



Norfolk Vanguard Project presentation

February 2019

Overview of presentation

- Electrical systems and grid
- Key project decisions / changes
- Project programming and phasing

Site selection for OCP and OPS

- The onshore connection point (OCP) is the interface between *onshore* and *offshore* transmission systems
 - Location of the OCP was defined before project scoping, through a joint process involving NG(SO) and Applicant (documented in Interface Selection Report)
 - Driven by NG(SO) Licence obligations (co-ordinated, economic & efficient); minimising *total* costs to consumer, and minimising *total* environmental impacts
- The onshore project substation (OPS) is the final part of the offshore transmission system
 - Location of the OPS was selected through the EIA process (documented in Chapter 4 Site Selection of the ES)
 - OPS must be close to the OCP; the initial search area was a 3km circle around the OCP (i.e. the NG substation at Necton)
 - Selection of OPS sites outside this search area would have involved ‘moving’ the OCP – additional time and cost to re-visit OCP selection process and re-scope

Transmission system options

- At scoping, the Applicant put forward two alternative technology options for the offshore transmission system: *HVAC* and *HVDC*
- The selection of transmission technology had wide-ranging consequences relating to project impacts:
 - *Offshore platforms* – The HVAC scheme involved up to *three* offshore electrical platforms; the HVDC scheme required up to *two* platforms
 - *Export cables* – The HVAC scheme involved up to *six* sets of export cables; the HVDC scheme required up to *two* pairs of export cables
 - *Cable relay station* – The HVAC scheme involved the construction of an onshore facility close to the landfall location; this was not required in the HVDC scheme
 - *Onshore project substation* – In the HVAC scheme, the visual profile of the OPS is largely below *15m*; in the HVDC scheme, the OPS contains converter halls up to *19m* in height

Onshore transmission works at OCP

- To connect Norfolk Vanguard, NG(TO) is proposing to carry out some changes to the *onshore* transmission infrastructure at Necton:
 - *Substation extension* – The existing 400kV substation will be extended to the north-west, adding *seven* new switchgear bays
 - *Pylons* – The existing corner tower will be taken down and replaced with a new terminal tower at roughly the same location; one additional terminal tower will be constructed close to the substation extension
 - *Overhead lines* – The overhead line will be temporarily diverted onto a set of temporary towers; after this the line will be returned to an alignment which is very similar to the current alignment

Selection of HVDC transmission option

- This decision was made by the Applicant following statutory consultation and pre-submission
 - Informed by concerns about the width of the onshore cable easement, and the requirement for a cable relay station
 - Followed an intensive review of HVDC supply chain capability and technology readiness, to ensure that the HVDC solution was deliverable
- The decision resulted in the following changes to the project:
 - *Offshore platforms* – Maximum number reduced from *three* to *two*
 - *Export cables* – Maximum number reduced from *six* sets of cables to *two* pairs; onshore cable easement reduced from *100m* to *45m* (allows for NV and NB cables)
 - *Cable relay station* – Eliminated from the scheme
 - *Onshore project substation* – Use of HVDC requires construction of converter halls at OPS; arguably greater visual impact
- See also Applicant Response to WQ 20.2

