MORAY EAST
OFFSHORE WINDFARM

Construction Programme & Construction Method Statement Document

Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure

April 2019

Moray Offshore Windfarm (East) Limited

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List of Abbreviations

AC	Alternating Current
AHT	Anchor Handling Tug
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CaP	Cable Plan
CDM	Construction (Design and Management) Regulations
CMS	Construction Method Statement
CSV	Construction Supply Vessel
DGPS	Differential Global Positioning System
DP	Dynamic Positioning
DS	Design Statement
DSLP	Development Specification and Layout Plan
EMP	Environmental Management Plan
ES	Environmental Statement
FID	Final Investment Decision
FLO	Fisheries Liaison Officer
HAZID	Hazard Identification
HiPaP	High Precision Acoustic Positioning
HLV	Heavy Lift Vessel
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
JNCC	Joint Nature Conservation Committee
JUP	Self-propelled Jack-up Construction Vessel
LMP	Lighting and Marking Plan
MCA	Maritime and Coastguard Agency
Moray East	Moray Offshore Windfarm (East) Limited
MORL	Moray Offshore Renewables Limited
MPCP	Marine Pollution Control Plan
NLB	National Lighthouse Board
NtA	Notice to Airmen
NtM	Notices to Mariners
NSP	Navigational Safety Plan
OfTI	Offshore Transmission Infrastructure
OSP	Offshore Substation Platform
OSV	Offshore Supply Vessel

PLGR	Pre-lay Grapnel Run
PS	Piling Strategy
PSV	Platform Supply Vessel
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
SCADA	Supervisory Control and Data Acquisition
SEPA	Scottish Environment Protection Agency
HSE	Health, Safety and Environmental
SNH	Scottish Natural Heritage
TI	Transmission Infrastructure
t	Tonne
TJB	Transition Joint Bay
UXO	Unexploded Ordnance
VMP	Vessel 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 Modified Transmission Infrastructure ES in 2014.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited and hereinafter referred to as Moray East)** – the legal entity submitting this Construction Programme (CoP) and Construction Method Statement (CMS) document;
- **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;
- **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 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 and a further Marine Licence for two additional distributed OSPs was granted in September 2017.The onshore TI was awarded Planning Permission in Principle in September 2014 by Aberdeenshire Council and a Planning Permission in Principle under Section 42 in June 2015;
- **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;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);
- **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) – 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) – 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) – 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: 04629/18/1 – consent 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: 04627/18/1 – consent 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: 04628/18/2 - consent 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.

- **OfTI Licences** – are comprised of the following:
  - Marine Licence for the Offshore Transmission infrastructure – Licence Number 05340/14/0 – consent 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 – Licence Number 06347/17/1 – consent 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 Construction Programme (CoP) and Construction Method Statement (CMS) document has been prepared to address the specific requirements of the relevant conditions attached to Section 36 Consent and Marine Licences issued to Moray East.

The overall aim of the CoP section of this document is to set out the intended construction programme for the Development (Moray East Offshore Wind Farm and OfTI). This section of the document covers the following information:

- The proposed dates for commencement of construction;
- The proposed details of mobilisation of plant and delivery of materials;
- The proposed dates, durations and sequencing of construction work for all key elements of the Development (highlighting contingency planning for poor weather or other delays); and
- The scheduled date for final commissioning of the Development

The overall aim of the CMS section of this document is to set out construction procedures and good working practices in relation to the installation of the Development assets. The CMS covers, in line with the requirements of Section 36 Consents and Marine Licence conditions, and in line with industry standards and good practice, the following:

- Construction procedures in relation to foundations and substructures, wind turbine generators (WTGs), offshore substation platforms (OSPs) and inter-array, OSP interconnector and export cables;
- Good working practices to be employed during construction;
- Identification of key contractors and vessels involved in construction;
- The roles and responsibilities of key project personnel and contractors during construction with respect to environmental management; and

The CMS confirms that the construction procedures to be employed align with those considered in the wind farm and OfTI Applications, and that construction-related mitigation measures detailed in the Applications will be applied during installation.

This CoP and CMS document is intended to be referred by personnel involved in the construction of the Development, including Moray East personnel, key contractors and subcontractors. All method statements and work plans produced in relation to the Development by Moray East and its contractors must comply with this CoP and CMS document.

1 Introduction

1.1 Background

Section 36 Consents were granted in March 2014 for the construction and operation of three offshore wind farms (Telford, Stevenson and MacColl) within the Moray East site. Marine Licences for the three offshore wind farms were granted in September 2014 (together the Section 36 Consents and Marine Licences for the Wind Farm are referred as the Moray East Offshore Wind Farm Consents). The Moray East Offshore Wind Farm Consents were varied in March 2018 and assigned to Moray East Offshore Wind Farm (East) Limited (Moray East) in June 2018.

A Marine Licence for the associated Offshore Transmission Infrastructure (OfTI) was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017 (together these are referred to as the OfTI Licences).)

Moray East is a joint venture partnership between EDP Renewables, Engie, Diamond Generating and China Three Gorges which has been established to develop, finance, construct, operate, maintain and decommission the Moray East Offshore Wind Farm.

1.2 Objectives of this Document

The Moray East Offshore Wind Farm Consents and OfTI Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of offshore construction. Two such requirements are the approval of a Construction Programme (CoP) and a Construction Method Statement (CMS). This document has been prepared to satisfy the requirements of the Section 36 Consents and OfTI Licences. The CoP and CMS conditions and it is referred to as 'CoP and CMS document'.

The relevant conditions setting out the requirement for a CoP for approval are set out in full in Table 1-1.

The relevant conditions setting out the requirement for a CMS for approval are set out in full in Table 1-2.

Table 1-1: CoP consent conditions to be discharged by this plan

Consent Document	Condition Reference	Condition Text	Reference in this CoP & CMS document
Section 36	9	The Company must, no later than 6 months prior to the Commencement of the Development, submit a Construction Programme (CoP) in writing, to the Scottish Ministers for their written approval.	This document sets out the CoP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Scottish Ministers with the Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Chamber of Shipping (CoS), the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH), Scottish Fishermen's Federation (SFF) and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers
		The CoP must be in accordance with the ES.	Section 7
		The [Wind Farm] must, at all times, be constructed in accordance with the approved CoP (as updated and amended for time to time by the company)	Section 2
		Any updated or amendments made to the CoP by the company must be submitted, in writing, by the Company to the Scottish ministers for their written approval.	-

Consent Document	Condition Reference	Condition Text	Reference in this CoP & CMS document
		The CoP must set out: a) The proposed date for Commencement of [the Wind Farm];] b) The proposed timings for mobilisation of plant and delivery of materials, including details of onshore lay-down areas c) The propose timings and sequencing of construction work for all elements of the [Wind Farm] infrastructure; d) Contingency planning for poor weather or other unforeseen delays; and e) The scheduled date for Final Commissioning of the [Wind Farm].	Section 4
OfTI Marine Licence	3.2.2.3	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a CoP, in writing, to the Licensing Authority for their written approval.	This document sets out the CoP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with the MCA, NLB, CoS, JNCC, SNH, SFF and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Scottish Ministers
		The CoP must be in accordance with the Application	Section 7
		The CoP must set out: a) The proposed date for Commencement of the [OfTI]; b) The proposed timings for mobilisation of plant and delivery of materials, including details of onshore lay-down areas: c) The proposed timings and sequencing of construction work for all elements of the [OfTI] infrastructure; d) Contingency planning for poor weather or other unforeseen delays; and e) The scheduled date for Final Commissioning of the [OfTI].	Section 4
OSP Marine Licence	3.2.2.3	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a Construction Programme ("CoP"), in writing, to the Licensing Authority for their written approval.	This document sets out the CoP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with SNH, SEPA, MCA, NLB, THC and Aberdeenshire Council ("AC") and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Scottish Ministers
		The CoP must set out: a) a) The proposed date for Commencement of the Works; b) b) The proposed timings for mobilisation of plant and delivery of materials, including details of onshore lay-down areas; c) The proposed timings and sequencing of construction work for all elements of the Works infrastructure; d) Contingency planning for poor weather or other unforeseen delays; and e) The scheduled date for Final Commissioning of the Works.	Section 4

Table 1-2: CMS consent conditions to be discharged by this plan

Consent Document	Condition Reference	Condition Text	Reference in this CoP and CMS document
Section 36 Consents	10	The Company must, no later than 6 months prior to the Commencement of the Development submit a CMS, in writing, to the Scottish Ministers for their written approval.	This document sets out the CMS for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Scottish Ministers with the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Royal Society for the Protection of Birds (RSPB) Scotland, the Planning Authority and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers
		The CMS must set out the construction procedures and good working practices for installing the Development.	Section 5 and Section 6
		The CMS must be in accordance with the construction methods assessed in the ES and must include details of how the construction related mitigation steps proposed in the ES are to be delivered.	Section 7
		The Development must, at all times, be constructed in accordance with the approved CMS (as updated and amended from time to time by the Company).	Section 2
		Any updates or amendments made to the CMS by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	-
		The CMS must, so far as is reasonably practicable, be consistent with the Design Statement (DS), the Environmental Management Plan (EMP), the Vessel Management Plan (VMP), the Navigational Safety Plan (NSP), the Piling Strategy (PS), the Cable Plan (CaP) and the Lighting and Marking Plan (LMP).	Section 1.4 and cross-reference to other consent plans throughout this CoP and CMS document
OfTI Marine Licence	3.2.2.4	The Licensee must, no later than 6 months prior to the Commencement of the Works submit a CMS, in writing, to the Licensing Authority for their written approval.	This document sets out the CMS for approval by the Licensing Authority
		Such approval may only be granted following consultation by the Licensing Authority with the JNCC, SNH, SEPA, MCA, NLB, Aberdeenshire Council and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Licensing Authority
		The CMS must set out the construction procedures and good working practices for constructing the Works.	Section 5 and Section 6
		The CMS must be in accordance with the construction methods assessed in the Application and must include details of how the construction related mitigation steps proposed in the Application are to be delivered.	Section 7
		The CMS must, so far as is reasonably practicable, be consistent with the DS, the EMP, the VMP, the NSP, the PS, the CaP and the LMP.	Section 1.4 and cross-reference tos to other consent plans throughout this CoP and CMS document
OSP Marine Licence	3.2.2.4	The Licensee must, no later than 6 months prior to the Commencement of the Works submit a CMS, in writing, to the Licensing Authority for their written approval.	This document sets out the CMS for approval by the Scottish Ministers

Consent Document	Condition Reference	Condition Text	Reference in this CoP and CMS document
		Such approval may only be granted following consultation by the Licensing Authority with SNH, SEPA, MCA, NLB, Aberdeenshire Council and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Scottish Ministers
		The Works must, at all times, be constructed in accordance with the approved CMS.	Section 2
		Any updates or amendments made to the approved CMS must be submitted, in writing, to the Licensing Authority for their prior written approval.	-

1.3 CoP and CMS Document Structure

In response to the specific requirements of the Section 36 Consents and OfTI Licences conditions, this CoP and CMS document has been structured so as to be clear that each part of the specific requirements have been met and that the relevant information to allow the Scottish Ministers to approve the CoP and CMS has been provided. The document structure is set out in Table 1-3 below.

Table 1-3: CMS Document Structure

Section		Summary of Contents
1	Introduction	Provides background to consent requirements and overview of the CMS scope and structure; and Identifies those other consent plans relevant to the construction / installation process and provides a statement of consistency between the CMS and those plans.
2	Statements of Compliance	Sets out the Moray East statements of compliance in relation to the CMS consent conditions and the broader construction process.
3	Project Construction Overview	Provides an overview of the project, identifies key contractors and construction roles and responsibilities.
4	Construction Programme (CoP)	Provides an overview of the key milestone dates during construction of the wind farm and OfTI assets.
5	Construction Methods and Procedures	Provides further detail on each step of the installation process for the Development.
6	Good Working Practices	Sets out the good working practices that will be applied during the installation process for the Development.
7	Compliance with the Environmental Statement	Sets out confirmation that the details set out in this CoP and CMS document are in accordance with those assessed in the ES and Modified TI ES; and Sets out how the mitigation measures related to construction identified in the ES and Modified TI ES are to be delivered (by reference to this CoP and CMS document or other relevant consent plans).

1.4 Linkages with other Consent Plans

This CoP and CMS document sets out the proposed offshore construction methods for the Wind Farm and the OfTI. However, ultimately it will form part of a suite of approved documents that will provide the

framework for the construction process – namely the other consent plans required under the Section 36 Consents and OfTI Licences.

The other plans named in the relevant consents clearly have a link to the CoP and CMS document in so far as they either provide additional details on the construction methodology and / or provide details on the control of construction to mitigate or manage potential environmental impacts and impacts on other marine users.

Some of these documents will be submitted for approval by the Scottish Ministers subsequent to the approval of the CoP and CMS document. Consistency between these documents and the CoP and CMS document will be achieved by ensuring that the later documents are consistent with the terms of the already approved CoP and CMS document. Note that other relevant consent plans are cross-referenced as appropriate in this CoP and CMS document but the detail from those other plans is not repeated here.

The interaction of this CoP and CMS document with other consent plans, is detailed in Table 1-4 below.

Table 1-4: CoP and CMS consistency and links to other Consent Plans

Condition	Consent Plan	Consistency with and linkage to CoP and CMS document
Section 36: Condition 13; OfTI Marine Licence Condition: 3.2.2.7; & OSP Marine Licence: Condition 3.2.2.8	Design Statement (DS)	The DS includes representative Wind Farm visualisations from key viewpoints based upon the final Development Specification and Layout Plan (DSLP) and must be prepared and signed off by at least one qualified landscape architect; its purpose is to inform interested parties of the final Wind Farm scheme proposed to be built. This CoP and CMS document presents the construction methods, good practice and mitigation measures for the Development, which will be in line with that to be detailed in the DS.
Section 36: Condition 14; OfTI Licences: Condition 3.2.1.2	Environmental Management Plan (EMP)	The EMP sets out the environmental management framework for the construction and operation of the Wind Farm and OfTI. The installation and construction works described in this CoP and CMS document will be undertaken in line with the environmental management measures described in the EMP. In addition, specific good practice measures and mitigation measures are detailed within this CoP and CMS document (these being consistent with the measures described in the EMP, where relevant).
Section 36: Condition 15; OfTI Marine Licence Condition: 3.2.2.8; & OSP Marine Licence: Condition 3.2.2.9	Vessel Management Plan (VMP)	The purpose of the VMP is to outline measures and practice to mitigate disturbance or impact to marine mammals and birds throughout the construction period of the Development. The VMP will also consider operational management and coordination of vessels. The VMP details how vessel movements will be managed during construction of the Wind Farm and OfTI. This CoP and CMS document refers to the same indicative construction vessels which are included in the VMP. The VMP will be implemented in parallel with this CoP and CMS document and the measures described in the VMP will apply to the vessels undertaking the activities described in this CoP and CMS document. This CoP and CMS document will therefore be implemented in accordance with the approved VMP for the Development.

Condition	Consent Plan	Consistency with and linkage to CoP and CMS document
Section 36: Condition 17; OfTI Marine Licence Condition: 3.2.2.9; & OSP Marine Licence: Condition 3.2.2.10	Navigational Safety Plan (NSP)	The NSP sets out the navigational safety measures to be applied for the Development including matters related to marine co-ordination, safety zones, routing, anchorages and notifications and communications for other sea users. The NSP also sets out emergency response procedures. The NSP will apply to all vessels undertaking the activities described in this CoP and CMS document. This CoP and CMS document will therefore be implemented in accordance with the approved NSP for the Development.
Section 36: Condition 11; OfTI Marine Licence Condition: 3.2.2.5; & OSP Marine Licence: Condition 3.2.2.6	Piling Strategy (PS)	The PSs (Wind Farm and OfTI) contains further and greater detail on how the piling methods and programme have been developed to reduce effects on noise sensitive species. They provide more detailed description of the piling procedures (and associated mitigation and monitoring) adding to the information contained in this CoP and CMS document. The detailed information contained within the PSs is not repeated within this CoP and CMS document but the piling operations described in this CoP and CMS document will be undertaken in compliance with the more detailed procedures set out in the PSs.
Section 36: Condition 18 & OfTI Marine Licence Condition: 3.2.2.10	Wind Farm Cable Plan (CaP)and OfTI CaP	The Wind Farm CaP and OfTI CaP provide more detailed specifications of the cables, their installation, burial and/or protection, their interactions with the environment and safety considerations, adding to the information contained in this CoP and CMS document. The detailed information which will be contained within the CaP is not repeated within this CoP and CMS document, but the cable installation operations described in this CoP and CMS document will be undertaken in compliance with the more detailed procedures set out in the CaP.
Section 36: Condition 19; OfTI Marine Licence Condition: 3.2.2.14; & OSP Marine Licence: Condition 3.2.2.5	Lighting and Marking Plan (LMP)	The LMP provides details of lighting and marking of the Wind Farm and OfTI structures (where applicable) during construction and operation of the Development. This detail is not repeated within this CoP and CMS document; however this CoP and CMS document will be implemented in accordance with the approved LMP for the Development.
Wind Farm Marine Licences Condition 3.1.12; OfTI Marine Licence Condition 3.1.12 ; and OSP Marine Licence Condition 3.2.1.8	Marine Pollution Contingency Plan (MPCP)	The MPCP provides the overarching framework for pollution prevention measures and contingency plans during the construction and operation of the Development. Bunkering details are also included in the MPCP. The installation and construction works described in this CoP and CMS document will be undertaken taking into account these pollution prevention measures.

2 Statements of Compliance

2.1 Introduction

The following sections are intended to re-affirm the Moray East commitment to ensuring that the Development is constructed in such a manner as to meet the relevant legislative requirements set out by the Section 36 Consents and OfTI Licences, but also broader legislative requirements; specifically it sets out:

- A number of statements of compliance relating to this CoP and CMS document and the broader requirements of the project consents;
- Matters related to health and safety, and environmental management;
- Matters related to equipment and materials;
- Matters related to construction personnel, including training and competence;
- Matters related to construction vessels; and
- Matters related to good working practices.

Reference is made throughout to other, relevant consent plans required by the project consents and to other sections of this CoP and CMS document where further detail is provided.

2.2 Statements of Compliance

Moray East in undertaking the construction of the project will ensure compliance with this CoP and CMS as approved by the Scottish Ministers (and as updated or amended from time to time).

Where updates or amendments are required to this CoP and CMS document, Moray East will ensure the Scottish Ministers are informed as soon as reasonably practicable and where necessary the CoP and CMS document will be updated or amended.

Moray East in undertaking the construction of the project will ensure compliance with other, relevant consent plans as approved by the Scottish Ministers, as set out in Section 1.4 above.

Moray East in undertaking the construction of the project will ensure compliance with the limits defined by the original application, the project description defined in the Moray East ES 2012, Moray East Modified TI ES 2014 and OSP Marine Licence Application Documents 2017 and the Offshore Consents Variation Application Report 2017 referred to in Annex 1 of the Section 36 Consents (as varied in March 2018) and Part 2 of the OfTI Licences in so far as they apply to this CoP and CMS document (unless otherwise approved in advance by the Scottish Ministers).

Moray East will, in undertaking the construction of the project, require compliance with Moray East Company HSE systems and standards, the relevant HSE legislation and such other relevant legislation and guidance so as to protect the safety of the Moray East construction personnel and other third parties.

