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VATTENFALL

Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 4.2 FAQ documents

Applicant: Norfolk Boreas Limited
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Photo: Ormonde Offshore Wind Farm

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Norfolk Vanguard & Norfolk Boreas Offshore Wind Farms

Frequently Asked Questions - updated 16th June, 2017

Contents Page

1. Who is Vattenfall?

Vattenfall is a Swedish state owned energy company operating in northern Europe. We generate electricity, produce heat and distribute both through local networks. Vattenfall operates four offshore wind farms in UK waters and four onshore schemes, comprising nearly 1GW of installed capacity which feeds into the National Grid. Further information about Vattenfall can be found on our website, www.vattenfall.co.uk

2. What is Vattenfall proposing to do off the coast of Norfolk?

Vattenfall is proposing to develop two new offshore wind farms in the North Sea, off the coast of Norfolk, each having a target capacity of 1.8Giga Watts. The wind farms are called Norfolk Vanguard and Norfolk Boreas. Together the combined wind farms are expected to generate enough clean renewable electricity to meet the equivalent demand of around 2.6 million UK households.

The proposed wind farms of Norfolk Vanguard and Norfolk Boreas have been named after two ships commanded by Lord Nelson during his career. Born in Norfolk in 1758, Lord Nelson went on to become a leading figure in British naval history.

The project websites contains further information about these proposals;
http://norfolkvanguard.vattenfall.co.uk/
http://norfolkboreas.vattenfall.co.uk/

3. Why two projects?

Together, Norfolk Vanguard and Norfolk Boreas will have a combined installed capacity of 3.6GW. This represents 10% of UK household demand[2] and is three times greater than the planned power production of Sizewell B.

In our experience, developing adjacent or clustered projects in sequence aids the delivery of low cost renewable energy for the consumer, through:

- Shared infrastructure
- Improved knowledge of constructing and operating in the area
- Phased deployment of innovative, best-in-class technology

4. What is Vattenfall proposing to do onshore?

Vattenfall has accepted National Grid's connection offers for Norfolk Vanguard and Norfolk Boreas based on an onshore connection point at the existing 400kV Necton National Grid Substation.

Vattenfall is committed to using underground cables to bring power from the landfall to the existing grid network; this has the benefit of avoiding the landscape and visual impacts associated with overhead lines.

We are consulting with communities, landowners and other stakeholders on the most appropriate location for all the onshore infrastructure required for both projects; this includes each projects' substation location, cable corridor, cable relay station (only required if AC export cables are used) and landfall.

We will ensure that information relating to the grid connection and onshore works is updated on each the project website when decisions are made. There is a high resolution map available on the consultation pages of the websites;
http://norfolkvanguard.vattenfall.co.uk/article/consultation-process
http://norfolkboreas.vattenfall.co.uk/article/consultation-process
(and click on 'view larger map')

5. How will the projects work together?

Norfolk Vanguard and Norfolk Boreas will be the subject of separate planning applications. We began to give details of how the two projects will work together during recent drop-in exhibitions. The complete set of information boards from the **Public Drop in Exhibitions, Round 2 on March/April 2017** can be found here:
http://norfolkvanguard.vattenfall.co.uk/article/documents
http://norfolkboreas.vattenfall.co.uk/article/documents

The majority of the offshore and onshore cable corridor will be shared between both projects. Onshore construction of the projects will be coordinated as far as possible.

The plan is that cable ducts for both projects will be laid in one installation process with cables pulled through the ducts later. This coordinated approach will considerably minimise disruption to local communities.

The projects may share a landfall location, however landfall construction will be undertaken separately for each project.

If AC technology is used, each project will require a separate cable relay station. Co-location of the cable relay stations is possible, however consenting and construction would be undertaken separately.

Each project will require its own onshore substation. Where possible, these will be co-located and works coordinated in order to minimise disruption and impacts.

It is intended that one landscape strategy for both projects would be included in the consent for Norfolk Vanguard to allow planting around the substation and cable relay station (if one is required) to mature as early as possible to provide screening.

National Grid works, including an extension to the existing substation and modification of the overhead lines, will accommodate connections for both Norfolk Vanguard and Norfolk Boreas. It is expected that all National Grid works will be completed for both projects at the same time.

6. What stage are you at?

Norfolk Vanguard and Norfolk Boreas are both Nationally Significant Infrastructure Projects (NSIP) and so an Environmental Impact Assessment (EIA) is required as part of the Development Consent Order (DCO) application under the Planning Act 2008.

In October 2016, we submitted a request for an EIA Scoping Opinion on the Norfolk Vanguard project to the Planning Inspectorate.

You can view the Norfolk Vanguard related Planning Inspectorate material here:
http://norfolkvanguard.vattenfall.co.uk/article/planning-process

The Norfolk Boreas EIA Scoping Report was submitted to the Planning Inspectorate in May 2017. The Planning Inspectorate undertakes a formal process to consult with stakeholders on the proposed scope of the EIA. Once complete, the Planning Inspectorate will publish a formal response to Vattenfall (expected to be end of June 2017). This response will inform the scope of the EIA and subsequent Environmental Statement (ES). Vattenfall will produce a Non-Technical Summary (NTS) setting out the scope of the EIA. This will be published on the project website.

Over several weeks the projects' multidisciplinary teams have been reviewing feedback from our participatory drop-in exhibitions (just short of 800 people attended drop-ins in October, and around 830 people attended the March / April drop-ins), ongoing expert stakeholder discussions and discussions with landowners, as well as information from surveys and environmental assessments. This work continually feeds into refining the project design. In mid-June 2017, in keeping with our open and transparent approach to communication and responding to community requests to be updated as soon as project decisions are made, we publicised revisions to the project design. This was done via our third Newsletter which is sent to more than 35,000 homes within the original Norfolk Vanguard search area, letters to and meetings with key stakeholders, and website updates. The refined project proposals show one landfall zone to the south of Happisburgh village, two cable relay station zones, the underground cable corridor and a refined project substation zone located to the east of the existing National Grid and Dudgeon substations.

The results from the early environmental assessment work and an update on the locations of proposed onshore infrastructure will be made public as part of formal consultation on the Preliminary Environmental Information Report (PEIR) in October / November 2017. The next round of Drop-in Exhibitions with members of the local community will also take place around this time. Again the responses we receive in relation to that consultation will feed into the project design and our submission of a Development Consent Order (DCO) application for Norfolk Vanguard in Summer 2018. The DCO application for Norfolk Boreas is expected to be in 2019.

We anticipate a decision will be made by the Secretary of State on our Norfolk Vanguard application in 2019, and for Norfolk Boreas the following year.

More information about the programme can be viewed in the material presented at the last drop-in events.

There will be project updates between the significant milestones outlined above.

7. How will local communities, landowners, businesses and interest groups be consulted about the wind farm and electricity transmission network proposals?

We will maintain a dialogue with communities throughout the development, construction and operation phases of our projects. Vattenfall is committed to early, effective and engaging communication with the local communities where we operate. Due to the size of this projects, they are classed as Nationally Significant Infrastructure Projects (NSIP). NSIPs include the kinds of large scale facilities that support the everyday life of the country, such as major transport routes, major gas pipelines, water reservoirs and sewage treatment plants, power stations, power lines and wind farms. They require development consent under formal and strict procedures outlined in The Planning Act 2008 and need to demonstrate extensive consultation with local communities and statutory organisations prior to submitting an application and how information received from consultees has fed into the project design.

To date, we have met local people at a series of drop-in events conducted in October 2016 and March / April 2017.

We visited seven locations in the autumn of 2016, and welcomed nearly 800 people to our participative exhibitions.
Reports relating to the feedback we received during the October 2016 drop-ins can be found here: http://norfolkvanguard.vattenfall.co.uk/article/documents

In the Spring of 2017 we went to nine location across Norfolk and were joined by 830 people overall. We are very happy with the level of interest shown in learning more about the projects and in contributing to the shaping of the proposals.

Reports relating to the feedback we received during the March-April 2017 drop-ins can be found here: http://norfolkvanguard.vattenfall.co.uk/article/documents

8. Why do you consult communities so early in the process, if there are no definite plans relating to the location of onshore infrastructure?
The Planning Act 2008 describes clearly our duty, as developers of Nationally Significant Infrastructure Project (NSIP), to consult with a range of interested parties.
See also questions 6 and 7.
Currently we are engaged in "informal pre-application consultation" with a wide range of stakeholders and with members of the local community – you can find out more about the process here:
https://infrastructure.planninginspectorate.gov.uk/application-process/the-process/

Sharing the steps we follow during our decision-making process to refine project proposals provides opportunities for local and national stakeholders, experts, people who are potentially impacted by the project, and people with an interest to influence our thinking, appropriately and in a timely manner. This consultation also encourages innovation and enables us to work with local people to be creative and make the most robust, sustainable and best decisions we can.
The downside is that some people will be concerned by uncertainty around whether or how they might be impacted by the proposals as they develop. We do not wish to prolong uncertainty, and can empathise with people's concerns. However we must review and assess all the information and ideas, concerns and opportunities presented to us, and respond to them.

Before the latest revision of project proposals (June 2017), we were considering::

- Three possible landfall zones. The two, in the northern area are constrained in terms of space. Each offered space for one project deploying Alternating Current (AC) technology or two projects deploying Direct Current (DC) technology to transmit power to the National Grid.
- Seven possible cable relay station zones. Cable relay stations – one for each project – are only required should we decide that the best technology overall to deploy is AC transmission of power. There is a general preference for co-location of cable relay stations because it avoids dispersal of infrastructure over a wider area, and therefore avoids more environmental and social impacts. There may also be technical and financial arguments for this approach. If compelling reasons against co-location emerge, these will be given equal consideration.
- A zone near the existing 400KV National Grid substation, near Necton, that we were assessing for the best location to site the projects' substations. As with the cable relay station, we are seeking to co-locate both project substations in order to avoid dispersal of infrastructure over a wider area, and reduce environmental and social impacts.

Along with the 200m-wide underground cable corridor, these were the elements of onshore infrastructure presented for consultation at the March-April 2017 drop-in events.

The June 2017 revision, taking into account recent community feedback, stakeholder and landowner input and information from technical and environmental assessments, has identified the landfall zone south of Happisburgh as our preferred landfall. Two of the seven cable relay station zones have been maintained for further assessment, and the project substation zone has been revised – it is now smaller and occupies an area to the east of the existing NG and Dudgeon

substations. These revisions have been communicated widely, via a project Newsletter, letters and our website.

We will continue to communicate locally and on our website..

9. Will AC or DC technology be used and why has this technology been selected?
A decision on the use of AC or DC technology will not be taken until after consent has been achieved as part of the detailed design and Final Investment Decision of the project. The inclusion of both transmission technology options through consent submission is required to meet full technical and economic flexibility to deliver against government targets for offshore wind cost reduction and to ensure the projects can deploy the most appropriate and advanced technology available closer to the time when construction would begin. Maintaining flexibility during the early stages of project development allows us to future-proof the projects Whilst both technology options are being considered, only one transmission option will be developed during the final design.

10. What are the factors that influence Vattenfall's decision on whether to opt for power transmission using AC or DC?
The decision whether to adopt high-voltage direct current (HVDC) or the more common high voltage alternating current (HVAC) technology to transmit power from the wind farm site to the National Grid is a complex one, influenced by a number of variables, not least the technological and supply chain development that is possible between now and when we envisage beginning procurement and project construction in the early 2020s.

