

Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 12.7 Phase I non-statutory public exhibition materials

Applicant: Norfolk Boreas Limited
Document Reference: 5.1.12.7
Pursuant to APFP Regulation: 5(2)(q)

Date: June 2019
Revision: Version 1
Author: Copper Consultancy

Photo: Ormonde Offshore Wind Farm

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Dan Tysk wind farm

WELCOME

We have a series of information boards explaining our early ideas for an offshore wind farm known as Norfolk Vanguard. You can also find out about the process that we follow to develop and finalise our plans and, most importantly, how you can get involved. The information we are sharing with you today is our early thinking – we are looking for your input and advice.

Inform our early decisions

Whilst our thinking is at an early stage, some decisions will happen following this first phase of feedback from you and technical stakeholders. We hope you take this opportunity to raise questions, provide information you think we need to consider and share any concerns with us.

How can I provide feedback?

- Talk to the project team. They are here today to answer your questions and above all to listen to your ideas and feedback.
- Write your comments on the flip chart paper. You can respond to and prompt other people's comments too.
- For more detailed comments, you may prefer to use your questionnaire.
- This information will also be available on our website. If you think of things you wish to raise after leaving today, you can do so online. Please feel free to encourage others to participate as well.



Norfolk Vanguard can produce enough electricity to meet the annual consumption of approximately 1.3 million homes.

Ref:
The European Wind Energy Association
<http://www.ewea.org/wind-energy-basics/faq/>



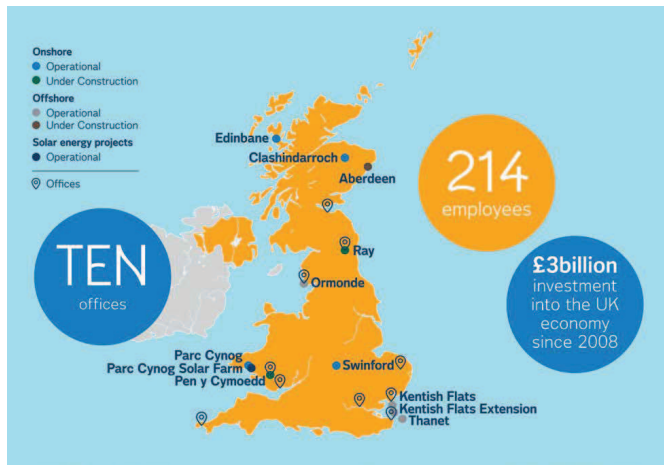
Norfolk Vanguard is named after a ship in Lord Nelson's command in the 1700s.



WE ARE VATTENFALL

This part of the exhibition introduces you to Vattenfall. You can learn more by talking to staff here. The staff are also eager to learn from you about Norfolk and how your input can shape the project into a flagship development for the area and the North Sea.

Vattenfall is 100% owned by the Swedish state and is one of Europe's largest energy providers, operating in Sweden, Denmark, Finland, Germany, the Netherlands, Poland, and the United Kingdom, with more than 28,000 employees.



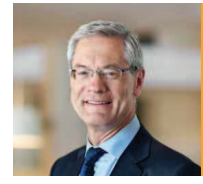
Sustainable production

Wind power is one of the fastest growing energy sources in the world and will play a key role in meeting climate targets. Vattenfall has one of the largest deployments of wind farms in Europe.

Vattenfall is continuing to expand its wind operations in the UK. You can learn more about these from the UK Wind brochure which is available at the exhibition today.



In Swedish Vattenfall means "Waterfall".
The company's origins, over 100 years ago, were as early producers of 100% renewable hydropower.



Magnus Hall – CEO, Vattenfall
"Our aim is to be carbon neutral by 2050. Investing in wind energy is central to our strategy."

Working with local communities

Involving local communities is important. When we are designing our projects, communities have the opportunity to get involved and influence plans before a final proposal is put forward.



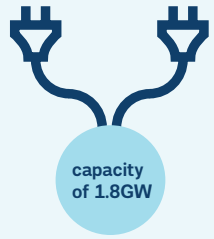
INTRODUCING THE PROJECT

Norfolk Vanguard in brief

We expect Norfolk Vanguard to have up to 257 turbines. The wind turbines will be located at least 47 km off the coast of Norfolk.



This will be the one of the largest wind farms in the world and has a target capacity of **1.8 gigawatts (GW)**.



Why here?

Choosing where we locate a wind farm, and the infrastructure needed to connect it to the grid network, is an important process. Initially, we look at information and data from a wide range of sources – we call it “constraints mapping”.

Offshore we look at wind speeds, ground conditions and other uses of the sea, including protected areas. Onshore we map a range of constraints including the road networks, landscape, natural and heritage features.

This then helps us start a conversation with communities and stakeholders about a more refined area where we can locate turbines, cables, substations and any other buildings or equipment needed for the wind farm to operate effectively.

Background

In 2010, Vattenfall acquired rights from The Crown Estate, in a joint venture with ScottishPower Renewables, to develop the East Anglia Offshore Wind Farm Zone.

