, puffin, fulmar, kittiwake, guillemot, seabird assemblage.
Troup, Pennan and Lion's Heads	SPA	The Troup, Pennan and Lion's Heads Special Protection Area is a 9 km stretch of sea cliffs along the Aberdeenshire coast. The cliffs support large colonies of breeding seabirds. Troup Head is an RSPB reserve. Notified interest features: razorbill, fulmar, herring gull, kittiwake, guillemot, seabird assemblage.
Pentland Firth Islands	SPA, SSSI	The Pentland Firth Islands are located between the Orkney Islands and the mainland coast of north-east Scotland. Notified interest features: Arctic tern.
Hoy	SPA, SSSI	Hoy SPA is of special nature conservation importance for supporting large populations of breeding seabirds. Notified interest features: great skua, peregrine, puffin, fulmar, red-throated diver, great black-backed gull, kittiwake, Arctic skua, guillemot, seabird assemblage.
Copinsay	SPA, SSSI	Copinsay SPA regularly supports in excess of 20,000 breeding seabirds. Notified interest features: fulmar, great black-backed gull, kittiwake, guillemot, seabird assemblage.
Loch of Strathbeg	SPA, SSSI, Ramsar	Loch of Strathbeg SPA is a site of International importance comprising a shallow freshwater loch with surrounding wetland, dune and grassland communities. It provides wintering habitat for a number of important wetland bird species, particularly wildfowl. SPA Notified interest feature: Eurasian teal, greylag goose, pink-footed goose, whooper swan, sandwich tern, barnacle goose, waterfowl assemblage. SSSI notified interest features: breeding bird assemblage, eutrophic loch, fen meadow, open water transition fen, wintering pink-footed goose, whooper swan, greylag goose, goldeneye, goosander, mute swan, pochard, tufted duck and wigeon.
Auskerry	SPA, SSSI	Auskerry is a small, uninhabited low-lying island situated 5 km south of Stronsay in the Orkney Islands of northern Scotland. Notified interest features: Arctic tern, storm petrel.
Calf of Eday	SPA, SSSI	Calf of Eday SPA supports large colonies of breeding seabirds. Notified interest features: fulmar, great black-backed gull, cormorant, kittiwake, guillemot, seabird assemblage.

Site	Status	Main Conservation Interest
Rousay	SPA, SSSI	Rousay SPA consists of areas of maritime heath and grassland, and seacliffs. Notified interest features: fulmar, kittiwake, Arctic tern, Arctic skua, guillemot, seabird assemblage.
West Westray	SPA, SSSI	West Westray SPA is an 8 km stretch of sea cliffs, together with adjacent grassland and heathland, along the west coast of the island of Westray in Orkney. The cliffs support large colonies of breeding auks and kittiwakes while the grassland and heathland areas support breeding colonies of skuas and terns. Notified interest features: razorbill, fulmar, kittiwake, Arctic skua, Arctic tern, guillemot, seabird assemblage.
Papa Westray	SPA, SSSI	Papa Westray is a small island lying close to Westray in the northern Orkney islands in Scotland. Notified interest features: Arctic tern, Arctic skua. The SSSI and RSPB reserve in North Hill.
Sule Skerry and Sule Stack	SPA, SSSI	The SPA comprises two uninhabited islands and supports European important populations of seabirds. Notified interest features: gannet, guillemot, Leach's petrel, puffin, shag, storm petrel, seabird assemblage.
Fair Isle	SPA, SSSI	Fair Isle SPA supports internationally important populations of breeding seabirds on its cliffs and maritime heath and grassland. Notified interest features: gannet, Arctic skua, Arctic tern, Fair Isle wren, fulmar, great skua, guillemot, kittiwake, puffin, razorbill, shag, seabird assemblage.
North Rona and Sula Sgeir	SPA, SSSI	The uninhabited islands of North Rona and Sula Sgeir, together with several outlying rocky islets and adjacent waters, lie 65 km north of Lewis. The coastlines of both islands consist mainly of cliffs except for two low-lying peninsulas on North Rona. Notified interest features: gannet, fulmar, great black-backed gull, guillemot, kittiwake, Leach's petrel, puffin, razorbill, storm petrel, seabird assemblage.
Sumburgh Head	SPA, SSSI	Sumburgh Head is located at the most southern tip of the Shetland mainland in northern Scotland. Notified interest feature: Arctic tern
Mousa	SPA, SSSI	Mousa is a small island located off the east coast of the south part of the Shetland mainland in northern Scotland. Notified interest feature: Arctic tern
Noss	SPA, SSSI	Noss SPA is an offshore island lying 5 km east of Lerwick, Shetland. It supports breeding seabirds on cliffs and also on inland heathlands and grasslands. Notified interest features: gannet, fulmar, great skua, guillemot, kittiwake, puffin, seabird assemblage.
Foula	SPA, SSSI	Foula is the most westerly of the Shetland Islands, which are situated to the north of the Scottish mainland and Orkney. Notified interest feature: Arctic tern
Papa Stour	SPA, SSSI	Papa Stour lies on the west coast of mainland Shetland in northern Scotland. Notified interest feature: Arctic tern
Fetlar	SPA, SSSI	Fetlar is one of the northernmost of the Shetland Islands in northern Scotland. Notified interest feature: Arctic tern