For long-distance transmission, HVDC systems can be beneficial as they cause lower electrical power losses than HVAC systems. Also the number of cables required to transmit the same electrical power are fewer and hence lower environmental impact and cost with regard to cable installation. However, the lower power losses in the cables are offset by power losses associated with the necessary conversion from HVAC to HVDC offshore and from HVDC to HVAC at the National Grid connection. HVDC systems are in their infancy - no offshore HVDC converters are operational in the UK yet and few have been deployed around the world - so the supply chain and knowledge of the technology is more limited than for HVAC.

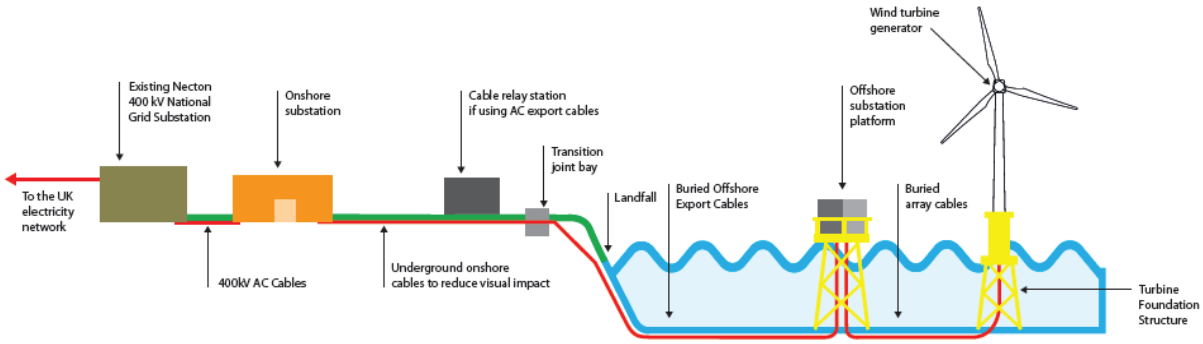
In comparison, HVAC is the standard technology utilised around the world for electrical power transmission and therefore the knowledge and supply chain, including in the UK, is better established and more competitive. This can deliver cost savings and the benefits of maturity. Although more cables are required to transmit the same power as HVDC, this does have an up-side, allowing a more resilient transmission connection should a cable failure occur, minimising the lost renewable energy to the National Grid whilst repairs are made, which can be a substantial time in the offshore environment.

All of these aspects are carefully being considered and investigated to understand the most efficient transmission technology solution. The complexity of the decision and the potential advances which could occur prior to construction are why we need to maintain flexibility over the transmission solution until post consent.

For the Norfolk Vanguard and Boreas projects, an HVAC transmission system requires a single cable relay station (for each project) near the midpoint of the distance between the project and its connection to the National Grid. This station compensates for 'charging currents' generated by the underground HVAC cables and improves the HVAC system's efficiency. The HVAC system also requires an HVAC substation located at the existing National Grid 400 kV substation near Necton . Although the amount of land required for this substation would be very similar to

that for the HVDC converter station, the buildings and equipment would be less bulky, and easier to screen with suitable siting and planting.

Regardless which option is selected Vattenfall has committed to putting all the onshore cables underground, rather than the alternative of deploying overhead cables and pylons. By deciding to underground cables, Vattenfall has taken an important decision - at our cost - determined by our desire to minimise the visual and environmental impact in the region.



11. I own land in one of the search areas, when will you speak to me?

If you need to speak to someone about land-related issues, Consents Solutions, land agents based in Norfolk, have been engaged to liaise with all landowners and occupiers to discuss route alignments, survey access, land use and landowner concerns and ultimately
agree consents for all land-based infrastructure once a preferred route is selected. The primary contact will be Bob McCarthy (bobmccarthy@consentssolutions.com, 07787 783517)
Ardent Management will complete a process of Land Referencing to identify all landowners and occupiers. Initial contact will be via letter with an accompanying form, it is important that landowners and occupiers provide details of all known interested parties to ensure they continue to be engaged and consulted throughout the project.

12. If my land is affected what will be required?

At the landfall site on the coast, we will require an area for jointing sub-marine cables from the offshore generators to land cables. If we use AC export cables, a cable relay station will be required close to the landfall. A Norfolk Vanguard and a second Norfolk Boreas substation, close to the existing 400kV Necton National Grid Substation will also be required.
Cable easements from the coast to this substation will be needed for the underground cables.

13. Will these projects have an adverse impact on the local environment (on and offshore)?

With appropriate siting and continued consultation with relevant stakeholders, the development of offshore wind farms should have minimal impact on the local area. Any wind farm that receives consent will have gone through a rigorous planning procedure and in-depth consultation with interested bodies regarding potential impacts. Vattenfall is undertaking a number of environmental surveys. Offshore, these include bird and marine mammal surveys and surveys of the animals on the seabed. Onshore, we are collecting data on plants and animals as well as carrying out surveys to understand existing levels of traffic and noise in the area. We are using these data to undertake environmental impact assessments to fully understand the effects of our project and any mitigation required. The findings of these surveys will be presented in the Preliminary Environmental Impact Report (PEIR), which will be published in October / November 2017.

Vattenfall participates in and supports a number of independent scientific studies, led by academics in the UK and across Europe to look at any potential impact of wind developments on wildlife and habitats. Some information relating to Marine Mammals is available here:
http://norfolkvanguard.vattenfall.co.uk/article/documents
See the Marine Mammal information sheet.

Very recent information (published on 1st May 2017) on abundance estimates of harbour porpoise, white-beaked dolphin and minke whale in the North Sea indicate no change over the 22 years covered by the surveys with marine mammal populations apparently not adversely affected by the large scale offshore wind developments over the last ten years https://synergy.st-andrews.ac.uk/scans3/2017/05/01/first-results-are-in/

14. How will these schemes benefit the Norfolk economy?

The industry trade body, RenewableUK, says that more than 70,000 jobs will be created in the UK renewables industry within the next decade. Projects such as Norfolk Vanguard
will contribute to the growth of an economically important industry. We will be able to provide some details about specific local benefits for Norfolk after completing our assessment of the impact of the wind farm on the local economy. We are convinced, based on our experience elsewhere, that Norfolk can expect significant benefit from this scheme.
Local businesses can register their interest in the scheme here;
http://norfolkvanguard.vattenfall.co.uk/article/contact-us (please complete the form under the media contact information)

15. What types of benefits and opportunities will there be associated with these projects for communities?

As a leading energy company, Vattenfall is guided by principles of sustainable development. This means we actively seek opportunities for our investments to create wider benefits and particularly to deliver solutions for people living in the areas we operate. Norfolk is an unique place with its own identity and priorities. We'd like the local experts, people who live, work and play here, to tell us what is important for Norfolk's future – its environment, people and economy. We are excited to begin a conversation with local people and stakeholders, which over the next months and years gives us a chance to explore together opportunities for bringing meaningful, lasting benefit to the local area.

Already some ideas are coming in, many associated with providing educational, skills and training opportunities for young people. While we are only at the development phase of both projects and cannot commit to making major capital investments in Norfolk until project permission is granted for Norfolk Vanguard and Norfolk Boreas, already we are providing opportunities for young

people and local businesses. We are collaborating with local skills organisations, schools and sixth form colleges to provide a flavour of the work that is entailed in developing major infrastructure projects. We are awarding local contracts where possible, for example Norfolk Wildlife Services have been contracted to undertake onshore ecological surveying.

16. The site has some fishing interests, as well as major shipping and ferry routes passing through or near to it. Will the wind farm force them to be moved?
In line with standard offshore practice, we are working on the presumption that vessels not involved in wind farm-related activities should remain 500m away from each turbine/work site during construction and commissioning. Once the cables are installed and any exclusion areas around hazards are removed, it is expected that fishing can continue within the area of the wind farm. With regard to shipping, the site has been selected to avoid potential conflicts with major shipping routes. We are undertaking extensive consultation with shipping organisations as part of the development of these projects. Any mitigation required will be discussed in detail with the relevant statutory authorities and other stakeholders during the development process.

17. Another offshore wind developer is planning to run underground cables trough Norfolk too. How will you ensure that the cumulative impacts associated with these projects are minimised?
Vattenfall are progressing Norfolk Vanguard and Norfolk Boreas, in such a way as to ensure the projects are fully coherent and aligned to minimise impacts and maximise opportunities.
DONG Energy is progressing Hornsea Project Three. Hornsea Project Three is a project with its own technical and environmental characteristics and constraints, and is subject to a completely separate Development Consent Order Process. Although both projects are in Norfolk, Hornsea Project Three will make landfall near Cromer, many kilometres away from where the Norfolk Vanguard and Norfolk Boreas cables will come ashore (currently zones between Bacton and south of Happisburgh are being considered) and will connect to National Grid at Norwich Main. Vattenfall and DONG teams are collaborating where there are opportunities to do so, particularly in relation to where underground cables are likely to cross, to ensure we progress the projects appropriately and sensitively.

18. What is the plan for the roads and if they are closed - how long will they stay closed for?
It will be necessary to have road closures and traffic management for periods of time in order to complete the works. Efforts will be made to avoid or minimise traffic disruption. Trenched crossing of a single-track road will require temporary road closure for a week or so. Crossing a larger road would be achieved using temporary traffic lights, trenching one lane at a time; duration is likely to be about 2 weeks. Road closures in a given locality will be sequenced so that alternative routes are available for motorists and other road users.

19. Will landfall engineering cause further instability to a changing coastline?
The Norfolk coastline is subject to natural processes and is changing, as is the case in many other dynamic coastal environments across the UK. This is not a new phenomenon. Local Authorities working with the Environment Agency in England are charged with creating, maintaining and executing coastline management plans. Vattenfall is engaging with relevant organisations regarding coastal issues.

We have also commissioned a study to investigate the impact of coastal processes on the area where we seek to bring transmission cables ashore. The purpose is to ensure that any activities we undertake do not have any negative impact on coastal realignment, and also to ensure that over the medium and long term, natural processes do not impact on our project. Planned site investigations providing detailed geological and geotechnical information will enable us to ensure that any works we undertake will not exacerbate coastal realignment processes.

20. Will electromagnetic fields (EMF) be emitted by Norfolk Vanguard and Norfolk Boreas' underground cables, cable relay stations and substations? Will the EMF impact on human and animal health?

Electromagnetic fields (EMF) are a part of the natural world: the earth has a natural static magnetic field and static electric fields are generated in the atmosphere. Electric and magnetic fields are also generated wherever electricity is transmitted or used. These occur when utilising household appliances, from electricity sent through wiring, and from sources in the built environment such as power lines and electrified railways.

Very extensive scientific research has been carried out to investigate potential for health risks from EMF[1]. National[2] and international[3] health protection bodies have developed guidelines for public EMF exposure that are set to protect health.

The underground cables, cable relay stations (if required) and substations associated with the Norfolk Vanguard and Norfolk Boreas Offshore Wind Farm grid connection will comply with the recommended government EMF guidelines set to protect public health. These guidelines are set out in a Code of Practice[4], that was developed by the UK Government. The Code of Practice will be adhered to, to ensure that the maximum magnetic field strengths that could be generated by the proposed design are well below the guideline exposure limits, Vattenfall will provide evidence of this compliance in the projects' DCO applications.

