NORTH FALLS

Offshore Wind Farm

Outline Cable Specification and Installation Plan (Clean)

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Glossary of Acronyms

CBRA	Cable Burial Risk Assessment
CD	Chart Datum
CFWG	Commercial Fisheries Working Group
CPS	Cable Protection System
CSIP	Cable Specification and Installation Plan
DCO	Development Consent Order
DWR	Deep Water Route
EACN	East Anglia Connection Node
ECC	Export Cable Corridor
ES	Environmental Statement
HDD	Horizontal Directional Drilling
km	kilometre (unit of length)
KP	Kilometre Point
m	Meter (unit of length)
MCA	Maritime and Coastguard Agency
MFE	Mass Flow Excavation
MHWS	Mean High Water Springs
mm	Millimetre (unit of length)
MMO	Marine Management Organisation
NGET	National Grid Electricity Transmission
OCSIP	Outline Cable Specification and Installation Plan
OSP	Offshore Substation Platform
PLA	Port of London Authority
PLGR	Pre-Lay Grapnel Run
TJB	Transition Joint Bay
UTROV	Utility Remotely Operated Vehicle
UXO	Unexploded Ordinance
VTS	Vessel Traffic Service
WTG	Wind Turbine Generator

Glossary of Terminology

Array area	The offshore wind farm area, within which the wind turbine generators, array cables, platform interconnector cable, offshore substation platform(s) and/or offshore converter platform will be located.
Deep Water Route(s)	The routes into London ports crossed by the ECC, namely the Sunk Deep Water and the Trinity Deep Water. The locations of these are defined within 9.57 Deep Water Route Cable Installation Areas (Future Dredging Depths) Plan.
EACN	The National Grid Substation that North Falls connects into.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Offshore cable corridor	The corridor of seabed from array area to the landfall within which the offshore export cables will be located.
Offshore converter platform	Should an offshore connection to a third party High Voltage DC Cable (HVDC) cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing High Voltage Alternating Current (HVAC) and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the offshore substation platform(s) to the landfall, as well as auxiliary cables.
Offshore project area	The overall area of the array area and the offshore cable corridor.
Offshore substation platform(s)	Fixed structure(s) located within the array area, containing HVAC electrical equipment to aggregate the power from the wind turbine generators and increase the voltage to a more suitable level for export to shore via offshore export cables.
National Grid connection point	The grid connection location for the Project. National Grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the National Grid connection point.
Platform interconnector cable	Cable connecting the offshore substation platforms (OSP) or the OSP and offshore converter platform.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition Joint Bay	Transition Joint Bay is an underground concrete unit where the offshore cable is jointed to the onshore cable.
Trenchless crossing	Use of a technique to install limited lengths of cable below ground without the need to excavate a trench from the surface, used in sensitive areas of the onshore cable route to prevent surface disturbance. Includes techniques such as HDD.
Wind Turbine String	A wind farm is made up of a number of wind turbine strings. A wind turbine strings is where, due to limits on the power transfer of the cable, a few turbines (typically 5-8) are connected together by inter-array cables and feed into the substation for export to shore.

1 Introduction

1. This outline Cable Specification and Installation Plan (OCSIP) sets out the principles with which the final CSIP must accord. The CSIP will be submitted for approval by the Marine Management Organisation (MMO) and is secured via condition of the transmission assets Deemed Marine Licence in Schedule 9 of the draft Development Consent Order (DCO).

2. The final CSIP will be developed in consultation with the following stakeholders:
   - Marine Management Organisation (MMO)
   - Natural England
   - Maritime and Coastguard Agency (MCA)
   - Trinity House Corporation
   - Port of London Authority (PLA)
   - Harwich Haven Authority
   - London Gateway Port Authority
   - Sunk Vessel Traffic Service (VTS)
   - Port of Tilbury London Limited

3. A comments register will be developed with the CSIP and submitted alongside the CSIP to the MMO.

4. This OCSIP and the final CSIP covers the installation and cable route preparation of the export cables within the Export Cable Corridor (ECC). It does not include the inter-array cables within the North Falls array area, which will be subject to other pre-construction management plans. .