Moray East will, in undertaking the construction of the project, ensure compliance with other relevant legislation and require that the necessary licences and permissions are obtained by the key contractors and sub-contractors through condition of contract and by an appropriate auditing process. Moray East will also require all contractors and subcontractors to comply with all relevant maritime safety related legislation regarding vessel certification, manning and safety requirements, and any required survey, certification and inspection arrangements will be discussed and agreed with the relevant MCA Marine Office in advance of works commencing.

It is also a condition of the Wind Farm Marine Licences (condition 3.2.1.2), OfTI Licences (conditions 3.2.2.15) that Moray East must supply Third Party Certification (TPC) or Third Party Verification (TPV) of the works:

> *The Licensee must, no later than 3 months prior to the Commencement of the Works, provide the Licensing Authority (unless otherwise agreed, in writing, with the Licensing Authority) with TPC or TPV (or suitable alternative as agreed, in writing, with the Licensing Authority) of the basis of design for all [WTG and OSP foundations, jacket, OSP platform structures and met mast structures].*

Moray East will provide a TPV in accordance with the Marine Licence conditions as detailed above.

2.3 Health and Safety Management

The Development is a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM regulations). Moray East will ensure compliance with the CDM regulations in the design of the project and through the completion of the construction process.

Although these are not environmental regulations, they have a profound influence on how construction is organised and therefore have an influence on environmental performance.

In addition to being the Licensee, under CDM, Moray East is the Client (as defined in the Regulations) and will also fulfil the duties of Principal Designer (as defined in the Regulations), and Principal Contractor (as defined in the regulations). A team (separate from the Client and Principal Designer personnel) supported by organisational governance will deliver the Principal Contractor role (the term Principal Contractor is used throughout the document).

The Principal Contractor shall have a construction phase plan (required by the CDM regulations), reviewed and approved by Moray East as the Client, that sets out the day-to-day arrangements for the management of health and safety during construction.

2.4 Environmental Management

Further information concerning environmental management is set out in the EMP; the construction and installation of the Development described by this CoP and CMS document will be undertaken in line with the procedures and practices set out in the EMP.

2.5 Equipment and Materials

All materials, plant or equipment will require to be audited, either during manufacture or prior to despatch from the suppliers' premises, by a suitably qualified discipline inspector or engineer. Moray East shall be satisfied that any vendor or contractor supplying goods which require traceability has an adequate system of unique identification to satisfy these requirements.

All goods and materials loaded on board construction vessels shall require to be checked against the relevant documentation such as services reports, repair orders, packing list, cargo manifests, purchase orders, material certificates, test reports or material specifications or such other documentation as may be relevant. Inspections will include consideration of quality, quantity, identification numbering, damage in transit and general dimensions (and if such inspections are not or, due to circumstances, cannot be inspected in part or whole this will be noted).

If doubt arises as to the fitness for purpose of any supplied product it shall require to be clearly marked and quarantined until the suspected non-conformance can be resolved.

An appropriate system for the logging, storage, and marking of all equipment and materials will be required on each vessel. The supplier's special instructions and delivery notes will require to be complied during handling, storage and installation with appropriate training or notification of personnel. The correct lifting procedures will require to be followed to ensure safe, efficient handling. These processes will be auditable by Moray East or the Principal Contractor.

2.6 Construction Personnel – Training and Competence

Moray East will require that all personnel engaged in the construction process have adequate experience to perform the activities executed under their responsibility or in their scope.

Moray East will require that all key contractors and sub-contractors have sufficient manpower resources of the required competence to meet the contractual requirements.

Personnel performing specific assigned tasks on the project will be qualified on the basis of appropriate education, training, competence and experience. The Principal Contractor shall make specific checks on particular qualifications in order for people to be allowed to work (e.g. offshore survival), but both Moray East and the Principal Contractor shall audit competency and training on a risk basis.

Moray East will ensure that a project organogram (see Section 3.10 below) is in place and that the roles and responsibilities of all named personnel and appropriate communication details / channels are clear and that clear project management procedures are in place for all aspects of the construction.

Moray East will require that all construction personnel attend inductions including, but not necessarily limited to, matters related to Site Rules, Health and Safety requirements, arrangements for First Aid and Emergency Response, and Environmental Management.

All arrangements concerning environmental competence, training and induction are presented in the EMP.

2.7 Construction Vessels

Moray East will require that all construction vessels meet the required, recognised standards and will comply with the international maritime rules (as adopted by the flag state) and regulations. Where necessary, Moray East will conduct appropriate independent vessel audits on all construction vessels to ensure they meet these standards and are fit for purpose for their prescribed roles.

All construction vessels will comply with the procedures and requirements set out in other relevant consent plans such as the VMP and NSP document, the LMP and the EMP.

2.8 Good Working Practices

Good working practices are set out separately under Section 6 of this CoP and CMS document and in respect of the specific reference made in the consents in this regard.

Moray East will require all possible good working practice is applied by the key contractors and sub-contractors throughout the construction process in seeking to minimise the risks to personnel, other sea users and the environment.

3 Project Construction Overview

3.1 Introduction

This section provides an overview of the Development and construction timing assumptions. It identifies relevant key contractors, briefly describes the main construction vessels, and sets out the main roles and responsibilities in relation to Moray East and the key contractors.

This section also cross-references a number of the other consent plans where further information on these topics will be provided in satisfaction of the consent condition relating to the relevant consent plan (see also Section 1.4 of this CoP and CMS document for relationship with other consent plans).

The specific detail on the construction and installation process is then provided in Section 4 of this CoP and CMS document.

3.2 Development Overview

The Development will consist of the following main components:

- A total generating capacity of approximately 950 MW, however the total generation capacity will be constrained by the transmission entry capacity of 900 MW (further details provided within DSLP);
- 100 WTGs of up to 10 MW rated generating capacity (further details provided within the DSLP);
- Jacket substructures each installed on three pin pile foundations driven into the seabed;
- Three AC offshore substation platforms (OSPs) to collect the generated electricity and transform the electricity from 66 kV to 220 kV for transmission to shore;
- A network of buried or (if burial is not possible) mechanically protected, subsea inter-array cables to connect strings of WTGs together and to connect the WTGs to the OSPs;
- Two OSP interconnector cables that link the OSPs to one another; and
- Three buried or mechanically protected, subsea export cables, each of approximately 60-65 km in length, to transmit the electricity from the three OSPs to the landfall at Inverboyndie and connect to the buried onshore export cables for transmission to the onshore substation and connection to the national electricity transmission system; and
- Minor ancillary works such as the deployment of met buoys (if required) and permanent navigational marks as defined in the LMP.

The location and layout of the Development is fully described within the DSLP (Moray East, 2019a).

The construction of the permanent works comprising the Development will be limited to within the Moray East site (combined area of the consented Telford, Stevenson and MacColl Offshore Wind Farms) and OfTI corridor, as shown in the Section 36 Consents and OfTI Licences.

The final layout and more detailed design specification of the Moray East site and OfTI is set out in the Moray East DSLP.

Information on the subsea cabling layout, specification and installation methodologies will be set out in the Wind Farm CaP for inter-array cables and the OfTI CaP for offshore export cables and OSP interconnector cables.

3.3 Timing of Construction Works

Details of the construction programme for the works described in this CoP and CMS document are provided in Section 4, and satisfy the requirements set in Condition 9 of the Section 36 Consents and Condition 3.2.2.3 of the OfTI Licences for a Construction Programme (CoP).

3.4 Key Contractors

Moray East has appointed five main contractors to install the main components of the Development described in this CoP and CMS document. The roles and responsibilities of the key contractors and the interface with the Moray East project team are illustrated in Figure 3-2. It should be noted that GeoSea designated activities are contracted with a joint venture consortium of Geosea and Smulders. Geosea are the lead organisation.

In line with the requirements of the Marine Licences for the Wind Farm and OfTI Licences (Conditions 2.5, 2.6 and 3.1.2[1]) the final identities of the persons responsible for making deposits, acting on behalf of the licensee, vessels, contractors and subcontractors will be notified to the Licensing Authority prior to their engagement in the works.

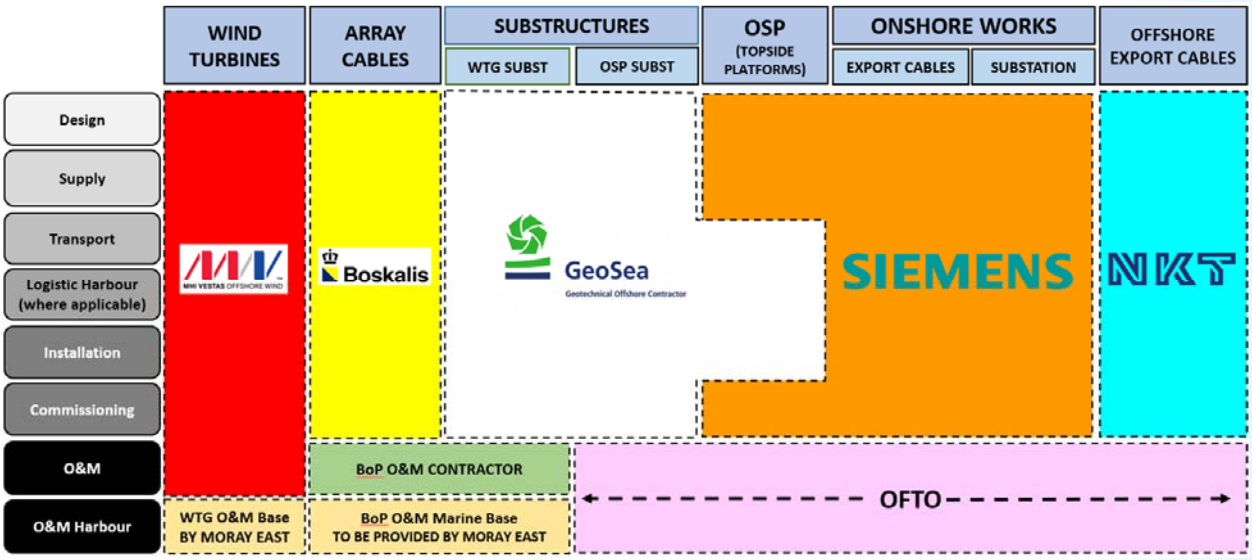


Figure 3-1: Moray East Key Contractors and Responsibilities

3.5 Subcontractors

The key contractors will be responsible for identifying and contracting subcontractors such as may be required to provide services for the completion of the design and construction works, including for ancillary works / construction support as required.

3.6 Main Construction Vessels

The main construction vessels that will be used to complete the construction works described in this CoP and CMS document are presented within the Vessel Management Plan (VMP) (required under

[1] The equivalent to Condition 3.1.2 of the OfTI Marine Licence in the OSP Marine Licence is Condition 3.1.3.

Condition 15 of the Section 36 Consent, Condition 3.2.2.8 of the OfTI Marine Licence and Condition 3.2.2.9 of the OSP Marine Licence). In addition, the VMP provides details of additional support vessels that may be required throughout the construction phase of the Development.

3.7 Marine Co-ordination

Moray East will obtain competent marine advice and assistance in relation to marine coordination and planning which includes but will not be limited to:

- Provision of marine input into project risk assessments (HAZIDS, etc);
- Assistance in demonstrating that all marine activity hazards have been mitigated to as low as reasonably practicable (ALARP) and taking into account any metocean and ground conditions; and
- Carrying out of audits and assessments of vessels and their operators (company and vessel audits) to check they are fit for purpose for the project.

Moray East recognises that the extent and capability of marine operations co-ordination is critical to the control of the construction process. It will define all the requirements for the safe and effective working of the onshore and offshore construction sites, aiming to ensure the safety and security of all equipment, assets and personnel.

The main topics which will require detailed arrangements to be developed, communicated and audited are as follows;

- Marine Co-ordination Management;
- Weather Forecasting and Met Ocean Data;
- Navigational Marking;
- Vessel Chartering and Marine Support;
- Marine Logistics and Marshalling;
- Personnel Training and Certification;
- Emergency Response and Co-ordination
- Marine Co-ordination Centre; and
- Marine Warranty Survey.

A web based marine management and monitoring tool will be deployed so marine traffic and asset management can be controlled during the offshore works.

Prior to and throughout the Wind Farm construction phase, a marine co-ordination centre will be established to control all offshore works and vessel movements. A marine co-ordination system will provide access to the following information:

- Chart view of site assets/infrastructure in “as-built” status, including but not limited to marking buoys, cables, substructures, OSPs, WTGs, etc;
- Vessel work planning;
- Real time vessel tracking including location coordinates and chart view of vessel locations. Vessel tracking data will be recorded, with the functionality to be replayed during the whole construction period. This information will be available through an Automatic Identification System (AIS);
- Vessel crew information; and
- Alerts for guard zones and geofences.

Regarding site data, the marine co-ordination system will provide the following information:

- Site specific wind data which will be measured at the existing offshore met mast;
- Site specific metocean data from wave sensor devices located at the marking buoys;
- A number of bathymetry, geotechnical, geophysical and UXO surveys will have been undertaken by Moray East by the time the construction starts. The GIS data obtained from those surveys shall be integrated in the marine co-ordination system;
- Through the marine co-ordination system it shall be possible to create a weather conditions report for 5 days-look ahead. Key contractors shall have access the weather forecast via an internet portal with unlimited access 24 hours 7 days per week; and
- Regarding construction site management, the marine co-ordination system will provide the following information:
    - Vesssel Coordination / Tracking & Recording
    - Weather Warnings
    - A designated marine co-ordinator for voice communications with the vessels shal be equipped with a Marine VHF & Tetra system. Marine HFH radio and AIS coverage across the offshore construction site will be provided by Moray East as required.

3.8 Construction Ports

The construction ports are still to be confirmed, however, the following assumptions have been included in in Section 4 of this CoP and CMS document:

- The pin piles will either be delivered to and stored at the port of Invergordon before installation or transported directly to site;
- The jacket substructures will be delivered to a port in the Cromarty Firth (the port of Invergordon and / or Nigg), where they will be stored in an onshore laydown area before loadout for installation;
- The WTG components will be delivered to the port of Invergordon, where components will be stored in an onshore laydown area for pre-assembly prior to loadout for installation;
- The inter-array and OSP interconnector cables are expected to be transported directly to site from the manufacturing facility;
- All main elements of the OfTI will be delivered directly to site from the location of fabrication as required;
- Crew transfer and delivery of smaller ancillary components to the offshore construction sites will take place from a number of ports within the close vicinity of the Development.

Full details of the constructions ports will be provided in the NSP and VMP.

3.9 Wind Farm Helicopter Operations

Helicopter operations are currently planned for crew transfer from mainland to certain construction vessels. No helicopter operations are planned to access WTGs or OSPs.

Take-off and landing will be managed from the relevant airport. Helicopters operations on approach to the Development will be managed and coordinated from the relevant construction vessel, with involvement from the MCC.

3.10 Moray East and Key Contractor Roles and Responsibilities

3.10.1 Introduction

The following sections set out the key roles and responsibilities for each of the main parties involved in the construction and installation process. The organisational arrangements and interfaces for Moray East and the key contractors are set out in organograms and the main roles and responsibilities within Moray East and the five key contractor organisations in relation to the main, overarching construction process are then described.

Further information on organisational responsibilities and interfaces (and the "chain of command") in relation to environmental management is set out in the approved EMP. Organisational arrangements and responsibilities in relation to vessel management are set out in the VMP. Organisational arrangements, roles and responsibilities in relation to navigational safety are set out in the NSP. Roles and responsibilities and organisational arrangements related to piling operations are set out in the PS.

Organisational charts illustrating the Moray East interfaces with the key contractors are set out below.

3.10.2 Moray East - Key Roles and Responsibilities

A summary of the Moray East organisational structure and the key roles during the construction of the Development is set out in Figure 3-2 below. The main Moray East roles and responsibilities are described in Table 3-1 below. In the event of any changes to the Moray East organisational structure which has a material impact on the roles and responsibilities as set out in Table 3-1 below then Moray East will inform MS-LOT of such changes.

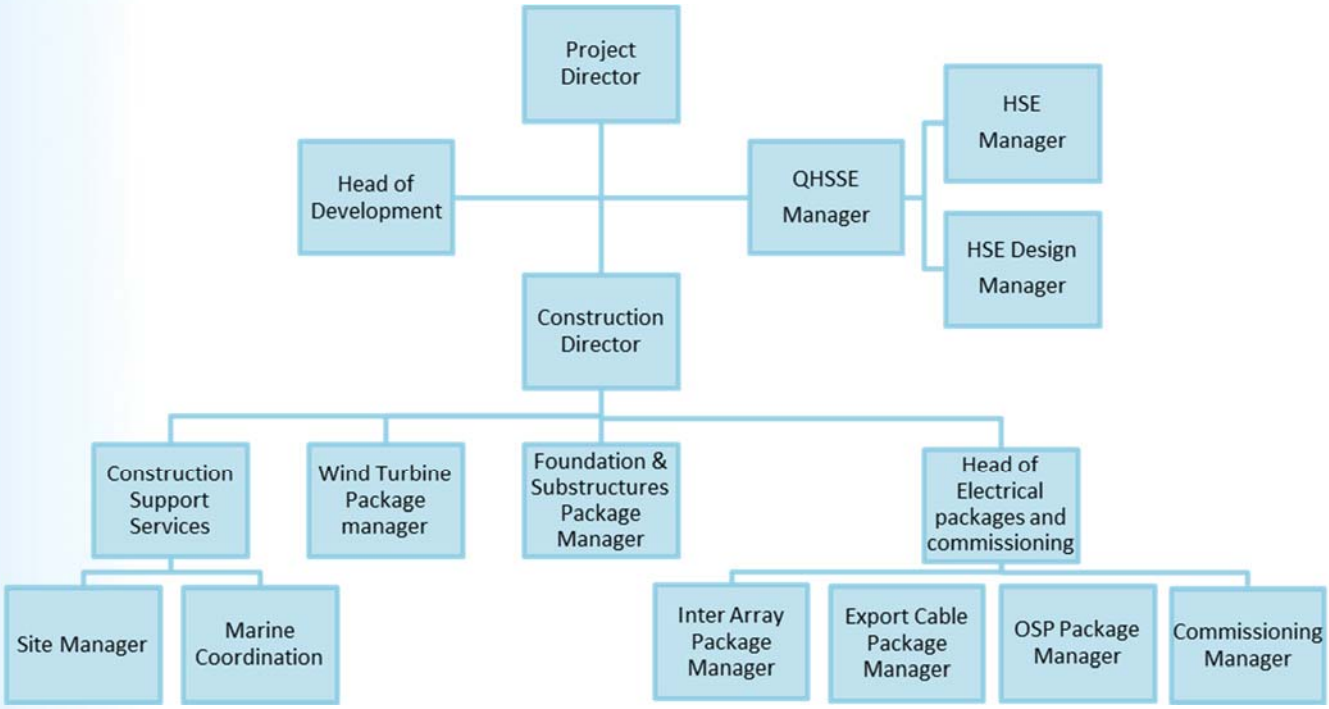


Figure 3-2: Moray East organisational structure and key roles, and interface with key contractors

Table 3-1: Key Moray East roles and responsibilities

Role	Responsibilities
Moray East	Moray East has overall responsibility for the CoP and CMS and compliance.
Moray East Project Director	Overall responsibility for the project delivery. The Project Director is accountable to the Moray East board for the overall project delivery strategy and the effective governance of the Development.
Moray East Construction Director	Overall responsibility for construction and commissioning of the Development up to the handover to the operations and maintenance function.
Moray East Head of Development	Reporting to / advising the Project Director and Moray East Board in relation to consenting related matters and providing environmental input where required; Ensure provision of resources from the Development Team in the review of relevant contractor documentation in line with this CoP and CMS document and the ES commitments; and Where necessary reporting to MS-LOT and other stakeholders including MFRAG on compliance with the CoP and CMS document.
Moray East QHSSE Manager	Ensure risks from construction works are reduced to ALARP and ensure that Principal Contractor is reviewing Contractor's risk assessments; Ensuring management arrangements are in place for Principal Contractor and the contractors legal compliance reviews; Ongoing project construction performance monitoring; Reporting of incidents; Complete a pollution incident report for all spillages; Onshore emergency response coordination; and Improvement Management.
Moray East Project HSE Manager	Day-to-day contact with Principal Contractor and Contractors; Collation of performance data; Inspection and audit; Incident investigation; Moray East focal point for deposits, chemicals, transport, waste, and equipment; Emergency response; and Liaison with marine coordination centre.
Moray East HSE Design Manager	Support with any ongoing design process and ensuring construction risks are addressed.
Package Managers	Responsible for ensuring sufficient resources and processes are in place across their work package to deliver the construction phase of the project in accordance with the CoP and CMS document and the whole project.
General Site Manager	Reporting to the Construction Director responsible for the site management of the works.
Marine Coordinator	Coordinate all activities at offshore sites including vessel and personnel movements and site surveillance.
Commissioning Manager	Managing the commissioning of the onshore and offshore high voltage electrical infrastructure associated with the Development.