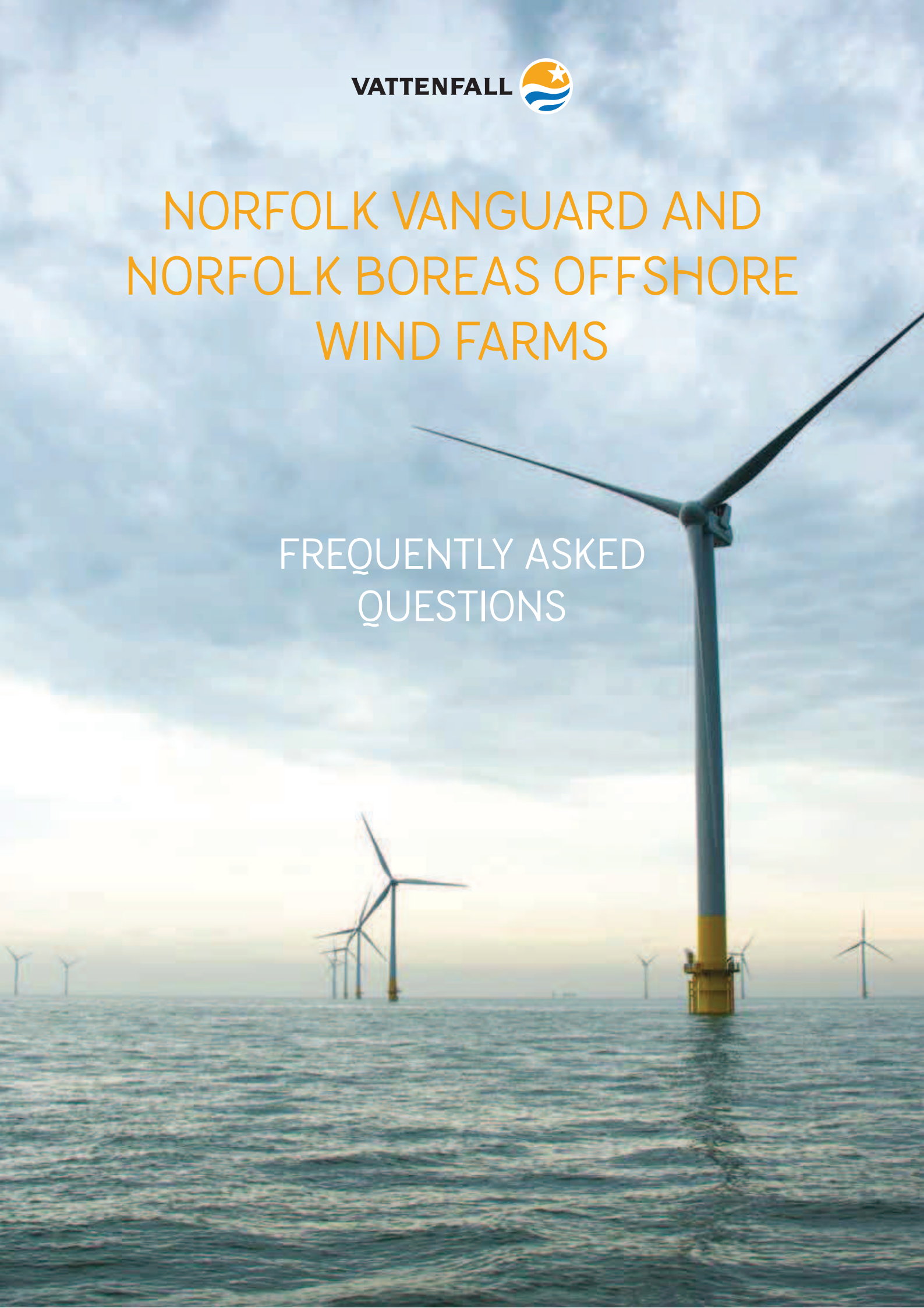
EMF from electricity transmission has not been shown to adversely affect livestock or onshore wildlife. Some animals can sense EMF, particularly marine species such as elasmobranch fish (sharks and rays) and also some migratory birds. The potential effects of EMF on sensitive species (with mitigation if required) will be considered in the Environmental Impact Assessment where relevant.

[1] SCENIHR, "Potential health effects of exposure to electromagnetic fields (EMF)," European Commission, Luxembourg, 2015.
WHO, "Environmental Health Criteria 238. Extremely Low Frequency Fields.," WHO, 2007.
A. McKinlay, S. Allen, R. Cox, P. Dimbylow, S. Mann, C. Muirhead, R. Saunders, Z. Sienkiewicz, J. Stather and P. Wainwright, "Review of the scientific evidence for limiting exposure to electromagnetic fields (0-300 Ghz)," *Documents of the NRPB,* vol. 15, no. 3, 2004.
IARC, "IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 80 Non-ionising Radiation, Part 1: Static and Extremely Low-Frequency (ELF)," IARCPress, 2002.
[2] A. McKinlay, S. Allen, R. Cox, P. Dimbylow, S. Mann, C. Muirhead, R. Saunders, Z. Sienkiewicz, J. Stather and P. Wainwright, "Advice on limiting exposure to electromagnetic fields (0-300 Ghz)," *Documents of the NRPB,* vol. 15, no. 3, 2004.
Department of Health; Department for Communities and Local Government; Department of Energy and Climate Change, "Government response to the SAGE recommendations," Department of Health, 2009.
[3] ICNIRP, "Guidelines for Limiting Exposures to Time-Varying Electric, Magnetic and Electromagnetic Fields (Up to 300 GHz)," *Health Physics,* vol. 74, no. 4, pp. 494-522, 1998.
ICNIRP, "Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz to 100 kHz)," *Health Physics,* vol. 99, no. 6, pp. 818-836, 2010.
European Council, "Council recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)," OJEU L199/59, 1999/519/EC, 1999.
[4] DECC, "Power Lines: Demonstrating compliance with EMF public exposure guidelines. A voluntary Code of Practice," Department of Energy and Climate Change, 2012.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/37447/1256-code-practice-emf-public-exp-guidelines.pdf

VATTENFALL

NORFOLK VANGUARD AND NORFOLK BOREAS OFFSHORE WIND FARMS

FREQUENTLY ASKED QUESTIONS



Introduction

The purpose of this document is to provide a quick reference for you to learn more about the project, find answers to questions you may have, as well as point you to more detailed or background information published on our website.

There is some additional information here on the function of some of the onshore infrastructure outlined on our online interactive map of the project (you'll find links to it in this document), and responding to recent questions following our latest project refinement announced in February 2018. For example, there are initial answers to questions from local people about what you might potentially experience during onshore construction works. We hope the answers here provide reassurance that all our operations are undertaken sensitively and according to established guidelines and legal parameters, as well as our own measures of good practice. Having your feedback throughout the early development of our proposals has helped shape a project that, as far as possible, is sensitive to local interests and needs, by design. Naturally, if the project is consented, detailed design will be undertaken, and further communication will follow.

Thanks again for your interest and involvement.

The Norfolk Vanguard Project Team

April 2018

Contents

1. Who is Vattenfall?

Vattenfall is a Swedish state-owned energy company operating in northern Europe. Vattenfall has invested over £3 billion in UK wind power since 2008 and, as of early 2018, we operate more than 1GW of installed capacity with more than 4GW of onshore and offshore wind in development over the next decade.

Vattenfall operates electricity distribution networks in Sweden and Germany and is developing smart grid solutions to ensure security of supply and help people use energy more efficiently. We are one of Europe's largest producers and distributors of district heating. Vattenfall also offers energy services, such as charging solutions for e-mobility, solar power, heat pumps and smart control of energy consumption.

We believe the world is in urgent need of finding alternative, cleaner ways of powering and heating homes, industries and cities. Our purpose is to enable fossil-fuel free living within one generation and to achieve this we are investing and innovating, particularly in key areas including offshore wind, district heating, decentralised generation and distribution, and electrification. Further information about Vattenfall can be found on our website, **www.vattenfall.co.uk**.

2. What is Vattenfall proposing to do off the coast of Norfolk?

Vattenfall is proposing to develop two new offshore wind farms in the North Sea, off the coast of Norfolk, each having a target capacity of 1.8GW. The wind farms are called Norfolk Vanguard and Norfolk Boreas. Together the combined wind farms are expected to generate enough clean renewable electricity to meet the equivalent demand of around 2.6 million UK households.

The proposed wind farms of Norfolk Vanguard and Norfolk Boreas have been named after two ships commanded by Lord Nelson during his career. Born in Norfolk in 1758, Lord Nelson went on to become a leading figure in British naval history.

The following websites provide further information about these proposals;

- **www.vattenfall.co.uk/vattenfallinnorfolk**
- **www.vattenfall.co.uk/norfolkvanguard**
- **www.vattenfall.co.uk/norfolkboreas**

Currently Vattenfall is preparing a Development Consent Order (DCO) which will be submitted to the Planning Inspectorate in order to gain consent to build and operate the Norfolk Vanguard Project. Scoping of the Norfolk Boreas project has already taken place and the Scoping Report is available here (**bit.ly/2v5ujOt**). A Development Consent Order for Norfolk Boreas will be submitted in the summer of 2019.

3. How much energy will Norfolk Vanguard and Norfolk Boreas contribute to the UK's energy needs? And why develop two projects?

Together, Norfolk Vanguard and Norfolk Boreas will have a combined installed capacity of 3.6GW. This represents 10% of UK household demand and is three times greater than the planned power production of Sizewell B. Both are very large projects in their own right and would be developed in two phases each.

In our experience, developing adjacent or clustered projects in sequence aids the delivery of low cost renewable energy for the consumer, through:

- Shared infrastructure
- Improved knowledge of constructing and operating in the area
- Phased deployment of innovative, best-in-class technology

Elements of the Norfolk Vanguard and Norfolk Boreas onshore works in particular will be co-located and/or undertaken at the same time, in order to minimise local disruption and impacts.

of the UK offshore wind cumulative deployment target for 2030

(as recommended by the Committee on Climate Change in the 5th Carbon Budget)

Prevent more than 2,000,000 tCO_2 from entering the atmosphere

Together NV & NB will deliver 10% equivalent UK domestic electricity needs

of the East of England's electricity demand (domestic, commercial and industrial), or 2% of the UK's annual equivalent electricity demand

(Department for Business, Energy and Industrial Strategy, 2016)

4. How will Norfolk Vanguard and Norfolk Boreas work together?

Norfolk Vanguard and Norfolk Boreas will be the subject of separate planning applications. We began to give details of how the two projects will work together during our second round of drop-in exhibitions (March/April 2017). The complete set of information boards from drop-in events can be found here:

- **https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/documents/**
- **https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkboreas/documents/**

The majority of the offshore and onshore cable corridor will be shared between both projects. Onshore construction of the projects will be coordinated as far as possible. Cable ducts for both projects will be laid in one installation process with cables pulled through the ducts in up to four sequential phases (two per project). This coordinated approach will considerably minimise disruption to local communities.

The projects share a landfall location, however landfall construction may be undertaken separately for each project.

Each project will require its own onshore project substation. These will be co-located and where possible works coordinated in order to minimise disruption and impacts. We are considering a masterplan approach for landscaping for the two projects, to allow more time for planting around the substation works to mature, where possible. However, not all planting required for the two projects will be undertaken entirely under the Vanguard application – there will still be some planting which is required for Boreas which would be consented under the Boreas DCO.

The Norfolk Boreas onshore project substation will be included within the Norfolk Boreas DCO application.