In February 2016 The Crown Estate granted each developer its own ‘project specific agreement’. This new working arrangement is an effective way to secure the potential of the entire zone and deliver low cost, low-carbon power to the UK consumer. Vattenfall is developing Norfolk Vanguard and a second offshore wind farm, Norfolk Boreas.



i Due to the curvature of the earth the human eye can only see 5km from sea level and only 33km from 100m above sea level, meaning that you would be unable to see Norfolk Vanguard from the coast!



Ruari Lean – Project Manager, Vattenfall *“I’ve worked in the wind industry for nearly ten years, and have seen it grow and develop into one of the most exciting industries in the world. I’ll be leading the team working on this project. We want to see how we can deliver the best possible projects and make the most of the opportunities from this investment, whilst minimising the impacts.”*



WHY DO WE NEED RENEWABLE ENERGY?

The renewable energy industry is growing rapidly as the world acts on climate change.

A clean, home-grown and affordable supply

The amount of renewable energy powering the UK is growing. In 2015, 25% of the UK's electricity was generated from renewables – almost half of this came from wind energy. The cost of generation from renewables is falling and there is significant potential to reduce it further. This is an industry priority.

The Climate Change Commission has said that offshore wind could be one of the most affordable energy sources for the UK in the next ten to twenty years.

Tackling climate change

The potential impacts associated with climate change include (DECC 2014):

- Increased frequency of extreme weather events such as floods and drought
- Reduced food supplies
- Impacts on human health
- Increased poverty
- Ecosystem impacts, including species extinction.

Approximately 27% of UK carbon emissions are produced through energy generation. Carbon emissions can be reduced by moving towards renewable energy sources such as offshore wind power. Norfolk Vanguard has a target capacity of 1.8 gigawatts (GW), which is similar to that of a typical coal or gas-fired power station. At this size, the project will produce enough clean electricity to meet the electricity needs of 4% of UK households.

After climate talks in Paris in 2015, the UK has committed to working with other countries in order to limit global temperature increases to 1.5C. The Climate Change Act sets the framework for the UK to transition to a low-carbon economy. The Act requires that UK emissions of greenhouse gases in 2050 are reduced to at least 80% below 1990 levels.

A series of “carbon budgets” shape the UK's approach to meeting these targets. “Budgets” are in place now which set out the targets that need to be met between now and 2032.

The UK has one of the best wind energy resources in Europe. Offshore wind could generate over 400 terawatt hours per year, greater than the total UK electricity demand in 2014.