In addition, the ECoW will have a role in terms of ensuring that the Development is constructed in compliance with this CoP and CMS document and other relevant consent plans. The ECoW will report directly to the Moray East Development Team, and will interface with the Package Managers and directly with relevant key contractors as appropriate. The role of the ECoW in terms of monitoring and reporting on consent plan compliance and the organisational structure relating to environmental management is set out in more detail in the EMP.

A Marine Co-ordinator will be appointed prior to construction commencing. The Marine Co-ordinator will be based at the Marine Co-ordination Centre. The Marine Co-ordinator will liaise with key contractors and the Moray East Site Manager to enable a plan of operations to be formulated and promulgated. They will monitor movements of vessels, people and equipment offshore, monitor weather conditions, co-ordinate permits to work and act as a first point of contact for emergency response and marine assistance.

3.10.3 Key Contractor Roles and Responsibilities

The project is being constructed through five main contracts as illustrated in Figure 3-1 above. Table 3-2 below provides an overview of the contractor roles and responsibilities in relation to construction activities.

Table 3-2: Key Moray East contractor roles and responsibilities in relation to construction activities

Contractor	CDM Duties	Description of Work
GeoSea/Smulders Consortium	Contractor	Installation of piles for WTGs and OSPSs. Installation of WTG and OSP Jackets. Installation of OSP Top Sides.
Royal Boskalis Westminster N.V.	Contractor	Installation of Inter Array Cables. Cable pull in at WTG and OSPs. Boulder removals from cable routes.
NKT A/S	Contractor	Installation of Offshore Export Cables. Boulder removals from cable routes.
Siemens Transmission and Distribution Limited	Contractor	Commissioning of OSP Top Sides.
MHI Vestas Offshore Wind	Contractor	Installation and Commissioning of WTGs.
Moray East	Principal Contractor	Definition of management procedures of the offshore works. Definition of the site rules. Marking of the construction site. Provision of weather forecasts. Provision of site data to ensure works can be done safely. Boulders and UXO clearance of the construction area close to WTGs. Coordination of all contractors getting access to the Development area. Provision of guard vessels. Management of Permits to Work. Commissioning of the high voltage network. Cascade requirements of this CoP and CMS document to all contractors.

4 Construction Programme (CoP)

4.1 Introduction

This section provides an overview of the Development (as consented under the Section 36 Consents and Marine Licences) and presents the key milestone dates for the commencement of works, the main construction activity and the commissioning of the Wind Farm and OfTI.

4.2 Key Milestone Dates

The key milestone dates within this CoP are presented in Table 4-1 and shown in Figure 4-1 below.

Offshore construction works will be carried out year round and around the clock (i.e. 24 hour working, 7 days a week unless noted otherwise).

Table 4-1: Summary of key milestone dates

Milestone	Anticipated Programme
First Generation	April 2021
Final Commissioning	February2022
Wind Farm	
Commencement of Wind Farm Construction	May 2019
Mobilisation of Plant, Delivery of Materials to Onshore Laydown Areas (where required)	To match installation timings as set out below. Onshore laydown of WTG and substructure components over the period from Q2 2019 and throughout the offshore installation period.
Timing and Sequencing of Construction Work	Pile Foundations[2]: - May 2019 - March 2020 Jackets[3]: - July 2020 - November 2020 WTGs (including commissioning): - January 2021 - October 2021 Inter-array Cables: - Campaign 1 - October 2020 - December 2020 - Campaign 2 – February 2020 – May 2020
OfTI	
Commencement of OfTI	May 2019
Mobilisation of Plant and Delivery of Materials	To match installation timings as set out below
Timing and Sequencing of Construction Work	Horizontal directional drilling (HDD) and installation of ducts at landfall: - May 2019 - November 2019 OSP Pile Foundations[2]: - May 2019 – March 2020 OSP Jackets[3]: - July 2020 – November 2020 OSP Topsides: - July 2020 – September 2020 Export Cables: - July 2020 – October 2020

[2] Piling of WTGs and OSPs foundations will be undertaken in a single campaign. The programme shows duration of entire piling campaign.

[3] Installation of WTGs and OSPs substructures will be undertaken in a single installation campaign. The programme shows duration of entire substructure installation campaign.

Figure 4-1: Offshore Construction Programme

4.3 Wind Farm Construction Programme

4.3.1 Introduction

The Moray East Wind Farm construction programme is presented in Figure 4-1 above. With reference to Figure 4-1 and in line with the requirements of the Section 36 Consents, the sections below detail the proposed:

- Date of commencement of construction of the wind farm;
- Timings for the mobilisation of plant and delivery of materials, including details of onshore laydown areas (where required);
- Timing and sequencing of construction work for all elements of the wind farm infrastructure;
- Contingency planning for poor weather or other unforeseen delays; and
- Scheduled date for final completion and commissioning of the wind farm.

4.3.2 Commencement of Wind Farm Construction

The Section 36 Consents define the Commencement of the wind farm as:

"the date on which Construction begins on the site of the [Wind Farm] in accordance with this consent."

The wind farm construction commences with the start of the pre-piling campaign for the WTG substructures in May 2019. The commencement of the construction of the wind farm will therefore be in May 2019.

Following Final Investment Decision (FID) on the Moray East Offshore Wind Farm orders have been placed for components of the Development required early in the process, or those with long lead in times, including the WTGs.

The delivery and stockpiling of materials and onshore fabrication activities to facilitate construction of the wind farm will commence prior to Commencement of the Wind Farm, as shown in the programme in Figure 4-1.

4.3.3 Mobilisation of Plant, Delivery of Materials and Use of Onshore Laydown Areas

The key components of the Wind Farm are:

- Piled foundations;
- Jacket substructures;
- WTGs; and
- Inter-array cabling.

Piles and Jackets

The arrival of the plant required to install the wind farm components will be timed to coincide with the timing of the main installation activities, as set out in Section 4.3.4 below.

The piled foundations and jacket structures will either be delivered to the construction port where they will be stored in an onshore laydown area before loadout for installation or transported directly to site.

It is currently envisaged that it will take approximately six months to fabricate the required number of piles, with fabrication commencing in Quarter 1 2019 and ending in Quarter 3 2019.

It is currently envisaged that it will take approximately 16 months to fabricate the required number of jackets, with fabrication commencing in Quarter 2 2019 and ending in Quarter 4 2020.

WTGs

The WTG components will be delivered to the construction port where components will be stored in an onshore laydown area for pre-assembly prior to loadout for installation.

WTG deliveries from the manufacturing facility to the construction port are scheduled from Quarter 3 2020.

It is envisaged that the WTG nacelles will arrive from the manufacturing facility almost complete and pre-tested, and that WTG pre-assembly will take place at the onshore laydown areas at the construction port. It is assumed that WTGs will be assembled at a rate of approximately 4 days per WTG.

Inter-Array Cables

Deliveries of cables will be phased to match installation requirements. The cables are expected to be transported directly to site from the manufacturing facility.

4.3.4 Timing and Sequencing of Construction Work

The following sections detail the proposed timings and sequencing of construction work for all elements of the Wind Farm and relate to the construction programme provided in Figure 4-1.

Piling of Foundations

Pile installation is planned to take place in a single phase between May 2019 and March 2020. Piling activities have been programmed during the winter months between November 2019 and February 2020 to provide the flexibility required in case delays occur during the summer months.

Jacket Substructure Installation

Jackets will be installed onto the pre-installed piles between the months of July 2020 to November 2020 inclusive.

WTG Installation

It is expected that all piles and jacket foundations will have been installed prior to the WTG installation campaign, providing significant contingency buffer between the installation campaigns. WTG installation is scheduled to be completed over a nine month period between January 2021 and October 2021. It is likely that WTG installation will proceed at a rate of approximately 2.5 WTGs per week.

WTG commissioning is anticipated to be completed approximately 20 days after installation of each WTG.

Inter-Array Cable Installation

Inter-array cable installation will take place over two installation campaigns: Campaign 1 between October and December 2020 and Campaign 2 between February and May 2021. During this time cables will be laid, buried and terminated at WTG and OSP locations. The campaign will include the installation of two OSP interconnector cables between the three OSP locations.

4.3.5 Contingency Planning

Given the nature and scale of the construction project the potential exists for unforeseen delays, including from events that are outwith Moray East's control such as periods of unsuitable weather and equipment failure.

Moray East has undertaken weather analysis and assessed programme risks; the construction programme set out in Figure 4-1 has been designed with reasonable contingencies included.

4.3.6 Final Commissioning of the Wind Farm

Annex 3 of the Section 36 Consents defines Final Commissioning of the Wind Farm as:

"the date on which all wind turbine generators forming the [Wind Farm] have supplied electricity on a commercial basis to the National Grid, or such earlier date as the Scottish Ministers deem the [Wind Farm] to be complete."

It is anticipated that the wind farm will be commissioned over a 10 month period, with first electricity generation scheduled for April 2021 and the full commissioning of the wind farm scheduled for February 2022.

The anticipated date of final commissioning of the wind farm is therefore scheduled to be February 2022.

4.4 OfTI Construction Programme

4.4.1 Introduction

The Moray East Farm construction programme is presented in Figure 4-1. With reference to Figure 4-1 and in line with the requirements of the OfTI Licences, the sections below detail the proposed:

- Date of commencement of the construction of the OfTI assets;
- Timings for the mobilisation of plant and delivery of materials, including details of onshore laydown areas (where required);
- Timing and sequencing of construction work for all elements of the OfTI;
- Contingency planning for poor weather or other unforeseen delays; and
- Scheduled date for final completion and commissioning of the OfTI.

4.4.2 Commencement of OfTI

The OfTI Licences define the Commencement of the OfTI as

"the date on which the first vessel arrives on the Site to begin carrying on the Licensable Marine Activity in connection with the construction of the [OfTI], as described in Part 2 of this licence."

The OfTI construction commences with the start of the pre-piling campaign for the OSP substructures in May 2019. The commencement of the construction of the OfTI will therefore be in May 2019.

The Commencement of the OfTI is therefore May 2019.

Following FID on the Moray East Offshore Wind Farm, orders have been placed for components of the OfTI required early in the process, or those with long lead in times, including the export cables and OSPs.

4.4.3 Mobilisation of Plant, Delivery of Materials and use of Onshore Laydown Areas

The key components of the OfTI are:

- Three OSPs;
- Two OSP interconnector cables; and
- Three export cable circuits (and cable protection material (as required)).

The OSP topsides will be installed upon similar specification piled jacket foundations as the WTGs; the installation of the piled foundations and jackets to support the OSPs will be undertaken using the same vessels as for the WTG foundations / jackets and therefore will fall within the periods of pile and jacket installation described in Section 4.3 above.

The arrival of the plant required to install the OfTI components will be timed to coincide with the timing of installation activities, as set out in Section 4.4.4 below.

All main elements of the OfTI, other than the foundations, will be delivered directly to site from the location of fabrication as required; no onshore laydown areas will therefore be required for the completion of the OfTI installation process. Some minor / ancillary components may be delivered to local ports prior to being transported to the Development site.

OSP Fabrication and Supply

The piles and jackets fabrication and supply for the OSP will be undertaken at the same time as the WTG (please see Section 4.3.3 above).

The OSP topsides are anticipated to be fabricated between December 2018 and July 2020. The supply window for the three OSP topsides is from April 2020 to July 2020 in order to meet the installation campaign as set out in Section 4.4.4 below.

Export Cable Manufacture and Supply

Deliveries of cables will be phased to match installation requirements. The cables will be transported to site directly from the manufacturing facility.

Where required cable protection material will be transported directly to site from source.

4.4.4 Timing and Sequencing of Construction Work

The following sections detail the proposed timings and sequencing of construction for all elements of the OfTI, and relate to the construction programme provided in Figure 4-1.

Installation of Horizontal Ducts

The export cables make landfall to the west of Inverboyndie. Horizontal directional drilling (HDD) and duct installation is required to get the cable ashore. The first offshore vessels will arrive on site to provide support works to the HDD. Offshore installation of horizontal ducts will be completed between May and November 2019.

OSP Installation

The piled foundations and jackets for the OSPs will be installed during the pile and jacket installation campaign as referenced in Section 4.3.4 above. It is expected that OSP topsides will be installed between July 2020 and September 2020 assuming the OSP jackets and topsides are installed as early as possible in order to minimise risk.

Export Cable Installation

Each of the export cable circuits (and any required cable protection material) will be installed in a single length from the landfall site and Inverboyndie and the OSP locations. The installation of the three export cables will be completed between July 2020 and October 2020.

4.4.5 Contingency Planning

Given the nature and scale of the construction project the potential exists for unforeseen delays, including from periods of unsuitable weather and equipment failure which are outwith Moray East control.

Moray East has undertaken weather analysis and assessed programme risks; the construction programme set out in Figure 4-1 has been designed with reasonable contingencies included.

4.4.6 Final Commissioning of OfTI

The OfTI Licences define the final commissioning of the OfTI as

"the date on which all the [OfTI] have been used to supply electricity on a commercial basis to the National Grid, or such earlier date as the Licensing Authority deem the [OfTI] to be fully commissioned."

First generation is planned for April 2021.

It is proposed that the onshore transmission works (including cable installation and substation construction) will be completed by October 2020 following 24 months of civil, mechanical and electrical engineering works (between October 2018 and October 2020).

The proposed date for the final commissioning of the OfTI is February 2022, which coincides with that for the Wind Farm, as this is the date that electricity will be exported from all WTGs forming the wind farm, and therefore the date that the wind farm begins supplying electricity on a commercial basis.

4.5 Compliance with Application and Environmental Statements

The Section 36 Consents and OfTI Licences conditions require that this CoP and CMS document is in accordance with the Moray East ES 2012 and Moray East Modified TI ES 2014 (the ESs).

The Moray East ES 2012 and Moray East Modified TI ES 2014 set out an indicative construction programme. This indicative programme:

- Sets out the anticipated maximum duration of the Development and key elements of construction activity;
- Assumed sufficient flexibility beyond the timescales proposed to accommodate unforeseen events including:
    - Variations in ground conditions;
    - Critical logistics and supply chain constraints or delays;
    - Delays or acceleration to arrival, or failures, of specialist equipment;
- Assumed construction activities would take place all year round, 24 hours a day, seven days a week (although dependent on weather conditions).

Figure 4-2 below presents the indicative construction programme provided in ESs and how it compares with the construction programme provided within this CoP and CMS document.

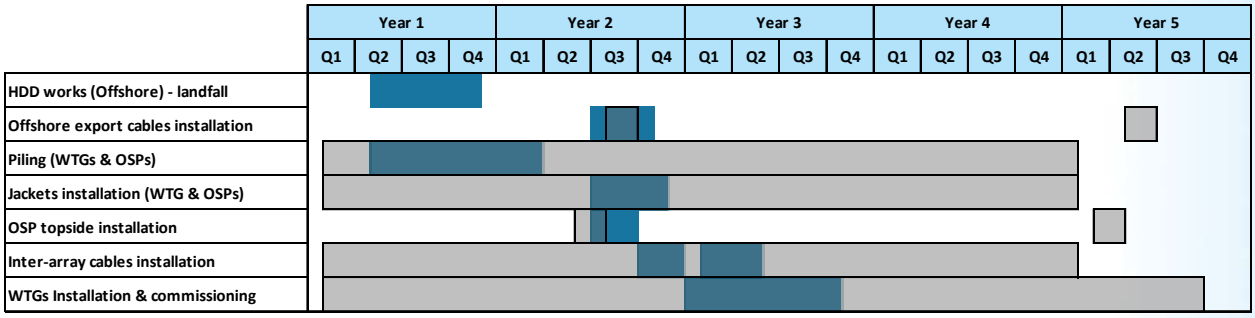


Figure 4-2: Construction Programme as presented within this CoP and CMS document (highlighted in blue) and how it compares to the indicative construction programme presented within the Moray East ES 2012 and Moray East Modified TI ES 2014 (highlighted in hatched shading).

The comparison set in Figure 4-2 above shows that the duration of the construction works is significantly shorter than those presented in the indicative programmes presented within Moray East ES 2012 and Moray East Modified TI ES 2014. The main reason for the significantly lower duration of construction activities associated with the Wind Farm relates to the reduced number of WTGs to be installed (100 WTGs instead of up to 339 WTGs considered within the Moray East ES 2012), reduced number of piling events (due to the reduced number of foundations but also related to selected jacket design which only requires 3 piles instead of the 4 piles considered in the Moray East ES 2012) and reduced number of associated inter-array cables. Further details on the Development Design are provided within the DSLP.

In relation to the OfTI, durations have shortened as only three export cables are being installed rather than the four that were consented. The distributed OSPs require nine pin piles rather than the 32 included for the AC OSPs in terms of the Moray East Modified TI ES 2014. HDD has been selected as the installation methodology at the landfall (see the DSLP for further details) and was included in the Moray East Modified TI ES 2014 assessments. The indicative programme in the Modified TI ES 2014 shows the anticipated duration of the installation of the offshore export cables including a trenched installation of cables at the landfall. Figure 4-1 and Figure 4-2 above show the HDD landfall works as a separate activity in the programme.

The overall construction programme for the Development is significantly shorter than the programme considered within the Moray East ES 2012 and Moray East Modified TI ES 2014: up to five years of construction activities were considered in the Moray East ES 2012 and Moray East Modified TI ES 2014 and less than three years are now assumed for the Development (as shown in Figure 4-1 above).

Below is a summary of the comparison between the assumptions used in the ESs and how they compare with the programme in Figure 4-1 above:

- Offshore export cables: Two offshore export cable installation campaigns (of two cables each), split three years apart, were considered within the Moray East Modified TI ES 2014. The current programme, assumes the installation campaign of the three export cables will be sequential, and therefore only a single campaign of around four months is being considered.
- Piling, jackets and OSP topsides installation: The Development programme within Figure 4-1 above assumes a single piling installation and a single jacket installation campaign for the WTGs and OSPs, however piling and jacket installation for the OSPs was assessed separately within the Moray East Modified TI ES 2014 and as part of the OSP installation campaign. The worst case scenario assessed within the Moray East ES 2012 was up to five years of piling (see the Chapter 7.3 Marine Mammals), however the indicative programme within the Project Description Chapter 2.2 (Plate 2.2-3) assumed four years for the combined piling and jacket installation activities. As shown in Figure 4-1 above piling is only expected to approximately 11 months and the jacket installation around five months.
- Inter-array cables: The Moray East ES 2012 considered that the inter array cables installation could take up to four years, whilst Figure 4-1 above shows that the inter array cables installation is only predicted to take around seven months split into two installation campaigns.
- WTGs installation and commissioning: Ten months are considered within the Development programme in Figure 4-1 above for the WTG installation and commissioning, however almost five years were considered within the Moray East ES 2012.