Modification of the National Grid overhead lines, will accommodate connections for both Norfolk Vanguard and Norfolk Boreas. Extensions to the existing National Grid 400kV substation will be required for both Norfolk Vanguard and Norfolk Boreas. The Vanguard DCO application will include proposals for the extension works to National Grid substation required to accommodate the Norfolk Vanguard project, and the Boreas DCO will include the works required for the Boreas connection.

5. How will Norfolk Vanguard and Norfolk Boreas benefit the Norfolk economy?

The Government's Clean Growth Strategy (October 2017) describes a plan for growing our national income while cutting greenhouse gas emissions. It states how achieving clean growth will increase our productivity, create good jobs, boost earning power for people – especially in centres where particular green growth sectors, including offshore wind, will focus their operations. It also sets out how clean growth will help protect the climate and environment upon which we and future generations depend. Greg Clark, the Secretary of State for Business, Energy and Industrial Strategy predicts the opportunity for people and business involved in the low carbon economy as being huge, citing the potential for 11 per cent per year growth between 2015 and 2030, four times faster than the projected growth of the economy as a whole. The industry trade body, RenewableUK, says that more than 70,000 jobs will be created in the UK renewables industry within the next decade.

Projects such as Norfolk Vanguard and Norfolk Boreas, which together represent multibillion pound investments, will contribute to the growth of an economically important industry. There is a requirement for developers to achieve at least 50% UK content throughout the lifetime of their projects. We will continue to develop our supply chain strategy to ensure we achieve this target and we are convinced, based on our experience elsewhere, that Norfolk can expect significant benefit from this scheme. We are currently beginning preliminary conversations with the local supply chain, and have issued an early supply chain brochure (**https://bit.ly/2lMXkAv**) giving companies an impression of the kinds of onshore and offshore support and services we shall require if the project is consented.

If the Norfolk Vanguard and Norfolk Boreas offshore wind farms are consented and built, our current estimates indicate are that there will be around 300-400 construction jobs directly supported during the two years (2022-23) of peak activity associated with the construction of the onshore project substation, National Grid extension and cable route duct installation. A further 150 skilled personnel will be required to pull and joint cables onshore and a further 150 highly skilled personnel required annually to operate and manage the wind farms over the next 25 plus years that Norfolk Vanguard and Norfolk Boreas would be producing energy. In addition to these directly required personnel, there will be many others engaged in the supply chain, providing the goods and services the projects require over development, construction and operation, and eventually decommissioning.

Already during development we have awarded a number of local contracts including to Norfolk Wildlife Services for ecological surveying, Cefas based in Lowestoft for meteorology and oceanography studies, and SI Drilling (a local drilling company) undertook our site investigation drilling. In order to ensure that as many people from Norfolk and from the LEP region help develop and benefit from opportunities that the projects can bring, if built, we are engaging with local business organisations and training providers to help those interested in working with us to learn more about our industry and prepare for involvement with energy projects of the future.

To date, we have supported and partnered in the development of an innovative pilot training project aimed at young people, deploying 3D Virtual Reality computer technology to understand the multiple constraints and opportunities that influence the developments of offshore wind farms. You can read about this work here (**http://bit.ly/NVB3DWVR**).

Local businesses can find out more about Supply Chain opportunities and register their interest here:

http://bit.ly/NVSupplyChain

Students from Paston College engage in our innovative 3D-VR offshore wind development programme that focuses on employability skills and understanding wind industry innovations

More about Norfolk Vanguard – and how consultation has shaped the project

6. What is Vattenfall proposing to do onshore?

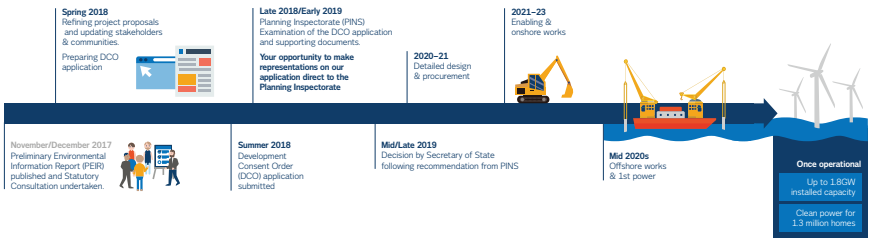
Very early on in the project's development, Vattenfall accepted National Grid's connection offers for Norfolk Vanguard and Norfolk Boreas based on an onshore connection point at the existing 400kV Necton National Grid Substation. Associated with this decision, Vattenfall committed to using underground cables to bring power from the landfall to the existing grid network; this has the benefit of avoiding landscape and visual impacts associated with overhead lines. These are key decisions, underpinning later project refinements.

Since these early decisions, extensive consultation with communities, landowners, stakeholders with specialist local knowledge and statutory responsibilities and other stakeholders, as well as environmental surveys, including targeted geophysical investigations, have guided project refinement and site selection. This has helped to determine the most appropriate location for the onshore infrastructure required for both projects at landfall (where offshore cables come ashore), along the cable corridor, and where power will connect into the National Grid. You can read about the site selection process in the relevant Chapter of our Preliminary Environmental Information Report (**bit.ly/2svaUVQ**), or a shorter version in the Consultation Summary Document (**bit.ly/2svaUVQ**).

Following the Statutory Consultation for Norfolk Vanguard, Vattenfall announced in February 2018 that we are committing to deploying innovative HVDC technology to transmit power from Norfolk Vanguard and Norfolk Boreas, to the National Grid. This decision reduces overall impact by reducing the number of power transmission cables, and eliminating the need for Cable Relay Stations. See also Q10

To see our latest proposals, please view a high resolution, interactive map on the "About the Project" page of the website; **www.vattenfall.co.uk/norfolkvanguard**

Norfolk Vanguard timeline



7. At what stage in its development is Norfolk Vanguard now?

Norfolk Vanguard and Norfolk Boreas are both Nationally Significant Infrastructure Projects (NSIP's) and so an Environmental Impact Assessment (EIA) is required as part of the Development Consent Order (DCO) application under the Planning Act 2008.

Norfolk Vanguard has recently completed its Statutory Consultation period (November – December 2017). We are currently preparing our Development Consent Order (DCO) application under the Planning Act 2008. We intend to submit our DCO application to the Planning Inspectorate in Summer 2018.

A number of important revisions have been made to the project following Statutory Consultation.

These are described briefly on our February 2018 Newsletter (**bit.ly/2svaUVQ**) and more fully in Hearing Your Views III. You can see the current project proposals by viewing an interactive map available on the 'About the project' page of the website **www.vattenfall.co.uk/norfolkvanguard**. This allows you to zoom in and out, and travel the breadth of the project. The key and a short explanation for each feature appears when you click on the Vanguard feature.

We anticipate a decision will be made by the Secretary of State on our Norfolk Vanguard application in 2019, and for Norfolk Boreas the following year.

There will be project updates published on the Norfolk Vanguard website between the significant milestones outlined below.

8. How are local communities, landowners, businesses and interest groups consulted about the wind farm proposals?

Vattenfall is committed to early, effective and engaging communication with local communities where we work, and we maintain a dialogue with communities throughout the development, construction and operation phases of our projects.

Due to the size of our Norfolk projects, they are classed as Nationally Significant Infrastructure Projects (NSIP). NSIPs include the kinds of large scale facilities that support the everyday life of the country, such as major transport routes, major gas pipelines, water reservoirs and sewage treatment plants, power stations, power lines and wind farms. They require development consent under formal and strict procedures outlined in The Planning Act 2008 and need to demonstrate extensive consultation with local communities, directly affected parties like landowners, and statutory organisations prior to submitting an application. The projects also need to record how information received from consultees has fed into the project design. All this information is documented in a Consultation Report and this is submitted with the Development Consent Order (DCO) application.

To date, we have:

- Distributed around 100,000 newsletters to local households
- Convened 31 public events (including staffed exhibitions, workshops and pop up information points)
- Presented information to local Parish Councils, convened briefings with local MPs and many deliberative meetings with statutory stakeholders, training sessions with schools and colleges, and we have seen an increase in participation from those normally considered "harder to reach"
- Spoken with over 2500 people attending our events and fed back through numerous consultation and meeting reports e.g. See the Hearing Your Views I, II, III (**bit.ly/2svaUVQ**)
- Received over 1200 responses providing written feedback to local events (both informal as well as formal consultation associated with the Norfolk Vanguard project)
- Received and responded to many hundreds of emails from local people and stakeholders
- Written and distributed many information leaflets, reports and consultation materials responding to local interests, information needs and requests plus many contributions to local media channels (broadcast and print) and also maintained a proactive social media campaign

The PEIR is a key piece of work which is considered as part of the pre-application consultation for the project – so we should also mention that the information within the PEIR has been used as part of the formal consultation process as well.

During our Statutory Consultation for Norfolk Vanguard which took place between 7th November, and 11th December, 2017 we consulted on Preliminary Environmental Information, contained within the Preliminary Environmental Information Report (PEIR). We received over 780 written submissions. The report "Hearing your Views III" describes this feedback and where and how we have taken suggestions on board and modified our plans. Our February 2018 Newsletter also summarises this information.

Please find reports and newsletters here: **bit.ly/2svaUVQ**

We also have a land team dedicated to talking to landowners and a special page on our website aiming to respond to specific landowner interests and needs.

More newsletters are planned in order to keep people informed regarding project proposals, and how to get involved in the next stages of project evolution. Of course there are also regular updates on the project web pages too.

9. Why are communities consulted early in the process, even before the plans relating to the location of onshore infrastructure are finalised?

The Planning Act 2008 clearly describes our duty, as developers of a Nationally Significant Infrastructure Project (NSIP), to consult with a range of interested parties.

See also questions 7 and 8.

Currently we are engaged in "statutory and non-statutory pre-application consultation" with a wide range of stakeholders and with members of the local community – you can find out more about the process here: **https://infrastructure.planninginspectorate.gov.uk/application-process/the-process/**

Sharing the steps we follow during our decision-making process as we refine project proposals provides opportunities – for communities, local and national stakeholders, experts, people who are potentially impacted by the project – to influence our thinking, appropriately and in a timely manner. This consultation also encourages innovation and enables us to work with local people to be creative and make the most robust, sustainable and best decisions we can.

The downside is that some people will be concerned by uncertainty around whether or how they might be impacted by the proposals as they develop. We do not wish to prolong uncertainty, and can empathise with people's concerns. However we must review and assess all the information and ideas, concerns and opportunities presented to us, and respond to them.

Following consultation events, we have published the feedback we receive in "Hearing your Views" and workshop reports – available here (**bit.ly/2svaUVQ**). Similarly, while the detail is to be found in "Hearing Your Views III", the February 2018 Newsletter highlights key project refinements that have been made since the Statutory Consultation, taking into account:

- Broad-ranging and in-depth feedback from a wide variety of local, regional and national communities and stakeholders
- Ongoing discussions with expert topic groups and with landowners and occupiers
- Ongoing environmental assessments, which help us identify and avoid sensitive features, including early geophysical surveys to help detect buried archaeology
- Technical design revisions following a strategic review of technology development in electrical infrastructure

By regularly reporting back on the feedback we receive, we hope that those who have participated in our consultation will see how their input has helped to shape the project. We are very grateful to all who have taken the time to get involved.

The project currently outlined (March 2018) on our interactive map shows the key elements of the project as will be described in our Development Consent Order (DCO) application.

10. What project revisions have been announced in February 2018?

Vattenfall announced significant design decisions about the Norfolk Vanguard wind farm proposals in February 2018.