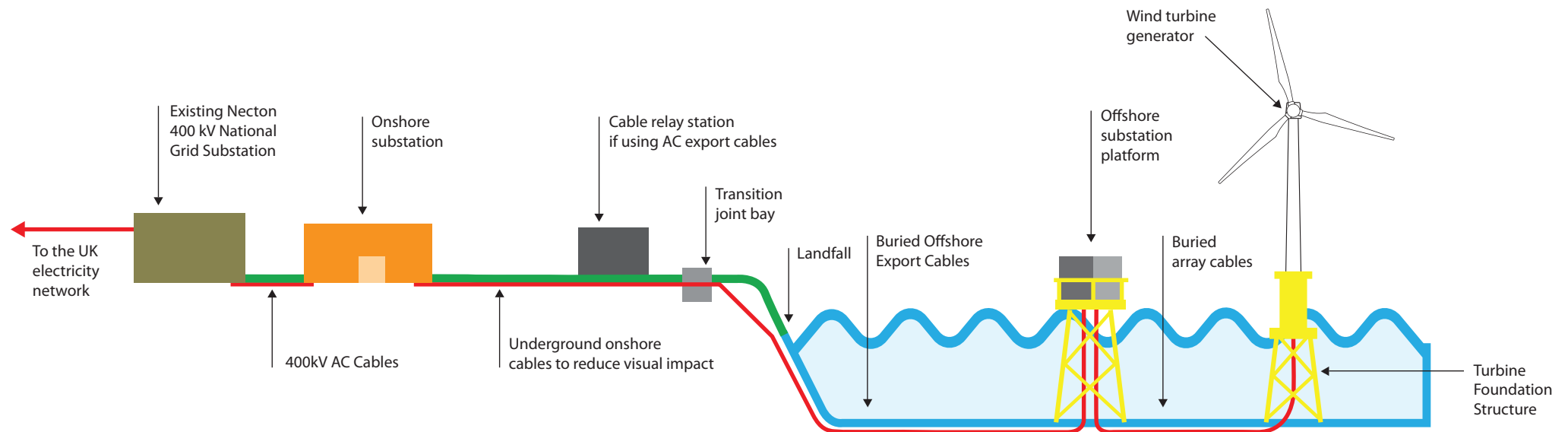


HOW AN OFFSHORE WIND FARM WORKS

- The blades of the wind turbines act like sails, converting the energy of the wind into mechanical energy – in the form of torque in the rotating shaft of the turbine.
- In each wind turbine, the shaft drives an electrical generator which converts the mechanical energy into electrical energy.
- The electrical energy produced by the wind turbines is collected together at an offshore substation platform via a network of medium-voltage cables (called 'array cables').
- In the offshore substation platform, the electrical energy is stepped up to a higher voltage; it may also be converted from alternating current (AC) to direct current (DC).
- The energy is transmitted to shore via high-voltage subsea cables (called 'export cables'). High-voltage AC and DC cables can carry much more power than medium-voltage cables; they are also more efficient.
- The subsea cables are joined directly to a set of onshore export cables in an underground 'transition joint bay' close to the shoreline. The onshore cables carry the energy further inshore, to the onshore substation.
- At the onshore substation, the electrical energy from the wind farm is converted to 400kV AC, ready for injection into the National Grid system. The substation also contains special equipment to help keep the grid voltage stable.
- Finally, the energy is transmitted a short distance to the existing National Grid substation. This will probably require a short run of buried 400kV cables.



Wind is a form of solar energy and is a result of the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and the rotation of the earth.



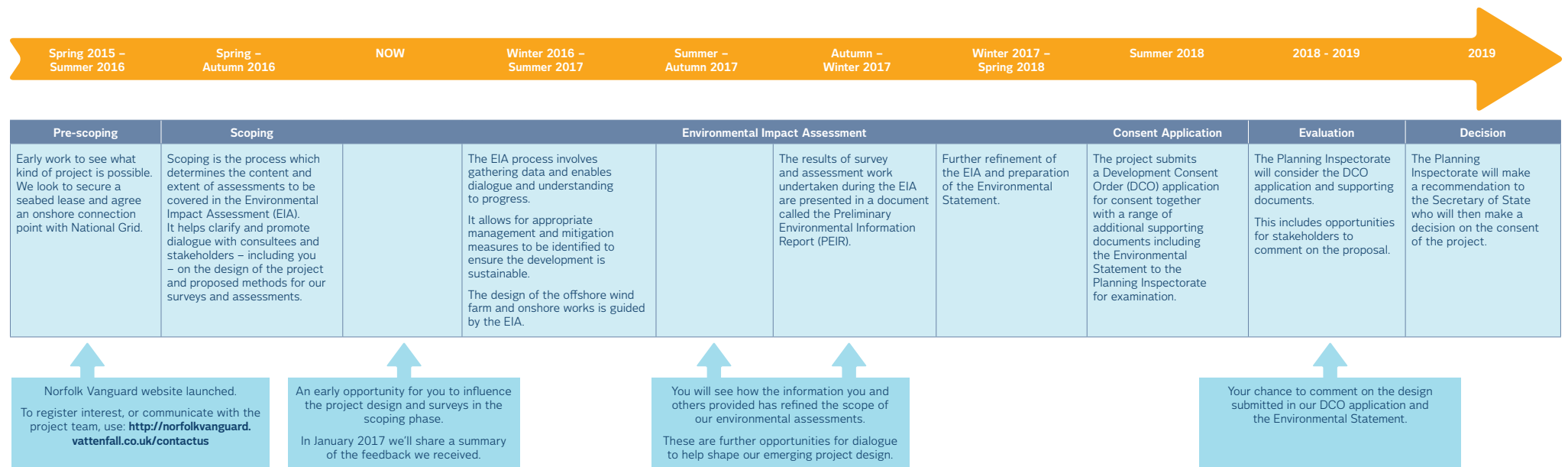


THE DEVELOPMENT CONSENT PROCESS

Norfolk Vanguard is expected to make a significant contribution to the UK energy supply. It is a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 and therefore we must apply for a Development Consent Order (DCO). The DCO application will be submitted to the Planning Inspectorate. The Planning Inspectorate examines the

application before making a recommendation to the Secretary of State for Business, Energy and Industrial Strategy, who makes the final decision on whether the proposed project is acceptable. In due course, we shall undertake a separate DCO process for Norfolk Boreas.

Pre-application consultation is a key part of the NSIP process and is essential in allowing us to understand the local area and develop the best possible project. It allows us to progress with greater confidence, as early ideas and assumptions are checked, and any local opportunities and sensitivities we may not yet be aware of are pointed out to us by local experts – you!



We exchange information with many stakeholders, including statutory consultees regularly and repeatedly during the Development Consent Order (DCO) process. Their reviews and feedback help shape the project.

