Beatrice Offshore Wind Farm Consent Plan

Construction Method Statement (OfTW)



December 2016



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Project Title/ Location	Beatrice Offshore Wind Farm	
Project Reference Number	LF000005	
Date:	December 2016	

# Beatrice Offshore Wind Farm Construction Method Statement (OfTW)

## Pursuant to the Marine Licence (Offshore Transmission Works) Condition 3.2.2.4

## For the approval of the Scottish Ministers

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#### **Consent Plan Overview**

#### Purpose and Objectives of the Plan

This Construction Method Statement (CMS) has been prepared to address the specific requirements of the relevant conditions attached to the Marine Licence issued to Beatrice Offshore Windfarm Limited (BOWL) for the construction of Offshore Transmission Works (OfTW) associated with the Development.

The overall aim of the OfTW CMS is to set out construction procedures and good working practices in relation to the installation of the offshore Export Cables and the interconnector cable. A separate Wind Farm CMS has been prepared that addresses the Wind Farm and the remainder of the OfTW (i.e. the Offshore Transformer Modules (OTMs)).

The OfTW CMS confirms that the construction procedures described are in accordance with those considered in the original Application, and that construction-related mitigation measures detailed in the Application will be applied during installation.

All method statements developed by contractors involved in the Development must comply with the procedures set out in this OfTW CMS.

#### Scope of the Plan

The OfTW CMS covers, in line with the requirements of the Marine Licence condition, and in line with industry standards and good practice, the following:

- Construction procedures in relation to the installation of the offshore Export Cables;
- Good working practices to be employed during construction;
- Identification of Key Contractors;
- The roles and responsibilities of key project personnel and contractors during construction with respect to environmental management; and
- Confirmation that the construction methods described within the OfTW CMS align with those considered in the original Application.

#### Structure of the Plan

The OfTW CMS is structured as follows:

Sections 1 to 4 set out the scope and objectives of the OfTW CMS, provide an overview of the Development, set out statements of compliance and detail the process for making updates and amendments to this document.

Section 5 provides detail around construction procedures equipment to be utilised and sequence of installation works.



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Section 6 presents the good working practices to be applied by BOWL and contractors during construction.

Section 7 and Appendices A and B demonstrate compliance with the original Application.

#### **Plan Audience**

This OfTW CMS is intended to be referred to by personnel involved in the construction of the offshore Export Cable, including BOWL personnel, Key Contractors and Subcontractors.

Compliance with this OfTW CMS will be monitored by the BOWL (Consents and Licensing Team), the BOWL Ecological Clerk of Works (ECoW) and the Marine Scotland Licensing and Operations Team.

#### **Plan Locations**

Copies of this OfTW CMS are to be held in the following locations:

- BOWL Head Office;

- At the premises of any agent, Key Contractor or Subcontractor (as appropriate) acting on behalf of BOWL;

- The BOWL Marine Coordination Centre at Wick;

- With the ECoW(s).



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## List of Abbreviations and Definitions

Term	Definition / Description
AC	Alternating Current.
Application	The application letters and Environmental Statement submitted to the Scottish Ministers by BOWL on 23 April 2012 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by BOWL on 29 May 2013.
BOWL	Beatrice Offshore Windfarm Limited (Company Number SC350248) and having its registered office at Inveralmond House, 200 Dunkeld Road, Perth, PH1 3AQ.
CBRA	Cable Burial Risk Assessment.
CIS	Cast Iron Shells, a protective articulated cable casing that is designed to withstand abrasion, corrosion and high impact.
CLV	Cable Lay Vessel
Consent Plans	Other plans, schemes or programmes referred to in this OFTW CMS as are required by the conditions of the OfTW Marine Licence, Wind Farm Marine Licence and/or the Section 36 Consent as the case may be.
CoP	Construction Programme as required for approval under Condition 10 of the Section 36 Consent and Condition 3.2.2.3 of the OfTW Marine Licence (Ref: LF000005-PLN- 138).
CDM Regulations	The Construction (Design and Management) Regulations 2015.
CLT	Consents and Licensing Team.
COLREGS	International Regulations for Preventing Collisions at Sea 1972.
COSHH	Control of Substances Hazardous to Health (under the Control of Substances Hazardous to Health Regulations 2002).
CPS	Cable Protection System, a protective articulated cable casing installed between the OTM J-tube bellmouth and the seabed. It is designed to protect the cable from J-tube to seabed by providing increased cable stability, abrasion protection, corrosion resistance, protection from dropped objects and weighted anchorage to the seabed.
DECC	Department of Energy and Climate Change.
Development	The Wind Farm and the OfTW.
Development Area	The marine area associated with the Wind Farm and OfTW



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Term	Definition / Description
	corridor.
Direct Pipe	DIRECT PIPE® is a pipeline installation methodology pioneered by Herrenknecht, a form of HDD which has the advantages of micro tunnelling technology. This technique excavates the borehole using a micro tunnelling machine, pushed by the prefabricated final pipeline in one single step.
DoL	Minimum Depth of Lowering (of buried cables), where possible.
DS	Design Statement required for approval under Condition 14 of the S36 consent and Condition 3.2.2.7 of the OfTW Marine Licence.
DSLP	Development Specification and Layout Plan as required for approval under Condition 13 of the S36 Consent and Condition 3.2.2.6 of the OfTW Marine Licence (LF000005- PLN-152).
ECoW	Ecological Clerk of Works as required for approval under Condition 30 of the Section 36 Consent and Condition 3.2.2.12 of the OfTW Marine Licence.
EC1	Beatrice Transmission subsea Export Cable 1 (Easterly cable).
EC2	Beatrice Transmission subsea Export Cable 2 (Westerly cable).
EMP	Environmental Management Plan as required for approval under Condition 15 of the Section 36 Consent and Condition 3.2.1.2 of the OfTW Marine Licence (Ref: LF000005-PLN-144).
ERCoP	Emergency Response Cooperation Plan.
ES	The Environmental Statement submitted to the Scottish Ministers by BOWL on 23 April 2012 as part of the Application.
Entry Point	The onshore entry point for the pipe on completion of the Direct Pipe installation activities and after the pipeline has been cut to the required length. Typically, the final pipe entry point corresponds to the front wall of the Pipe Thruster Pit.
Export Cables	The High Voltage (HV) Alternating Current (AC) 220kV electrical transmission cable required to connect Wind farm to the OnTW.
Final Exit Point	The offshore seabed end of pipe position, once the pipeline has been pulled back in to the seabed to achieve the



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BOWI	Construction	Method	Statement	(OfTW)	)
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Term	Definition / Description
	required depth of burial. It is also the point at which the Polypipe attaches the pipe end flange.
FLO	Fisheries Liaison Officer.
H&S	Health and Safety.
HDD	Horizontal Directional Drilling. A steerable, trenchless, method of installing an underground pipe, conduit or cable in a shallow arc along a prescribed bore path by using surface-launched drilling equipment, with minimal impact on the surrounding area.
HSE	Health and Safety Executive (or Health, Safety and Environment).
HVAC	High Voltage Alternating Current.
OTM Interconnector Cable	High Voltage (HV) Alternating Current (AC) 220kV cable required to connect the OTMs to one another.
J-tubes	Steel tubes that allow the installation of cables by providing a safe and secure conduit through which the cables can be pulled. The tubes run from the cable termination points on the OTM top deck down the support structure and bend outwards in a 'J' shape terminating in a wide bell mouth approximately 2-3m above the seabed. The J-tube provides long term protection for the cable routed from subsea to the upper deck.
Key Contractors	The contractors appointed for the individual work steams of marine installation; transmission; and WTGs.
Km	Kilometre.
kV	Kilovolt.
Licensing Authority	The Scottish Ministers.
LMP	Lighting and Marking Plan as required for approval under Condition 20 of the Section 36 Consent and Condition 3.2.2.14 of the OfTW Marine Licence (Ref: LF000005-PLN- 136).
Marine Co-ordination	The management and surveillance of people, vessels and offshore structures and progress of the construction works to ensure the safe preparation and execution of offshore activities, in order to minimise the probability of an incident, and to provide effective response if an incident does occur.
Marine Licences	The Wind Farm Marine Licence and the OfTW Marine Licence



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Term	Definition / Description
MHWS	Mean High Water Springs.
MS - LOT	Marine Scotland Licensing Operations Team.
MPCP	Marine Pollution Contingency Plan as required for approval under Condition 3.1.12 of the OfTW Marine Licence (LF000005-PLN-165).
MW	Megawatt.
NSP	Navigational Safety Plan as required for approval under Condition 18 of the Section 36 Consent and Condition 3.2.2.9 of the OfTW Marine Licence (LF000005-PLN-128).
NtoM	Notice to Mariners.
OfTW	The Offshore Transmission Works. The OfTW includes the transmission cables required to connect the Wind Farm to the OnTW. This covers the OTMs and the cables from the OTMs to the Mean High Water Springs (MHWS) at the landfall west of Portgordon on the Moray coast. It also includes the two OTMs and the OTM interconnector cable.
OfTW CaP	The Offshore Transmission Works Cable Plan in respect of the Export Cable installation and OTM commissioning to be submitted for approval under Condition 3.2.2.10 of the OfTW Marine Licence (Ref: LF000005-PLN-214).
OfTW CMS	The Offshore Transmission Works Construction Method Statement in respect of the Export Cable installation and OTM commissioning to be submitted for approval under Condition 3.2.2.4 of the OfTW Marine Licence (Ref: LF000005-PLN-184).
OfTW Marine Licence	The written consent for the OfTW granted by the Scottish Ministers under Section 20(1) of the Marine (Scotland) Act 2010 and Section 65 of the Marine and Coastal Access Act 2009, issued on 2 September 2014, as revised by the revised licence issued on 27 April 2016.
OHSAS	Occupational Health and Safety Assessment Series.
O&M	Operation and Maintenance.
OnTW	Onshore Transmission Works. Includes all the components and operations for the onshore elements.
OSP	Offshore Substation Platform.
ОТМ	Offshore Transformer Module means an alternating current (AC) OSP which is a standalone modular unit that utilises the same substructure and foundation design as a WTG. Each transformer module is the collection point for half the Wind Farm's WTG generated power at 33kV and converts it to the 220kV onshore transmission voltage to minimise