The ESs also considered different dates for the start of construction. The Moray East ES 2012 considered a start of construction in 2015 and the Moray East Modified TI ES 2014 considered a start of the wind farm construction in 2017 with a start of the OfTI construction in 2018. The current Development programme (Figure 4-1) shows a start of construction activities in 2019. The reason for the delays in the start of construction relate to delays in award of a Contract for Difference for the Development.

5 Construction Methods and Procedures

5.1 Introduction

The following sections set out the process for the main seabed preparation and construction activities, namely:

- Boulder and UXO clearance;
- Pile foundations, jacket substructures and scour protection (where required);
- WTGs (including tower sections);
- OSP topsides;
- Wind farm inter-array and OSP interconnector cabling;
- Offshore export cabling, and
- Electrical connection and commissioning.

A simple overview of the construction sequence is provided in Figure 4-1 above. Detailed description of the construction processes for each of the main elements of the sequence is presented in the sections below. Good working practices to be applied during construction are described separately under Section 6 below.

5.2 Pre-Construction – Seabed Preparation

Detailed analysis of ground conditions in the Moray East site and along the OfTI corridor has identified distinct areas where there is potential for boulders, seabed debris and / or the presence of unexploded ordnance (UXO), which may affect construction activities.

The strategy for clearance of boulders, seabed debris and for identifying and dealing with UXOs is summarised in the following Sections 5.2.1 to 5.2.3.

5.2.1 Boulder Clearance

In areas where boulder presence may inhibit cable or foundation installation a boulder clearance campaign will be completed ahead of cable installation activities. Two methods will be employed depending on the number of boulders present.

Boulder plough route clearance

Figure 5-1: Boulder plough (left) and typical seabed result (right)

For routes with a large number of boulders a towed plough unit will be used to clear the route. The plough has the capacity to clear boulders (up to ~2 m in diameter) for each cable corridor in one pass. The plough is deployed from an anchor handling vessel over a stern roller and therefore does not require a frame for launch and recovery. The plough is towed over the seabed and pushes boulders or debris to either side of the cable route.

The positioning of the plough is maintained by mounted acoustic beacon, and associated vessel high precision acoustic positioning (HiPaP) system, coupled with the vessel differential global positioning system (DGPS). An ROV will be used to support the operations particularly during launch and recovery.

Following deployment of the boulder plough a remotely operated vehicle (ROV) will be used to survey the cleared path and identify any remaining boulders. Where these remaining boulders have the potential to disrupt cable installation a boulder grab will be used to relocate boulders from the cable routes, as described below. Grabbed boulders will be relocated immediately adjacent to the cable routes.

Boulder grab

For the WTG / OSP foundation footprint areas and for routes with fewer boulders, individual boulder removal is more efficient than ploughing. This method will also be used to clear any remaining boulders following the boulder plough described above. A boulder grab will be positioned over the approximate object location using the vessel dynamic positioning (DP) system. Using a combination of the GPS position and cameras (or acoustic devices depending on the visibility) the operator will locate the target and move the boulder grab into position above it. The boulder grab is then lowered onto the target and the grab is closed. The boulder grab would be lifted up to clear the sea floor, the vessel would move to a safe location off the immediate route or foundation footprint area and the boulder / debris would be lowered to the seabed and released.

Clearance of boulders will be undertaken immediately following completion of plough operations. The duration of clearance activities will be dependent on the number of boulders remaining following plough operations and the number of boulders present in works footprint areas.

Where cleared, boulders will all be relocated within areas of existing high boulder density in close proximity to the WTG / OSP location or moved outside the cable route in close proximity to the cables and having given consideration to potential alternative uses, i.e. scour protection or cable protection.

5.2.2 Clearance of Seabed Debris: Pre-lay Grapnel Run

The removal of out of service cables, fishing nets, wire and other debris which will affect cable installation and burial will be undertaken by clearing the routes with a grapnel train.

A standard offshore anchor handling vessel (commonly a multicat type) will deploy a ‘train’ of grapnel and hooks that will penetrate up to 0.5 m into the seabed to hook surface debris, known as a pre-lay grapnel run (PLGR). The grapnel train is towed over the stern roller of the tow vessel and is equipped with a tension line monitor. During the grapnel run operations the tension is monitored and constant increases in tension indicate that debris or an out of service cable is hooked into the grapnel. Any debris will be recovered to surface or moved to a safe location off the cable route. Any out of service cable which becomes exposed shall be cut and removed to prevent future snagging risk.

For the inter-array cable activities on the Moray East project a grapnel or hook assembly will be added to the boulder clearance plough, allowing for simultaneous boulder clearance and grapnel clearance from a single pass.

The interval between PLGR and cable lay will be typically not more than 2 weeks before the start of cable lay operations to reduce the chance that debris has been deposited on the route prior to the commencement of cable installation.

Any waste recovered to the surface and taken onshore for disposal will be taken to a suitably licensed facility for disposal/recycling for that waste type. Waste will only be transported by a registered waste carrier.

Figure 5-2: Typical Grapnel Train

5.2.3 UXO Strategy

A detailed geophysical survey comprising an array of magnetometers and high frequency imaging sonar shall identify targets on the seabed. All the target data will be reviewed by specialist UXO consultants who will further identify potential items that may cause a threat to the installation of cables and jacket substructures with avoidance being the primary method of risk mitigation.

Where some potential UXO items cannot be avoided, they will be individually inspected by a ROV and if the inspection confirms the item to be a UXO then a charge will be placed on the item and detonated. A further survey, using video cameras, will be conducted to prove the item is destroyed.

Disposal operations shall be in day light and will comply with environmental regulations, and actively reduce any impact to flora, fauna and cetaceans. Environmental impact mitigation measures shall be considered in the European Protected Species (EPS) Risk Assessment produced to support the UXO clearance.

5.3 WTG and OSP Support Structures (Foundations and Jacket Substructures)

5.3.1 Components to be Installed

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

The main components to be installed are summarised in Table 5-1. The WTG and OSP jacket substructures are shown in Figure 5-3 and Figure 5-4 below.

Table 5-1: Summary of WTG and OSP Support Structure Components to be Installed

Component	Number
Foundation piles	103 x 3 WTG and OSP jacket pin piles (excluding pile refusal allowance)
Jacket substructure	100 three leg WTG jacket substructures 3 three leg OSP jacket substructures

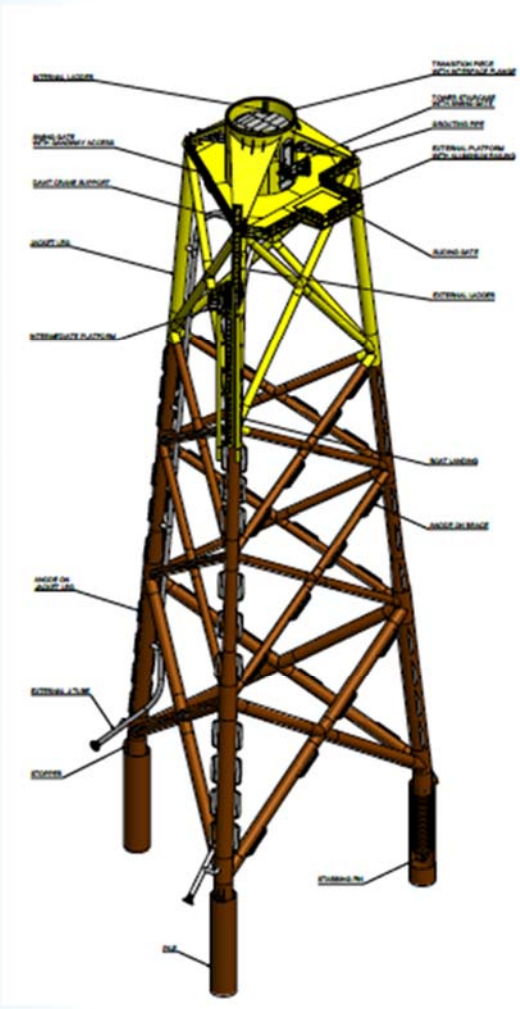


Figure 5-3: WTG Jacket 3D View

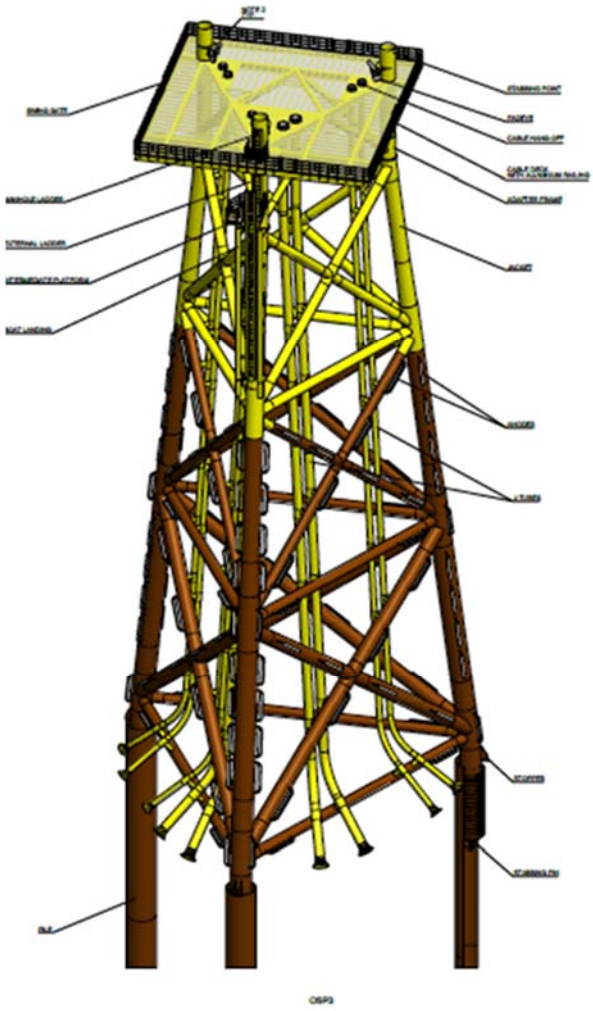


Figure 5-4: OSP Jacket 3D View

5.3.2 Scour Protection

Scour protection will be deployed after foundation installation as follows:

- On those foundations which are identified as requiring additional protection, including all OSP foundations and a limited number of WTG jackets where from the effects of seabed lowering from scouring are deemed critical; and
- Scour protection system will consist of materials deposited on the seabed either prior to or post pile installation (or both in the case of a two layer design) in the form of a filter layer and surface rock placement.
- Scour protection will be deployed from a 'fall pipe' vessel mobilised to the site. This vessel will lay an accurate layer of material on the seabed using a remotely controlled 'fall pipe' deployment and survey system.

Any scour protection used will be mapped and notified to MS-LOT.

5.3.3 Piling Installation Works

5.3.3.1 Installation Vessels

A detailed description of the piling strategy will be provided in the Piling Strategy (PS).

The foundation pin piles will be installed from a pile installation vessel (or vessels) mobilised on to the site. The vessel(s) will likely be a self-propelled jack-up construction vessel (JUP), equipped with heavy lift craneage suitable for the pile lifting and installation operations. Once manoeuvred into the correct position the JUP will deploy the vessel legs and jack-up clear of the water level each location. Forecasts of site specific leg penetration in to the seabed indicate penetration depths up to 15 m below the seabed level may be encountered, though penetrations of 5 m are deemed more likely. A typical JUP is shown in Figure 5-5 below.

Typically piles will be brought to the installation vessel whilst on site using dynamically position controlled platform supply vessels (PSV). Piles will be lifted from the supply vessels horizontally and placed onto the installation vessel deck using the installation vessel crane.

Figure 5-5: Typical Jack-up vessel for piling operations

5.3.3.2 Pile Supply

The piles will be transported either directly from the fabrication yard or from an onshore storage / marshalling harbour (port of Invergordon) by means of a PSV. Storage at the marshalling harbour may be either onshore yard facilities or barge based 'floating' storage. The PSV will load the piles using harbour craneage (likely shore based however floating crane may also be utilised) for at least one foundation and will then sail to the installation vessel which remains offshore.

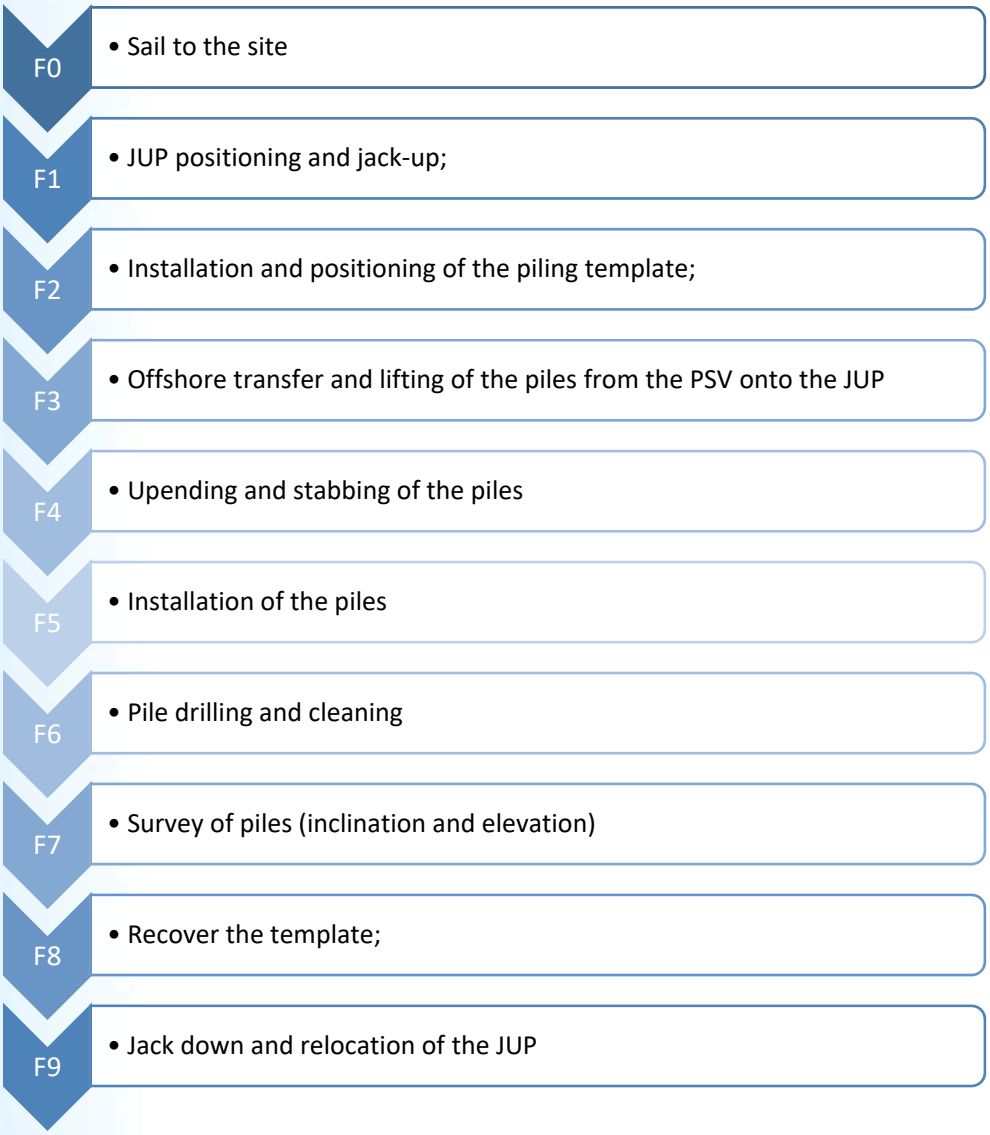
The PSV will have a dynamic positioning (DP) system allowing safe lifting operations close to the JUP.

It is expected that one PSV for pile supply will be sufficient to complete the pre-piling installation sequence without causing delays for the installation vessel.

5.3.3.3 Pre-Piling Works

A pre-piling methodology (where piles are driven into the seabed prior to jacket installation) has been selected as the construction methodology for the installation of the pile foundations.

The main steps of the pre-piling campaign phase are the following:



JUP positioning and jack-up

Pre-installation surveys will be carried out at each location to confirm the bathymetry and soil conditions.

After sailing to the offshore site, the JUP will manoeuvre into position using its dynamic positioning system, and maintain this position whilst deploying jack up legs (Figure 5-6 below).

Once positioned at its target location, the vessel will deploy the jack up legs and commence a preload operation the extent of which will depend on the soil conditions, prior to fully jacking up to the required level.

The clearance between the vessel and sea level will be dependent on the forecast weather conditions, however the ability to jack to give sufficient clearance for safe operation will always be available.

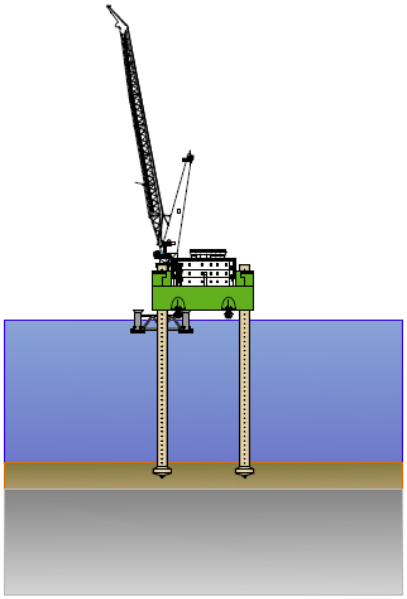


Figure 5-6: Arriving at Site- Positioning & Jacking Up

Installation and positioning of the piling template

The piling template which is stowed below the vessel is lowered to the seabed by operating the winches and controls (Figure 5-7 below), or if using a deck stowed template, will be lifted off the vessel deck and deployed to the seabed using the vessel crane.

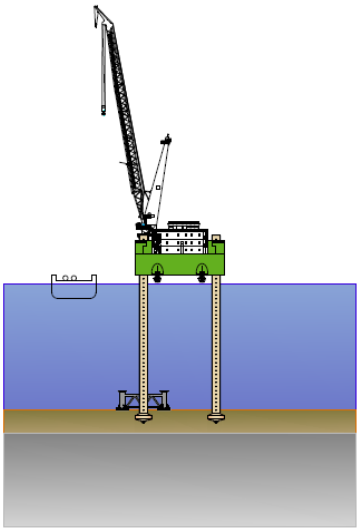


Figure 5-7: Lowering Template

Once deployed to the seabed, the horizontality of the template will be corrected by in-built levelling equipment within the template.

Deployment and positioning of the template will be constantly monitored by ROV onboard cameras and other integrated sensors to ensure position and level are within tolerance.

After all piles have been installed at one location, the template is recovered.

Offshore transfer and lifting of the piles from the PSV onto the JUP

The piles will be lifted by the JUP crane from the PSV onto the JUP (Figure 5-8). The PSV is positioned adjacent to the JUP and the JUP crane is used to lift the pre-piles on board one by one.