Site	Status	Main Conservation Interest
Forth Islands	SPA, SSSI	Forth Islands SPA consists of a series of islands supporting the main seabird colonies in the Firth of Forth. The islands of Inchmickery, Isle of May, Fidra, The Lamb, Craigleith and Bass Rock were classified on 25 April 1990. The extension to the site, classified on the 13th February 2004 consists of the island of Long Craig, which supports the largest colony of roseate tern in Scotland. It is the most northerly of only six regular British colonies. Notified interest features: gannet, Arctic tern, common tern, cormorant, fulmar, guillemot, herring gull, kittiwake, lesser black-backed gull, puffin, razor bill, roseate tern, Sandwich tern, shag, seabird assemblage.
Hermaness, Saxa Vord and Valla Field	SPA, SSSI	Hermaness, Saxa Vord and Valla Field Special Protection Area lies in the north-west corner of the island of Unst, Shetland, at the northernmost tip of Britain. It consists of 100-200 m high sea cliffs and adjoining areas of grassland, heath and blanket bog. Notified interest features: gannet, fulmar, great skua, guillemot, kittiwake, puffin, red-throated diver, shag, seabird assemblage.
Rum	SPA, SSSI	Rum SPA includes the Inner Hebridean Island of Rum, which has a largely rocky coast with cliffs rising to 210 m, and adjacent coastal waters. Notified interest features: Manx shearwater, golden eagle, guillemot, kittiwake, red-throated diver, seabird assemblage.
Moray Firth	SAC	Notified interest features: Subtidal sandbanks, Bottlenose dolphin.
Dornoch Firth and Morrich More	SAC	Notified interest features: reefs, subtidal sandbanks, glasswort and other annuals colonising mud and sand, Atlantic salt meadows, estuaries, intertidal mudflats and sandflats, otter, common seal, coastal dune heathland, dunes with juniper thickets, lime-deficient dune heathland with crowberry, shifting dunes, dune grassland, humid dune slacks, shifting dunes with marram grass.
Berriedale and Langwell Waters	SAC	Notified interest features: Atlantic salmon.
River Oykel	SAC	Notified interest features: Atlantic salmon, freshwater pearl mussel.
River Thurso	SAC	Notified interest features: Atlantic salmon.
River Evelix	SAC	Notified interest features: Freshwater pearl mussel.
River Moriston	SAC	Notified interest features: Atlantic salmon, freshwater pearl mussel.
River Spey	SAC	Notified interest features: sea lamprey, Atlantic salmon, otter, freshwater pearl mussel.
Rosehearty to Fraserburgh Coast	SSSI	Notified interest features: turnstone, purple sandpiper, curlew, eider.
Rora Moss	SSSI	Notified interest feature: raised bog.
Buchan Ness to Collieston	SPA	Notified interest features: fulmar, guillemot, herring gull, kittiwake, shag, seabird assemblage.
Buchan Ness to Colliestron	SAC	Notified interest feature: vegetated sea cliffs.
Bullers of Buchan Coast	SSSI	Notified interest features: breeding seabird colony, guillemot, kittiwake, shag, coastal geomorphology of Scotland, maritime cliff.
Collieston to Whinnyfold Coast	SSSI	Notified interest features: breeding seabird colony, fulmar, guillemot, kittiwake, razorbill, sea wormwood.

Appendix 2 Moray East Offshore Wind Farm Financial Security Information (Confidential)

MORAY EAST
OFFSHORE WINDFARM

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