To learn more about planning and nationally significant infrastructure projects, see www.infrastructure.planninginspectorate.gov.uk

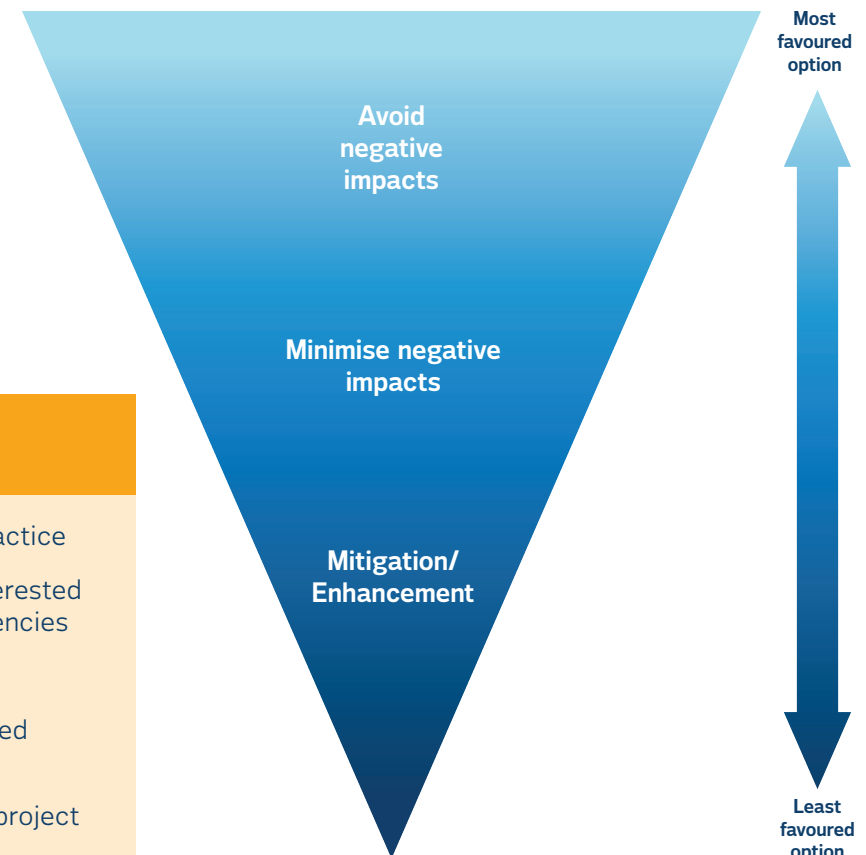
THE PURPOSE OF AN ENVIRONMENTAL IMPACT ASSESSMENT

What is an Environmental Impact Assessment?

The EIA is a systematic process that must be followed for Norfolk Vanguard. The EIA ensures that potentially significant effects of a project and the scope for reducing them are properly understood.

Through the EIA process we:

- assess a project's likely environmental, social and economic effects
- consider mitigation measures to reduce the level of adverse effects
- assess any remaining effects with these measures applied
- identify opportunities

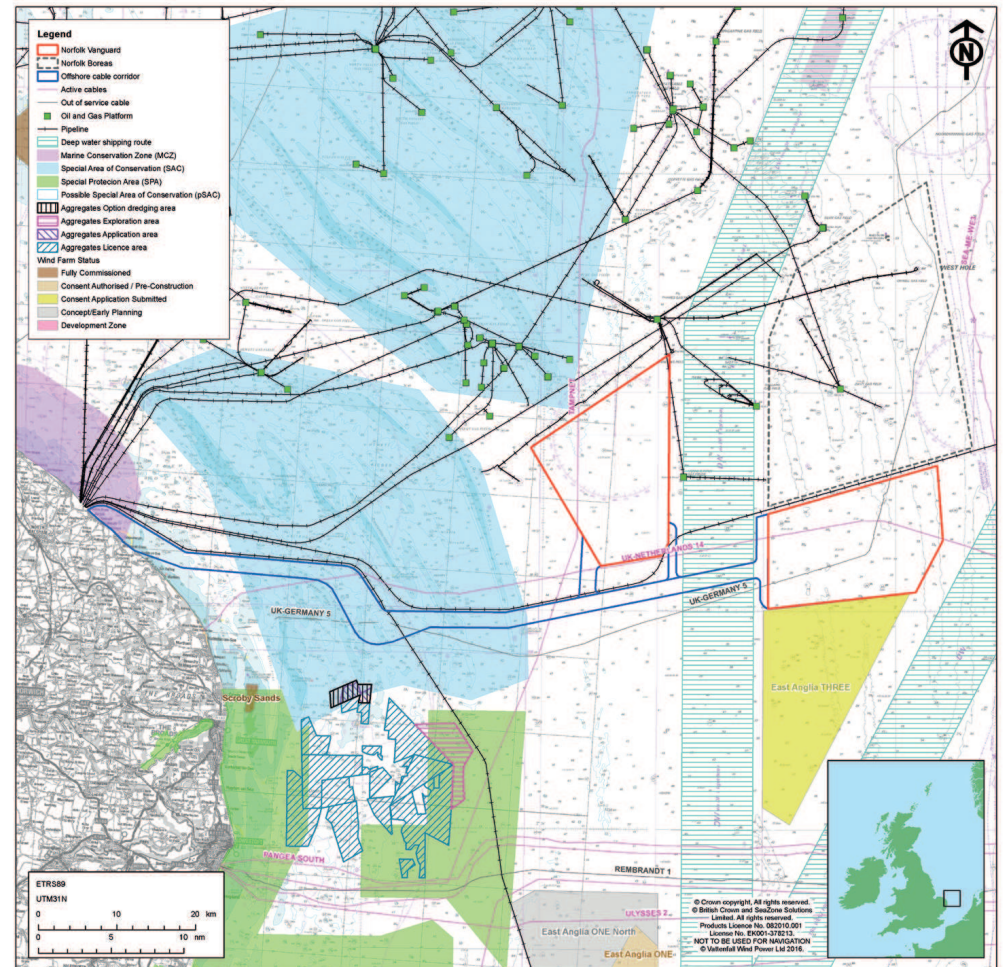
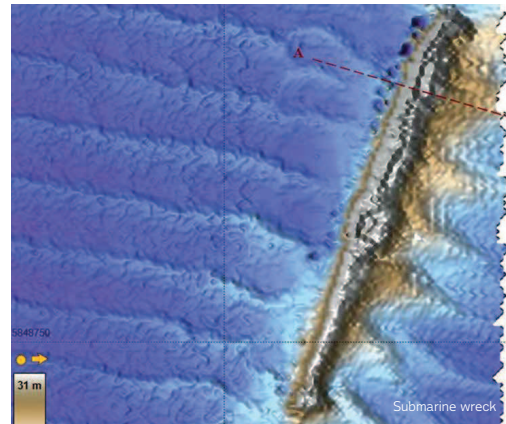
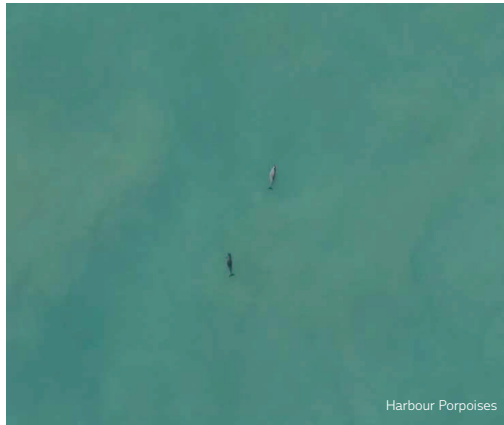