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Term	Definition / Description
	electrical losses.
PEMP	Project Environmental Monitoring Plan as required for approval under Condition 27 of the Section 36 Consent and Condition 3.2.2.1 of the OfTW Marine Licence.
Pipe Thruster	The unit which is used to provide up to 750 tonnes of thrust or pull force to the pipeline string being installed.
Pipe Thruster Pit	The onshore location of the Pipe Thruster. The Pipe Thruster Pit (sometimes known as the launch pit) is a temporary pit structure which provides the necessary structural anchorage for the Pipe Thruster Unit and is configured to allow the required ground entry angle for the pipe. The Pipe Thruster Pit is usually constructed from sheet piles and concrete which is fully removed on completion of the pipeline installation.
PLGR	Pre-lay grapnel run is a route clearance activity to remove longitudinal debris (fishing nets, ropes, wires etc.) which may impede cable lay or its subsequent burial.
Polypipe	The Polypipe is a medium or high density plastic pipe 20- 30m conduit which facilitates the cable entry and pull-in into the offshore pipe entry point situated beneath the seabed. The Polypipe is attached to the pipe end flange. On completion of the cable pull-in both the Polypipe and cable are buried beneath the seabed for long term protection.
Pop-out	The offshore seabed exit point for the direct pipe and micro tunnelling machine. The pipeline is "over" pushed out onto the seabed to allow recovery of micro tunnelling machine, before the pipe is sealed and pulled back in to the seabed to achieve the required depth of seabed burial at the end of the pipe
RAM	Restricted in their Ability to Manoeuvre.
ROV	Remotely Operated Vehicle.
Section 36 Consent	Consent granted by the Scottish Ministers under Section 36 of The Electricity Act 1989 to construct and operate the Wind Farm, dated 19 <sup>th</sup> March 2014.
SEIS	The Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 29 May 2013 as part of the Application.
SHE	Safety, Health and Environment.
Subcontractor	Subcontractors to the Key Contractors.
t	Tonnes.
Transition Joint Bay	The transition joint bay (TJB) where the 220 kV Subsea cable is jointed to the 220 kV Land cable. The TJB is part of



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Term	Definition / Description
	the permanent cable infrastructure and is set some distance back from the Entry Points
UKHO	UK Hydrographic Office.
UXO	Unexploded Ordnance.
VMP	Vessel Management Plan as required for approval under Condition 16 of the Section 36 Consent and Condition 3.2.2.8 of the OfTW Marine Licence (Ref: LF000005-PLN- 168).
Wind Farm	The offshore array development as assessed in the ES including WTGs, their foundations, inter-array cabling and meteorological masts.
Wind Farm CMS	Wind Farm Construction Method Statement as required for approval under condition 11 of the Section 36 Consent and Condition 3.2.2.4 of the OfTW Marine Licence approved by MS-LOT on 10 October 2015 (ref: LF000005-PLN-145).
Wind Farm Marine Licence	The written consent for the Wind Farm granted by the Scottish Ministers under Section 20(1) of the Marine (Scotland) Act 2010, issued on 2 September 2014, as revised by the revised licence issued on 27 April 2016.
WSI	Written Scheme of Investigation.
WTG	Wind Turbine Generator.



#### 1 Introduction

#### 1.1 Background

1.1.1 BOWL received consent for the Wind Farm under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 19<sup>th</sup> March 2014 (the Section 36 Consent) and was granted two marine licences from the Scottish Ministers for the Wind Farm and associated Offshore Transmission Works (OfTW), on 2<sup>nd</sup> September 2014 and subsequently superseded on 27 April 2016 (reference: [04461/16/0]/[04462/16/0]).

#### 1.2 Objectives of this Document

- 1.2.1 The OfTW Marine Licence contains a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of OfTW construction.
- 1.2.2 One such requirement is the approval of a Construction Method Statement (CMS), the purpose of which is to set out OfTW offshore construction procedures and good working practices.
- 1.2.3 The relevant condition setting out the requirement for an OfTW CMS for approval is set out in full in Table 1.1.
- 1.2.4 A separate Wind Farm CMS has been prepared that addresses the Wind Farm and the remainder of the OfTW (i.e. the OTMs). This consent plan was approved by MS-LOT on the 10th of October 2015 and also partially discharges the OfTW Marine Licence condition 3.2.2.4.
- 1.2.5 This OfTW CMS serves to discharge OfTW Marine Licence condition 3.2.2.4 in respect of the OfTW.

Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this OfTW CMS
Marine Licence (OfTW)		The Licensee must, no later than 6 months prior to the Commencement of the [OfTW] submit a CMS, in writing, to the Licensing Authority for their written approval.	This document sets out the OfTW 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, the Highland Council, Moray 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	Sections 5.0 and 6.0

#### Table 1.1 - Consent Condition to be discharged by this OfTW CMS



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Consent Document	Condition Reference	Condition Text	Reference to relevant Section of this OfTW CMS
		constructing the [OfTW].	
		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.	Sections 7.0 and Appendices A and B
		The CMS must, so far as is reasonably practicable, be consistent with the Design Statement ("DS"), the EMP, the Vessel Management Plan ("VMP"), the Navigational Safety Plan ("NSP"), the Piling Strategy ("PS") (if required), the Cable Plan ("CaP") and the Lighting and Marking Plan ("LMP").	Section 1.4 and cross-references to other Consent Plans throughout this OfTW CMS

1.2.6 In addition to the specific requirements of Condition 3.2.2.4 of the OfTW Marine Licence for an OfTW CMS (as set out in Table 1.1) this OfTW CMS also includes information in respect to near-shore installation works which will comprise a form of HDD known as Direct Pipe installation (See Section 5) and therefore includes information in respect of Condition 3.2.3.8 of the OfTW Marine Licence, as set out in Table 1.2.

#### Table 1.2 - Other consent conditions relevant to this OfTW CMS

Reference	Condition	Where addressed
OfTW Marine Licence 3.2.3.8	The Licensee must ensure the seaward end point of the HDD will be located as far offshore as practicable towards the depth of closure; the landward exit point of the HDD will be located onshore of the high-water mark, which may move landward due to coastal retreat; and the cables will be suitably buried between the seaward exit of the HDD and the depth of closure (the depth of water beyond which annually significant wave events will cease to contribute to beach sediment supply and morphological processes).	Section 5.3 (Export Cable Installation)

#### 1.3 OfTW CMS Document Structure

1.3.1 In response to the specific requirements of Condition 3.2.2.4 of the OfTW Marine Licence, this OfTW CMS has been structured so as to be clear that each specific requirement of the conditions has been met and that the relevant information to demonstrate that requirements of the Consent Condition are met by this OfTW CMS. The document structure is set out in Table 1.3.



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#### Table 1.3 – OfTW CMS document structure

Section	Title	Overview
1	Introduction	Provides background to consent requirements and overview of the OfTW CMS scope and structure; and Identifies those other Consent Plans relevant to the construction/installation process and provides a statement of consistency between this OfTW CMS and those plans
2	BOWL Statements of Compliance	Sets out the BOWL statements of compliance in relation to the OfTW CMS Consent Condition and the broader construction process
3	Updates and amendments to this OfTW CMS	Sets out the procedures for any required updating to or amending of the approved OfTW CMS and subsequent further approval by the Scottish Ministers
4	Project Overview	Provides an overview of the project and the key contractors and their roles and responsibilities
5	Construction Methods and Procedures	Provides further detail on each step of the offshore Export Cable installation process
6	Good working practices	Sets out the good working practices that will be applied during the Export Cable installation process
7 and Appendices A and B	Compliance with the Environmental Statement (ES), Supplementary Environmental Information Statement (SEIS) (Construction methods and mitigation)	Sets out how the details in this OfTW CMS are in accordance with those assessed in the ES and SEIS; and Sets out how the mitigation measures related to construction identified in the ES and SEIS are to be delivered (by reference to this OfTW CMS or other relevant Consent Plans)

#### 1.4 Linkages with Other Consent Plans

- 1.4.1 This OfTW CMS sets out the proposed offshore construction methods for the offshore Export Cables and the OTM Interconnector Cable (the OfTW). 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 Marine Licences and the Section 36 Consent.
- 1.4.2 Condition 3.2.2.4 of the OfTW Marine Licence (see Table 1.1 above) requires this OfTW CMS to be, so far as is reasonably practicable, consistent with a number of other specifically named Consent Plans, namely (in the order listed in condition 3.2.2.4):
  - The Environmental Management Plan (EMP (Ref: LF000005-PLN-026) (required under Condition 3.2.1.2 of the OfTW Marine Licence and Condition 15 of the Section 36 Consent);
  - The Piling Strategy (PS) (Ref: LF000005-PLN-142) (required under Condition 3.2.2.5 of the OfTW Marine Licence and Condition 12 of the



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Section 36 Consent) although see paragraph 1.4.3 below.

- The Design Statement (DS) (Ref: LF000005-PLN-167) (required under Condition 3.2.2.7 of the OfTW Marine Licence and Condition 14 of the Section 36 Consent) although see paragraph 1.4.3 below.
- The Vessel Management Plan (VMP) (Ref: LF000005-PLN-168) (required under Condition 3.2.2.8 of the OfTW Marine Licence and Condition 16 of the Section 36 Consent);
- The Navigational Safety Plan (NSP) (Ref: LF000005-PLN-128) (required under Condition 3.2.2.9 of the OfTW Marine Licence and Condition 18 of the Section 36 Consent);
- The Cable Plan (CaP) (Ref: LF000005-PLN-214) (required under Condition 3.2.2.10 of the OfTW Marine Licence and Condition 19 of the Section 36 Consent); and
- The Lighting and Marking Plan (LMP) (Ref: LF000005-PLN-136) (required under Condition 3.2.2.14 of the OfTW Marine Licence and Condition 20 of the Section 36 Consent).
- 1.4.3 Although Condition 3.2.2.4 of the OfTW Marine Licence makes reference to the PS and DS, these consent plans are not relevant to the OfTW CMS. Piling is not required for the installation of the offshore Export Cables nor for the OTM interconnector cable and no components of the OfTW works described by this OfTW CMS are visible above the sea surface. As such, this OfTW CMS makes no further reference to the PS or the DS.
- 1.4.4 The other plans named in OfTW Marine Licence Condition 3.2.2.4 have a link to the OfTW CMS in so far as they either provide additional details on the construction methodology (for example the OfTW CaP) and/or provide details on the control of construction to mitigate or manage potential environmental impacts and impacts on other marine users (for example the EMP, the VMP, the NSP and the LMP).
- 1.4.5 The interaction of this OfTW CMS with those Consent Plans specifically listed in OfTW Marine Licence condition 3.2.2.4 is detailed in Table 1.4 below.