1.1 Project overview

5. The North Falls Offshore Wind Farm project (herein ‘North Falls’ or ‘the Project’) is located approximately 40km from the East Anglian coast. Up to 57 turbines will be placed within the proposed array area. The power from the windfarm will be transmitted via cables to an onshore connection to the National Grid at National Grid Electricity Transmission (NGET)’s new proposed East Anglia Connection Node (EACN) substation west of Little Bromley.

6. The offshore export cables will make landfall at Kirby Brook, Essex.

2 Pre-construction surveys

7. Geophysical and geotechnical surveys would be carried out before works commence and the information from those surveys would allow the following to be determined:

- Route debris;
- Boulders;
- Archaeological features;
- Unexploded Ordnance (UXO) presence;
- Seabed features;
- Sediment depth; and
- The specific nature of the seabed.

8. The data from these surveys will be used to define the final cable routing, specification, installation and potential need for cable protection.

3 Seabed preparation

9. Following the completion of all preconstruction activities, including satisfying preconstruction statutory consent conditions, engineering, design and procurement and detailed site surveys, seabed preparation is one of the first elements of the offshore construction process for the offshore cables.

10. Ahead of cable installation, the cable route will be prepared to identify and, if necessary, remove obstructions and obstacles. During this period the final cable route may be refined subject to the results of assessment and preparation works.

11. Depending on timing, these works may be subject to a separate CSIP covering the preparation activities described below (where required), ahead of cable installation. The details below are provided for context, setting out the considerations that may impact the scope and timing of these activities. Further details on the specific activities used for cable route preparation are contained within ES Chapter 5 Project Description [APP-019].

12.

3.1 UXO clearance

- UXO will be dealt with in line with the requirements of the outline Navigation Installation Plan [xxx] as issued at Deadline 5. It will be carried out in line with the protocol as stated in Section 4.3.

3.2 Boulder clearance

13. Geophysical surveys will be undertaken post-consent to inform the need for boulder clearance requirements. Where large volumes of boulders are

present, micro siting of cables around these may not be possible. If left in situ, boulders could present the following risks:

- Exposure of cables and/ or not achieving target burial depth for cables;
- Obstruction risk to the cable installation equipment leading to damage and/or delays; and
- Risk of damage to the cable assets themselves.

14. Boulders may be cleared using a number of methods, depending on the density of boulders encountered. Where boulders are present in high density, a boulder clearance tool, for example, SCAR plough or similar may be employed. In areas of low density, it may be more efficient to use a grab to target and re-locate individual boulders. Typical grab tools may be used such as the Utility Remotely Operated Vehicle (UTROV) tine grab or a clamshell grab. There is the potential that boulders may be removed by the use of a boulder clearance tool and/ or a grab tool at any location in the offshore Order Limits.

15. In areas of low density, it may be more efficient to use a grab to target and re-locate individual boulders. Relocated boulders are placed as close to the original position as possible, but outside the area to be affected by the cable installation tools.

16. Boulders may be cleared using a number of methods, depending on the density of boulders encountered. Where boulders are present in high density, a boulder clearance tool, for example, SCAR plough or similar may be employed. In areas of low density, it may be more efficient to use a grab to target and re-locate individual boulders. Relocated boulders are placed as close to the original position as possible, but outside the area to be affected by the cable installation tools.

17. Boulders from both outside and inside the Deep Water Routes will not be relocated within the Deep Water Routes.

18. This activity is expected to be completed within weeks to months, however, there are several variables that may affect this and it is possible the activity may not be carried out in one single campaign.

3.3 Archaeology

19. Any archaeology finds found either outside or within the Deep Water Routes will not be relocated within the Deep Water Routes.

3.4 Pre-lay grapnel run

20. Following the pre-construction route survey and boulder clearance works, a Pre-Lay Grapnel Run (PLGR) may be undertaken prior to cable installation. A vessel will be mobilised with a series of grapnels, chains, recovery winch and suitable survey spread.

21. These works will take place within the PLGR clearance corridor with up to 3,009,600 m2 of seabed disturbed - the actual disturbed area is expected to

be much smaller as the grapnels used for PLGR operations are typically only 1-2m wide. For the majority of the route a single pass with the PLGR grapnels would be expected to be performed but for certain sections multiple passes may be required.