Key characteristics of the Environmental Impact Assessment process

- It is systematic, comprising a sequence of tasks that is defined both by regulation and by practice
- It is consultative, with provision being made for obtaining information and feedback from interested parties including local authorities, members of the public and statutory and nonstatutory agencies
- It is analytical, requiring the application of specialist skills
- The EIA allows opportunities for environmental, social and economic concerns to be addressed throughout the project
- It is impartial, with its objective being to inform decision-making rather than to promote the project

OFFSHORE ~ WHAT WE CONSIDER

You will see from the map, there is already a wide range of marine activity in the wider North Sea, near where we are developing Norfolk Vanguard.





OFFSHORE ~ WHAT WE CONSIDER

Factors we investigate include:

- **Marine geology, oceanography and physical processes.** We survey the seabed to inform turbine foundation design and location, and how best to bury the array cables. Oceanographic measurements help us understand the forces (current, wave and tide) that the foundations need to withstand.
- **Marine water and sediment quality.** Samples of the seabed sediment are taken and analysed to determine if any contaminants are present. Existing water quality data is also considered.
- **Seabed ecology (offshore and intertidal).** We film underwater video and collect samples to understand habitats and species on the seabed.
- **Shipping, navigation.** We collect data on vessels in the area, how many there are, and the routes they follow. In consultation with users and organisations such as Trinity House and the Maritime and Coastguard Agency (MCA), this allows us to carry out navigational risk assessments.
- **Aviation.** We consult with the Ministry of Defence and National Air Traffic Services to understand impacts on aviation and radar.
- **Offshore archaeology.** Surveys of the seabed show where there are archaeological remains such as ships and aircraft. We consult with the Marine Management Organisation and Historic England about how best to protect any archaeological features.
- **Fisheries.** The wind farm area is fished predominantly by Dutch beam trawlers. The inshore waters within the offshore cable corridor are important for UK fishermen for potting, netting, long-lining and trawling. We use catch record data to understand fish and shell fish populations.
- **Offshore ornithology and marine mammals.** Data on birds and marine mammals is collected by aircraft using high resolution digital stills through monthly surveys. We engage with organisations such as Natural England (NE), the Royal Society for the Protection of Birds (RSPB) and Whale and Dolphin Conservation (WDC).

Have we missed anything?

Do you have information we should consider in the EIA, or specific features or activities you would like to highlight to help us understand the area better? These might include:

- Development plans
- Marine transport or access issues
- Ecology or wildlife issues
- Historic or current marine uses
- Recreational activities

Are there local groups or organisations you think we need to engage with? You can do this by writing on the flip charts next to the boards.



Whilst undertaking detailed seabed scanning for the development of wind farm projects in the East Anglia Zone, Vattenfall and ScottishPower Renewables discovered an 'uncharted' wreck of a WWI German submarine, missing in action since 1915. As an official military maritime grave, the wreck will remain undisturbed in its final resting place.