#### Table 1.4 – OfTW CMS Consistency and links to other named Consent Plans

Other named Consent Plan	Consistency with and linkage to OfTW CMS	
EMP	The EMP sets out the environmental management framework for the installation and operation of the offshore Export Cable. The installation and construction described in this OfTW CMS 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 OfTW CMS (these being consistent with the measures described in the EMP where relevant).	
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 also considers operational management and coordination of vessels. The VMP details how vessel movements will be	



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Other named Consent Plan	Consistency with and linkage to OfTW CMS		
	managed during construction of the offshore Export Cable. This OfTW CMS refers to the same indicative construction vessels which are included in the VMP. The VMP will be implemented in parallel with this OfTW CMS and the measures described in the VMP will apply to the vessels undertaking the activities described in this OfTW CMS.		
LMP	Provides details of lighting and marking of the Wind Farm and OfTW structures (where applicable) during construction and operation of the Development. This detail is not repeated within this OfTW CMS		
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 sets out navigational lighting and notification requirements to be followed by cable lay vessels and vessels Restricted in their Ability to Manoeuvre (RAM). The NSP will apply to all vessels undertaking the activities described in this OfTW CMS.		
OfTW CaP	Provides the more detailed specification of the cables, their installation, burial and/or protection, their interactions with the environment and safety considerations, adding to the information contained in this OfTW CMS. The detailed information contained within the CaP is not repeated within this OfTW CMS.		



#### 2 BOWL Statements of Compliance

#### 2.1 Introduction

- 2.1.1 The following sections are intended to re-affirm the BOWL commitment to ensuring that the Development is constructed in such a manner as to meet the relevant legislative requirements set out by the OfTW Marine Licence, specifically it sets out:
  - A number of statements of compliance relating to this OfTW CMS and the broader requirements of the BOWL consents;
  - Matters related to Safety, Health and Environmental (SHE 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.
- 2.1.2 Reference is made throughout to other, relevant Consent Plans required by the BOWL consents and to other sections of this OfTW CMS where further detail is provided.

#### 2.2 Statements of Compliance

- 2.2.1 BOWL in undertaking the construction of the OfTW will require compliance with this OfTW CMS as approved by the Scottish Ministers (and as updated or amended from time to time following the procedure set out in Section 3 of this OfTW CMS).
- 2.2.2 Where updates or amendments are required to this OfTW CMS, BOWL will require that the Scottish Ministers are informed as soon as reasonably practicable and where necessary the OfTW CMS will be updated or amended (see Section 3 below).
- 2.2.3 BOWL, in undertaking the construction of the OfTW, will require compliance with other relevant Consent Plans as approved by the Scottish Ministers, as set out in Section 1.4 above.
- 2.2.4 BOWL, in undertaking the construction of the OfTW, will require compliance with the limits defined by the original application and the project description as defined in the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) and referred to in Part 2 of the OfTW Marine Licence except in so far as amended by the terms of the OfTW Marine Licence (unless otherwise approved in advance by the Scottish Ministers) (see section 7 and Appendix A (ES Rochdale envelope compliance) and Appendix B (relevant mitigation identified in the ES)).
- 2.2.5 BOWL, in undertaking the construction of the OfTW, will require compliance with BOWL company SHE systems and standards, the relevant HSE legislation and such



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other relevant legislation and guidance so as to protect the safety of the Wind Farm and OfTW construction personnel and other third parties.

2.2.6 BOWL will, in undertaking the construction of the OfTW, require compliance with all other relevant legislation and require that all necessary licences and permissions are obtained by the Key Contractors and Subcontractors through condition of contract and by an appropriate auditing process.

#### 2.3 SHE and Environmental Management

- 2.3.1 Further detail on SHE and environmental management is set out in the EMP; the installation of the offshore Export Cable described by this OfTW CMS will be undertaken in line with the procedures and practices set out in the EMP. The following section summarises the key BOWL commitments.
- 2.3.2 The Development, including the offshore Export Cable, is a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM regulations). BOWL will require compliance with the CDM regulations in the design of the OfTW and through the completion of the construction process.
- 2.3.3 The BOWL company SHE standards and risk management procedures (including those related lifting operations) will be applied in completing the construction of the OfTW and will be applied as minimum standards through conditions of contract with the key contractors and sub-contractors.
- 2.3.4 Management standards in line with ISO 9001, 14001 and OHSAS 18001 will require to be applied for the overall BOWL project management system, and the management systems of all Key Contractors and subcontractors will be required to comply with the same principles.
- 2.3.5 BOWL will require compliance with the Control of Substances Hazardous to Health Regulations 2002, (COSHH in ensuring that the risk to health from workplace exposure to hazardous substances is appropriately assessed and that exposure is prevented or, where this is not reasonably practicable, adequate controls are implemented and exposure monitored and managed to within acceptable levels in line with relevant regulations.
- 2.3.6 BOWL will require that all Key Contractors and Subcontractors have completed adequate risk assessments for all aspects of the construction.

#### 2.4 Equipment and materials

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



- 2.4.2 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).
- 2.4.3 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.
- 2.4.4 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 with 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.

#### 2.5 Construction personnel – training and competence

- 2.5.1 BOWL 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 in a safe manner for themselves and others and are adequately supported at all levels.
- 2.5.2 BOWL will require that all Key Contractors and Subcontractors have sufficient manpower resources of the required competence to meet the contractual requirements. Safe manning levels for all onshore and offshore activities will be determined by industry guidance and past experience
- 2.5.3 BOWL will require that personnel performing specific assigned tasks on the project will be qualified on the basis of appropriate education, training, competence and experience. Records of training or relevant certification will be required to be made available to BOWL for auditing where necessary.
- 2.5.4 BOWL will require that a project organogram (see Section 4.9) is in place and that the roles and responsibilities of all named personnel are clear and that clear project management procedures are in place for all aspects of the construction.
- 2.5.5 BOWL will require, through condition of contract, that welfare facilities are provided and maintained to the requirements of the Construction (Design and Management) Regulations 2015 and Workplace (Health, Safety & Welfare) Regulations 1992.
- 2.5.6 BOWL will require through condition of contract that suitable and sufficient first aiders are in place and that first aid provision meets, or surpasses, recommendations as laid down in the Health & Safety (First Aid) Regulations 1981 and that all first aid personnel hold a valid qualification.



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- 2.5.7 BOWL 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.
- 2.5.8 Further information relating to construction personnel training and competence is set out in the EMP submitted for approval by the Scottish Ministers.

#### 2.6 Construction vessels

- 2.6.1 BOWL 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, BOWL 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.
- 2.6.2 All construction vessels will comply with the procedures and requirements set out in other relevant Consent Plans such as the VMP, the NSP, the LMP and the EMP.

#### 2.7 Good working practices

- 2.7.1 Good working practices are set out separately under Section 6 of this OfTW CMS and in respect of the specific reference made in the consents in this regard.
- 2.7.2 BOWL will require relevant good working practice be applied where necessary by the Key Contractors and Subcontractors throughout the construction process in seeking to minimise the risks to personnel, other sea users and the environment.



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### 3 Updates and Amendments to this OfTW CMS

- 3.1.1 This OfTW CMS sets out the proposed methods for construction and installation of the offshore Export Cables and the OTM interconnector cable.
- 3.1.2 The OfTW Marine Licence condition 3.2.3.1 recognises that updates or amendments to this OfTW CMS may be required, stating that:

Any updates or amendments made to the CoP, CMS, PS (if required), DSLP, VMP, NSP, CaP, TTP, and LMP by the Licensee, must be submitted, in writing, by the Licensee to the Licensing Authority for their written approval.

- 3.1.3 The main approach to the construction process is described in this OfTW CMS including:
  - Number and specification of cables;
  - Landfall location; and
  - Installation procedures.
- 3.1.4 Where it is necessary to update this OfTW CMS in the light of any significant new information related to the construction and installation methods, BOWL propose to use the change management process set out in Figure 3.1 in identifying such information, communicating such change to the Scottish Ministers, re-drafting the OfTW CMS if required, seeking further approval for the necessary amendments or updates and disseminating the approved changes/amendments to responsible parties.



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#### 4 **Development Overview**

#### 4.1 Introduction

- 4.1.1 This section of this OfTW CMS provides an overview of the OfTW, identifies the main Key Contractors, and sets out, in relation to BOWL and the Key Contractors, main roles and responsibilities.
- 4.1.2 This section also cross-references to a number of the other Consent Plans where further information on these matters will be provided in satisfaction of the Consent Condition relating to the relevant Consent Plan (see also Section 1.4 of this OfTW CMS for relationship with other Consent Plans).
- 4.1.3 The specific detail on the offshore Export Cables and OTM Interconnector Cable construction and installation process is then provided in Section 5 of this OfTW CMS.

#### 4.2 Development Overview

- 4.2.1 The Development will consist of the following main components:
  - A total generating capacity of not less than to 588MW;
  - Up to 84 wind turbines of 7MW rated generating capacity;
  - Jacket substructures each installed on four pile foundations driven into the seabed;
  - Two AC 220 / 33 kV substation platforms, referred to as Offshore Transformer Modules (OTMs) to collect the generated electricity and transform the electricity from 33kV to 220kV for transmission to shore;
  - A network of circa 140km of inter-array, buried or mechanically protected, subsea cables to connect strings of turbines together and to connect the turbines to the OTMs;
  - Two buried or mechanically protected, subsea Export Cables, totalling circa 140km in length, to transmit the electricity from the two OTMs to the landfall at Portgordon and connect to the two onshore buried Export Cables for transmission at the transition joint pit. The onshore Export Cables further transmit the electricity to the BOWL onshore substation at Blackhillock. After which further 400 kV cabling connect the BOWL substation to the National Grid network via the neighbouring Scottish Hydro Electric Blackhillock substation.