22. The CSIP will set out the PLGR corridor and programme of works.

3.5 Sandwave clearance

23. In some areas within the offshore ECC, existing sandwaves and similar bedforms may be required to be cleared or levelled before array and offshore export cables are installed. This is done for several reasons:

- Many of the cable installation tools require a relatively flat surface in order to achieve cable burial to the target depth. It may not be possible to successfully bury a cable on a slope above a critical gradient; and
- The cable must be buried to a depth where it is expected to stay buried throughout the lifetime of the project. Sandwaves are generally mobile features that migrate naturally. Over time, sandwave migration can cause cables to become exposed if they are not sufficiently cleared before cable installation.

24. Across areas of high shipping traffic it may be necessary to undertake removal of upper (typically mobile) seabed sediments to ensure industry standard trenching tools can reach a depth of burial sufficient to adequately protect the cable from anchor strike (as informed by the CBRA).

25. Sandwave clearance / bed preparation may be undertaken using the following methodologies:

- Mass flow excavator (MFE)
- Boulder clearance plough; and/ or
- Dredging:
- Water injection dredging;
- Trailer hopper suction dredger;
- Water injection dredger
- Backhoe dredging.
- Cutter suction dredger

26. The CSIP will describe the approach, timing and scale of any seabed preparation.

3.6 Sediment disposal

27. Material may be collected from seabed preparation, depending on the selected technique. If material is collected by commercial-scale suction dredger for example, then it will be released at the water surface within the disposal sites proposed in 9.52 Outline Sediment Disposal Management Plan.

28. Sediment disposal will be defined in 9.52 Outline Sediment Disposal Management Plan (submitted at Deadline 4).

4 Export Cable Installation

4.1 Cable installation

29. The cable burial depth will be dependent on numerous factors which are described in this document, and which will vary along the offshore ECC. The cables will be buried below the seabed wherever possible, with a target burial depth informed post consent by the Cable Burial Risk Assessment (CBRA) that will support the CSIP.

- Jet trenching;
- Pre-cut and/or post-lay ploughing;
- Simultaneous lay and burial;
- Mechanical trenching;
- Mass/ Controlled flow excavation;
- Vertical injector; and
- Rock cutting.

30. Cables will be designed, installed, maintained and operated so as not to preclude or impede dredging to a depth of at least 22m below CD within the DWR areas Sunk A and Trinity as shown on the Deep Water Route Cable Installation Areas (Future Dredging Depths) Plan. Cables will be installed so as not to preclude or impede dredging to a depth of at least 19m below CD in the DWR area Sunk B as shown on the Deep Water Route Cable Installation Areas (Future Dredging Depths) Plan. This commitment is secured in the DCO through Requirement [2(3)].

31. Cables in DWR area Sunk B will installed with a gradient of no more than 1:5 from Sunk A.

32. The CSIP will set out the method of cable installation including information on the equipment, timing and programme of these works.

4.2 Cable jointing

33. Cable installation vessels are limited in the length of cable they can transport and install in a single loadout. Where lengths of offshore cable must be jointed to one another, it is not possible to bury the joint using conventional cable burial tools such as ploughs. It is therefore necessary to excavate a pit to accommodate the joint, which is then backfilled to ensure the joint’s protection. Each export cable circuit will require up to two joints, giving a maximum requirement of up to four cable joints for the offshore export cables.

34. Planned field joints will not be located in the DWR areas.

35. Details of the locations and methodology of cable jointing will be provided in the CSIP.

4.3 Cable protection

36. In some cases, where burial cannot be undertaken, or where the minimum necessary cable burial depth cannot be achieved, it is necessary to use alternative methods such as rock placement, concrete mattresses or other solutions such as Cable Protection Systems (CPS) or protective aprons to protect the cable from external damage. It should be stressed that cable burial is the preferred method of installation, and additional cable protection will only be used as a contingency where cable burial is not appropriate or achievable. The cables will be buried below the seabed wherever possible, with a target burial depth defined post-consent taking account of the ground conditions and other factors.

37. Cable protection may consist of one or more of the following methods:

- Rock placement;
- Concrete mattresses;
- Flow dissipation devices;
- Protective aprons, coverings, cladding or pipes; and/ or
- Rock bags.

38. Further details on the MDS and methods of cable protection are set out in ES Chapter 5 Project Description [APP-019].