Figure 5-8: PSV Pile Delivery

Upending and stabbing of the piles

The piles will be upended from their horizontal storage position into their vertical position, using an upending tool connected to the main hook of the on-board crane (Figure 5-9 below). The bottom of the pile will be supported by a saddle and hook system or similar.

Figure 5-9: Saddle & Hook System for upending piles

The sequence for positioning the piles for installation is as follows:

1. Slewing the pile over to the appropriate location, which will either be a moon pool (a hole in the vessel deck) or to one of the overboard positions.
2. Lowering and "stabbing" the pile into the template pile (sleeve), guided by the guidance cones at the top of the sleeve.
3. Check pile verticality/template horizontality (Figure 5-10 below).
4. Disconnect rigging arrangements and prepare for next pile.

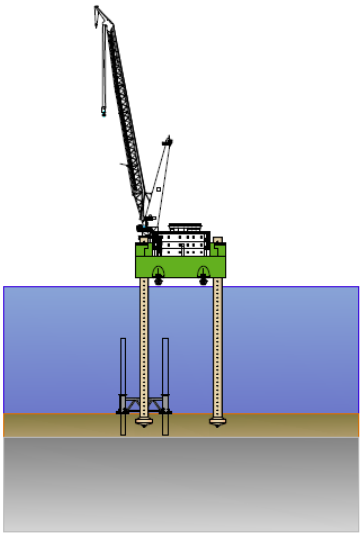


Figure 5-10: Stabbing Piles in the Template

Installation of the piles

Two installation methods have been considered:

1. Driving: the piles will only be driven using a hydraulic installation hammer. At these locations it has been calculated that the target depth could be reached without the need for relief drilling.
2. Drive–Drill–Drive: the piles will be driven until refusal using a hydraulic hammer, then the soil contained in the pile will be removed from seabed level to pile toe level and finally the pile will be driven again.

Pile driving

The pile driving procedure starts after the piling template has been installed on the seabed and the piles have been stabbed. Pile inclination and will be monitored during piling operations. The piling hammer is suspended from the installation vessel crane and lowered onto the top of the pile (Figure 5-11 below).

Pile driving is commenced following the soft start and impact energy ramp up in accordance with the PSs (Wind Farm PS (Moray East, 2019b) and OfTI PS (Moray East, 2019c)).

Figure 5-11: Pile Driving

Pile drilling and cleaning

Once the pile has been driven to target depth, the soil contained in the first 7 m of the pile should be removed to allow the jacket installation at a later stage.

A specific tool will be used for these operations. This tool is composed of a dredging / cleaning head and an air lift system to remove the soil and fitted with steel brush to clean the inside of the pile. Removed material is deposited adjacent to the pile / pile template. This activity may be undertaken from a separate vessel at a later stage.

Survey of piles (inclination and elevation)

During the pre-piling operations, three different survey phases can be defined:

1. The first one focuses on the positioning of the JUP, from sailing to jack up at position as this will determine the positioning of the pile template on the seabed.
2. The second one concentrates on the pile installation phase, from lowering template to pile reaching target depth.
3. The third phase comprises the very accurate measurement of the as built surface elevation and inclination of the piles prior to the installation vessel finishing at the specific location.

Recovering the template and relocation of the JUP

Following completion of pile installation and survey, the seabed template is then retrieved. The JUP undergoes jacking down and leg extraction operations, before relocating to the next location.

5.3.4 Jacket Installation Works

5.3.4.1 Installation Vessels

The jacket installation works will be carried out by a floating heavy lift vessel (HLV) mobilised on to the site (Figure 5-12 below). The vessel will be equipped with heavy lift craneage with sufficient capacity and lifting height suitable for the jacket lifting. The vessel will remain afloat during the lifting operations.

The HLV will typically load out and seafasten a number of jackets vertically onto the vessel deck at a suitable harbour location and transit to the Moray East site where it will deploy each jacket onto the pre-installed piles. Alternatively, jackets may be shipped directly to the HLV at the offshore site on barge (using attendant tugs) where upon the jacket would be lifted from the barge and deployed directly into the pre-installed piles.

Figure 5-12: Indicative jacket installation vessel - HLV

The HLV will be equipped with a dynamic positioning system which will allow the vessel to maintain position on each location during the jacket lifting and installation operations. Alternatively, an anchoring system may be utilised, which would require support from at least one additional anchor handling tug (AHT) to deploy and recover the anchors.

The main installation vessel may also be supported by an additional PSV or construction supply vessel (CSV). The CSV will be outfitted with a crane (Figure 5-13 below). The CSV will undertake the pile cleaning, prior to the jacket installation, and perform the grouting operations, after the jacket installation. Additionally, the CSV can also perform the survey activities, where required.

Figure 5-13: Indicative construction support vessel

5.3.4.2 Jacket Supply

Jacket load-out

The jackets will be loaded vertically onto the jacket installation vessel using the vessel crane or lifted onto a transportation barge using a shore side crane at the quayside of the base port. The jackets will be seafastened to the vessel deck for transportation to site (Figure 5-14 below).

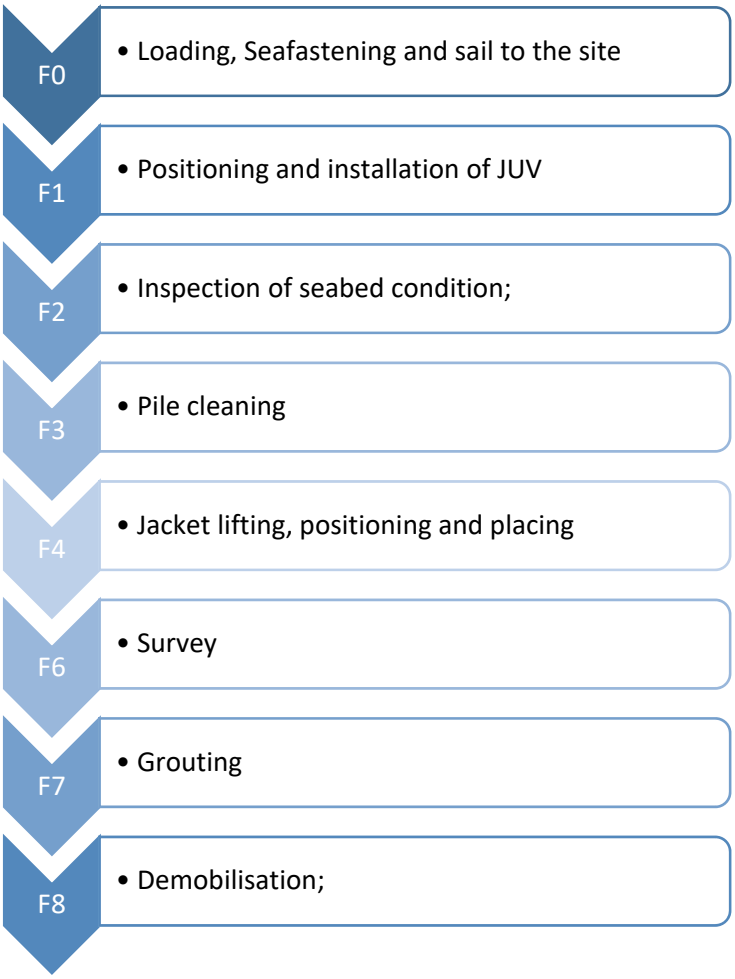
Figure 5-14: Sea fastening of Jacket

Jacket transport to the site

Based on the installation vessels or barge capacity limitations, transportation to the Moray East site of up to five jackets may be achieved per trip. The jackets will be transported in a vertical position.

5.3.4.3 Installation of Jackets.

The main steps for the jacket installation are the following:



Positioning and installation vessel

Once it has arrived near the target location (at a safe distance) the HLV will move into the installation position, adjacent to the pre-piled coordinates using its DP system. If using an anchoring system to maintain position, anchors (typically a minimum of four) will be deployed from the HLV and set with the aid of supporting AHTs.

Inspection of seabed condition

Prior to the jacket installation operation, an ROV survey will confirm level of the seabed, the absence of any debris and the overall suitability for placement of the jacket. This survey may be conducted from the installation vessel or alternatively immediately prior to the arrival on site by the CSV.

Pile cleaning

Prior to installation of the jacket, the piles have to be cleaned internally. This operation will be performed from a CSV using a high pressure water jetting tool, though may also be undertaken from the HLV.

Jacket lifting

The HLV crane will connect to the top of the jacket using the remotely actuated lifting tool. When all jacket sea fastenings have been disconnected, the jacket can be lifted from the deck (Figure 5-15 below).

The first jacket will be lifted clear of the vessel and other deck structures, with the assistance of winched ‘tag lines’ to prevent excessive motions.

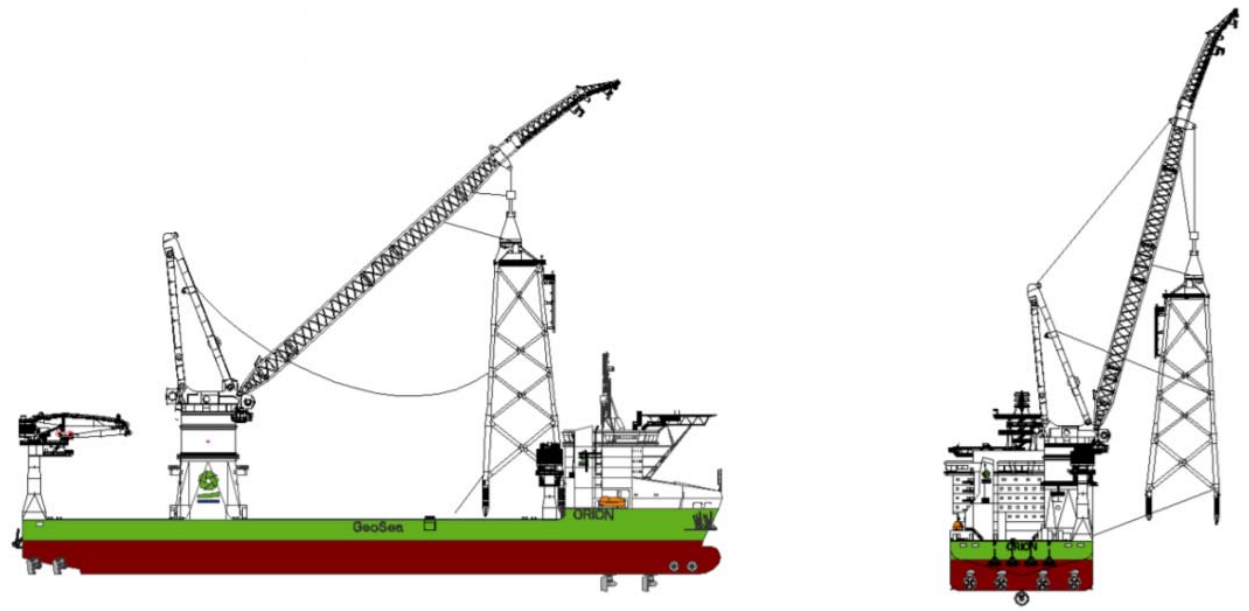


Figure 5-15: Jacket Installation onto pre-installed piles

Jacket Positioning and Placing

The jacket is lowered into the sea and through the water column until the bottom of the jacket legs reach a level approximately 3 m above the pre-installed pile top levels.

With an ROV deployed to provide visual monitoring of the placement of the jacket, by using the crane to ensure the position and deck mounted tag lines to control orientation and movement, the jacket will be lowered such that the stab in tubulars on the bottom of the jacket are located into the piles.

When jacket piles are fully penetrated, the jacket will be supported on specifically design steel 'stoppers' at the base of the jacket which rest on the top face of the piles. Accurate measurements during pre-piling will allow correct adjustments of the jacket leg stoppers to ensure the verticality of the structure.

After the jacket is placed and rests on the piles a gangway will be installed between the HLV and the jacket top platform to allow further checks, including measurement of the verticality and the installation of temporary navigation lighting (if not already installed).

Survey

The contractor will measure the inclination of the jacket during the installation. The inclination of the jacket structure shall be measured during various phases of the jacket installation such as lowering of the jacket onto the seabed.

5.3.5 Grouting

Once the correct verticality of the jacket is confirmed after levelling operations, the grouting activities at the pile can start. The purpose of grouting is to establish a sound and reliable connection between the piles driven into the seabed and the jacket mounted on top of the piles.

Grouting works can be undertaken from the HLV or more likely from an attendant Offshore Platform Supply Vessel (PSV) in order to allow the HLV to continue jacket installation.

Figure 5-16: Connection point on jacket for grouting

The grouting materials will consist of the following:

- BASF Master Flow 9800 High Strength grout or similar alternative;
- Fresh water; and
- Seawater.

For jacket leg / pile interface, there is a primary grout line on top of the jacket (Figure 5-16 above). The grouting equipment located on the vessel will be connected to the primary line with grout hoses running along the gangway from the vessel to the jacket.

Following jacket installation for each pre-pile, grout shall be mixed in proportions and injected to fill the space between the jacket 'stab-in' steelwork and the internal pile surface. An ROV shall be used to observe grouting operations and the overflow, to verify the complete filling of the connection. Measures will be put in place to mitigate grout overflow into the sea.

5.3.6 Demobilisation of Installation Spread

After all jackets are completely installed, the HLV and other support vessels will be demobilised.

5.4 Inter-Array and OSP Interconnector Cable Installation

5.4.1 Inter-Array and OSP Interconnector Cable Manufacture and Supply

The inter-array and OSP interconnector submarine cables will be designed and manufactured by a European supplier. It is expected three cable conductor cross sections sizes will be required; 240 mm^2, 500 mm^2 and 630 mm^2. The supply also includes the two OSP interconnector cables (500 mm^2). The cable design is high voltage alternating current (HVAC) for 66 kV, with aluminium (inter-array cables) or copper (interconnector) stranded conductors (3 phases) and XLPE insulation. The constructed cable will contain the associated metallic screens, sheaths, bindings and fibre optic elements and is encased by a single layer of helically applied steel armour wires.

As a separate component, a cable protection system will be designed and procured. Its purpose is to protect the cable where it is in the free span zone from the structure exit location and into burial in the seabed. In this zone the cable is affected by dynamic environmental loads (waves and current). The cable

protection, illustrated in Figure 5-17 below, system protects the cable from these loads and also provides impact protection.

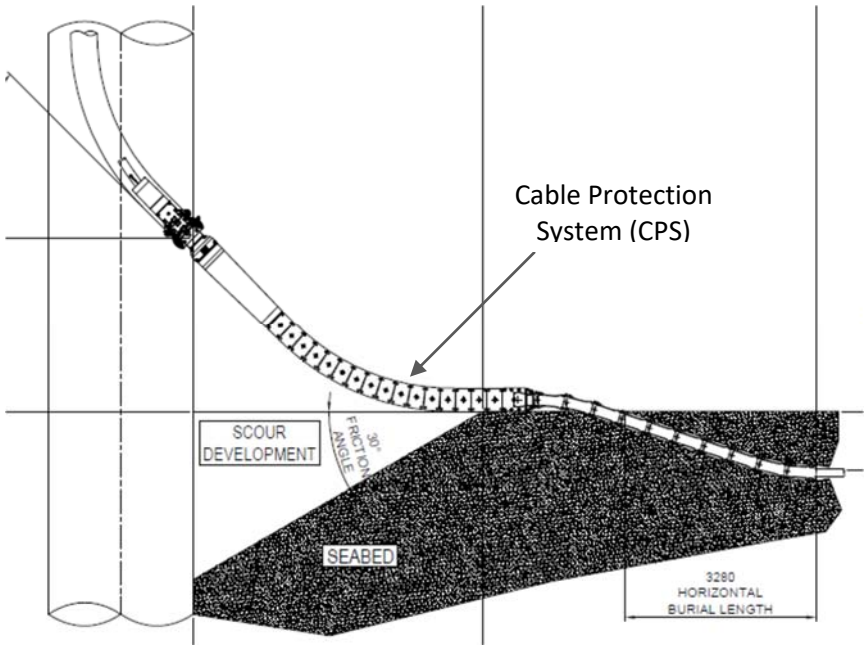


Figure 5-17: Cable Protection System

5.4.2 Cable Layout and Configuration

The inter-array and OSP interconnector cable layout provides connection between all WTGs and OSPs. The cables connecting between WTGs and also the final connection from the WTGs to the OSP are defined as inter-array cables, whilst the cables connecting directly between the three OSPs are defined as OSP interconnector cables.

The inter-array cable layout is of a radial design, with WTGs connected in cable 'strings' to the OSPs. Details of the cable routes and cable lengths are presented in the DSLP and CaP.

At each WTG or OSP connection, the cable and associated cable protection system will be pulled into and through a steel 'j-tube' mounted to the structure. The j-tube entry bellmouth is located approximately 2 - 3 m above seabed level. Sufficient cable shall be pulled up onto the platform cable deck to allow for it to be terminated into the electrical switchgear located in the WTG or on the OSP.

5.4.3 Route Engineering

The cable installation contractor will employ specialist route engineering techniques to design the optimal cable routes across the site. The route engineering shall take account of the following:

- Soils and shallow geology to evaluate burial performance or burial risks;
- Seabed topography, sandwaves and potential free span;
- Maintaining clearance from debris, wrecks, and potential UXOs;
- Minimise the level of boulder clearance; and
- Installation limitations and cable approaches to structures.

The output of the route engineering process will be cable design routes, and confirmed cable lengths for manufacture.

5.4.4 Cable Routes Site Survey and Cable Burial Risk Assessment

In order to support the route engineering and cable burial plan Moray East shall complete a detailed geophysical and geotechnical survey of the preliminary cable routes. The survey shall provide the required soil and seabed condition information to allow the selection and specification of the burial tooling. The survey will also identify debris, wrecks or boulders which pose a hazard to trenching operations, as well as potential unexploded ordinance within the defined cable installation corridors.

A cable burial risk assessment shall be completed and will assess the human (primarily fishing and shipping) and natural hazards to the cables over the life of the Wind Farm. The level of cable protection and depth of lowering is then defined for individual cable routes and soil conditions in a cable burial plan.

5.4.5 Cable Loadout and Transportation

The cable installation vessel N-Durance will mobilise for cable load out operations and transit to the chosen cable manufacturer's load out site. The cable loadout site and quayside will be equipped with storage carousels, cable handling rollers, cranes, tensioners, and chutes.

The cable installation vessel will be configured to receive and pack cable into an on-deck carousel.

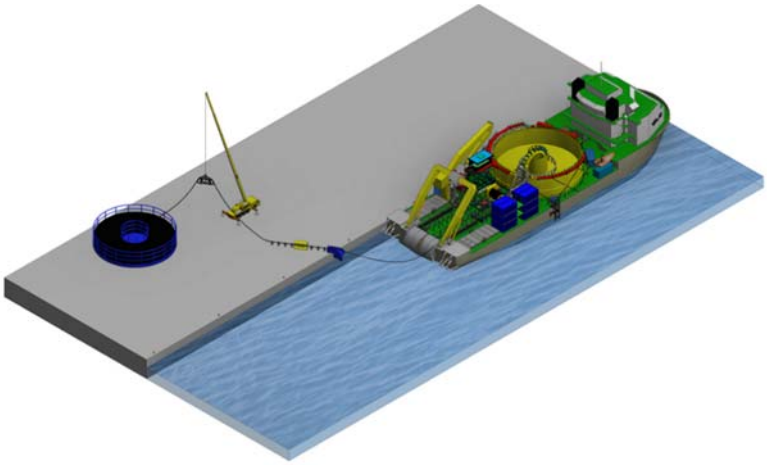


Figure 5-18: Cable Lay Vessel – Quayside set-up cable load out

The N-Durance is a DP Class II cable installation and burial vessel and is equipped with a 26 m diameter 5000 Te capacity on deck carousel for storage of cable.