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- One OTM Interconnector Cable of circa 1.2km in length that links the OTMs to one another; and
- Minor ancillary works such as the deployment of met buoys and aids to navigation as defined in the Lighting and Marking Plan (LMP) (Ref: LF000005-PLN-136).
- 4.2.2 This OfTW CMS relates only to the Export Cables and the OTM Interconnector Cable; the Wind Farm CMS covers the Wind Farm and OTMs.
- 4.2.3 Figure 4.1 below shows the location of the Wind Farm and offshore Export Cable corridor, Export Cables, OTM locations and the interconnector cable. Two High Voltage Alternating Current (HVAC) 220 kV subsea Export Cables will be connected to the OTMs located in the centre of the OWF and extend from the OTMs to the common landfall location west of Portgordon on the Moray coast. A single HV AC 220 kV interconnector cable will connect the two OTMs to one another.
- 4.2.4 The Export Cables and OTM Interconnector Cable coordinates are presented in Table 4.1 below.

Layout		Start Point		End Point			
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Approximate Length (m)	
Export Cable 1							
OTM1	Landfall	50 70.10'E	64 56.558'N	49 74.30'E	63 91.575'N	68.400	
Export Cable 2							
OTM2	Landfall	50 61.13'E	64 57.311'N	49 73.64'E	63 91.607'N	69.900	
OTM Interconnector cable							
OTM1	OTM2	50 70.10'E	64 56.558'N	50 61.13'E	64 57.311'N	1,200	

#### Table 4.1 – OfTW cable arrangements and cable lengths

- 4.2.5 The layout and more detailed design specification of the Export Cables and OTM interconnector cable is set out in the OfTW Design Specification Layout Plan (DSLP) (Ref: LF000005-PLN-181) (required under Condition 3.2.2.6 of the OfTW Marine Licence).
- 4.2.6 Further information on the Export Cable and interconnector cable layout design, specification and installation methods is set out in the OfTW Cable Plan (CaP) (Ref: LF000005-PLN-214) (required under Condition 3.2.2.10 of the OfTW Marine Licence).



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## 4.3 Timing of the offshore construction works

4.3.1 Details of the construction programme for the works described in this OfTW CMS are provided in the Construction Programme (CoP) consent plan (required under Condition 3.2.2.3 of the OfTW Marine Licence) (Ref: LF000005-PLN-138). It is currently anticipated that the offshore construction works will be carried out around the clock (i.e. 24 hour working 7 days a week unless noted otherwise).



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Figure 4.1 – Wind farm location and OfTW cable route

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#### 4.4 Key Contractors

4.4.1 The roles and responsibilities for the construction works for the contractor and the interface with the BOWL project team for the works described in this OfTW CMS are set out under Section 4.8 below.

#### Siemens Transmission Distribution Ltd. and Nexans Norway

- 4.4.2 BOWL have contracted Siemens Transmission and Distribution Limited (STDL) and Nexans Norway (part of the wider Nexans group) who have formed a Joint Venture, to design, manufacture, supply and install the offshore and onshore transmission infrastructure. Nexans Norway will design, supply and install the offshore Export Cables and the OTM Interconnector Cable.
- 4.4.3 Nexans Norway is part of the Nexans group, a world leading cable manufacturer, with industrial facilities in 40 countries and commercial activities worldwide. Nexans Norway produce and install submarine power cables and advanced umbilical to transmit and connect renewables projects to national transmission systems around the globe.
- 4.4.4 Siemens Transmission and Distribution Ltd (STDL) is the UK's largest transmission substation contractor, employing around 700 employees in the UK. STDL designs and constructs AC and DC substations for UK generation, transmission and distribution companies and industrial customers. The business is currently working on design and build contracts for three offshore wind farm connections.

#### 4.5 Subcontractors

- 4.5.1 Nexans Norway will be responsible for identifying and contracting sub-contractors such as may be required to provide services for the completion of the construction works. The installation of the horizontal pipes through which the cables will be installed where they reach landfall will be subcontracted to Stockton Drilling.
- 4.5.2 Examples of additional services that may need to be sub-contracted include (noting that unexploded ordnance (UXO) survey has already been completed) nearshore works, seabed preparation, back-hoe trencher, rock dumping vessel, support vessels, guard vessels (if required), survey services, transport services, supply of minor components, waste services, vessel provisioning and bunkering services and provision of equipment to be used in the construction works.

#### 4.6 Main Construction Vessels

- 4.5.3 Details of the main construction vessels that will be used to complete the construction works are provided in the Vessel Management Plan (VMP) (required under Condition 3.2.2.8 of the OfTW Marine Licence and Condition 16 of the Section 36 Consent) (Ref: LF000005-PLN-168).
- 4.5.4 BOWL intends to apply for safety zones during tie in of Export Cables to the OTMs



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(under the provisions of the Energy Act 2004). Subject to the consideration of the safety zone application by DECC, these would be expected to be 500m safety zones around the OTMs. Further details on safety zones and the general provisions for navigational safety are set out in the Navigational Safety Plan (NSP).

- 4.5.5 The Cable Lay Vessel (CLV) which will be utilised during cable installation works is a 'Restricted in their Ability to Manoeuvre (RAM)' vessel. RAM vessels are restricted in their ability to manoeuvre as a result of the nature of their work. They will be required to comply with the International Convention for the Prevention of Collisions at Sea (COLREGS), which is the international convention regulating vessel movements. They will also transmit safety warnings to inform other vessels of their movements (further detail on navigational safety is presented within the NSP).
- 4.5.6 If required during cable laying operations on certain sections of the route (e.g. the shipping lane between 9-20km of the Export Cables offshore from the Pipe Thruster Pit) the CLV may be accompanied by a guard vessel, dependent on assessment of shipping density in the area at the time of the cable lay.

#### 4.6 Marine Co-ordination

- 4.6.1 BOWL will establish marine co-ordination for the windfarm construction activities prior to construction commencing. The Marine Co-ordinator will be based at the Marine Co-ordination Centre (MCC) which will ultimately be based at Wick Harbour. Crew transfers to the construction area will take place from Wick Harbour once the MCC is established. In the event that Wick Harbour is inaccessible due to adverse weather conditions or where additional capacity is required, Buckie Harbour may also be used for crew transfer and any Marine Coordination activities as required.
- 4.6.2 The Marine Co-ordinator will liaise with Key Contractors and Subcontractors to enable a plan of operations to be formulated and promulgated. The following measures will be managed from the MCC to facilitate construction activities:
  - Permission for construction vessels to enter the construction area and safety zones will be managed by the Marine Coordination Centre, for example using a Permit to Work system;
  - The MCC will establish protocols for approaching and leaving the Development Area as well as management systems to record the work being undertaken and the vessels and personnel undertaking that work;
  - Movements of vessels around the Development Area will be monitored from the Marine Coordination Centre;
  - The Marine Co-ordinator and their support team will obtain and provide localised weather information for vessels working on the Development to plan the construction activities. The Centre will also maintain a copy of the Emergency Response and Co-operation Plan (ERCoP) and will be the main point of contact in the event of emergency incidents;
  - The MCC will also ensure the safety of the Development Area using



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appropriate methods; and

- The MCC will establish and [promulgate] entry and exit points to the construction areas to ensure interference with other marine users is minimised.
- 4.6.3 All marine operations and vessel movements will be required to be planned with due regard to the requirements of this VMP and the NSP.

#### 4.7 Construction Ports

- 4.7.1 It is anticipated that the Export Cable components will be shipped directly to the Development Area from the site of manufacturer (Halden, Norway) on board the CLV. Any requirements for a construction port for the OfTW cable works will be determined by Nexans Norway.
- 4.7.2 Local crew transfer to the construction site will be undertaken from Wick harbour or Buckie Harbour in the event that access to Wick is restricted.

#### 4.8 BOWL and Key Contractor Roles and Responsibilities

#### **Introduction**

- 4.8.1 The following sections set out the key roles and responsibilities of the ECPI, STDL/Nexans Consortium, who have been contracted to design and build the Beatrice OfTW transmission works from the onshore National Grid connection point to the two offshore OTMs (See section 4.4).
- 4.8.2 Further information on organisational responsibilities and interfaces (and the 'chain of command') in relation to environmental management is set out in the EMP (required under Condition 3.2.1.2 of the OfTW Marine Licence and Condition 15 of the Section 36 Consent).
  - 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.
  - Organisational arrangements, roles and responsibilities in relation to lighting and marking during construction are set out in the LMP.
  - Organisational arrangements, roles and responsibilities in relation to the Wind Farm and OTM construction are set out in the Wind Farm CMS.



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#### Organisational roles and responsibilities

4.8.3 The organisational arrangements and interfaces for BOWL and the key contractor are set out in the following organograms and the main roles and responsibilities within BOWL and Nexans Norway in relation to the main, overarching construction process are then described.

#### **BOWL - Key Roles and Responsibilities**

4.8.4 A summary of the BOWL organisational structure and the key roles during the construction of the OfTW is set out in Figure 4.2 below. The interface with Nexans Norway is indicated by reference to Figure 4.3 below which shows further details of the Key Contractor organisational structure and key roles and responsibilities.