ONSHORE WORKS ~ THE SITE SELECTION PROCESS

Before we can progress from looking at a wide area, which just illustrates where works could theoretically occur, and instead look at something that is more refined, we first must consider many aspects such as the environmental, physical, technical, commercial and social features and their associated constraints and opportunities. These aspects are depicted in the following boards.

Substation, landfall and cable relay station

We will need to construct some new onshore electrical infrastructure, to transmit power from the offshore wind farm to the National Grid 400kV substation at Necton. This will be achieved using buried cables rather than overhead lines. There will be some above-ground elements: a new substation close to National Grid's and possibly a cable relay station near landfall.

The following criteria guides site selection:

- Residential properties and sensitive areas (e.g. schools)
- Designated sites and protected species
- Landscape setting and viewpoints
- Existing land use
- Flood risk
- Archaeology and heritage assets
- Engineering requirements and feasibility
- Highway access
- Consultation and feedback

Underground Cable

Underground cables will transmit power from the landfall to the substation.

The following guide the site selection of the underground onshore cable routes:

- Residential properties
- Historic buildings
- Designated sites
- Residents' access to local services, roads and footpaths
- Utilising open agricultural land in flat terrain, and along field boundaries
- The need for complex crossings, e.g. road, river and rail
- Important habitat, trees, ponds, agricultural ditches and hedgerows
- Other underground services such as gas pipelines
- Consultation and feedback

The feedback you provide today, and during this information exchange period is important!

Your feedback today will feed into the site selection process. Taking into account what we learn from you and others, focused surveys help us determine preferred route options. We will update and consult you further at the next round of drop-in exhibitions (summer 2017).

A sector-based approach – making it easier for you to help shape the best possible project for Norfolk

- Our aim is to give you an opportunity to focus your responses. You might for example, like to highlight local features we should factor into our thinking in the Bacton area for example (Sector 1 on the Landfall Search Area map) – such as committed plans for a development, flooding issues, or the opportunity to locate near existing industrial infrastructure.
- If you're not familiar with the area and the sectors, you can still highlight some principles the EIA process should follow, or tell us your ideas and concerns.
- We shall apply any/all relevant points and principles (whether highlighted in relation to a particular sector, or not) to the whole scoping area.



ONSHORE WORKS ~ THE SITE SELECTION PROCESS

The map shows the project search area.



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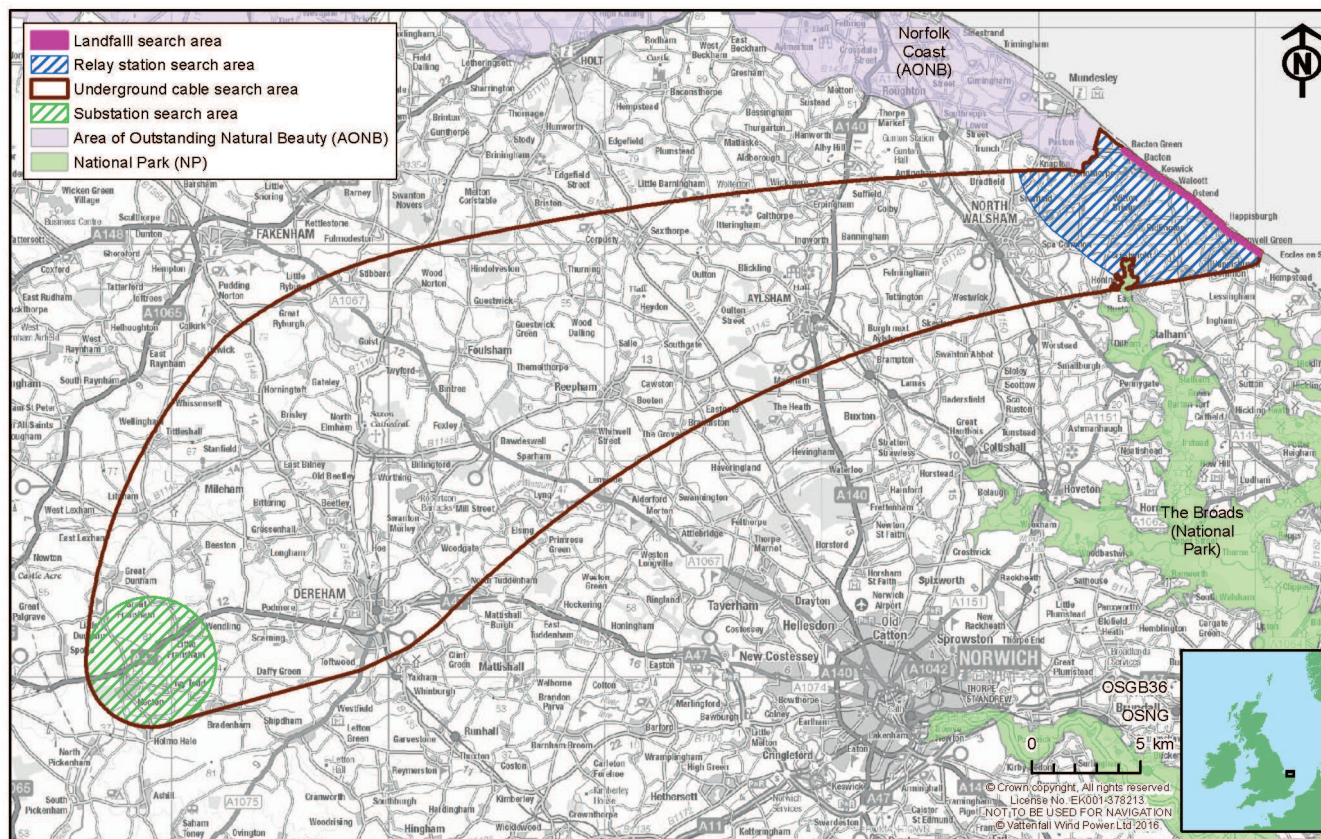
FINDING THE BEST UNDERGROUND CABLE ROUTE