Two loads outs are required to complete all the inter-array and OSP interconnector cables across the Wind Farm. The load out sequence and manufactured cable lengths shall be engineered and pre-agreed with the manufacturer.

The load out operations are controlled by the offshore shift supervisor (vessel) and quayside foreman (cable manufacturer) carefully monitoring the spooling speeds of both carousels, as well as a cable catenary in the water. The differing sizes of cables are packed into separate partitions of the carousel to allow increased volume of cable and better flexibility in lay operations.

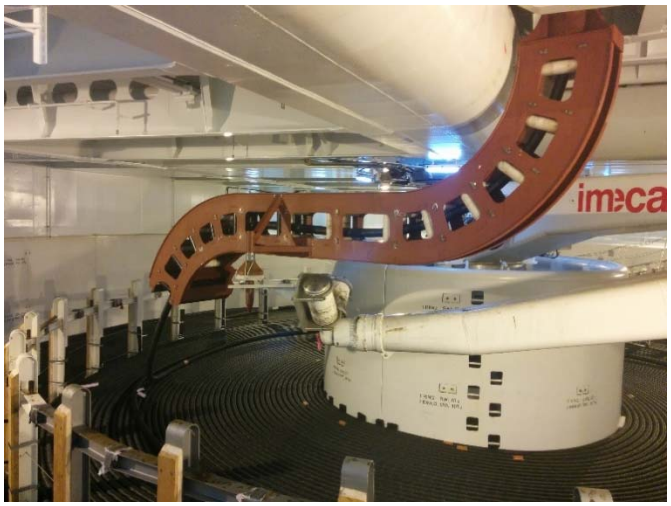


Figure 5-19: Partitioned carousel with cable loading

5.4.6 Preparatory Works and Pre-Lay Survey

Prior to cable installation operations an installation support vessel will mobilise and enter the Moray East site. This is a walk-to-work vessel using an actively compensated mobile gangway to allow pull-in and preparation personnel access to the WTGs and OSPs. The preparatory work will include:

- Foundation inspection and pull-in equipment set-up including; winches, rigging and monitoring equipment;
- Installation or checking of messenger lines located in the cable pull-in j-tubes;
- Removal of the subsea and topside J-tube exit covers; and
- A pre-construction survey of each cable route by ROV to identify hazards to cable installation.

5.4.7 Inter-Array and OSP Interconnector - Cable Installation

The installation of the inter-array and OSP interconnector cables will be completed on a string by string basis. The installation support vessel will work ahead of the cable lay vessel and the pull-in teams will set-up the pull-in equipment and prepare each structure for cable installation.

5.4.7.1 First End Pull-in

The cable lay vessel will set-up stern to the foundation j-tube exit heading. The pull-in wire messenger line is transferred from the foundation to the cable lay vessel deck and the pull-in winch is brought to deck and connected to the cable, including its associated cable protection system. The cable end is overboarded and pulled into the j-tube. The cable protection system will dock into the j-tube bellmouth and the cable is then pulled up into the foundation cable deck and the overlength required for the final connection is laid out. A ‘hang-off’ clamp is fitted to support the cable in the j-tube. The vessel will move off from the structure and lay cable on the seabed.

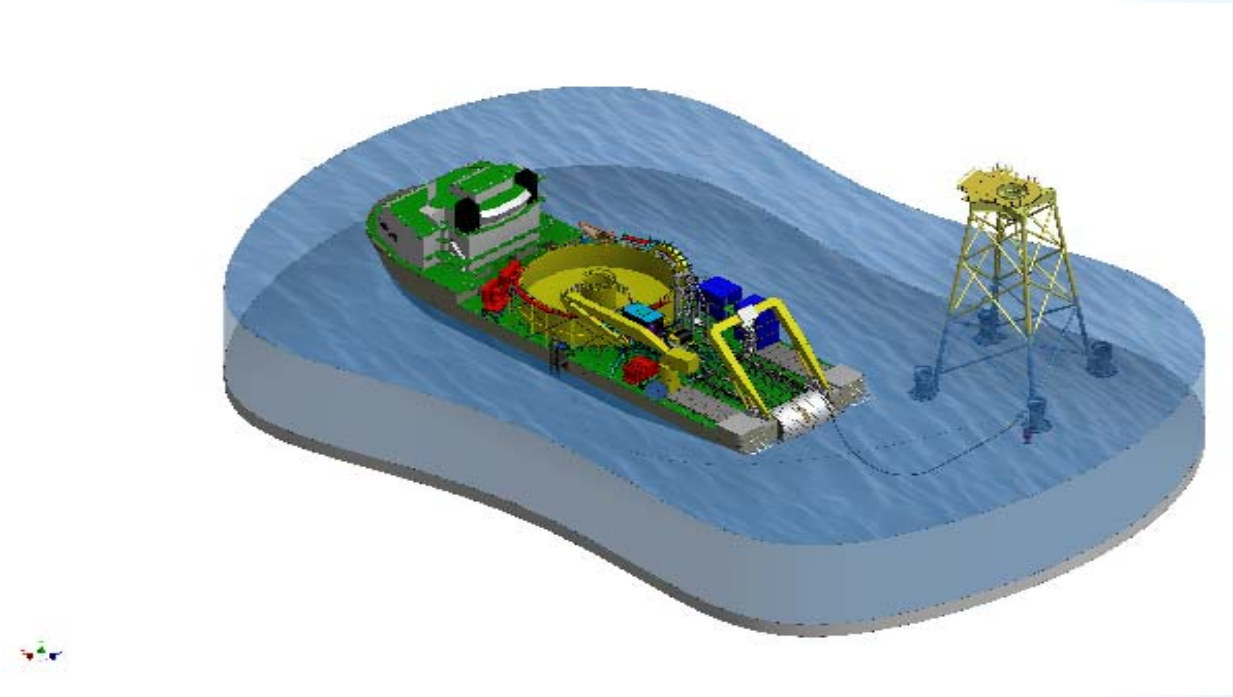


Figure 5-20: First end cable pull-in and vessel laying away

5.4.7.2 Cable Lay

Following first end pull-in, the cable will be laid along the defined cable design route with the cable shape and tension monitored throughout by ROV and the deck tensioner read out. Normal cable lay speed is around 400-600 m/hr.

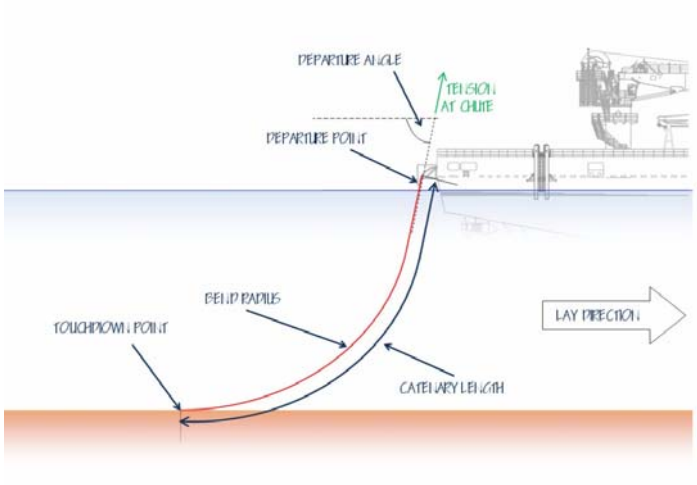


Figure 5-21: Cable Lay parameters

5.4.7.3 Second End Pull-in

Having laid the cable between two foundation locations, on approach to the second foundation the cable protection system will be assembled on the cable lay vessel deck. The pull-in teams will be transferred onto the foundation and pull-in winch set-up and preparations shall be completed. The key operations are:

- Calculate the required remaining cable length;
- Position the vessel at 90° to the cable approach into the foundation;

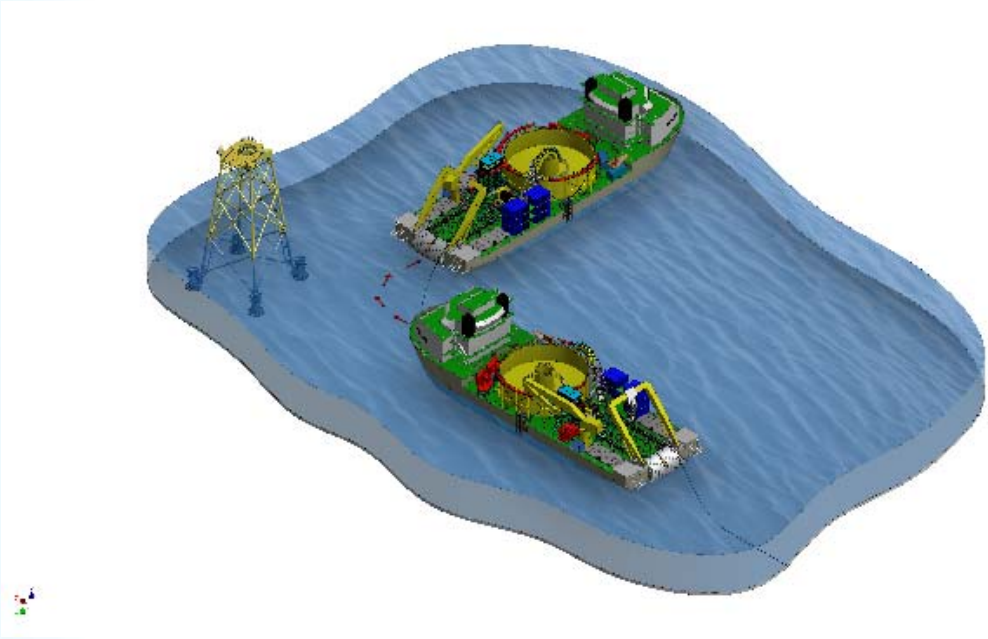


Figure 5-22: Lay vessel second end approach to structure

- Cut and seal the cable end;
- Transfer the messenger line and pull-in winch wire to the vessel deck;
- Move the cable around the cable handling quadrant and overboard using the vessel crane;

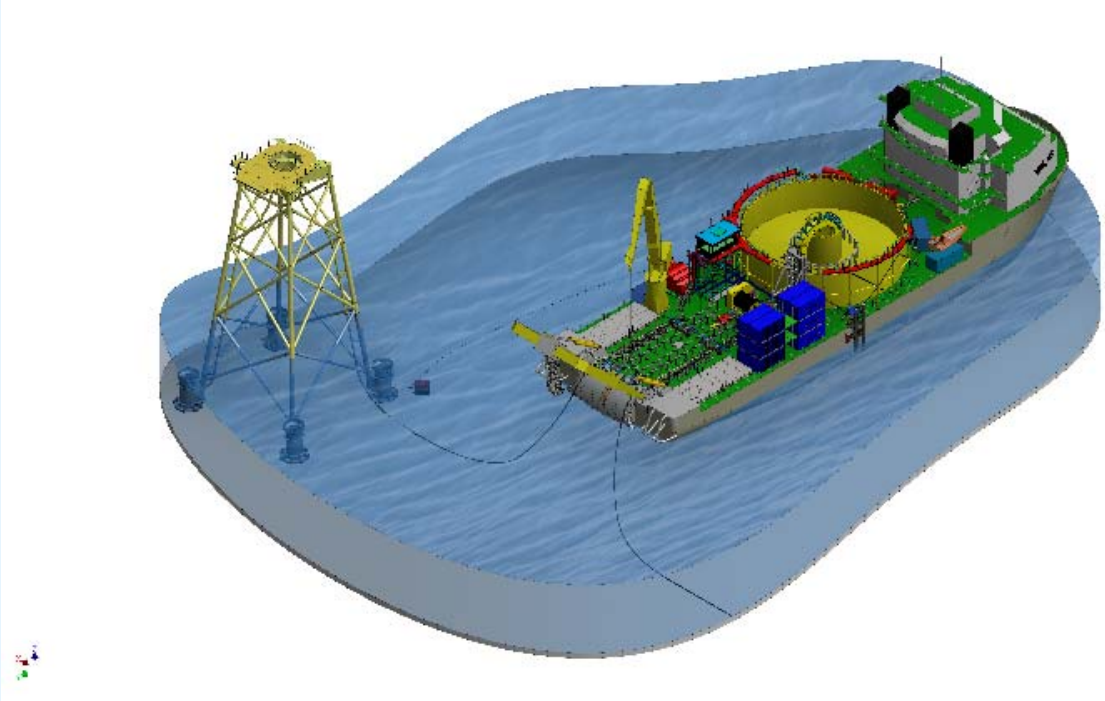


Figure 5-23: 2nd End pull-in and cable quadrant overboarding

- Pull in the cable into the foundation whilst lowering the quadrant to the seabed;

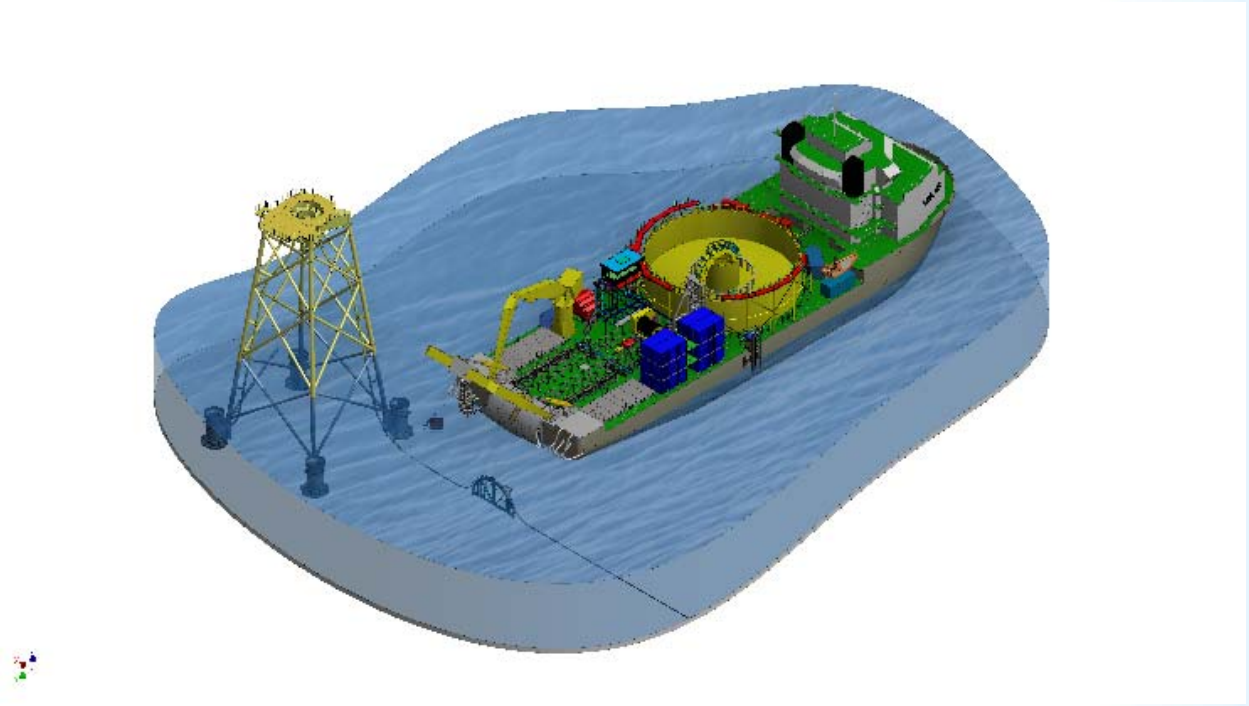


Figure 5-24: Cable and Cable Handling quadrant lowered to seabed prior to release

- Tip the quadrant and release the cable on the seabed;
- Complete the docking of the cable protection system into the j-tube bellmouth and pull the cable up to the foundation deck; and
- Secure the overlength of cable in the hang-off clamp.

5.4.8 Cable Burial and Protection

The installed cables will primarily be protected by burial. The depth of lowering of each cable route will be based on the soil conditions and the cable burial risk assessment, however a target depth of lowering of 1.0 m is planned across the Moray East site. A trenching support vessel will be mobilised with the trenching tool(s) and a survey ROV. The trenching units are launched and recovered with dedicated lifting frames.

The burial tools employed will be tracked vehicles with cutting and jetting, and jetting only capabilities. A typical trencher unit uses a chain cutter with mounted cutting picks, or similar, to break up and clear a defined trench through hard clays and peaty soil types. A jetting nozzle unit and cable depressor will lower the cable further into the cut trench.

Figure 5-25: Typical cutting and jetting tracked burial tool

A typical jet trenching unit will be employed in the sands, silts and softer clay type soils. These tools use high pressure jet nozzles (jet swords) and large water volumes to liquefy the soil, and allow the cable self-weight to lower the cable into the seabed.

Figure 5-26: Typical jet trenching tool

A combination of the two units can be used along a single route. The jetting trencher can be used for second passes where the cable has not reached the required depth of lowering.

A post burial survey of the cable will be completed by a survey ROV with a mounted cable tracker unit. This survey will provide the achieved depth of lowering and identify if further trenching or cable protection is required (e.g. rock placement or concrete mattresses).

Rock Placement Protection

Where trenching of the cable is not practical, or the seabed soil conditions do not allow the cable to achieve the required level of protection, the installation of rock placement on the cable may be required.

The rock will be loaded out into a dedicated rock placement vessel. The vessel is typically a dynamically positioned fallpipe vessel. This allows accurate placement of the rock from a fallpipe exit onto the cable. The rock berm height and slope angles are defined during the design phase. The operation is monitored by the fall pipe ROV. As built rock placement positions and level of cover are provided, and the final level of cable protection can be assessed.

5.4.9 Termination and Testing

After the cable protection operations are completed the overlength of cable pulled into the structure will be stripped back. The three individual cable power cores and the fibre optic bundle are split out. The permanent hang-off assembly is fitted to the j-tube top flange and cable armour wires are secured to the structure to support the cable weight.

The individual cable cores are then routed through the foundation and terminated with a connector into the electrical switchgear. All accessories and cable elements which require it are electrically earthed to the foundation.

After termination, post installation electrical and fibre optical testing is completed to verify there are no defects or damage in the cable system.

A complete inter-array cable system is then handed over for energisation of the cable network.

5.5 WTG Installation

5.5.1 Components to be Installed

The components to be installed on Moray East are summarised in Table 5-2 below.

Table 5-2: Summary of WTG Components to be Installed

Component	Number
WTG Towers	Up to 100 WTG towers, each consisting of 3 sections
WTG Nacelles	Up to 100 MHI Vestas V164 nacelles
WTG Blades	100 sets of blades (3 blades per set)

5.5.2 Delivery to Intermediate Delivery Port (IDP)

The various components that make up the WTG shall be delivered from the ports of origin to the selected IDP for Moray East. The components will be shipped as outlined in Table 5-3.

Table 5-3: Preliminary Component Origin

Component	Origin (presumed)	Delivery IDP	Estimated no. of Trips
WTG Towers	Europe	Invergordon	Approximately 75no. shipments in total
WTG Nacelles	Lindo, Denmark		
WTG Blades	Isle of White, UK		

5.5.3 Pre-Assembly Works

Prior to WTG installation, the IDP will store up to 20 full WTG components to ensure there is sufficient buffer to allow the installation activities to continue with the incoming shipment rate of WTG components. The breakdown of pre-assembly activities at the IDP consist of:

1. Tower pre-assembly including positioning for loadout (3 sections into a single tower);
2. Nacelle pre-assembly including positioning for loadout; and
3. Blades re-stacking including positioning for loadout (3 blades stacked).