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## Table 4.2 – Key BOWL roles and responsibilities

Role	Responsibility
Project Director	The Project Director is accountable to the BOWL Board for the overall project delivery strategy and the effective governance of the Development.
Senior Project Manager	Employed by BOWL to oversee the effective delivery of the construction phase of the whole OfTW.
SHE Manager	The Project SHE Manager is a member of the project management team responsible for providing support, advice and guidance on all aspects of Safety Health & Environmental management on the project.
Senior Engineering Manager and support team	The Senior Engineering Manager is responsible for overall technical integrity of the wind farm design and the associated construction and installation engineering.
Senior O&M Manager and support team	The Operations and Maintenance Manger works as an integrated member of the project team to ensure that both the final wind farm design and its as-built condition meet all requirements and specifications defined by BOWL.
Package Manager and Package Teams	The Package Managers have similar responsibilities as the Senior Project Manager but for their individual sub-packages of the project.
Installation Managers	The installation managers are responsible for the successful delivery of their individual sub-packages by the Key Contractor, ensuring design, delivery, commissioning and reporting meets with the contractual requirements and programme.
Consents and Licensing Team Manager	The Consents and Licensing Team Manager is responsible for the effective management of all consent, planning permission and land related activities through the Refinement and Execution phases of the project. Manages the ECoW, FLO and archaeological consultant roles.
Project Controls Manager	The Project Controls Manager is responsible for the leadership and management of the project controls team and ensuring all project controls functions are effectively integrated at all levels of project management and delivery.
Senior Quality Manager	The Senior Quality Manager is responsible for ensuring that the Project Quality Plan is developed and implemented, and Quality risks to the project are identified, assessed, managed, reviewed and reported effectively and efficiently.



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Role	Responsibility
Risk Manager	The Risk Manager supports the Senior Project Manager, the Project Controls Manager and the Package Managers to ensure that the risks to the project are identified, assessed, managed, reviewed and reported effectively and efficiently.
Lead Construction Manager	The Lead Construction Manager is responsible for developing and implementing the construction plan in conjunction with Package Managers and Key Contractors. Manages and monitors construction interfaces and monitors all construction and installation activities.
Marine Coordinator	The Marine Coordinator will coordinate all activities on site including all vessel and personnel movements and site surveillance.
Lead Commissioning Manager	The Lead Commissioning Manager is responsible for the development and implementation of the commissioning and handover plan for the Development, in conjunction with the Package Managers and Key Contractors. Manages all testing, inspection and commissioning activities.

4.8.5 In addition, the ECoW will have a role in terms of ensuring that the OfTW is constructed in compliance with this OfTW CMS and other relevant Consent Plans. The ECoW will report directly to the CLT Manager, and will have interface with the Package Manager and directly, where necessary, with relevant Key Contractors. 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.

#### Nexans Norway - Key Roles and Responsibilities

4.8.6 A summary of the Nexans Norway organisational structure and the key roles during the construction of the OfTW is set out in Figure 4.3 below. The interface with the BOWL team is indicated by reference to Figure 4.2 above. The main Nexans Norway roles and responsibilities are described in Table 4.6 below.





#### Table 4.3 – Key Nexans Norway roles and responsibilities

Role	Responsibility
Nexans Project Manager	Responsible for overseeing the effective delivery of the Transmission System, supply and installation, from National Grid connection at Blackhillock substation to the two offshore OTMs
Offshore Manager	The Offshore Manager is responsible for all activities related to the installation operation. He shall ensure that all operations are conducted according to procedures and Nexans' regulations for quality of the work and safety on site.
Vessel Master	The Vessel Master is responsible for the operation of the relevant vessel. He is responsible for transit navigation, port clearance, pilotage and all maritime personnel and safety on-board.
QA and HSE Manager	Responsible for the management of health, safety and environmental issues and developing the QA plan and for QA checking and inspection.
Installation Engineer	The Installation Engineer shall assist the Offshore Supervisor and the Offshore Manager in monitoring the work and in particular follow the checklists to ensure that all items are correctly reported and logged.
Offshore Supervisor	The Offshore Supervisor's main task is to conduct the installation operation according to the procedures and instructions given by the Installation Manual. They will be responsible for the correct



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Role	Responsibility
	operating instructions to vessel crew, ROV personnel, survey personnel and deck crew/operators. The offshore supervisor will be responsible for managing the work of the Land Supervisor, Diving Supervisor, ROV Supervisor and Deck Foreman.
Cable Engineer	The Cable Engineer has detailed knowledge of the HVAC cable and shall assist the Offshore Manager and Offshore Supervisor with all questions regarding cable handling.



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#### 5 Construction Methods and Procedures

#### 5.1 Introduction

- 5.1.1 This section sets out the cable laying techniques for the subsea Export Cables and OTM interconnector cable.
- 5.1.2 Details of the location and layout of the cables are provided in Section 4 with further detail provided in the OfTW DSLP and CaP.

## 5.2 Overview of the OTM Interconnector Cable and Offshore Export Cable Construction Process

- 5.2.1 An indicative installation sequence for both Export Cables and the OTM Interconnector Cable is presented in Figure 5.1, including approximate durations for each activity.
- 5.2.2 Greater detail on each of the stages in the installation process (Stage 1 5) is then provided in the Section 5.3. Total duration for the installation and protection of both Export Cables and the OTM Interconnector Cable is estimated to be circa 455 days excluding any weather delays. Installation will be completed across two construction seasons.

#### Figure 5.1 - Export Cable and OTM Interconnector Cable installation sequence





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#### Components to be Installed

5.2.3 The main components that will be deposited or installed are summarised in Table 5.1. Nearshore the Export Cable will be installed through pre-installed horizontal pipes and will comprise of a 3-core 220kV HVAC cable with a copper conductor. The remaining subsea Export Cable and interconnector cable will comprise of 220 kV HVAC 3-core cable with an aluminium conductor. Both types of cables share similar physical dimensions.

#### Table 5.1 - Summary of offshore Export Cable and OTM Interconnector Cable components

Component of the works	Number	Key dimensions
Cable trenches	Up to 2 cable	Maximum width of cable trench: 4 - 5m
	trenches required on the seabed	Minimum target burial depth of 0.6m along majority of cable routes (deeper nearshore, including where cables travel via pre-installed pipes)
HVAC Export	2 x cables	Length of cables: ~ 70km each, from landfall to OTM
Cables		Cable types:
		Nearshore cable within ducted pipe: 220kV cable, 3-core cable
		Offshore cable: 220kV cable, 3-core subsea cable
Interconnector	1 x OTM Interconnector Cable	Length of cable: ~1.2km
Cable		Cable Type:
		220 kV subsea cable
Cable protection	2 Export Cables	4 x OTM J-tubes to seabed interface and a Cable Protection System (CPS) 10 – 15m in length.
		Estimated ~58km of each Export Cable will be buried.
		Rock placement is anticipated along a proportion of each of the cable routes (~6km per cable)
		Additional rock placement may be required along the Export Cable route where seabed jet burial is not effective due to ground conditions (including contingency total rock placement is considered unlikely to exceed 20% of the total Export Cable route length - it is anticipated that the final area will be significantly lower).

5.2.4 Further details of cable specification, burial risk assessment and installation of the Export Cables are provided for approval in the OfTW Cable Plan (CaP) (LF000005-PLN-214).



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#### **Delivery to the Construction Site**

- 5.2.5 All subsea cables will be transported to site direct from the point of manufacture at Halden, Norway by the CLV.
- 5.2.6 Details of the proposed construction vessels are set out in the Vessel Management Plan (VMP) (required under Condition 16 of the s36 consent and Condition 3.2.2.8 of the OfTW Marine Licence) (BOWL Document Ref: LF000005-PLN-168).

#### 5.3 Offshore Export Cable Installation

5.3.1 An indicative cable installation sequence for all cables is presented in Figure 5.1 above. This section provides a summary of the construction operations undertaken during each stage of Export Cable and OTM Interconnector Cable installation.

#### Export Cable Installation Stage 1 – Installation of horizontal cable pipes

- 5.3.2 Due to the existence of the SSSI at Spey Bay (and in accordance with OfTW Marine Licence condition 3.2.2.8) BOWL intends to install the Export Cables beneath the SSSI. In this location the Export Cables will be installed into pre-installed horizontal pipes running below the shoreline. Pre-installed horizontal cable pipes will be used for each of the two Export Cables from the onshore Thruster Pit location, under the SSSI area and out to an offshore exit point.
- 5.3.3 The design of the horizontal pipes and the means of installing them has been influenced by the results of a ground risk assessment, based on the geotechnical properties and morphology of the seabed, and an engineering assessment of the maximum pull-in loads that the Export Cables can withstand.
- 5.3.4 The horizontal pipes will be installed using a 'Direct Push Pipe' HDD method (referred to as 'direct pipe' below). The direct pipe method involves the use of a microtunnelling machine pushed through the ground with a pre-fabricated pipe from an onshore Pipe Thruster Pit to the final exit point. This methodology allows the pipe to be installed in a single step and removes the requirement for pilot drilling, reaming and final pipe pull-in otherwise required under a 'traditional' HDD approach. It also removed the risk of drill bore collapse in unconsolidated sediments.
- 5.3.5 The horizontal pipes, 48 inches in diameter, will be 420m to 450m in length extending from the onshore entry point located at the Pipe Thruster Pit to an offshore exit point (Figure 5.2). The onshore entry point will be located approximately 100m landward of MHWS. The Marine Licence Condition referring to the HDD works (see Table 1.2) requires that the final exit point should be located as far offshore as practicable towards the depth of closure. The distance of the exit point of the horizontal pipe offshore (between 420m and 450m) has been determined by ground risk assessment and assessment of the maximum pull-in loads that the cable can withstand when pulling it through the pipes when considering the mechanical properties of the cable



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5.3.6 During direct pipe installation, the micro-tunnelling machine and pipe behind it will be pushed into the ground from the onshore Pipe Thruster Pit. Seabed sediments will be excavated by the tunnelling machines cutting wheel and broken down into suitable sized material, which will then be pumped to shore via the pipe. The tunnelling system will be lubricated with bentonite solution at the cutting head and as a pipe anti-friction agent.