The map shows the onshore underground cable search area. We need to work out the best cable route within this area. You can help.

A grid connection offer was provided by National Grid in July 2016 based on an onshore connection point at the existing 400kV Necton National Grid Substation. The onshore cable route will therefore extend for approximately 50 km inland from the coast to this location.

Detailed feasibility and route selection studies are ongoing in order to identify the best route for the buried cable system, lowest associated costs and with the least environmental impact.

Please tell us about any features within the cable corridor search area you'd like us to be aware of when identifying options for the cable route.



FINDING THE BEST LANDFALL LOCATION

The map shows the landfall search area.
We need to find the best location within this area.

Landfall is where the offshore cables come ashore.

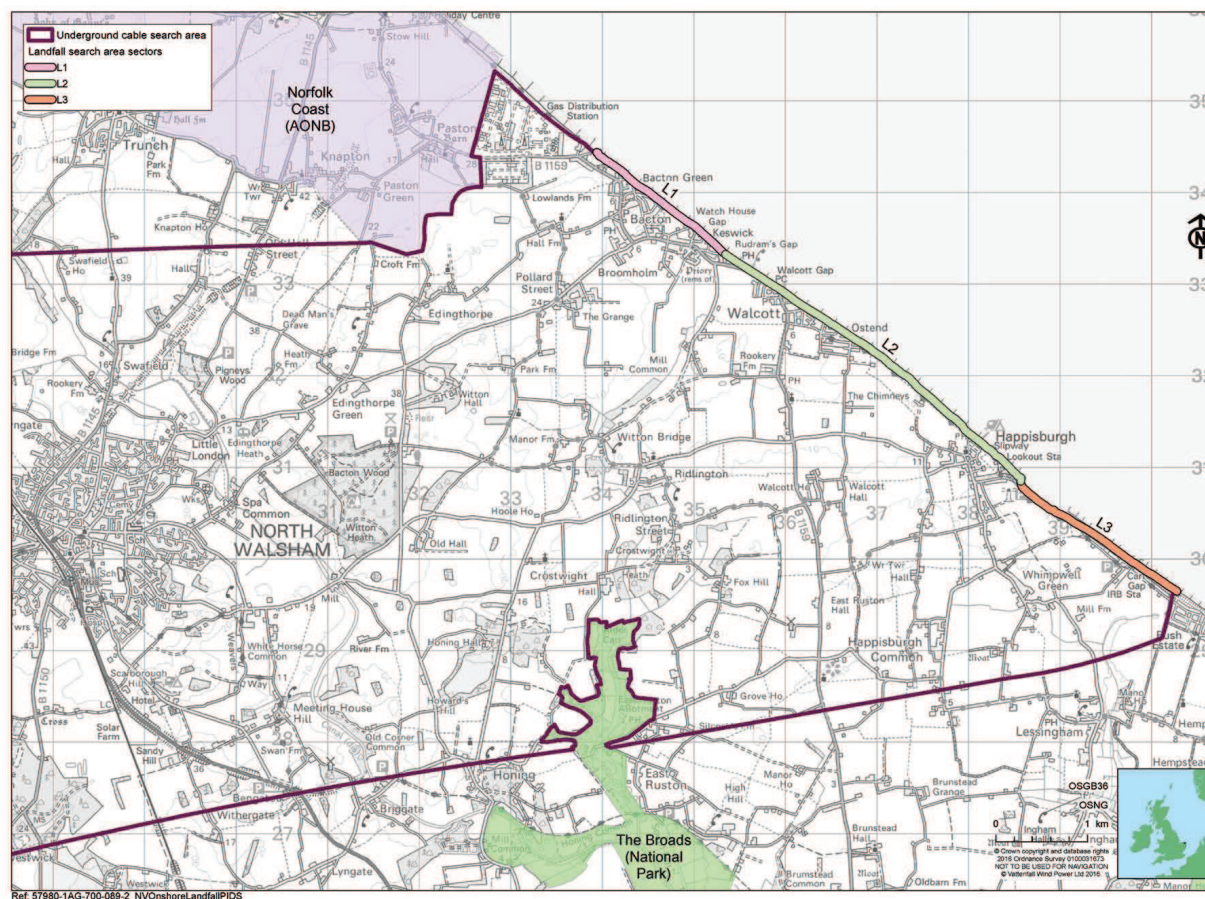
The map shows the landfall search area which extends from Bacton Green to Eccles-on-Sea.