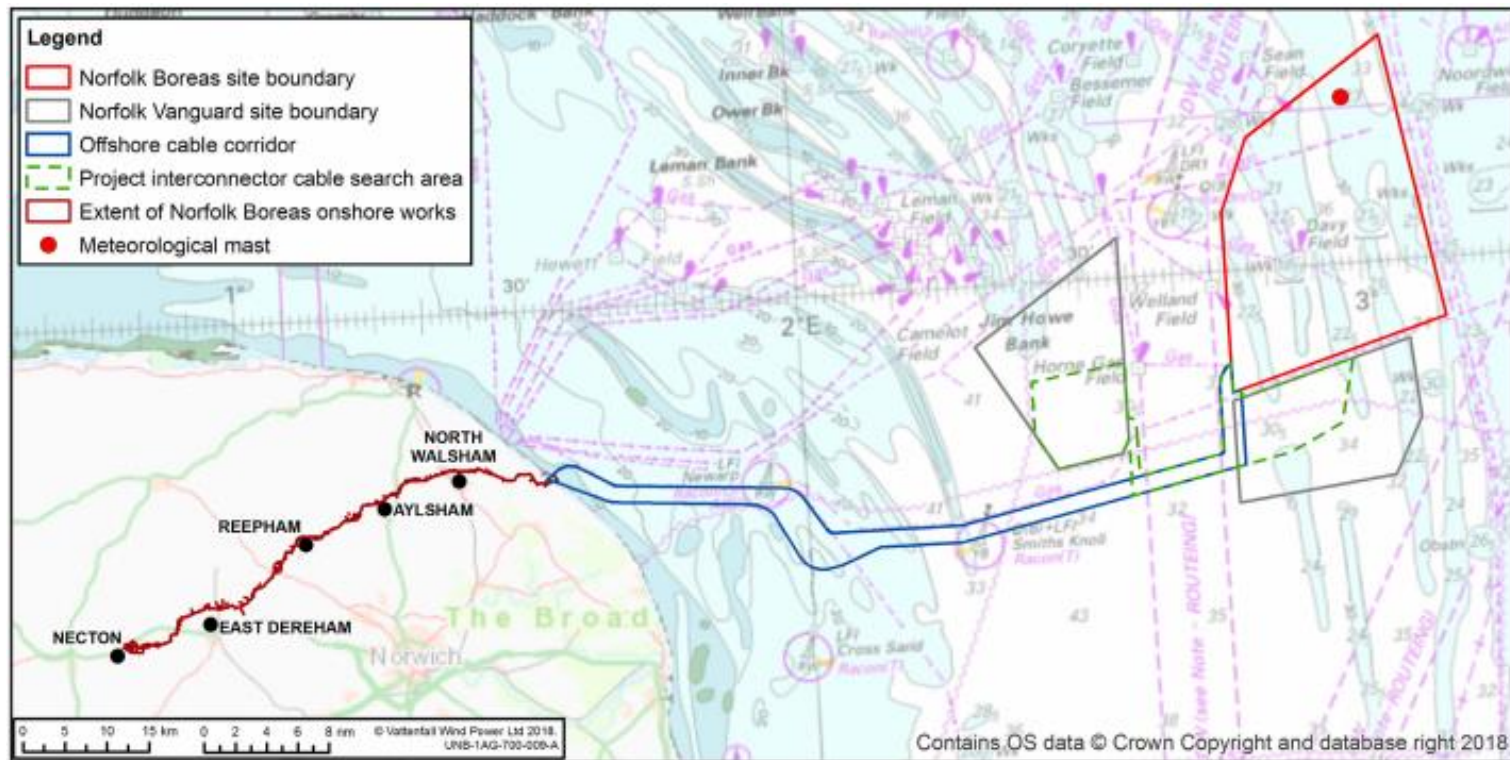
Site for onshore project substation

- This decision was made by the Applicant pre-submission
 - Informed by feedback received during scoping and EIA process
 - Siting options were illustrated using computer 3D models and photomontages
 - Also influenced by assessment of other factors, including access, noise, archaeology, flood risk
- The decision process is described in the Site Selection chapter of the ES
- See also Applicant Response to WQ 2.1

Changes made post-submission

- Several (minor) changes to the onshore cable route, to accommodate landowner preferences
- Increase in the number (six to 18) and diameter (3m to 5m) of pin-piles required to anchor the foundation for the offshore electrical platforms
- Extension to the search areas for the NG terminal towers, to allow for a cost-efficient design solution
- Removal of floating foundations from the design envelope (and reflected in the draft DCO at Deadline 2)
- See also Applicant Response to WQ 1.1

Norfolk Boreas



Norfolk Boreas (cont.)

To minimise overall local impacts, a strategic decision was made to co-locate or 'share' as much of the infrastructure as possible between the two projects:

- Shared OCP
- Shared onshore and offshore cable routes including landfall location
- Co-location of onshore project substations

To maximise benefits of the shared infrastructure, Norfolk Vanguard includes the following onshore works to benefit Norfolk Boreas (*see Applicant response to ExA written question Q2.3*):

- Pre-construction works throughout the onshore cable route will be sufficient for Norfolk Vanguard and Norfolk Boreas duct installation
- Norfolk Vanguard will install ducts for both projects throughout the length of the onshore cable route
- Norfolk Vanguard will create a permanent access to the co-located onshore project substations (requires modifications to the A47)
- National Grid overhead line modifications conducted for the connection of Norfolk Vanguard at the OCP will be sufficient to accommodate Norfolk Boreas

Programme for onshore works

- 6 years onshore – reduced so far as practicable
- Outline schedule presented in Table 5.36 of Chapter 5 Project Description with further detail provided in Appendix 20.1 (*in response to WQ20.22*)

Activity	Year					
	2020	2021	2022	2023	2024	2025
Landfall						
Duct Installation						
Cable Pull, Joint and Commission						
Phase 1						
Phase 2						
Onshore cable route						
Preconstruction works						
Duct installation works						
Cable pull, joint and commission						
Phase 1						
Phase 2						
Onshore project substation						
Preconstruction works						
Primary works						
Electrical plant installation and commission						
Phase 1						
Phase 2						

Onshore duct installation

- Installation of ducts for both Norfolk Vanguard and Norfolk Boreas in a single 2 year construction period
- Ducts to be installed in a sectionalised manner from mobilisation areas at an approximate rate of 150m/week
- Minimises the amount of land being worked on at any one time and would also minimise the duration of works on any given section of the route
- Approach is detailed in Section 5.5.2.3 of Chapter 5 and secured in the Outline Code of Construction Practice
- See also Applicant Response to WQ 20.21

Onshore cable pulling and offshore works

- Two phase onshore cable pulling, and offshore works (*WQ20.21 & WQ 20.106*)
 - May be required to allow flexibility in the supply chain acknowledging that at 1,800MW, Norfolk Vanguard is substantially larger than any other offshore wind farm built to date and may therefore be constructed in up to two 900MW units
- Cable pulling does not require the trenches to be reopened, with the cables pulled through the pre-installed ducts from jointing pits located at approximate 800m – 1000m intervals
- Access to joint pits may require up to 12 km (20%) of the running track to be retained or reinstated following duct installation