#### Figure 5.3 - Main system components of the Direct Pipe drill method



- 5.3.7 At the seabed push-out point the micro-tunnelling machine will be disconnected from the installed pipe by divers activating a hydraulic release once it completes the profile and exits at the seabed. The divers will then recover the tunnelling machine from the seabed using airbags.
- 5.3.8 Once the tunnelling machine is disconnected the pipe will be flooded and the end sealed by divers to prevent sediment entering the pipe. Once this is complete the pipe will be pulled back approximately 30m to the final exit point where the top of the pipe is buried 1m below the surface of the seabed. The total length of each pipe will be between 420m and 450m (from Pipe Thruster Pits to the final exit point). Once this is complete, backhoe trenching can commence.
- 5.3.9 If any difficulties are encountered during the tunnelling process, the pipe thruster can pull back the pipe together with the micro-tunnelling machine to begin the process again, or steer a deviation around a problematic ground area.



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5.3.10 Direct Pipe methodology offers a number of benefits over traditional HDD for installation of the pre-installed cable ducts; allowing a shallower profile that results in fewer electrical transmission losses and reduced installation risks.

#### Figure 5.2 - Direct Pipe drilling method



#### Figure 5.5 - Direct pipe installation sequence

	1. The micro-tunnelling machine and pipeline behind it will be pushed into the ground from onshore by a pipe thruster from a launch pit.
	<ul><li>2. The pipeline will travel beneath the seabed until it pops-out between 420-450m offshore.</li></ul>
A A A A A A A A A A A A A A A A A A A	3. Divers detach the micr-tunnelling machine and recover to the surface.
24	4. Once the micro-tunnelling machine has been removed, divers seal the end to ensure no sediment enters the pipe.
	5. The pipe is pulled back approximately 30m, until the top of the pipe end is 1m below the seabed.



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- 5.3.11 Prior to cable installation, divers will excavate the seabed in the area of the pipe exit. On exposing the pipe end, the divers will unseal it and install a Polypipe and messenger wire, which will remain flush with the seabed for cable pull-in and which will later be buried. The pull in wire is connected to a cable pull-in winch located within the onshore construction compound,

#### Figure 5.6 - Direct Pipe installation sequence (continued)

	6. Backhoe trenching commences to remove boulders along the cable route infront of the installed pipeline. The trench is then left to refill naturally.
	7. Divers re-open the trench close to the Direct Pipe to the pipe exit.
Pr-	8. Divers install a Polypipe and messenger wire to aid with cable installation that will take place later.

#### Export Cable Installation Stage 2 – Seabed Preparation

- 5.3.12 There is a high density of boulders of up to 1.5m diameter along the nearshore Export Cable routes that would prohibit cable burial.
- 5.3.13 A backhoe trencher will be used to prepare the seabed in the nearshore area from a point as close to the offshore pipe exit point as possible to 4.5km offshore from the Pipe Thruster Pits. To ensure trenching activity does not impact the installed horizontal pipes, backhoe trenching operations will commence approximately 5m from the pipe exit. Backhoe trenching will allow for the cable routes to be excavated and will allow the removal of both surface and sub-surface boulders which will be placed on the seabed a short distance away from the cable routes. Backhoe trenching will start as close to the exit as possible (typically 5m). The interface between the pipe exit and start of backhoe trenching will be trenched by divers.



- 5.3.14 Following trenching works, which will complete within 45 days, the trench that is now clear of boulders will be allowed to naturally refill with seabed sediments. This will enable subsequent installation of the cable using standard burial methods.
- 5.3.15 Seabed debris such as fishing gear and abandoned wires or chains can be detrimental to cable lay and cable burial operations and there is a risk that the seabed jetting tool that is intended to be used to bury pre-laid cables could become entangled or stuck. Therefore, approximately one month prior to the start of cable laying operations, all OTM Interconnector Cable and Export Cable routes the cable route will be cleared of any surface debris crossing the cable routes by the use of a Pre-Lay Grapnel Run (PLGR).
- 5.3.16 A specialised vessel will be mobilised together with any required survey and positioning equipment, and a grapnel assembly. A variety of grapnel types are available, and suitable grapnels (which will accommodate changing sediment conditions along the cable routes) will be selected prior to PLGR.
- 5.3.17 The PLGR vessel will tow a seabed deployed grapnel rig along the centreline of the cable route (re-runs will be conducted where the grapnel has not stayed within the target corridor). The grapnel tow winch will be fitted with a strain gauge which will detect the rise in tension when it encounters debris. Any debris encountered will be recovered to the deck of the vessel for appropriate licensed disposal ashore.
- 5.3.18 PLGR works will take approximately 15 days to complete.

### OTM Interconnector Cable and Export Cable Installation Stage 3 – Pre lay Surveys

5.3.19 Immediately prior to laying the OTM Interconnector Cable and Export Cables the CLV may perform a pre-lay survey along routes if required. This will be done after the vessel is loaded with the cable and has arrived at site. The pre-lay survey is designed to ensure no changes to the seabed have occurred that will affect the cable installation since the pre-construction surveys (See OfTW CaP for further information on pre-construction survey). A remotely operated vehicle (ROV) will be used to carry out any pre-lay survey requirement.

## OTM Interconnector Cable and Export Cable Installation Stage 4 – Cable installation

5.3.20 Once the direct pipes are pre-installed under the Spey Bay SSSI shoreline, and the pre-lay surveys have been completed, installation of the Export Cables and the OTM Interconnector Cable will commence.



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- 5.3.21 Cable installation will be undertaken by the CLV loaded with the Export Cable and interconnector cable lengths which are loaded on a dedicated cable carousel carried by the vessel.
- 5.3.22 Cable installation will take place in four campaigns. Due to the length of the Export Cables, each cable will be laid in two parts and then connected and joined at the midpoint. A brief outline of the installation stages is as follows:
  - Offshore Campaign 1: Load and lay Export Cable 1 Shore to midpoint,
  - Offshore Campaign 2a: Load and lay Export Cable 1 OTM to midpoint and joint;
  - Offshore Campaign 2b: Lay OTM Interconnector Cable– 1<sup>st</sup> End OTM 1 to 2<sup>nd</sup> End OTM;
  - Offshore Campaign 3: Load and lay Export Cable 2 OTM to mid-point; and
  - Offshore Campaign 4: Load and lay Export Cable 2 Shore to mid-point and joint second section of the second Export Cable from the nearshore ducted pipeline to the hairpin joint location at the mid-point offshore.

#### Offshore Campaign 1 (2017)

- 5.3.23 The first element of installation is pull-in of Export Cable 1 into the pre-installed pipe from the offshore end of the direct pipe Polypipe to the landfall site.
- 5.3.24 The CLV will set up at the offshore end, approximately 300m from the end of the preinstalled pipe.
- 5.3.25 A workboat will be anchored above the offshore end of the direct pipe Polypipe and will retrieve the pull-in wire from the Polypipe (which is connected back to the onshore pull-in winch at the landfall site) and pass the pull-in wire to the CLV. The CLV will then connect the pull-in wire to the cable end. The cable is then paid out from the CLV and floated towards the workboat.
- 5.3.26 The cable is then pulled into the Polypipe from the onshore pull-in winch and the floats are removed from the offshore end of the cable simultaneously. When the required cable length is pulled onshore, the workboat will move towards the CLV, lowering the cable behind it as it goes. Care will be taken to ensure the cable is laid on the route which has been back-hoed previously to enable subsequent seabed burial.
- 5.3.27 When the first end pull-in and laydown of the cable is completed the CLV will start laying the cable along the planned route to the mid-point approximately 35km offshore from the Pipe Thruster Pits and at a typical laying speed of between 10 and 25m per minute depending on surface and seabed conditions. At the mid-point the cable end will be sealed and the end laid to a ground rope and clump weight for ease of recovery.

Offshore Campaign 2a (2017)



- 5.3.28 The second section of Export Cable 1 (see Table 4.1 and Figure 4.1) will be installed at OTM1 in the following process.
- 5.3.29 A CLV with the second section of the Export Cable 1 will position itself near OTM1 to install the cable through the OTM J-tubes. The J-tubes are steel tubes that allow the installation of cables by providing a conduit through which the cables can be pulled. A remotely operated vehicle (ROV) will then detach the cover of the J-tube, and attach a wire from the vessel to a pre-installed J-tube messenger wire. The messenger wire will then be recovered onto the deck of the CLV.
- 5.3.30 The Export Cable will then be connected to the messenger wire, and the Cable Protection System (CPS) will be mounted on the cable during cable pay out to the OTM. The cable will be protected with approximately 10-15m of CPS from the outside of the J-tube into the seabed. The cable will be pulled onto the OTM and secured.
- 5.3.31 The CLV will then install the cable moving south along the route towards landfall and the point at approximately 35km, where the first section of Export Cable 1 was installed in the previous campaign. The first cable sealed end will then be recovered using the ground rope, from the seabed onto the CLV. Both cable ends will be tested and then jointed. Once complete the joint will be lowered to the seabed. Care will be taken so as not to twist or loop the cable during deployment of the joint to the seabed.
- 5.3.32 The joint lay down will be surveyed using an ROV to ensure cable integrity and that the lay down configuration is suitable for ROV jet burial. Once complete cable burial can commence.

#### Offshore Campaign 2b (2017)

- 5.3.33 During Offshore Campaign 2b the OTM interconnector cable will also be installed. First end pull-in as described above for Export Cable 1 will be carried out to install the first end of the Interconnector Cable to OTM1. The cable will then be laid out over approximately 1.2km.
- 5.3.34 Once the cable reaches OTM2, second end pull-in will take place. The cable will be measured, cut and prepared for the pull-in operation; prior to cutting and final deployment to the seabed the Cable Protection System (CPS) will be installed on the cable end.
- 5.3.35 An ROV will then connect the pull-in wire to a messenger wire and the messenger wire and pull-in wire are pulled onto the CLV. The pull in wire is then lowered to the seabed and attached to the cable by an ROV. The cable is then pulled in to OTM2. Once completed and secured on the OTM, cable burial will commence.

Offshore Campaign 3 (2018)



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5.3.36 The first section of Export Cable 2 will be installed on OTM2 via the method of first end pull-in as described above for Export Cable 1. The cable will be laid along the cable route to the mid-point approximately 35km offshore. The cable end will be sealed, and laid to a ground rope and clump weight.