Among these revisions, aimed at delivering an environmentally sustainable project, generating climate smart, low cost green electricity, is the decision to deploy High Voltage Direct Current (HVDC) cable technology to connect Norfolk Vanguard and its sister project Norfolk Boreas to the UK's National Grid. This is a strategic decision to back HVDC for Vattenfall's Norfolk wind farms as the company believes the HVDC technology will be cost competitive with High Voltage Alternating Current (HVAC) in the early 2020's whilst being better for local people and the environment where onshore infrastructure is located.

Our revised Norfolk Vanguard proposals, take into account:

- Broad-ranging and in-depth feedback from a wide variety of local, regional and national communities and stakeholders, submitted during the Statutory Consultation period (November – December 2017)
- Ongoing discussions with expert topic groups and with landowners and occupiers
- Ongoing environmental assessments, which help us identify and avoid sensitive features, including early geophysical surveys to help detect buried archaeology
- Technical design revisions following a strategic review of technology development in electrical infrastructure.

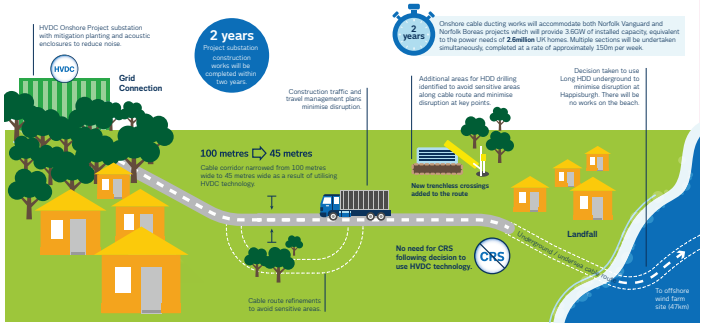
The key design decisions include:

- Adoption of HVDC transmission connections which will avoid the need for cable relay stations near Happisburgh for Norfolk Vanguard and Norfolk Boreas
- Using HVDC transmission technology means a much narrower cable corridor throughout – offshore and onshore. The 45m wide onshore cable corridor running from landfall near Happisburgh to a substation near Necton, 60km away, allows Vattenfall to avoid sensitive sites including historical heritage, like buried archaeology near St Mary's Chapel, Kerdiston and a medieval moat north of Necton. (Vattenfall originally proposed a 100m corridor in line with HVAC requirements).
- Long range horizontal direction drilling (HDD) at landfall near Happisburgh – where power transmission cables from the offshore wind farm come ashore – will mean no works are required on the beach
- Vattenfall will avoid impacts on all county wildlife sites and a number of important local amenity and tourism sites by adding further sections of trenchless crossings. As a result, features like Paston Way, Knapton Cutting, the Marriott's Way and Wendling Carr will be avoided
- Near Necton, part of the electrical assets comprising the HVDC Norfolk Vanguard substation would be enclosed within a building (the converter station). The footprint and maximum height of the HVDC Project Substation was provided in the PEIR and our Consultation Summary Document. Vattenfall will work with local residents and groups to minimise the substation's impact.

For more information, please see the February 2018 Newsletter (**http://bit.ly/2oP4Oe0**), or our report: "Hearing Your Views – III" (**http://bit.ly/2FquJTF**)

To see our media releases announcing the Project's deployment of HVDC cable technology to connect Norfolk Vanguard and sister project Norfolk Boreas to the UK's National Grid please see here: **https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/news-and-media/**

You can also view an interactive map of our revised proposals for onshore works here: **https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**



11. Is Vattenfall speaking to landowners with interests along the cable route?

Yes, Ardent Management has undertaken Land Referencing to identify all landowners and occupiers and contact has been made with relevant parties. Where a landowner has appointed a land agent we will always deal with their land agent in the first instance, rather than directly with the landowner. This may explain why, in some cases, an affected landowner is yet to be informed.

If you need to speak to someone about land-related issues, Consents Solutions, land agents based in Norfolk, have been engaged to liaise with all landowners and occupiers to discuss route alignments, survey access, land use and landowner concerns and ultimately agree consents for all land-based infrastructure.

Please contact Bob McCarthy (bobmccarthy@consentssolutions.com, 07787 783517)

There is a dedicated page on our website (**bit.ly/2v7zDRH**) where landowners can find more information. An updated landowner information pack is available there also.

It is important that landowners and occupiers provide details of all known interested parties to ensure they continue to be engaged and consulted throughout the project.

12. What type of community opportunities and benefits will be associated with these projects?

As a leading energy company, Vattenfall is guided by principles of sustainable development. This means we actively seek opportunities for our investments to create wider benefits and particularly to deliver solutions for people living in the areas we operate. Norfolk is an unique place with its own identity and priorities. We'd like the local experts, people who live, work and play here, to tell us what is important for Norfolk's future – its environment, people and economy. We are excited to begin a conversation with local people and stakeholders, which over the next months and years gives us a chance to explore together opportunities for bringing meaningful, lasting benefit to the local area. Already, the preferences with regards protection of the local environment has helped shape the project, encouraging Vattenfall to make a strategic decision to work with specialist supply chain partners to develop innovative HVDC transmission technology, in order to minimise local impact overall.

Chiming with local socio-economic baseline research we have conducted, and studies like Community Foundation Norfolk's "Vital Signs", local people we've spoken with have highlighted the need for opportunities for young people to enhance their skills, raise their aspirations and find quality jobs, that enable them to stay in Norfolk and contribute to its development. While we are only at the development phase of both projects, and therefore cannot commit to making major capital investments in Norfolk until project permission is granted for Norfolk Vanguard and Norfolk Boreas, already we are providing opportunities for young people and local businesses. We are collaborating with local skills organisations, schools and sixth form colleges to provide a flavour of the work that is entailed in developing major infrastructure projects.

Power transmission – from the Project, via the National Grid to UK homes, enterprises and industry

13. Will AC or DC technology be used and why has this technology been selected?

Following the Statutory Consultation, and the strong encouragement coming from communities and stakeholders in Norfolk to explore this option sooner rather than later, we brought forward technical design revisions and a strategic review of technology development in electrical infrastructure and made a strategic decision to back HVDC transmission technology. We believe it will be cost competitive with HVAC in the early 2020's. Vattenfall wants to be a leader in maturing HVDC technology to connect its large-scale, far offshore wind farms – like Norfolk Vanguard and Norfolk Boreas - to national grids. In taking that lead, we will work with HVDC technology suppliers to deliver cost competitiveness for big offshore wind farm projects. Importantly, our decision to deploy HVDC for the Norfolk Vanguard and Norfolk Boreas projects, which have long cable routes, results in less impacts on local people and the environment through the removal of permanent above ground infrastructure such as Cable Relay Stations and reduction in cable trenching requirements.

Our Development Consent Order (DCO) application will describe a project with an HVDC transmission system, the key elements of which are outlined on our interactive map.

https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/

This significant strategic decision will not be revised. Both Norfolk Vanguard and Norfolk Boreas will deploy HVDC transmission technology.

14. What are the factors that have influenced Vattenfall's decision on whether to opt for power transmission using AC or DC?

The decision whether to adopt High-Voltage Direct Current (HVDC) or the more common High Voltage Alternating Current (HVAC) technology to transmit power from the wind farm site to the National Grid is a complex one, influenced by a number of variables, not least the technological and supply chain development that is possible between now and when we envisage beginning procurement and project construction in the early 2020s.

For long-distance transmission, HVDC systems can be beneficial as they cause lower electrical power losses than HVAC systems. Also the number of cables required to transmit the same electrical power are fewer and hence lower the environmental impact and cost with regard to cable installation. However, the lower power losses in the cables are offset by power losses associated with the necessary conversion from HVAC to HVDC offshore and from HVDC to HVAC at the National Grid connection. HVDC systems are in their infancy - no offshore HVDC converters are operational in the UK yet and few have been deployed around the world - so the supply chain and knowledge of the technology is more limited than for HVAC.

In comparison, HVAC is the standard technology utilised around the world for electrical power transmission and therefore the knowledge and supply chain, including in the UK, is better established and currently, more competitive. This can deliver cost savings and the benefits of maturity.

However, the compelling message from Norfolk, emerging particularly strongly during the Statutory Consultation for Norfolk Vanguard, is that Vattenfall should pursue a strategy that addresses global, regional and local challenges – delivering projects that address societal challenges and are kind to the environment and our hosts and neighbours living near our projects. It is for this reason that we are seeking to lead the industry in developing appropriate HVDC technology, and that by the time we require the technology solutions they are robust and cost competitive. We have undertaken a strategic review and discussions with the supply chain, and feel confident that projects like Norfolk Vanguard and Norfolk Boreas, which are located many tens of kilometres offshore and have long cable corridors to connect power into the National Grid, are feasible using HVDC transmission systems and will provide cost-effective solutions for the UK consumer.

15. Why is Norfolk Vanguard connecting to the National Grid at Necton? Why are the Norfolk Vanguard and Norfolk Boreas transmission cables and those of Hornsea Project B crossing?

Determining the Onshore Connection Point (OCP) for an offshore wind farm project is one of the first key decisions that is taken when an energy developer submits a formal application for connection to the UK Transmission System, enabling the energy generated to be exported into the National Grid. National Grid is charged with co-ordinating a collaborative assessment of alternative connection solutions, in order to identify an option that best meets the requirements of the applicant, and achieves a coordinated, cost-effective and appropriately environmentally sensitive solution for UK energy consumers.

In 2016, after considering a range of alternative connection solutions, Vattenfall and National Grid concluded that a connection for the Norfolk Vanguard and Boreas projects at the Necton 400kV substation offers the best fit against these strategic criteria. Similarly, Hornsea Project Three undertook an equivalent exercise with National Grid and signed an agreement to connect into the National Grid at the existing 400kV substation south of Norwich. This sequence of events resulted in the crossing of cable routes. (For more detail, see below).

16. Will electromagnetic fields (EMF) be emitted by Norfolk Vanguard and Norfolk Boreas' underground cables and substations? Will EMF impact on human and animal health?

Electromagnetic fields (EMF) are a part of the natural world: the earth has a natural static magnetic field and static electric fields are generated in the atmosphere. Electric and magnetic fields are also generated wherever electricity is transmitted or used. These occur when utilising household appliances, from electricity sent through wiring, and from sources in the built environment such as power lines and electrified railways.

Very extensive scientific research has been carried out to investigate potential for health risks from EMF[1]. National[2] and international[3] health protection bodies have developed guidelines for public EMF exposure that are set to protect health.

Norfolk Vanguard and Norfolk Boreas Offshore Wind Farms will deploy HVDC transmission technology to transmit power into the National Grid. Expert bodies including Public Health England, the World Health Organisation and the International Agency for Research on Cancer have reviewed the available evidence from studies of humans and animals, and do not identify any health risk for humans or animals exposed to DC magnetic fields.

Furthermore, government EMF guidelines set to protect public health are outlined in a Code of Practice[4], that was developed by the UK Government. The Code of Practice will be adhered to, to ensure that the maximum magnetic field strengths that could be generated by the proposed design are well below the guideline exposure limits. Vattenfall will provide evidence of this compliance in the projects' DCO applications.

See also our EMF leaflet [**bit.ly/2svaUVQ**]

1 SCENIHR, "Potential health effects of exposure to electromagnetic fields (EMF)," European Commission, Luxembourg, 2015.

WHO, "Environmental Health Criteria 238. Extremely Low Frequency Fields.," WHO, 2007.