5.5.4 Component Load out and Transit

The installation jack up vessel will be jacked up at the quayside at IDP and readied for loading. The WTG components will be loaded onto the jack up vessel and fastened for transport to the site. A total of 4 complete WTGs will be loaded on for a single trip from the IDP to site (see Figure 5-27 below).

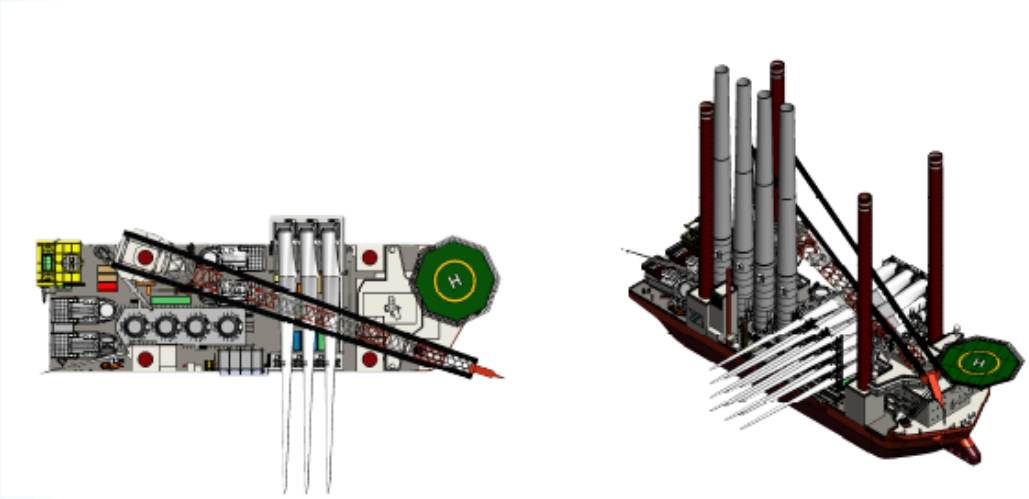


Figure 5-27: Fred Olsen Windcarrier Tern Class

After the WTG components are loaded and secured, the jack up vessel will jack down and begin the sail to site. Once the jack up vessel arrives at the first WTG location it will proceed to jack up adjacent to the WTG foundation and prepare for WTG installation.

5.5.5 Pre Installation Checks and Lifts

Upon arrival and after jacked up to the required elevation, the jack up vessel will secure a means of access from the jack up vessel to the foundation via a walk-to-work gangway.

Transition piece (TP) covers will be removed and loaded / fastened onto the jack up vessel for transport back to IDP.

Prior to any lifting of major components off the jack up vessel, there will be visual inspections and cleaning of the foundation flange to ensure a smooth connection between tower and TP flange.

The jack up vessel will also use a smaller auxiliary crane to lift tools, temporary power supply and connection bolts from the jack up vessel to the foundation transition piece in preparation for installation.

5.5.6 Tower Installation

The following process will be repeated for each tower installation:

1. A lifting yoke will be fitted to the main crane of the jack up vessel and the crane will manoeuvre over the first full tower to be installed. The tower will then be connected to the tower lifting yoke with a tag line system to control the orientation of the tower during lifting;
2. Sea-fastening will be released and the complete tower can be lifted from the jack up vessel deck and positioned over the foundation transition piece using the tag line system;

3. The tower will be mechanically connected to the flange of the foundation with bolts and the first step of tensioning performed according to specifications;
4. Once the complete tower is secured, the main crane will reduce the load to 0 t and the nuts connecting the tower and transition piece flange will then be tightened. After all nuts have been tightened the tower installation yoke can be released and returned to the deck of the jack up vessel;
5. Finally all tower / transition piece flange nuts will go through a final tensioning procedure in accordance with the contractor's specification.

5.5.7 Nacelle Installation

The following process will be repeated for each nacelle installation:

1. A lifting yoke will be connected to the main crane of the jack up vessel and the crane will manoeuvre over the first nacelle to be installed. The nacelle will then be connected to the nacelle lifting yoke through the dedicated lifting points within the main nacelle frame. A tag line system will be used to control the orientation of the nacelle during lifting;
2. Sea-fastening will be released and the nacelle can be lifted from the jack up vessel deck and manoeuvred over the installed tower using the tag line system and lowered in position;
3. The nacelle will be mechanically connected to the tower flange with bolts and fastened according to the Contractor's specifications;
4. Once the nacelle is secured, the main crane will reduce the load to 0 t and the lifting yoke can be released and returned to the deck of the jack up vessel.

5.5.8 Blade Installation

The following process will be repeated for each WTG rotor installation:

1. The main crane of the jack up vessel will manoeuvre over the first blade to be installed and secure to the blade. A tag line system will be used to control the orientation of the blade during lifting;
2. The blade will be released from the blade transport system (sea fastening) and then the blade is lifted out of the blade transport system;
3. The blade will be manoeuvred to the correct horizontal position of the hub on the installed nacelle;
4. The blade will be mechanically connected to the hub bearing flange with stud bolts and nuts and then tensioned according to the contractor's specifications;
5. When the blade is secured the main crane will reduce the load to 0t and the blade lifting tool is released from the blade and manoeuvred to next blade on deck to be installed;
6. The hub will be rotated to the next position via the pre-installed turning gear and locked ready to receive the next blade;
7. The above actions will be repeated for the remaining two (2) blades;
8. When all three (3) blades are installed the blade lifting tool will return to the deck of the jack up vessel.

Upon successful installation of all WTGs from the jack up vessel, the vessel will return to the IDP and repeat the above processes until all WTGs have been installed.

5.6 OSP Topside Installation

5.6.1 General

Along with the individual WTGs, Moray East Offshore Wind Farm will also include three OSPs. The main purpose of the OSPs is to house the electrical high voltage equipment for transformation of the power produced by the WTGs for onward export to the onshore substation.

The OSPs will each consist of a two deck (upper and lower) topside module placed on top of the pre-installed jacket substructure. The OSP jacket will include a cable deck and j-tubes conduits for inter-array and export cables and will be secured to the seabed via driven piles (see Section 5.3 above). The topside is designed to minimise the size and weight of the structure which also reduces offshore installation time.

The topside module shall carry equipment for high-voltage.

Access to the OSPs will be provided through boat landing on the substructure foundations. From the cable deck access to the other decks will be provided by stairs and ladders.

On the cable deck all cable hang-offs will be located as well as the cable routing to equipment on the upper and lower deck.

Two davit launched life rafts for emergency evacuation will also be located on the lower deck.

The upper deck will host the high voltage (HV) equipment and on the lower deck communication and control room and the emergency refuge will be located.

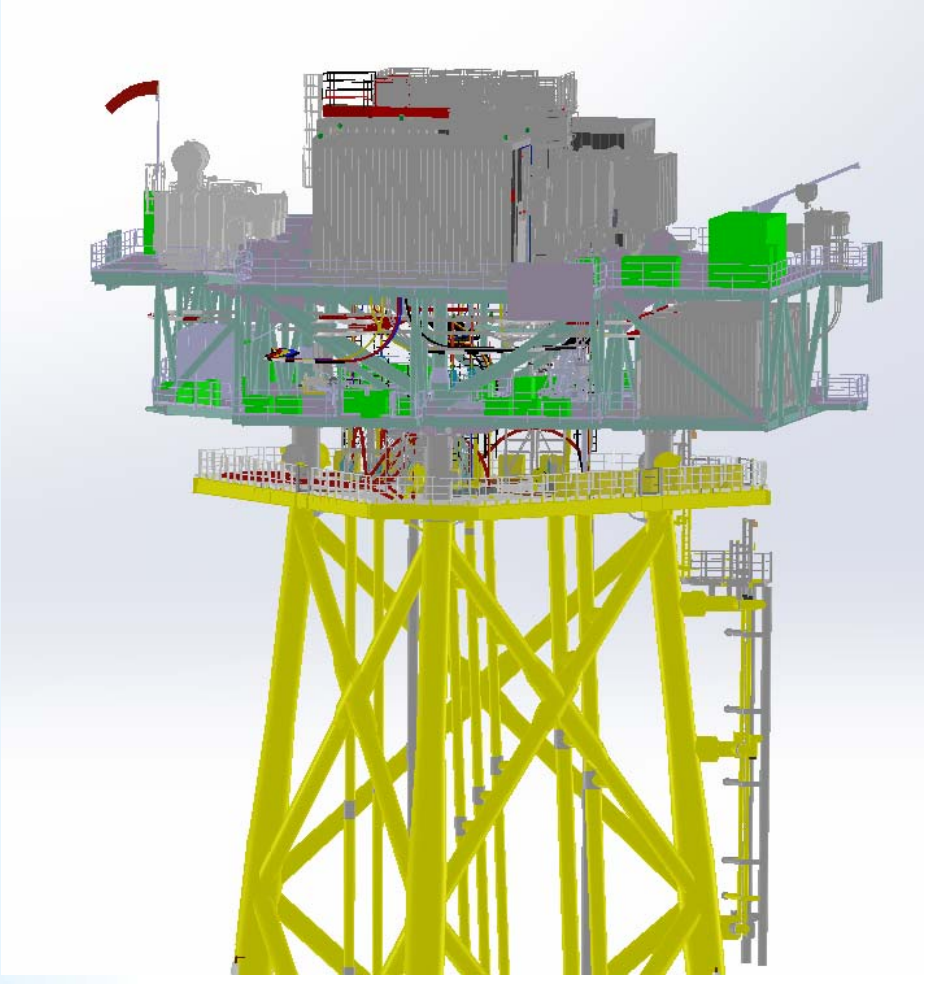


Figure 5-28: Isometric view of OSP Topside

5.6.2 Delivery to the Construction Site

The OSPs will be delivered directly to the Moray East site from the fabrication site for installation.

5.6.3 Substructure Installation

Installation of the pile and jacket substructures for the OSPs will be completed as described under Section 5.3 above.

5.6.4 Top side Installation

The topside module which includes the transformer and associated switchgear will be assembled as a single unit prior to being loaded onto a barge and transported to the Moray East site. This will ensure that once offshore, the lift of the module onto the substructure will take minimal time. Where possible, all rigging for lifting operations will be in place prior to shipping the module offshore.

Once a sufficient weather window is available, the lift will commence using a heavy lift vessel and the topside will be lowered onto the jacket substructure. It is anticipated that the topside module will be secured into position by use of a stab-in and a grouted connection.

5.6.5 Export Cable Installation

Installation of the export cables onto the OSPs will be as described in Section 5.7 below.

5.6.6 Inter-Array Cable Installation

Installation of the array cables onto the OSPs will occur after export cable installation. The installation will be as described in Section 5.4 above.

5.6.7 Hook Up and Commissioning

Pre-energisation commissioning activities take place within the OSP containers such as setting up communication systems with the shore, lighting, fire-fighting system commissioning etc. Once all systems are enabled, the OSP HV electrical systems are commissioned. When complete the OSP is operational and able to provide energisation for the WTGs as required.

5.7 Offshore Export Cable Installation

5.7.1 Offshore Export Cable Supply

The export cables are to be produced at the NKT HV Cables cable factory in Karlskrona, Sweden, and are of a standard HVAC (high-voltage alternating current) design: trefoil aluminium cores, XLPE insulation, associated screening, integral fibre optic cables, bedding and armouring.

5.7.2 Route Engineering

Specialist route engineering techniques will be used to optimise the cable route within the set OfTI Corridor. The route will be engineered to reduce the risk of complications during the cable installation and maintenance.

The route engineering shall take account of the following:

- Soils and shallow geology to evaluate burial performance or burial risks;
- Seabed topography, sandwaves and potential free span;
- Maintaining clearance from debris, wrecks, and potential UXOs;
- Minimise the level of boulder clearance; and

- Installation limitations and cable approaches to structures.

5.7.3 Export Cable Layout

A total of 3 export cables will be installed to the 3 OSPs. Further details will be provided in the DSLP and OfTI CaP.

The offshore export cables connect to the onshore export cable circuits at transition joint bays (TJBs), located at the landfall area at Boyndie Bay, which will form the 0 (zero) point for the cable lay.

At this shore end 3 HDD ducts are to be constructed well in advance of cable installation, that exit at approximately -10m LAT, approximately 1,100 m offshore. See section 5.9.6.

The route is designed as expediently as possible toward the platforms (see section 5.9.2 below), and along the route at kilometer point (KP) 45 (or 45 kilometers from the TJB) there is one subsea asset, a buried power cable, to be crossed by the Moray East export cables. See section 5.7.5 below.

At the OSPs the cable accompanied with a cable protection system will be pulled into and through a steel j- tube with a bellmouth approximately 2 - 3 m above seabed, with sufficient cable being pulled up onto the platform to allow for it to be connected to the HV switchgear on the OSP. The cable protection system is utilised as an installation aid and protection for the 'dynamic' movement of the cable over time.

It is intended that each of the offshore export cables are to be laid in one length with no offshore joints.

5.7.4 Export Cable Route Burial Assessment Survey

As part of the pre-installation works and ahead of the main export cable installation activities, a cable burial assessment has been carried out along the proposed route, to ascertain the likely seabed penetration of future hazards and therefore the cable burial requirement. This risk assessment has been informed by offshore surveys completed to date. The surveys and subsequent studies define the target depth the cable is to be buried to protect it in future from all natural and anthropogenic hazards. Further details will be provided within the OfTI CaP.

5.7.5 Third Party Cable Crossing

Three crossings, one per export cable, are to be engineered to protect against contact and sufficiently separate the Moray East export cables from the single Scottish Hydro Electric Transmission subsea cable (known as the SHET cable), an existing high voltage direct current (HVDC) transmission cable between Caithness and Moray.

The sequence of events will be to engineer rock type and quantities, expected to be standard quarried granite / gneiss and install a pre-lay rock berm, followed by post lay rock berm upon completion of cable lay.

In order to install the pre-lay berm, upon arrival infield, a fall pipe rock placement vessel will survey the already installed SHET cable to confirm its location. The vessel will then place 3 berms of rock across the cable at the crossing points of the to be installed Moray East cables.

5.7.6 HDD installation (landfall connection)

A total of 3 ducts of approximately 1,100 m will be installed using HDD, one at a time at the landfall location at Boyndie Bay above Mean High Water Springs.

The proposed HDD works will be undertaken in such a way as to cause minimum disruption to members of the public. The working area will be contained by fencing and access through the works will be restricted for health and safety reasons.

In order to install each duct/pipe, a pilot drill will first originate landward and exiting seaward. The drill hole will then be further opened to reach the diameter required for a duct/pipe of sufficient size to house the export cable. Upon completion of the hole opening, reaming and cleaning, a single length of extruded

pipe (fabricated offsite) will be floated into position from offshore and a 'pullback' operation will commence, whereby the drill string is connected to the floated pipe and this is drawn back through the hole to the landward end. Towing tugs and a small jack up or pontoon will be utilised offshore to facilitate this operation.

A dive team will locate the pipe end and proceed to use a dredge pump or similar to create a trench for the pipe to be lowered into. Upon completion, concrete mattresses will be placed on top of the duct to provide ballast. Divers will then use the dredge pump and airlift to provide backfill to the trench.

The onshore end of the duct will be flanged and a bellmouth installed to aid the future pull in of the cable.

5.7.7 Cable Collection (Loadout)

NKT HV Cables' specialist cable laying vessel the Victoria is scheduled to be utilised for the installation of the export cables.

The Victoria has enhanced dynamic positioning capabilities (DP3) with a 7,000 t upper turntable (cable storage and deployment equipment) capacity and 4,500 t lower turntable capacity.

The cables will be loaded from their place of manufacture in Karlskrona, Sweden. The anticipated transport of cables is divided in three lots / transports, each lot being each cable from shore to OSP.

The vessel will be moored alongside the factory and a series of cable handling equipment devices will take the cable from the factory, across the quayside and onto the vessel in a controlled manner.

When the cable loading is completed all equipment and cables on the vessel shall be sea fastened and the vessel will sail to the landfall location.

5.7.8 Export Cable Installation - Landfall

Prior to the vessel's arrival at site, the landfall site will be set up with a pull-in winch to draw the cable through the ducts installed earlier using HDD. The ducts will be inspected and cleaned utilising divers and a small multicat or jack up vessel offshore to assist.

For the installation of each cable, the installation vessel will stand offshore at the seaward end of the duct, ready to deploy the cable into the duct. The duct will have been pre-installed with a wire to aid the collection of the winch wire via a ROV launched off the installation vessel. After which the ROV will monitor as the cable is drawn into and through the duct by the landward winch.

The cable will then be secured to a strong point on the winch base onshore and the vessel will commence the lay the remainder of the cable toward the OSP. Jointing of the offshore export cable to the onshore export cable can then be completed as an onshore construction operation.

5.7.9 Export Cable Installation - Cable Free Lay

Following installation of the cable at the landfall, the installation vessel will then lay the cable to the seabed along the designed route, monitored by a ROV tethered from the vessel. This will be especially important to ensure the cable is accurately laid across the pre-installed rock berm at the crossing point described in Section 5.7.5 above and through any boulder fields.

5.7.10 Export Cable Installation - Second End Pull-in to OSP

The preferred method for installation of the final end of the export cable is through the use of a quadrant from the deck of the lay vessel, whereby a 'bight' of cable will be supported from deck to seabed during the pull in. The export cable end will be pulled into the OSP using a platform-mounted winch. Cable protection will be attached to the export cable on board the cable laying vessel prior to the pulling operation.

Following cable pulling, the cable will be routed within the OSP structure and connected to its termination point at the HV switchgear. Inspection and testing of each cable will be undertaken prior to its energisation.

5.7.11 Export Cable Installation – Cable Burial

Following cable lay on the seabed, tracked ROVs will be deployed from a vessel in order to bury the export cables. The ROVs will be configured in cutting or jetting mode depending on seabed conditions. Cutting is used in harder seabed conditions and is performed by chain cutters which are fitted with an array of cutting picks, positioned to efficiently and effectively cut the full width of the cutting boom. A slot trench defined by the cutter will provide protection to the cables in areas of hard clays. Where the seabed conditions are less difficult, such as sands or soft clays, the trenching mode will be water injection jetting from the same trenching ROV.

5.7.12 Post Installation Survey

The final position of the cable will be determined by means of a post installation survey. This will be carried out by a ROV moving along the cable route and recording the horizontal and vertical position of the cable relative to the seabed from the main lay vessel.

5.7.13 Cable Repair Contingency

If, during the cable lay operation, severe weather or a vessel / equipment failure occurs, it may become necessary to abandon the cable as a last resort.

During an abandonment operation the cable ends will be sealed and recovery rigging will be fitted, the location noted and the vessel will then prepare for repair mode.

The installation vessel will then return and collect one end of the cable to deck, the cable will be jointed to a new section and deployed, and the second end of this section will be jointed to other side of the cut cable.

The NKT HV cables subsea jointing arrangement consists of bending restrictors on each side of the steel body of the joint itself, within which the individual cable cores and fibre optics will be joined. These bending restrictors will protect the cable for possible over-bending at the joint connections, when the joint is overboarded.

The joint would then be buried by the same method as above, or via a controlled or mass flow excavation tool if the joint body and or lay down radii of the cable ends are too wide or too tight for the standard trenchers.

5.8 Electrical Infrastructure Commissioning

Following completion of the physical installation of the components that make up the OfTI, the OfTI will be commissioned and energised, allowing the Wind Farm to be commissioned and brought into commercial operation.