#### Offshore Campaign 4 (2018)

5.3.37 First end pull-in of the second section of Export Cable 2 into the pre-installed pipe will be conducted via the same method as described above for Export Cable 1. The cable will then be laid up to 35km where the first section of Export Cable 2 was installed in the previous campaign. The first cable sealed end will be recovered from the seabed onto the CLV using the ground rope. Both cable ends will be tested and then jointed. Once complete the joint will be lowered to the seabed. Care will be taken so as not to twist the cable during deployment of the joint to the seabed. The joint lay down will be surveyed using an ROV to ensure cable integrity and that the lay down configuration is suitable for ROV jet burial. Once complete cable burial will commence.

## Figure 5.7 - Example of a cable laying operation (cables first end being over-boarded from the CLV)



#### Export Cable Installation Stage 5 – Cable trenching and burial

5.3.38 Subsea cables are exposed to a range of threats from both natural and anthropogenic sources. Cables can be protected by armouring and by seabed burial. The most reliable form of cable protection is generally recognised as being burial into the seabed. The level of protection required for a cable is a function of the nature of the external threat, the strength of the seabed soils and the depth of burial. During installation the surface laid Export Cables and OTM Interconnector Cable will be either trenched into the seabed to the Depth of Lowering (DoL) by a dedicated



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trenching vessel, or will remain surface laid and be suitably protected, most likely by the addition of rock placement.

- 5.3.39 Exposed surface laid cable prior to burial or application of mechanical protection will be protected by guard vessel(s), strategically placed along the cable route to ward off any sea users whose activity is a threat to the cables (e.g. trawling, scallop dredging, etc.) or whose safety could be compromised by snagging on the cables.
- 5.3.40 During cable trenching operations, a seabed trenching tool will be launched from the cable trenching vessel. The surface laid cable will be straddled by the trencher to engage the water jetting swords. The seabed trenching tool will then complete a first trenching run to bury the cable. Progress of the burial operation will be dependent on target trench depth and the nature of the seabed sediments.
- 5.3.41 It is anticipated that cable burial will be primarily achieved by the use of a water jetting seabed trenching vehicle capable of performing jet trenching in softer sediments (Figure 5.8). Such jet trenching vehicles will use nozzles mounted on jet swords to inject water at high pressure into the soil surrounding the cable which fluidises the seabed in the immediate vicinity allowing the cable to sink under its own weight, before the soil re-settles over the top. 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.

#### Figure 5.8 - Examples of seabed cable trenching tools and cable plough





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- 5.3.42 Where dense sand and stiff clay sediments prevent the use of a standard jetting tool, a hybrid jet trencher that combines both jet trenching and chain cutting may be used.
- 5.3.43 A close fitting Cable Protection System (CPS) will be installed on the Export and OTM Interconnector Cables between the seabed and the J-tube interface to protect and stabilise the cable (Figure 5.9). The CPS will consist of articulated split pipes and bend restrictors to protect the cables from dropped objects, current induced fatigue, dynamic wave action, vibration and other local hazards at this interface.
- Figure 5.9 Example of cable protection system at OTM J-tube



5.3.44 Where ground conditions are such that the trenching tool is ineffective it may be necessary to install rock protection. Rock protection will be installed from a rock placement vessel using a dynamic positioning system (See Figure 5.10). In this case specialised rock placement equipment will be used to deploy the graded rock through a flexible fall pipe to the seabed. Positioning of the fall pipe exit will be controlled by a fall pipe ROV to ensure accurate placement and adequate protection of surface laid cables.



\*(5

(4) Fallpipe ROV

(5) Thrusters

0(5)

(1) Holds

(2) Fallpipe

(3) Pipe tower

Figure 5.11 - Fall pipe rock placement installation at the seabed.

2)

0(5)



5.3.45 The anticipated approach to Export Cable burial and protection is as follows, with cable protection strategies varying along the route of the Export Cables:

#### Pipe Thruster Pits (0km) to the final exit point of the pipes

• Cables will be protected within the pre-installed horizontal pipes from the onshore Pipe Thruster Pits, underneath the designated SSSI beach area, out to the seaward final exit point at 420m-450m from the Pipe Thruster Pits. At the final exit point, the pipes they will be buried 1m below the seabed, with the Export Cable buried 1.3m below the surface of the seabed within the pipes.

#### From the final exit point of the pipes to 4.5 km

 Due to the high density of boulders along this section of the route, a backhoe trencher will be used to prepare the seabed prior to cable lay. This will allow for the removal of both surface and sub-surface boulders, which will be placed on the seabed away from the cable routes. The trenches will then be allowed to refill



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naturally;

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• The water jetting trenching tool will bury the cables along the previously trenched route out to 4.5km from the Pipe Thruster Pits. For the first 20m-30m from the pipe final exit points, the cables will be buried to a DoL of between 1.3m and 1.5m until they reach the minimum DoL of 1.5mbelow the surface of the seabed. No additional protection is anticipated to be required.

#### Figure 5.12 – Example of cable burial at the pipe exit



#### <u>4.5 to 10.5 km</u>

- Conditions are expected to be unsuitable for cable burial; instead cables are likely to be surface laid and protected by rock placement (See the OfTW CaP);
- Due to the high frequency and size of surface boulders and the high probability of sub-surface boulders, the ground conditions are assessed as potentially unsuitable for cable burial. In this area cable burial using jet trenching will be attempted and where this is unworkable the cable will likely be protected by rock placement.
- Where rock placement is required rock berms will, as far as reasonably practicable, be profiled to minimise the risk of snagging by fishing gear.

<u>10.5 to 19 km</u>



• For this section of the cable route, the jetting tool will be used to achieve a minimum target burial depth of 0.6m. This area is identified as a shipping channel, so all operations will be conducted with guard boat support vessels.

#### <u>19 to 68.5 km</u>

- For the final section of the Export Cable route cables will be buried using a water jetting tool to achieve a minimum target burial depth of 0.6m.
- 5.3.46 It is anticipated that the OTM Interconnector Cable will be buried along the entire route, to achieve a minimum target burial depth of 0.6m.
- 5.3.47 Following installation, contractors will confirm that cable burial depth has been achieved and rock placement successfully installed such that the cables will not become exposed and be at risk of damage or pose a hazard to other sea users.



#### 6 Good Working Practices

#### 6.1 Introduction

6.1.1 The OfTW Marine Licence condition 3.2.2.4 relating to this OfTW CMS (see Table 1.1 above) includes the following requirement:

The CMS must set out the construction procedures and **good working practices** for constructing the Works.

6.1.2 Good working practice is not defined by the OfTW Marine License; for the purposes of complying with this requirement BOWL 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.

- 6.1.3 In the context of the construction of the OfTW 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 BOWL or the requirements of the BOWL consents).
- 6.1.4 The following sections set out the areas of good working practices that will be applied during the construction process described by this OfTW CMS. 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 in relation to aspects of the construction process (as set out in Section 5 of this OfTW CMS) (that, for example, act to avoid or reduce environmental impacts or impacts on other users).



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- 6.1.5 Cross reference is made to other relevant consent plans (as described under Section 1.4 of this OfTW CMS) and to the BOWL Statements of Compliance set out in Section 2.

#### 6.2 Offshore renewable industry good working guidance

- 6.2.1 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, BOWL will require that such good practice is reflected so far as reasonably practicable in the detailed method statements produced by the key contractors and sub-contractors.
- 6.2.2 Industry guidance documents are listed in Table 6.1.

Produced by Title		Scope		
The G9 <sup>1</sup> , 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, 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	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		

<sup>1</sup> Formed in 2010, the G9 comprises nine of the world's largest offshore wind developers and focuses on creating and delivering world class health and safety performance across all of its activities in the offshore wind industry. Membership comprises Centrica, Statoil, Eon, RWE, DONG Energy, Scottish Power Renewables, SSE, Statkraft and Vattenfall.



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Produced by	Title	Scope		
	2014)	supply chain for the construction of an UK offshore wind farm project		
Renewables UK	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.		
	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 Health and safety procedures

- 6.3.1 The BOWL commitments related to SHE and incorporating the adequacy of equipment used and the training and competence of all construction personnel as well as matters relating to construction vessels are set out in Section 2.3 2.6 above.
- 6.3.2 It is noted in Section 2.3 that the Development will be a notifiable project for the purposes of The Construction (Design and Management) Regulations 2015 (CDM regulations).



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- 6.3.3 BOWL will require compliance with the CDM regulations in the design of the OfTW and through the completion of the construction process. BOWL will appoint a Principal Designer and a Principal Contractor for the OfTW, ensure sufficient time and resources are allocated to the OfTW, provide relevant information and require that the Principal Designer and a Principal Contractor carry out their duties.
- 6.3.4 Combined, these commitments will act to reduce the risk of SHE incidents occurring during the construction of the Development.

#### 6.4 Construction management procedures

- 6.4.1 BOWL will require that 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 OfTW components as described in this OfTW CMS, including but not limited to:
  - A dedicated marine coordination centre to coordinate all activities on site including all vessel and personnel movements, and site surveillance (See Section 4.6 for further details).
  - 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 construction programme maintained regularly with input from the three EPC contractors;
  - Clear roles and responsibilities allocated to all parties (see also Section 4.8 above);
  - Appropriate and regular communications between all contracted parties and with relevant third parties;
  - Marine warranty surveyor approval at all key construction activities; and,
  - A clear process of reporting, recording and auditing of the construction process, contractor performance and methods for managing shortfalls in performance.

#### 6.5 Environmental management measures

6.5.1 The environmental management measures that will be applied by BOWL 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, once approved, will be applied in undertaking the proposed construction works set out in this OfTW CMS.

- 6.5.2 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:
  - VMP management of vessel operations to mitigate effects on marine mammal and bird populations;
  - NSP setting out matters related to the management of construction vessels to ensure navigational safety;
  - The lighting and marking plan (LMP) setting out lighting and marking to mitigate against impacts on other sea users;
  - The Marine Pollution Contingency Plan (MPCP) emergency response procedures to pollution incidents;
  - OfTW CaP cable installation procedures.
  - The commercial Fisheries Liaison Officer (FLO) liaison with the local fishing industry and notification of planned works and vessel movements; and,
  - The Archaeological Written Scheme of Investigation and Protocol for Archaeological Discoveries (Archaeological WSI and PAD) (LF000005-REP-416).
- 6.5.3 In addition, any matters set out in the ES and SEIS in relation to the mitigation and management of construction will be incorporated into the OfTW CMS (see Section 7 below and Appendix A).