39. In the nearshore (out to 1,600 m seaward of MHWS), any cable remedial protection will not include loose rock or gravel. Rock bags (or similar) or concrete mattresses may be placed at the ends of the Horizontal Directional Drilling (HDD) ducts.

40. All reasonable endeavours will be made to avoid the use of cable protection in the vicinity of the Sunk pilot boarding area so as to not reduce the navigable depth in this area. This area is defined as a 1nm radius around the Sunk pilot diamond, and a 1.5nm radius around the point 1.5nm directly east of the pilot diamond, as shown in Figure 4.1.

41. The final CSIP, taking into account the results of the CBRA and consideration of the potential environmental impacts set out in Section 2.2, will set out the need for and method of any cable protection required.

4.4 Cable crossings

42. It is necessary to cross existing cables in the offshore area to achieve the offshore connection from the array to the landfall and then onshore to the National Grid connection point. Offshore cable crossings will be subject to crossing agreements pre- or post-consent with the owners of those existing assets, and are necessary to provide protection to both assets, and to ensure a minimum separation so that cables do not overheat.

43. Cable crossings usually consist of a layer of protection over the existing asset (the separation layer) over which the North Falls cables would be installed. A

secondary layer would then be installed over the North Falls cable for protection. Cable crossings may utilise rock protection or concrete mattresses or bridging typically of steel or concrete construction. Due to most projects being in development, the exact numbers of crossings are still being confirmed, however, the protection for such crossings is contained within the volume of surface cable protection used within the environmental assessments.

44. Whilst the precise locations of cable crossings in the export cable corridor for future projects (specifically North Falls, Sealink and Neuconnect) is not known at this time, the ECC has been designed to ensure that these crossing will take place in areas of deeper water such that these crossings (including cable protection) do not reduce navigable depth by more than 5%.

45. Indicative locations for the cable crossings of Five Estuaries, Sealink and Neuconnect (should they be required) have been identified in Export Cable Crossing Zone Plan [REP1-059].

46. Details of all cable crossings will be set out in the CSIP.

47. Crossing designs will also be discussed with the Commercial Fisheries Working Group (CFWG)

5 Landfall

48. The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in TJBs (located onshore). The TJB, where the offshore cables join the onshore cables, would be located at the landfall at Kirby Brook. To enable the export cables from North Falls to be brought through to the TJBs, horizontal directional drillings (HDD) would be made, and ducts would be installed to pull through and accommodate the cables.

49. The works at the landfall include:

- Construction of the landfall compound;
- HDD works (or other suitable alternative trenchless techniques such as micro-boring) including temporary construction of HDD exit pits in the shallow subtidal;
- Construction of TJBs;
- Installation of offshore export cables (cable pulling);
- Installation of and jointing to onshore export cables; and
- Backfilling and re-instatement works.

50. Exit pits will be excavated or dredged to the required depth. This will be typically done via backhoe dredger type vessel or an excavator mounted on a support barge. Prior to forming the exit pit any obstructions or boulders in the intended exit locations will be removed if required.

6 Cable burial

51. The CSIP will informed by the outcomes of a cable burial risk assessment.

52. The assessment in the CBRA considers potential risks and impacts to the cables themselves. These, alongside impacts on other receptors such as shipping, marine archaeology and benthic ecology (as set out Section 2) will all contribute to the final cable design set out in the CSIP.

53. The CSIP will consider the following risks to cable burial:

- Shipping, including anchoring and exposure due to disturbance of the seabed
- Seabed gradients
- Seabed contacts
- Mobile seabed features
- Dredging
- Fishing activity
- Existing infrastructure

7 Monitoring

54. The approach to cable burial monitoring will be discussed with the relevant stakeholders and set out in the final CSIP. This will include consideration of both post-construction (as built) monitoring, and ongoing monitoring during operation.

55. The monitoring approach will consider:

- Areas of higher risk of cable exposure, e.g. mobile sediments
- Areas where cable burial depth is of greater significance, e.g. Deep Water Routes
- As built post-construction survey of location of cable routing and cable protection
- Frequency, spatial extent and technical details of proposed monitoring.
- Required environmental monitoring secured by the In Principle Monitoring Plan
- Reporting of monitoring

56. The need for and scope of ongoing monitoring activities will be reviewed following installation (once as-built details are known) and during the operational lifetime of the project.

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

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