A. McKinlay, S. Allen, R. Cox, P. Dimbylow, S. Mann, C. Muirhead, R. Saunders, Z. Sienkiewicz, J. Stather and P. Wainwright, "Review of the scientific evidence for limiting exposure to electromagnetic fields (0-300 Ghz)," Documents of the NRPB, vol. 15, no. 3, 2004.

IARC, "IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 80 Non-ionising Radiation, Part 1: Static and Extremely Low-Frequency (ELF)," IARCPress, 2002.

2 A. McKinlay, S. Allen, R. Cox, P. Dimbylow, S. Mann, C. Muirhead, R. Saunders, Z. Sienkiewicz, J. Stather and P. Wainwright, "Advice on limiting exposure to electromagnetic fields (0-300 Ghz)," Documents of the NRPB, vol. 15, no. 3, 2004.

Department of Health; Department for Communities and Local Government; Department of Energy and Climate Change, "Government response to the SAGE recommendations," Department of Health, 2009.

3 ICNIRP, "Guidelines for Limiting Exposures to Time-Varying Electric, Magnetic and Electromagnetic Fields (Up to 300 GHz)," Health Physics, vol. 74, no. 4, pp. 494-522, 1998.

ICNIRP, "Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz to 100 kHz)," Health Physics, vol. 99, no. 6, pp. 818-836, 2010.

European Council, "Council recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)," OJEU L199/59, 1999/519/EC, 1999.

4 DECC, "Power Lines: Demonstrating compliance with EMF public exposure guidelines. A voluntary Code of Practice," Department of Energy and Climate Change, 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/37447/1256-code-practice-emf-public-exp-guidelines.pdf

17. What is the cumulative EMF of your cables and the cables for Ørsted's Hornsea Project Three project crossing?

In response to local concerns, Vattenfall and Ørsted have jointly commissioned an independent study and resulting report which explores the electric and magnetic fields (EMFs) that could occur to their maximum extent where power cables from three large wind farms cross one another. The report calculates this for the crossing of Ørsted's Hornsea Project Three and Vattenfall's Norfolk Vanguard and Norfolk Boreas offshore wind farms. The report represents a conservative assessment of EMFs at this crossing, using worse case parameters, generated by a range of different possibilities, including which cables are on top or bottom, where they cross, and the angle of the crossing. The calculated fields presented in the report against these worst-case parameters and for all the cable crossing scenarios irrespective of whether AC or DC cable connections are used, will be compliant with the UK exposure limits set to protect members of the public against electric and magnetic field exposure.

Since the joint study was commissioned, Vattenfall have committed to adopting HVDC technology to transmit power from the proposed Norfolk Vanguard and Norfolk Boreas Offshore Wind Farms. This decision, as explained in our early EMF factsheet [**bit.ly/2svaUVQ**] effectively eliminates concerns associated with EMF from our transmission cables and very considerably reduces cumulative effects at the crossing point, irrespective of whether Ørsted deploy HVDC or HVAC transmission technology.

View the full report here: **bit.ly/2svaUVQ**

More information on electro-magnetic fields in general is available from National's Grid's website at **www.emfs.info** or from the EMF helpline on **0845 702 3270** or **emfhelpline@nationalgrid.com**.

Developing renewable energy projects that are sensitive to the local environment and people

18. Generally, how does Vattenfall seek to safeguard the environment?

An important part of Vattenfall's vision is to be among the leaders in developing environmentally sustainable production, supply, and distribution of energy. You can read about sustainability at Vattenfall here **https://corporate.vattenfall.com/sustainability/sustainability-at-vattenfall/**

Environmental performance must be – and is – at the core of our operations and our overall strategy.

Vattenfall handles many different environmental issues and we regard the management of greenhouse gas emissions, air quality, soil protection, land use, water protection, waste management, biodiversity, hydro dam safety, nuclear safety and resource efficiency to be our areas of priority.

You can review our environmental policies here: **https://corporate.vattenfall.com/sustainability/policies-and-management/environmental-policy-and-management/**

Vattenfall funds research and development programmes aiming to increase environmental protection at onshore and offshore wind farms.

One such programme is DEPONS, an international research project initiated and funded by a group of five offshore wind farm developers and led by Vattenfall. The aim of DEPONS is to improve knowledge of the impacts of piling noise on the southern North Sea harbour porpoise population. Data on movement patterns, and information on harbour porpoise densities at different distances from a wind farm under construction, are being fed into a simulation model. For the latest research and results, see **http://depons.au.dk**

Another ground-breaking offshore wind research programme supported by Vattenfall and covering a diverse range of interests, will provide insight into the lives of bottlenose dolphins, salmon, sea trout and sea birds as well as communities living around Vattenfall's European Offshore Wind Deployment Centre (EOWDC) off Aberdeen Bay.[**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/european-offshore-wind-deployment-centre/scientific-research/**]

Dolphin pod spotted by SMIU/St Andrews University researchers as part of a study funded by Vattenfall's European Offshore Wind Deployment Centre in north east Scotland

Credit: Monica Arso

19. Will these projects have an adverse impact on the local environment (onshore and offshore)?

Systematic process

Vattenfall are committed to designing and delivering environmentally sensitive projects.

As a Nationally Significant Infrastructure Project (NSIP), we as developers of the Norfolk Vanguard Offshore Wind Farm proposals must undertake an Environmental Impact Assessment (EIA). The EIA is a systematic process which ensures the project considers all environmental sensitivities and stakeholder feedback, and helps decision-makers consider the environmental consequences of proposed developments and ensure that potentially significant effects of a project and the scope for reducing them are properly understood. The EIA:

- ✓ assesses Norfolk Vanguard's potential environmental impacts;
- ✓ considers mitigation measures to reduce effects of potential impacts, and;
- ✓ assesses any remaining effects with these measures applied.

We have already undertaken extensive environmental surveys, according to the relevant regulations. In November 2017, we published our Preliminary Environmental Information Report (PEIR) alongside our Consultation Summary Document and Non-Technical Summary (NTS) of the PEIR. These documents are available on our website (**bit.ly/2svaUVQ**) and while the former provides details of the offshore and onshore Preliminary Environmental Information, the Consultation Summary Document and Non-Technical Summary will give you an overview of the EIA process and of our findings to date. The Environmental Statement will present the findings in full and will be submitted as part of the DCO application.

Early project commitments

A number of key early commitments have been applied to the decision making process:

- To rule out use of overhead lines both to minimise visual impacts and to deliver the project within the timeframes set by the UK government in relation to targets on renewable energy and CO_2 reduction.
- Taking a strategic approach to delivering Norfolk Vanguard and Norfolk Boreas by installing onshore ducts for both projects at the same time as part of the Norfolk Vanguard construction works. This would allow the main civil works for the cable route to be completed in one construction period and in advance of cable delivery, preventing the requirement to reopen the land in order to minimise disruption. Onshore cables would then be pulled through the pre-installed ducts in a phased approach at later stages.
- Selecting the shortest route preference (where practicable) for cable routing to minimise impacts, cost and transmission losses and minimising footprint for the offshore and onshore cable routes.
- Avoidance of key sensitive features where possible to avoid potential impacts. For example, the projects are avoiding:
  - ✓ Internationally designated sites for nature conservation (e.g. Special Areas of Conservation (SAC), Marine Conservation Zone (MCZ), Special Protection Areas (SPA), Ramsar sites);
  - ✓ Nationally designated sites for nature conservation (e.g. The Broads National Park, Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Local Nature Reserves (LNR)); and
  - ✓ Ancient woodland sites.

Responding to feedback and information

We received a very encouraging level of feedback to the Statutory Consultation from local community members and groups, environmental groups and Statutory consultees. This data has now been assimilated and has helped to inform our design assumptions, and shape our refined project proposals by embedding mitigation into the design of the project.

New measures to reduce impacts overall include the decision to implement an HVDC transmission system, which does not require a Cable Relay Station near landfall, and requires a reduced cable working width of 45m for both Norfolk Vanguard and Norfolk Boreas (down from 100m for a HVAC solution previously considered). This decision also means that cabling is reduced offshore from six trenches to two, for both projects.

An overview of the changes made following the Statutory Consultation is available in our February 2018 Newsletter (**bit.ly/2svaUVQ**), and an interactive map (**bit.ly/2IGbseM**) provides a means for you to view the project proposals in more detail. See also Q10.

Trenchless crossing techniques (e.g. horizontal directional drilling – see also Q.32) will be used to cross any main watercourses, main roads, railways, county wildlife sites and long distance footpaths which cannot be avoided, including at the following locations:

- ✓ River Wensum;
- ✓ River Bure;
- ✓ King's Beck;
- ✓ Wendling Beck,
- ✓ Wendling Carr;
- ✓ North Walsham and Dilham Canal;
- ✓ Marriott's Way;
- ✓ A47;
- ✓ A149;
- ✓ A140;
- ✓ North Walsham to Cromer Railway;
- ✓ Mid Norfolk Railway; and
- ✓ Paston Way.

In addition, a consideration of more detailed ecological constraints include:

- ✓ Ancient woodland – following the Forestry Commission's Standing Advice on Ancient Woodland and Veteran Trees, a buffer of 15m around all ancient woodlands has been used (Forestry Commission, 2014);
- ✓ Woodland – areas of woodland have been avoided where possible during the route selection process;
- ✓ Habitat – standing water bodies, trees, and agricultural ditches have been avoided where possible; and
- ✓ Hedgerows – the number of hedgerow crossings has been minimised as far as possible, taking other fixed constraints into account. When crossing hedgerows, the width of the cable easement will be reduced to the running track and cable trenches only (20m) to minimise the amount of hedgerow removal

Management documents

Additional mitigation (where required) will be delivered via an Outline Landscape and Environmental Management Strategy (OLEMS). This document, submitted alongside the final Environmental Statement, will be the primary document detailing the ecological mitigation measures required. The OLEMS will aim to ensure that all mitigation proposed is part of an integrated management strategy which will ensure that adverse impacts upon biodiversity and ecological networks are not treated in isolation.

20. How will you avoid impacting archaeological remains and historical artefacts?

Norfolk has a rich archaeological history. Vattenfall is committed to building a project with the least impact on the historic environment. We have used data from Norfolk Historic Environment Service and Historic England to map all known archaeological sites and heritage assets in the scoping area of the Project, so that mitigation can be embedded in the design and siting of the onshore infrastructure areas (both temporary and permanent) in order, as far as possible, to avoid impacts to known heritage assets.

A comprehensive geophysical survey campaign undertaken early has helped us understand more about known and unknown buried archaeological assets and to evaluate the presence/absence and significance of archaeological remains. Offshore wind developments provide an opportunity to discover more about our past.

If unknown archaeological remains are uncovered, a mitigation strategy would be prepared outlining a programme of further archaeological investigations, including excavation and watching brief (archaeological monitoring) requirements where necessary, as well as preservation where warranted and appropriate, prior to and during the construction phase. Vattenfall will work in partnership with Norfolk County Council Historic Environment Services and other organisations, to share knowledge gained by the project of local archaeological discoveries.

Archaeologist performing non intrusive geophysical surveys
Credit: Allen Archaeology Ltd

21. How will the works affect footpaths / bridleways?

Wherever possible the cable route seeks to avoid impacts on footpaths and minimise impacts to local residents in relation to access to services and road usage, including footpath closures. For example, by committing to a trenchless crossing at the landfall, the Norfolk Coast Path is being completely avoided and will remain open during construction and operation of the project.