#### 6.6 Project-specific good working practices

- 6.6.1 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 OfTW CMS and that will seek to reduce the environmental effects arising from the construction. The following sections set out the good working practices related to:
  - Seabed preparation;
  - Cable protection;



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- Minimising effects on other sea users.
- 6.6.2 A number of these are also set out in relation to environmental management in the EMP.

#### **Direct Pipe installation method**

6.6.3 The construction method has incorporated installation procedures at the landfall location to minimise the effects on coastal habitats. The cables will be installed via two horizontal preinstalled pipes so as to avoid interference with designated features of conservation importance associated with the Spey Bay SSSI and also provide suitable erosion protection. The preinstalled pipes will be installed using the 'direct pipe' technique (see Section 5.3.8).

#### **Seabed preparation**

6.6.4 The CLV may perform a pre-lay survey. This will be done after the vessel is loaded and has arrived at site to ensure no changes that will affect the cable installation have occurred since previous surveys were undertaken or at areas where on-board lay team need further detail for safe cable deployment (e.g. boulder fields) (See the OfTW CaP for more details). A Remotely Operated Vehicle (ROV) will be used to carry out any pre-lay survey prior to the commencement of cable laying operations. The cable route will be cleared of any longitudinal obstructions by the use of a PLGR and cleared of boulders in the nearshore area by a backhoe trencher. The pre-lay route clearance operations will maximise the efficacy of cable lay and trenching operations. This approach aims to increase the success rate of reaching the DoL on first pass by the trenching vessel.

#### Cable protection

- 6.6.5 BOWL's preferred cable protection option will be seabed burial of the Export and OTM Interconnector cables. Pre-construction surveys and a cable burial risk assessment will be completed to identify the suitability of this installation strategy along the length of the Export Cable.
- 6.6.6 It is anticipated that the cables will be buried along the majority of the Export Cable and OTM Interconnector route and this is the preferred method for protecting cables 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.
- 6.6.7 Where cable burial is not possible or where DoL cannot be reached additional cable protection will be applied, most likely to be rock placement (see Section 5.3).



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6.6.8 At the OTMs, between the seabed burial and platform J-tube the cable will be protected and stabilised using a bespoke Cable Protection System, which will be made up of bend restrictors and articulated plastic and cast iron cladding.



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#### Minimising effects on other sea users

- 6.6.9 BOWL 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.
- 6.6.10 In order to ensure that effects on these other marine users are minimised insofar as reasonably practicable, standard good working practices will be employed to ensure effective communication to reduce 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 (NtoMs);
  - Establishment of safety zones during construction;
  - Use of radio navigation warnings;
  - Appointment of a suitably qualified Fisheries Liaison Officer and local meetings with the local fishing community or representatives;
  - Charting of the OfTW by provision of information to the UKHO;
  - Notification of commencement and completion of the works to local mariners, fishermen's organisations and HM Coastguard and Buckie Harbour Master by use of NtoMs;
  - 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; and
  - Provision of details on the location of the Development for inclusion in the Clyde Cruising Club Sailing Directions and Anchorages.
- 6.6.11 Further information on the above items is provided in the Navigational Safety Plan (NSP).
- 6.6.12 In addition, the BOWL consents contain a number of other conditions which will essentially set out good working practice requirements in relation to reducing effects on other marine users, including:
  - Burial or otherwise protecting seabed cables as set out in detail in the OfTW CaP and this OfTW CMS;
  - 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)).
- 6.6.13 Further details on these consent requirements are provided in a number of the other necessary Consent Plans including the VMP, the NSP (which includes ERCoP), the OfTW CaP, the MPCP and the EMP. BOWL, in addition to the good working practices embodied in the Consent Condition, is also proposing, where necessary, to engage guard vessels during the period of active cable installation in order to ensure that third parties do not approach too close to the location of installation activities (see also Section 4.6 above).
- 6.6.14 BOWL has also applied for 500m construction safety zones under the provisions of the Energy Act 2004 which will act to provide a clear 'area to be avoided' for other marine users around the wind farm structures such as the OTMs although such safety zones do not apply to the cable works; the location of the active safety zones will be provided as part of the NtoMs issued.



## 7 Compliance with the Application, ES and SEIS

#### 7.1 Introduction

- 7.1.1 The relevant conditions of the OfTW Marine Licence require that the OfTW CMS be in accordance with the construction methods assessed in the ES / SEIS and Application, and that it includes details of how the construction related mitigation steps proposed in the ES / SEIS and Application are to be delivered. Sections 7.2 and 7.3 set out information from the ES/SEIs of the original application with regard to:
  - Consistency with the construction methods assessed; and
  - Construction related mitigation and management from the ES/SEIS.

#### 7.2 Compliance with Construction Methods Assessed in the ES/SEIS

- 7.2.1 The ES and SEIS described the range of methods that could be applied during the construction of the OfTW and described the likely method of offshore Export Cable installation. This was in the form of a 'Rochdale Envelope' incorporating a variety of options in relation to the OfTW design and the approach to installation).
- 7.2.2 Since the OfTW Marine Licence was granted, the design of the OfTW and the approach to installation has been substantially refined to that described in this OfTW CMS (and in other relevant Consent Plans). Appendix A provides a tabulated comparison of OfTW construction parameters and methodologies as presented in the ES/SEIS and this OfTW CMS.

#### 7.3 Delivery of Construction-related Mitigation Proposed in the ES/SEIS

- 7.3.1 The ES and SEIS detailed a number of mitigation commitments specific to installation activities. Measures are presented in full in Appendix B, which identifies where each commitment has been addressed within the OfTW CMS or within other Consent Plans where appropriate.
- 7.3.2 Beyond the measures described in Appendix B that are specific to construction methods, other mitigation measures relevant to the construction phase of the Development are implemented by a number of Consent Plans.



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## Appendix A - Compliance with ES/SEIS Rochdale Envelope Parameters

Table A1 presents a comparison of consented OfTW parameters relevant to the installation and construction process, against the details set out in this OfTW CMS.

Table A1 – Comp	arison of	ES/SEIS	Rochdale	Envelope	and	OfTW	CMS	construction	and
installation parame	eters								

Offshore Transmission Works	Rochdale envelope parameters	OfTW CMS	
Number of cable trenches	Up to 3 trenches required on the seabed	2	
Maximum width of cable trench	3m (total maximum area of seabed disturbance from cabling of 2.34km <sup>2</sup> )	Maximum width 4 – 5m (for the area of backhoe trenching) (but noting that the maximum area of disturbance for the Export Cable route will be circa 0.78km <sup>2</sup> )	
Seabed preparation	No specific methods described, though potential for seabed preparation acknowledged.	Pre-Lay Grapnel Run Backhoe trenching from the final exit point of the pipe to 4.5km offshore (from the Pipe Thruster Pits).	
Means of cable installation beneath the SSSI	HDD methodology, with the end of HDD located as far offshore as practicable	Direct Pipe methodology (a form of HDD incorporating micro-tunnelling), with the end of the Direct Pipe located as far offshore as practicable	
Depth of cable trench	0m to 2.5m	Minimum DoL of 0.6m	
Maximum number of cables per trench	3	1	
Installation method	Ploughing Trenching Jetting	Trenching Jetting	
Protection method	Concrete blanket / mattressing Rock net / gabion Rock placement	CPS at OTMs (footprint less than rock placement alternative assessed in the ES/SEIS) Most likely rock placement	
Maximum length of cable protection (i.e. Maximum length of surface laid cable)	45% of total cable length	6km per cable (~9% of cable length) + contingency for non-burial performance	
Maximum extent of cable protection	0.26km <sup>2</sup>	0.036km <sup>2</sup>	



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### Appendix B ES and SEIS Commitments

Table B1 presents the commitments made by BOWL in the ES and SEIS to mitigation measures relative to construction methods and processes set out in this OfTW CMS. The table provides details of the commitments and a cross-reference to where each commitment is implemented.

A complete register of the mitigation, management and monitoring commitments made in the ES/SEIS and required by Consent Condition is set out in the commitments registers included as part of the EMP.

Sοι	urce	Reference (ES or SEIS chapter)	Details of Commitment	Implementation
ES		Project Description	Horizontal Directional Drilling will be used to allow the cables to be installed under the Spey Bay SSSI.	Section 5
ES		Commercial Fisheries	Cables will be buried to a target depth of one metre, where it is reasonably practicable to do so. In instances where alternative protection is required, then the developer will seek where feasible to install appropriate and reasonable protection.	Section 5
ĒS		Physical Processes OfTW	The offshore end of the HDD will aim to exit as far offshore as is practicable, up to the 6 m LAT contour. If the full distance cannot be achieved due to geological or technological limitations, an alternative method of protecting the cable between the HDD exit and the depth of closure will be verified with Marine Scotland. The design of any alternative protection (pending further detailed engineering design works) will aim to minimise effects on sediment transport patterns and ultimately ensure that the protected features of the SSSI will not be adversely affected by the works	Section 5 and OfTW CaP Section 9
ES		Physical Processes OfTW	Visual and/or bathymetric surveys will be undertaken pre- and post-construction along part or all of the OfTW route and these surveys compared	OfTW CaP Section 6

#### Table B1 - ES and SEIS Construction-related Mitigation relevant to the OfTW CMS



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Source	Reference (ES or SEIS chapter)	Details of Commitment	Implementation	
ES	Commercial Fisheries OfTW	BOWL is committed to cable burial where feasible (minimum 55%);	OfTW CaP Section 8 and Section 9	
ES	Commercial Fisheries OfTW	BOWL is committed to protection of cable where burial is not feasible (up to 45%)	OfTW CaP Section 10	
SEIS	Introduction	The subsea cable will be a minimum of 500m (previously1.5 km) from the Beatrice Bravo Oil Platform	OfTW CaP Section 6	