Commissioning and energisation of electrical infrastructure will involve the following principle activities, each of which is described further below:

- Energisation of the onshore infrastructure associated with the Development;
- Energisation of each of the offshore export cables;
- Energisation and commissioning of electrical equipment on the OSPs;
- Energisation of the inter-array cable network; and
- Energisation and commissioning of electrical equipment on the WTGs.

As the OfTI and Wind Farm utilise equipment operating at voltages up to 220kV, electrical infrastructure commissioning will be undertaken in accordance with high voltage safety rules that will be put in place by Moray East in line with industry practice.

The offshore commissioning works described in this section will be undertaken by personnel who will transfer on a daily basis to the offshore site from a local commissioning port base using crew transfer vessels. An offshore accommodation vessel may be deployed at peak times.

Onshore Infrastructure Energisation

Before the OfTI and Wind Farm can be commissioned, the onshore infrastructure associated with the Development first requires to be connected to and energised from the local onshore transmission network at the connection point near New Deer in Aberdeenshire. This will be completed once the onshore substation forming part of the Transmission Infrastructure has been constructed. The energisation process will be coordinated with National Grid and Scottish Hydro Electric Transmission and, once undertaken, will allow all primary and auxiliary systems at the onshore substation to be commissioned such that they are ready to accommodate connection of the OfTI and the Wind Farm.

Offshore Export Cable Energisation

The first element of the OfTI that will be energised will be the offshore export cables. Each of these will be energised sequentially, together with the associated onshore export cable circuits, once: (i) onshore substation commissioning has been completed as described above; and (ii) the offshore export cables have been physically installed as described in Section 5.7.

OSP Energisation and Commissioning

Once the associated export cable has been energised, power will be available to each OSP which will allow the following commissioning activities to be undertaken:

- Energisation and commissioning of the primary systems on each OSP, such as high voltage switchgear and grid transformers;
- Energisation and commissioning auxiliary systems on each OSP, such as control and communications equipment required to ensure the OSPs can be operated and monitored remotely; and
- Commissioning and testing of metering equipment.

Once OSP commissioning has been successfully completed, Moray East will be able to energise and commission the inter-array cable network associated with the WTGs as described further below.

Inter-Array Cable Network Energisation

As described within the DSLP (Moray East, 2019a), the inter-array cable network that connects the WTGs to the OSPs will be arranged in a number of circuits or ‘strings’. These will be energised and commissioned individually once the cable installation and testing works described in Section 5.4 above have been completed for each circuit. The main activities involved in inter-array cable network commissioning are as follows:

- Inspection of high voltage equipment and cable terminations along the cable circuit to ensure it is ready to be energised;
- Functional testing of the high voltage switchgear at each WTG location to ensure it is operating correctly;
- Completion of a ‘switching programme’ where each cable and switchgear unit on the circuit is energised; and
- Inspection and monitoring of the energised equipment prior to progressing to the next stage of Wind Farm commissioning.

Once each inter-array cable circuit has been energised, Moray East will be able to progress with energisation of individual WTGs as described further below.

WTG Energisation and Commissioning

The WTG commissioning activities will be conducted on individual WTG basis once grid power is available at the WTG location. The commissioning process will follow the Contractor's commissioning manual and will only take place when the following activities have been completed:

- WTG installed;
- WTG Mechanical & Electrical Completion; and
- WTG Energised in accordance with Moray East'sHV Safety Rules.

The energisation of the WTG is a joint activity between Moray East and their contractor to ensure that the energisation is conducted safely and as efficiently as possible.

6 Good Working Practices

6.1 Introduction

The Section 36 Consents and OfTI Licences include the following requirement relating to this CoP and CMS document (see Table 1-2 above):

> *The CMS must set out the construction procedures and **good working practices** for installing the [Development / Works].*

Good working practice is not defined by the Moray East Offshore Wind Farm Consents or OfTI Licences. For the purposes of complying with this requirement Moray East have taken the requirement to imply the following:

> *The reasonable application of methods of working that have been shown to achieve the best outcomes or that reach or exceed relevant legislative standards.*

In the context of the construction of the Development this has been taken to apply to those standards, guidance or examples of good practice working that will act to:

- Manage the construction process so as to avoid harm to construction personnel or third parties; and
- Ensure effects on the environment and other users of the marine environment are minimised as far as reasonably practicable (and in line with the commitments made by Moray East or the requirements of the Moray East Offshore Wind Farm Consents and OfTI Licences).

The following sections set out the areas of good working practices that will be applied during the construction process described by this CoP and CMS document. They address the following specific areas:

- Offshore renewable industry good practice guidance;
- Health and safety procedures;
- Construction management procedures;
- Environmental management procedures; and
- Specific good working practice in relation to aspects of the construction process (as set out in Section 4 of this CoP and CMS document) that, for example, act to avoid or reduce environmental impacts or impacts on other users.

Cross reference is made to other relevant consent plans (as described under Section 1.4 of this CoP and CMS document) and to the Moray East Statements of Compliance set out in Section 2.

6.2 Offshore Renewable Industry Good Working Guidance

There are a number of good practice guidance documents that have been produced for or in relation to the offshore renewables industry in recent years. Where relevant, Moray East will require that such good practice is reflected in the detailed method statements produced by the key contractors and sub-contractors.

Industry guidance documents are listed in Table 6-1 below.

Table 6-1: Offshore Wind Construction Good Working (or Best Practice) Guidance

Produced by	Title	Scope
The G+, published through the Energy Institute	Working at height in the offshore wind industry (published December 2014)	Covering design, construction, commissioning, and operation; designed to reduce the need for work at height; topic guidance sheets, covering common hazards, personal protective equipment, training and competence, fitness requirements, and the responsibilities of those procuring, supervising and undertaking work; with supporting information, such as regulatory requirements in selected EU countries and technical standards.
	The safe management of small service vessels used in the offshore wind industry (published December 2014)	Cover working with vessels that have a gross tonnage of less than 500 tonnes, such as crew transfer vessels, guard vessels, survey vessels and construction support vessels. The guidelines cover audit and inspection regimes for wind farm service vessels, operating procedures for routine marine operations, training and competence of crew and passengers, and safety equipment.
The Crown Estate	Sharing lessons learned and good practice in offshore transmission (published June 2014)	Presents the findings from a study commissioned to understand experience and lessons learned in the development, construction and operation of offshore transmission infrastructure.
	Construction vessel guideline for the offshore renewables industry (Published September 2014)	This guideline is designed to follow on from Vessel safety guide 'Guidance for offshore renewable energy developers (Vessel safety guide)' published by RenewableUK in January 2012 and is intended to assist by providing guidance to developers and the supply chain for the construction of an UK offshore wind farm project
RenewableUK	Offshore Wind and Marine Energy H&S Guidelines (published March 2014)	H&S guidelines for the offshore wind sector covering all phases of development and identifying risks and significant safety hazards and activities.
	Safety and Emergency Response in Offshore Wind (Published November 2011)	Guidance on managing Search and Rescue resources within the UK Search and Rescue Region in relation to the development of offshore renewable development.
	Safety Circular: Notices to Mariners. Guidance for Offshore Wind & Marine Projects (Published 2013)	This Circular provides a short summary of the accepted scope and format for issuing Notices to Mariners (NtoM).
	Incident Response: Offshore Wind and Marine Projects (Published October 2012)	This circular sets out a reminder and simplified protocol for managing the immediate stages following an actual or potential major incident where 3rd party assistance may be required.
	FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (Published January 2014)	Sets out best practice guidance on liaison between the offshore wind industry and the fishing industry.
	H&S First Aid Needs Assessment (Published December 2013)	Provide basic information on how duty holders can assess the provision of adequate and appropriate equipment, facilities and personnel to ensure employees receive proper attention if they are injured or taken ill at work.

Produced by	Title	Scope
	Vessel Safety Guide Guidance for Offshore Renewable Energy Developers (Published April 2012)	Provides guidance and insight on the selection of vessels through all phases of wind farm development.

6.3 Construction Management Procedures

Moray East will ensure a range of project management procedures are in place during the construction process that will, alongside the relevant approved consent plans, act to ensure the safe, compliant installation of the major project components as described in this CoP and CMS document, including but not limited to:

- A dedicated marine coordination centre to coordinate all activities on site including all vessel and personnel movements, electrical switching and site surveillance.
- Contracts with key contractors to a recognised standard (e.g. FIDIC, LOGIC or similar);
- Detailed construction method statements and risk assessments prepared by each of the key contractors and sub-contractors;
- Appropriate interface management procedures;
- A detailed integrated construction programme maintained regularly with input from the key contractors;
- Clear roles and responsibilities allocated to all parties;
- Appropriate and regular communications between all contracted parties and with relevant third parties;
- Marine warranty survey of all key construction activities where required under the terms of the project's insurances;
- Independent verification of key elements of design; and
- A clear process of reporting, recording and auditing of the construction process, contractor performance and methods for managing shortfalls in performance.

6.4 Environmental Management Measures

The environmental management measures that will be applied by Moray East and the key contractors and sub-contractors incorporate a variety of good working practice and legislative standards in relation to the control of waste, dropped objects, pollution prevention, chemical usage, control of invasive non-native species, etc.

Environmental management measures are set out in the Environmental Management Plan (EMP) which will be applied in undertaking the proposed construction works set out in this CoP and CMS document.

In addition to the EMP, a number of other consent plans or requirements also incorporate matters related to environmental management (and incorporate elements of good working practice) including:

- The piling strategies– management of foundation piling operations to mitigate effects on marine mammal populations;
- The vessel management plan (VMP) – management of vessel operations to mitigate effects on marine mammal populations;

- The navigational safety plan (NSP) – setting out matters related to the management of construction vessels to ensure navigational safety;
- The lighting and marking plan (LMP) and the NSP – lighting and marking to mitigate against impacts on other sea users;
- The marine pollution control plan (MPCP) – response to pollution incidents;
- The cable plan (CaP) – cable installation procedures;
- The Commercial Fisheries Mitigation Strategy (CFMS) – sets out the mitigation strategy for commercial fisheries potentially affected by the Development;
- The commercial fisheries liaison officer (FLO) – liaison with the local fishing industry and notification of planned works, vessel movements etc; and
- The archaeological MARP/WSI.

In addition, any matters set out in the ESs in relation to the mitigation and management of construction will be incorporated into the CMS (see Section 7 below).

6.5 Project-Specific Good Working Practices

There are a number of specific good working practices that will be applied to certain aspects of the construction process as set out in this CoP and CMS document and that will seek to minimise the environmental effects arising from the construction. The following sections set out the good working practices related to:

- Drill arising and soil plug disposal;
- Grouting operations;
- Seabed preparation and jack-up usage;
- Cable and scour protection;
- Piling operations;
- Drilling muds;
- Cable installation; and
- Minimising effects on other sea users.

A number of these are also set out in relation to environmental management in the EMP.

Drill arisings and soil plug disposal

Where necessary drill arisings and soil plug material generated during pile installation will be deposited on the seabed adjacent to the foundation location. Volumes generated per pile will be small (estimated maximum of circa 230 m^3 for drill arisings and circa 24 m^3 for soil plugs per pile; a combined disposal of up to circa 254 m^3 per pile). Drilling is not likely to be required for every pile location and in some cases soil plug volumes will also be less.

In the case of soil plug, spoil will be deposited at the seabed in the vicinity of the piles by means of rigid piping or flexible hose and it is possible to control and monitor to some extent the number and location of spoil heaps to manage the impacts at the seabed.

Drill arisings are managed through a reverse circulation drilling system using seawater and deposited to the seabed.

Spoil heaps, if required, can be measured during disposal using Remote Operated vehicle (ROV) sensors or other appropriate methods. The height of the spoil mounds will not exceed 4 m above mean sea bed level (MSBL) at each pile location.

Grout will not be used to control drill spoil as was suggested as an option in the Environmental Statement, the material being left on the seabed for dispersion by the prevailing hydrodynamic forces.

Grouting

Grout will be used to cement the joints between the piles and jacket structures. The volumes of grout required will be minimised as far as possible through design.

Grout loss will be minimised by the monitoring and control of grout volumes being injected into each joint and by the subsea monitoring of grouting operations by use of an ROV.

The high-pressure grouting equipment will be pressure tested onshore prior to being loaded onto the installation vessel to ensure there are no leaks. Once grouting is complete the grouting equipment will be cleaned on the vessel with water in a controlled manner to prevent grout from washing overboard.

Seabed preparation and anchor/jack-up movements

No dredging activities are anticipated prior to foundation installation with seabed preparation limited to that described in Section 5.2 above thereby reducing seabed disturbance and the generation of spoil material and spoil disposal requirements.

Potential boulders at Jacket footprint locations are avoided in the design stage or removed prior to arrival of JUP in the field.

Jack up movements and leg re-positioning will be minimised through the design of installation process so as to avoid unnecessary disturbance to seabed habitats. Similarly, anchor movements will be minimised.

Cable and foundation scour protection

The current foundation design basis is to avoid the use of no scour protection around the foundation structures, thereby reducing impacts on seabed habitats as a result of the placement of scour protection material. It is, however anticipated that a minority of the WTG foundations (< 15%) located in areas of soft soils will require scour protection. In addition, foundations for the OSPs will require scour protection due to the number of cables terminating into these jackets.

The need for cable protection material is not currently anticipated, other than localised and close-fitting cable protection at the cables ends between the J- or I-tubes and the buried sections.

Soft start piling

Soft start piling procedures will be applied at the start of piling operations as part of the marine mammal mitigation protocol. Full details of the piling approach and wider marine mammal mitigation is set out in the Piling Strategy.

Drilling muds

Where relief drilling is required during pile installation, drilling operations will not require the use of oil-based lubricants, but instead will use seawater-based drilling systems with no added chemicals.

Cable installation

Inter-array cable installation (see Section 5.4) is expected to be completed principally by the use of a water jetting trenching tool. These tools use a high-pressure water jet to fluidise the seabed soils allowing the cable to sink under its own weight to the target burial depth. They rely on the disturbed sediment settling back into the cable trench to create cover/backfill on top of the cable as the trenching tool passes.

To maximise post-trenching cable cover and to minimise the disturbance of sediment away from the trench, site specific trencher settings will be derived based on the soil conditions to ensure disturbed sediment is monitored and managed efficiently throughout operations.

Further details on the cable laying process will be provided for approval in the CaP.

Minimising effects on other sea users

Moray East recognise that the Development represents a major infrastructure construction project in the waters of the Moray Firth that are also used by a variety of other marine users including other commercial shipping, the commercial fishing industry and recreational sailors.

In order to ensure that effects on these other marine users are minimised, standard good working practices will be employed to ensure effective communication to minimise interactions and communicate risks arising from construction works to others in the vicinity of the construction site. A number of these are specific requirements of the consents but also represent good working practice, including:

- The regular issuing of Notice to Mariners (NtMs);
- The issuing of Notice to Airmen (NOTAM) for movements of vessels with structures or equipment above 60 m (e.g. cranes);
- Charting on nautical and aviation charts in line with regulatory requirements (provision of information to the UKHO);
- Lighting of temporary and partially installed structures during construction;
- Establishment of safety zones during construction;
- Use of radio navigation warnings;
- Appointment of a suitably qualified Fisheries Liaison Officer;
- Notification of commencement and completion of the works to local mariners, fishermen's organisations and HM Coastguard and Buckie Harbour Master by use of NtMs;
- Notification of details of the works through the Kingfisher Fortnightly Bulletin and provision of information to the SeaFish industry on vessel routes, timings and location of the works and relevant operations;
- Provision of details on the location of the Development for inclusion in the Clyde Cruising Club Sailing Directions and Anchorages; and
- Direct engagement and regular communication with other stakeholders such as owners of existing infrastructure in the Moray Firth.

In addition, the project consents contain a number of other conditions which essentially set out good working practice requirements in relation to reducing effects on other marine users, including:

- Burial or otherwise protecting seabed cables;
- Provision and agreement of necessary marking and lighting and buoyage for the Development;
- Employment of measures (through use of the Transportation Audit Sheet) to control debris on the seabed and a process, where necessary, for the reporting of dropped objects and subsequent investigation/recovery;
- Agreed measures for emergency response (through the agreement of an Emergency Response and Co-ordination Plan (ERCoP)).

Further details on Moray East's approach to these consent requirements will be provided for approval in a number of the other necessary consent plans including the VMP, the NSP (which includes the ERCoP), the LMP, the CaP and the EMP. Moray East, in addition to the good working practices embodied in the consent conditions, is also proposing to engage guard vessels during the period of active construction in order to ensure that third parties do not approach too close to the Development area and the location of construction activities (see also Section 4.6 above).

Moray East will also apply for construction safety zones under the provision of the Energy Act 2004 which will act to provide a clear 'area to be avoided' for other marine users; the location of the active safety zones will be provided as part of the NtMs issued.

7 Compliance with the Environmental Statement

The relevant conditions of the Section 36 Consents and the OfTI Licences require that the CMS be in accordance with the construction methods assessed in ESs, and that it includes details of how the construction related mitigation steps proposed are to be delivered.

Detailed method statements and associated mitigation measures (as relevant) with regards to piling activities, cable laying and management of construction activities are covered in other plans such as the DS, DSLP, EMP, VMP, NSP, wind farm PS, OfTI PS, wind farm CaP, OfTI CaP and the LMP. This CoP and CMS document provides an overview of the construction activities, which will be aligned with more detailed information as set out in these plans. Table 7-1 below provides a summary of commitments which are CMS-specific.

Table 7-1: Construction-related mitigations relevant to the CoP and CMS document

Source	Reference	Details of Commitment	Section in CMS and CoP
Moray East ES 2012	Draft EMP	Detailed schedule of planned construction and monitoring - Detailed construction works method statement which confirms final choices of materials and volumes to be used	Section 4, Section 5
Moray East OSP Marine Licence Statement Regarding Implications for the ES and HRA 2017	Moray East OSP Marine Licence Statement Regarding Implications for the ES and HRA 2017	Seabed preparation is not required for the distributed OSPs.	At the time of preparation of the Moray East OSP ER it was considered that seabed preparation would not be required for the OSPs. However, following further detailed site investigations Moray East now considers that, while dredging is not required (see Section 6.5 above), seabed preparation as described in Section 5.2 above may be required for the OSPs. Nevertheless it is considered that only one of the OSPs is covered within the OSP Marine Licence, with two OSPs covered under the OfTI Marine Licence. Seabed preparation was assessed within the ESs and therefore considered in the context of up to 339 WTGs and up to eight OSPs (worst case scenario assessed within Moray East ES 2012). With a significant reduction of infrastructure planned for the Development (100 WTGs and 3 OSPs), it is considered that the impacts from seabed preparation for the OSPs are no worse than the impacts assessed within the ESs.

8 References

Moray East (2019a). Development Specification and Layout Plan. Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure, document submitted for approval to MS-LOT, on behalf of the Scottish Ministers, March 2019. Document Reference Ref 8460001-PCA0010-MWE-REP-003.

Moray East (2019b). Wind Farm Piling Strategy, Moray East Offshore Wind Farm, document submitted for approval to MS-LOT, on behalf of the Scottish Ministers, March 2019. Document Reference Ref 8460001-PCA0010-MOR-REP-007.

Moray East (2019c). Offshore Transmission Infrastructure Piling Strategy, Moray East Offshore Wind Farm Transmission Infrastructure, document submitted for approval to MS-LOT, on behalf of the Scottish Ministers, March 2019. Document Reference Ref 8460001-PCA0010-MWE-REP-005.

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