The onshore cable duct installation strategy is proposed to be conducted in a sectionalised approach in order to minimise the area of land being worked at any one time (approx. 150m sections). As a result of this construction strategy, the majority of paths could be kept open with appropriate safety precautions, such as fencing to separate the public from the works site. It is anticipated where the work section crossing a route could be diverted where possible and, potentially closed for approximately a one week period.

Once the work section has been completed, it is proposed to maintain ongoing public use of the Public Rights of Way (PRoW) through the use of banksmen to ensure temporary cessation of running track laying works and safe passage of users. Precise details for management and availability of PRoW will be agreed with the relevant local Public Rights of Way Officer prior to commencement of the relevant stage of works.

There will be no permanent closures of paths or non-motorised routes as part of the construction or operation of the project.

Reinstatement of footpaths will be undertaken following the construction works, in agreement with all relevant stakeholders and with agreed mitigation for landscape and ecology receptors.

A Code of Construction Practice would be prepared and agreed in consultation with all relevant stakeholders. This would detail methodologies to be used during construction activities, including all requirements for alternative routes of linear recreation routes including long distance trails, cycle routes, PRoW and local footpath networks, sign posting and dissemination of information to the public in order to minimise all possible impacts to an acceptable level.

22. Will landfall engineering cause further instability to a changing coastline?

The Norfolk coastline is subject to natural processes and is changing, as is the case in many other dynamic coastal environments across the UK. This is not a new phenomenon, although research links more frequent, dramatic weather events, which may be accelerating coastal retreat in some areas, to recent climatic changes. Local Authorities working with the Environment Agency in England are charged with creating, maintaining and executing coastline management plans. Vattenfall is engaging with relevant organisations regarding coastal issues to ensure our plans are well informed and sensitive to local changes and adaptation plans.

We are proposing to undertake engineering works at the coastline to the south of Happisburgh, in order to install a series of ducts under the beach and the sand cliffs. These ducts will enable us to bring the ends of the subsea export cables ashore, to a series of underground 'joint bays' in the fields behind the cliffs. These joint bays are where the subsea cables will be joined to the onshore export cables.

To install the ducts at the landfall, we are planning to use a tried-and-tested method known as Horizontal Directional Drilling (HDD). This method involves using special machinery to drill a long, curved 'hole', starting in the fields behind the sand cliffs and emerging in the seabed, well beyond the low water mark. The entry point for the drilling operation will be roughly 125m behind the cliffs, and the hole will pass several meters below the beach. As such, this operation will have no significant impact on either the cliffs or the beach.

The diameter of the hole will depend on detailed design of the cables, but is expected to be less than 1m. Once the drilling operation is completed, the duct – which is usually made of plastic or steel – is pulled into the hole. The duct stops the sides of the hole from collapsing, and provides a clear passageway for the cables.

With the HDD method, the drilling operation does not result in high levels of ground vibration. In a survey of ground vibration levels during an HDD operation at the River Wye, the monitoring equipment was positioned 3m away from the drill entry point. The measured level of vibration was well below the DIN 4150 Maximum Vibration Level at all times during the drilling operation. The highest vibration levels were recorded during heavy vehicle movements at the drilling site.

Research into the stability of HDD boreholes has shown that the integrity of the surrounding ground material is not compromised. In fact, the strength properties of this material tend to improve over time, as a result of ongoing consolidation of the material around the duct. Ground settlement at the surface is expected to be minimal, at 2mm or less.

In conclusion, we think it is highly unlikely that the proposed HDD operations at the landfall will accelerate erosion or cause further instability. We are not planning to make any surface excavations on the beach or at the existing cliff-line, which might act as 'weak points' during future storm events. Our proposed "drill lines" will be sufficiently far back from the cliff-line, and deep enough below the beach, to ensure that the ducts will not become exposed during the operational lifetime of the wind farm as a result of ongoing erosion. And finally, the drilling operations will not weaken the underlying structure of the coastal cliffs or the beach platform as a result of vibration or 'fracturing'.


This is an illustration

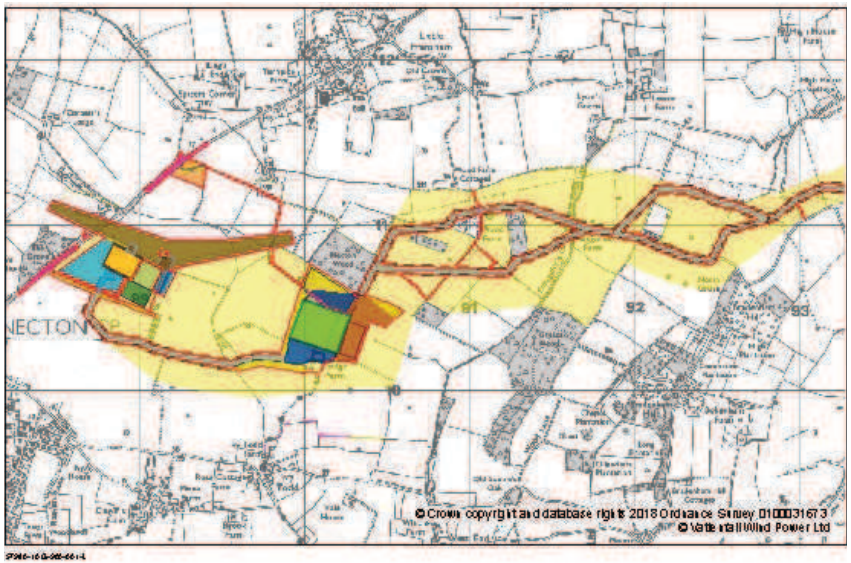
23. How is Vattenfall seeking to reduce operational impacts, particularly at the onshore project substation at Necton?

As evidenced by numerous examples in this document, Vattenfall, through the consultative EIA and site selection process, has strived to design a project that is as sensitive as possible to people and the environment, whilst also managing environmental, engineering and commercial considerations.
The decision to bury our transmission cables underground and to deploy HVDC technology, means that once construction is complete, there is very little permanent onshore infrastructure remaining in Norfolk. The exceptions will be port and facilities to accommodate operations and maintenance functions, and the project substation. These are essential elements of an energy generation project. We are currently negotiating with port facilities in Norfolk to site our operations base.

As noted elsewhere within this document, the site selection process for determining the best location for the Norfolk Vanguard onshore project substation has been iterative, consultative and responsive to both our evidence-based environmental assessments and feedback from local stakeholders within the community and representing expert views of many organisations, including those with statutory responsibilities. We believe the substation location illustrated on the interactive map is the best location and takes into account the balance of all factors considered through the EIA process.

Many of the factors we need to be sensitive to – for example ensuring we locate the substation away from as many residents as possible, minimising landscape and visual impacts, ensuring we can operate within noise limits agreed with local & national authorities' guidelines – have been addressed through the site selection process and this is documented within the site selection chapter of our PEIR document and systematic and inclusive local involvement is documented within various consultation reports. In addition further mitigation will be developed during the detailed design phase, for example ensuring we use best-in-class technology – which is rapidly innovating – for acoustic insulation, and electrical engineering for safety and efficiency. We are also considering varied options for mitigation of visual impacts, for example the final design of the substation. Mitigation will include on-site as well as layered planting schemes, developed in consultation with potentially affected residents. We have also considered factors such as drainage and the potential for flooding, highlighted to us by residents and the Parish Council, and our designs address and mitigate for these eventualities.

If the project is granted a Development Consent Order, detailed design will be undertaken to optimise technical deliverability and efficiency.



Onshore project substation

Similarly, we will consider further opportunities to ensure the infrastructure is locally sensitive, for example in terms of the colouring or cladding of buildings, and additional planting, and local people will be asked to consider relevant design principles.

It is our intention to work with our neighbours – those communities hosting our project infrastructure over the long term – to appropriately acknowledge the role they play in accommodating Nationally Significant green energy infrastructure that benefits the global environment and delivers UK policies and strategies. Very preliminary exploration is underway about how best to enter into dialogue about appropriate strategic local investments that could, for example, contribute to local resilience and sustainability. Such dialogue will follow appropriate guidance and Vattenfall's own proven track record of effective delivery in this area, as a discrete conversation, separate from engagement on shaping the project, once the project is submitted.

24. The site has some fishing interests, as well as major shipping and ferry routes passing through or near to it. Will the wind farm force them to be moved?

In line with standard offshore practice, we are working on the presumption that vessels not involved in wind farm-related activities should remain 500m away from each turbine/work site during construction and commissioning. Once the cables are installed and any safety zones around hazards are removed, it is expected that fishing can continue within the area of the wind farm.
With regard to shipping, the site has been selected to avoid potential conflicts with major shipping routes. We are undertaking extensive consultation with shipping organisations and fishermen as part of the development of these projects. Any mitigation required will be discussed in detail with the relevant statutory authorities and other stakeholders during the development process.

Construction of the wind farm and associated onshore works – what can communities expect?

25. How will you communicate with residents living near to the cable route, landfall and substation to ensure communities are forewarned of any activity and are able to liaise with Vattenfall?

Vattenfall will continue to liaise closely with host communities living close to our proposed onshore works. We will inform communities in advance of any works taking place directly and there will also be schedules of works on our website. Local Liaison Committees will be established to facilitate two-way communications so Vattenfall can ensure local people are well informed, and also to gather feedback from host communities about their experiences of the onshore works and to address any potential issues expediently.

26. How long will the onshore project construction take?

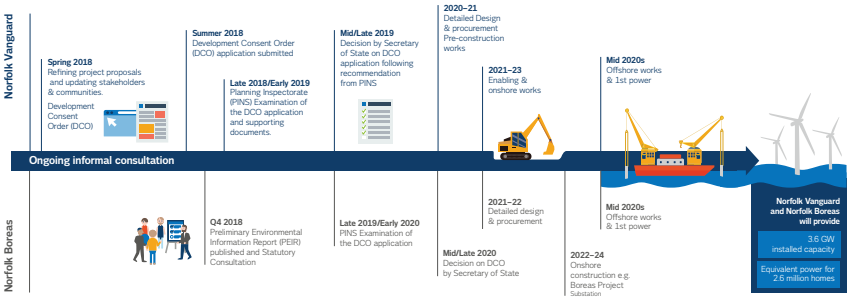
Construction of Norfolk Vanguard and Norfolk Boreas offshore wind farms is subject to receiving two Development Consent Orders. However, the design of the onshore infrastructure has been developed to co-locate the assets so far as possible and to conduct some works in parallel to minimise the impact of both projects.

Once all necessary consents, permissions and conditions are obtained, all onshore substation infrastructure (groundworks, roads and services, shared plant and buildings) and ducting for the onshore cables will be established prior to commissioning the first phase of the wind farm. Installation of cables and substation plant will then be carried out in sequence.

The overall programme of onshore construction activities across the entire route length is estimated to be as follows with indicative dates provided for reference, but are subject to change:

- **2020-2021**: Onshore pre-construction works approximately six months (e.g. hedge removal, pre-construction drainage)
- **2022-2023:** Cable duct installation works. 2 x 9-month seasons (assumed shut down over the winter period due to adverse weather conditions). Ducts for Norfolk Vanguard and Norfolk Boreas will be installed at the same time during this period to minimise the length of time for landowner disruption and maximise installation efficiency.
- **2024-2025 (Norfolk Vanguard) & 2026-2027 (Norfolk Boreas):** Cable pulling and jointing, approximately six months per project.
- **2022-2023 (Norfolk Vanguard) & 2024-2025 (Norfolk Boreas):** Main works for substation infrastructure – approximately two years per project.

Norfolk Vanguard and Norfolk Boreas timeline



27. How long will be needed in any particular area for cable installation?

In any one location along the cable route where standard open trenched installation is being conducted, excavations are likely to be in the order of 1 week's activity per 150m. The running track will be utilised for more extended periods during the duct installation works to allow ongoing access to other locations along the cable route whilst minimising impacts to the local highways network.

28. During construction of the onshore cable corridor and onshore project substation, what will normal working hours be?

Working hours will normally be 7am to 7pm five days per week, however there may be certain exceptions which will be discussed with the local authorities (for example, larger components may be best delivered outside these hours to avoid traffic impacts and limited 7 day 24hr working may be required during trenchless crossing activities).

Excavate Trench. Subsoil Store separate to topsoil store and lay ducts

Ducts Covered and Protective Marker Tiles Laid

29. How will you minimise traffic and local disruption during construction of the cable corridor?

Our decision to deploy an HVDC power transmission system carrying power from Norfolk Vanguard and Norfolk Boreas to the National Grid, reduces the number of HGV movements required during construction and the time required to conduct the installation compared to the requirements of an HVAC transmission system, as we will need to accommodate fewer cables in fewer underground ducts.

Duct Installation

We propose to install ducts for both the Norfolk Vanguard and Norfolk Boreas projects in a single campaign (2022-23), again reducing local disruption. We calculate a single working team shall complete the trenching and duct installation and reinstatement of approximately 150m sections of cable corridor per week. The ducting will progress from multiple work fronts along the cable corridor simultaneously. In this manner the major duct installation phase (main excavation works) will be completed within two years across the route length, although local impacts and works are anticipated to be shorter than this period as individual work sections are completed.

Within the 45m cable working width proposed to accommodate the transmission cables, is a running track. This will be used during duct installation as the access to the workfront from the mobilisation areas, keeping construction traffic off the public highways network as much as possible. During duct installation, no side accesses will be utilised.

During duct installation we will cross some local roads. In general, road crossings will be executed quickly (<1 week) to minimise disruption. Crossings of 2-lane roads will be managed without full closure of the road, but with temporary traffic lights. Crossings of single-lane roads will require temporary road closure. These will be sequenced so that alternative routes are available for motorists and other road users and will be signed.

Cable Pull Through and Operation

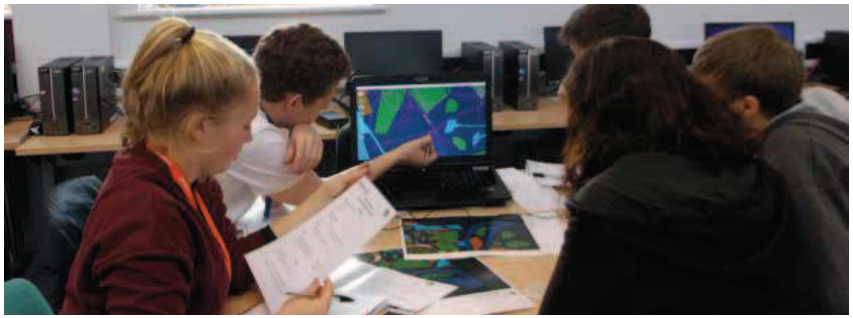
The accesses shown on the interactive map (**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**) enable access to the cable corridor post duct installation, when land that was running track and mobilisation areas has been reinstated. We need to have a right of access into all field parcels within which the ducts have been installed once reinstatement has occurred to minimise impacts such as removal of hedgerows or reinstatement of long lengths of running track to access parts of the cable corridor.

There are two main types of side access tracks shown:

Operational access. These accesses may only be required for operational emergency access over the lifetime of the project, for example in the event of any maintenance or repair of the cables. It is likely that the right of access over many of these accesses will never be used.

Construction access. A subset of the side accesses which have been identified as potentially feasible for access from the public highway as part of the cable pulling phase of the installation. Norfolk Vanguard cables will be pulled through the ducts in 2024-25 and the pull-through for Norfolk Boreas will be in 2025-26, with two cable pulling phases for each project (one per year), each requiring a period of 2-4 months to be completed per location.

Sections (in the order of 20% of the total cable route length) of the running track will be maintained or temporarily re-established post duct installation for the purposes of accessing the more remote joint locations where use of the public highways to deliver cable drums is not feasible or practical. Cable pull through locations will be located approximately every 800m along the cable corridor. By using the public highways network for this subset of construction traffic requirements, we can minimise the length of running track within the cable corridor to be reinstated for this phase of the works, preventing wholesale disruption to the land.

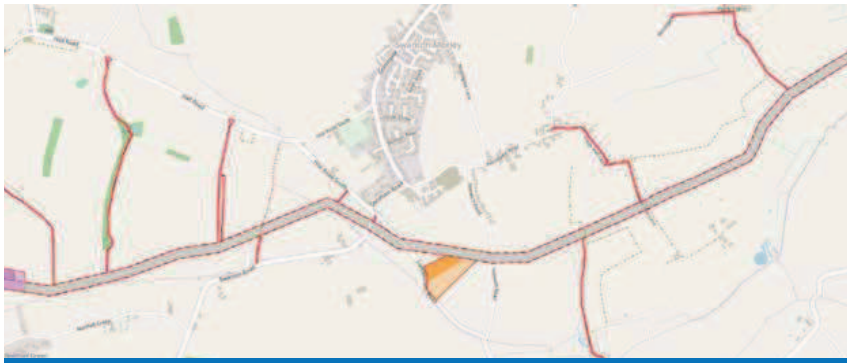


30. What traffic impacts might we experience along the cable corridor during operation?

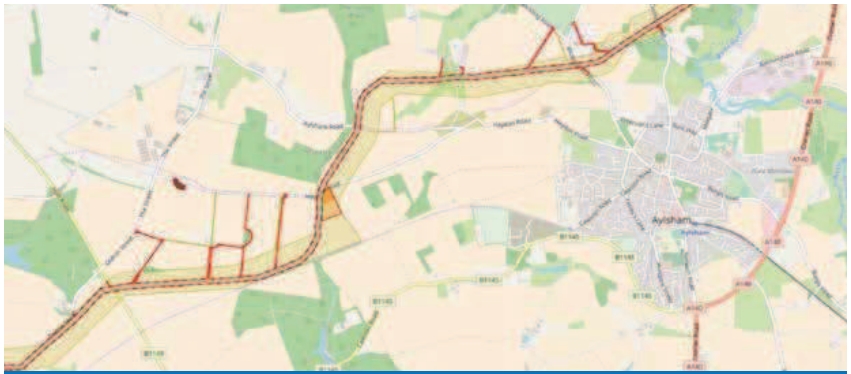
During operation, we will not need regular access to the cable corridor, therefore works traffic should be negligible. In the event of repairs being required or any maintenance, access is required to the cable corridor. This will be achieved by using the side accesses shown on the interactive map (**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**) to access the specific location from as close to the public highways network as possible so as minimise impacts to the land. The side accesses shown are not new, rather they are existing field access points used by landowners. There should be very little disruption experienced by people living or travelling close to the cable corridor during operation.

31. What is the plan for the roads and if they are closed - how long will they stay closed for?

It will be necessary to have road closures and traffic management for periods of time in order to complete the duct installation works. Efforts will be made to avoid or minimise traffic disruption. Trenched crossing of a single-track road will require temporary road closure for a week or so. Crossing a larger road would be achieved using temporary traffic lights, trenching one lane at a time; duration is likely to be about 2 weeks. Main roads such as the A47, A140 and A149 will be unaffected as a commitment to a trenchless crossing of these key features has been made.



Mobilisation zone



Mobilisation zone

For improved clarity and detail please visit our interactive map (**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**). The image here shows you what features to look for on the interactive map.

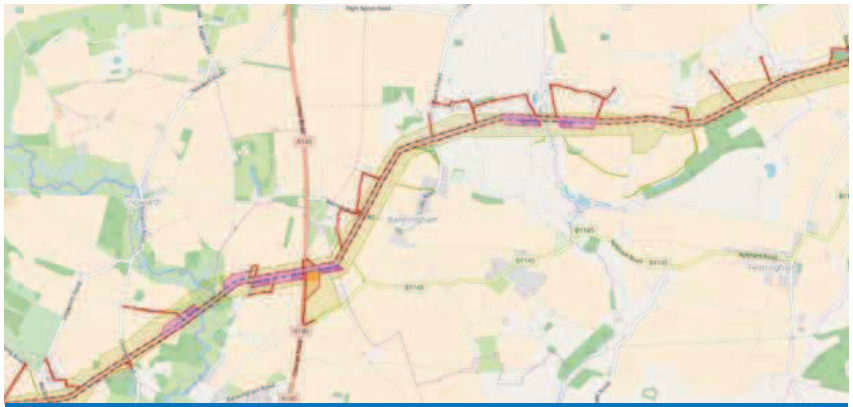
32. What is a Mobilisation Area and how many will there be?

This is a location providing some parking, office, welfare and storage facilities during the duct installation (2022-2023). The use of mobilisation areas is standard practice during construction works of this type. Mobilisation areas are approximately 100m x 100m and placed at strategically accessible locations from the highways network to service lengths of the cable route, acting as the transition for construction vehicles from the public highway to the cable corridor's running track.

Each mobilisation area services sections of the cable route, each section is typically defined by trenchless crossings of key features at each end of the section.

Each mobilisation area will therefore typically facilitate the duct installation between these constraints. There will therefore be in the order of 14 mobilisation areas along the cable route. We have allowance for mobilisation areas to be in place for up to 2 years, to provide flexibility to our construction programme and procurement approach, however, it is likely that any one mobilisation area would be in place for shorter than this period (12-18 months) as individual cable sections are completed.

Mobilisation areas will be fully reinstated after duct installation and will not be required for the cable pulling phase of the works, or during operation.



Trenchless crossing area

For improved clarity and detail please visit our interactive map (**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**). The image here shows you what features to look for on the interactive map.

33. Why are so many access routes shown along the cable corridor?

The side accesses shown on the interactive map (**https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/**) enable access to the cable corridor post duct installation when running track and mobilisation area land has been reinstated. We need to have a right of access into all field parcels within which the ducts have been installed once reinstatement has occurred to minimise impacts such as removal of hedgerows or reinstatement of long lengths of running track to access parts of the cable corridor. See also Q27. In addition to side access tracks for operation and construction, our proposals include one permanent access, which will be a new paved road to enable access to the onshore project substation. This access is proposed in order to keep all construction and operations traffic out of the village of Necton and surrounding hamlets.

34. What is a trenchless crossing?

At a number of locations along the route the ducts/cables are required to be installed underneath sensitive features such as railways and large watercourses which are not suitable to be crossed using open trench excavation methods. See also Q. 19

At these locations, a trenchless installation method such as micro-tunnelling, auger boring or most likely horizontal directional drilling (HDD) will be employed. This method allows a surface to surface drilling approach for installation of the cable ducts.

A compound of up to 150m x 50m will be required on one side of the crossing to accommodate the necessary drilling equipment at these locations with a further 100m x 50m receptor compound to be accommodated at the opposite side of the crossing. The crossing method employed will determine the additional temporary land required to facilitate the works.

The timescale for any trenchless works will be determined by ground conditions and length of drill required, although it can be expected to be in the order of 2 months to 6 months from mobilisation to demobilisation.

This is an illustration