This stretch of coastline has been identified as appropriate for landfall for the following reasons:

- It would result in a relatively short offshore cable route from Norfolk Vanguard
- It allows for onshore routing options outside the Broads National Park, Norfolk Coast AONB and Suffolk Coast & Heaths AONB
- There are minimal offshore cable/pipeline crossings required to bring the offshore cables to the area
- There is enough space to accommodate the maximum number of cables
- It would result in the offshore cables avoiding the areas of inshore seabed mobility off Gorleston
- It would result in the offshore cables avoiding the dredging grounds off Lowestoft

Please tell us about any features you want us to be aware of in any of the three sectors within the landfall search area.

You might also consider opportunities where our work during construction (or post-construction mitigation) can contribute to local efforts, such as managing and enhancing the coastline and near shore marine environment.



FINDING THE BEST CABLE RELAY STATION LOCATION

The map shows the cable relay station search area. We need to find the best location within this area to locate the cable relay station (if required).

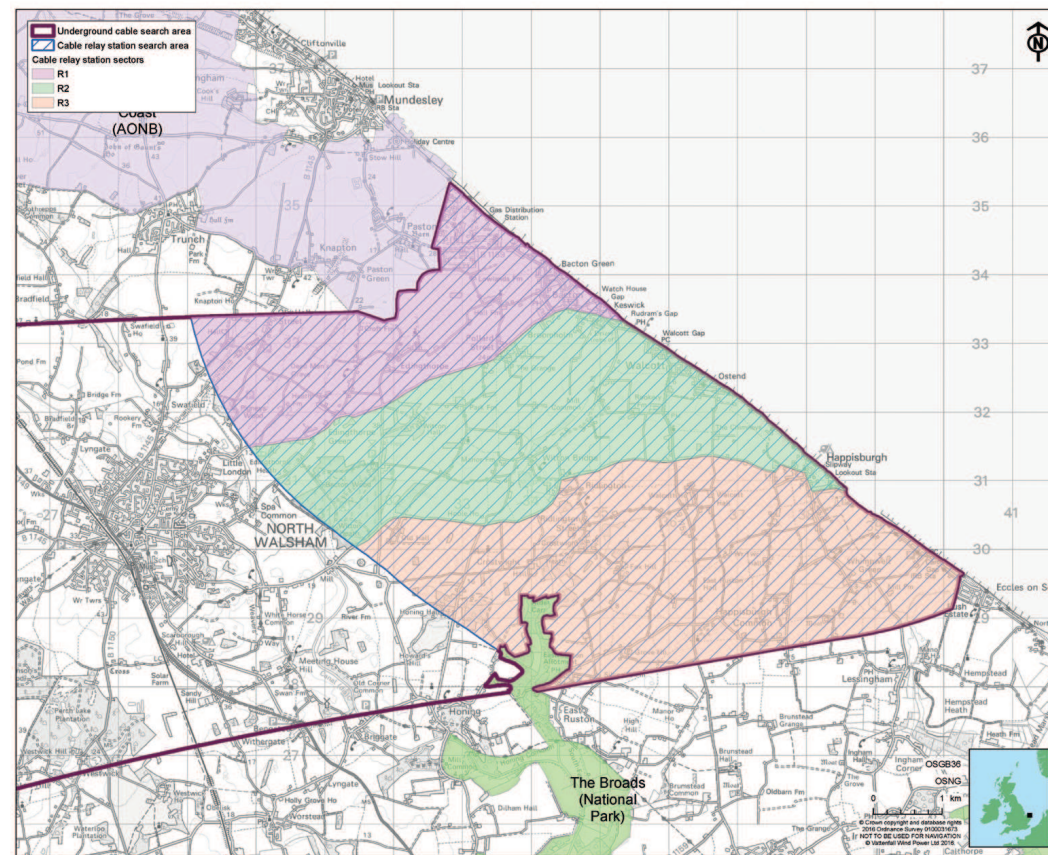
If HVAC (High Voltage Alternating Current) export cabling is used, a cable relay station will be required in order to increase the power transfer capability of cables, and reduce electrical losses in the system.

For technical reasons, the cable relay station needs to be as close as possible to the landfall location.

Our sector based approach takes into account an area within 5km of the landfall where it is possible to locate the cable relay station.

Please tell us about any features you want us to be aware of in any of the three sectors within the search area.

(i) The search area avoids the protected areas of Norfolk Coast Area of Outstanding Natural Beauty (AONB) and the Norfolk Broads National Park.



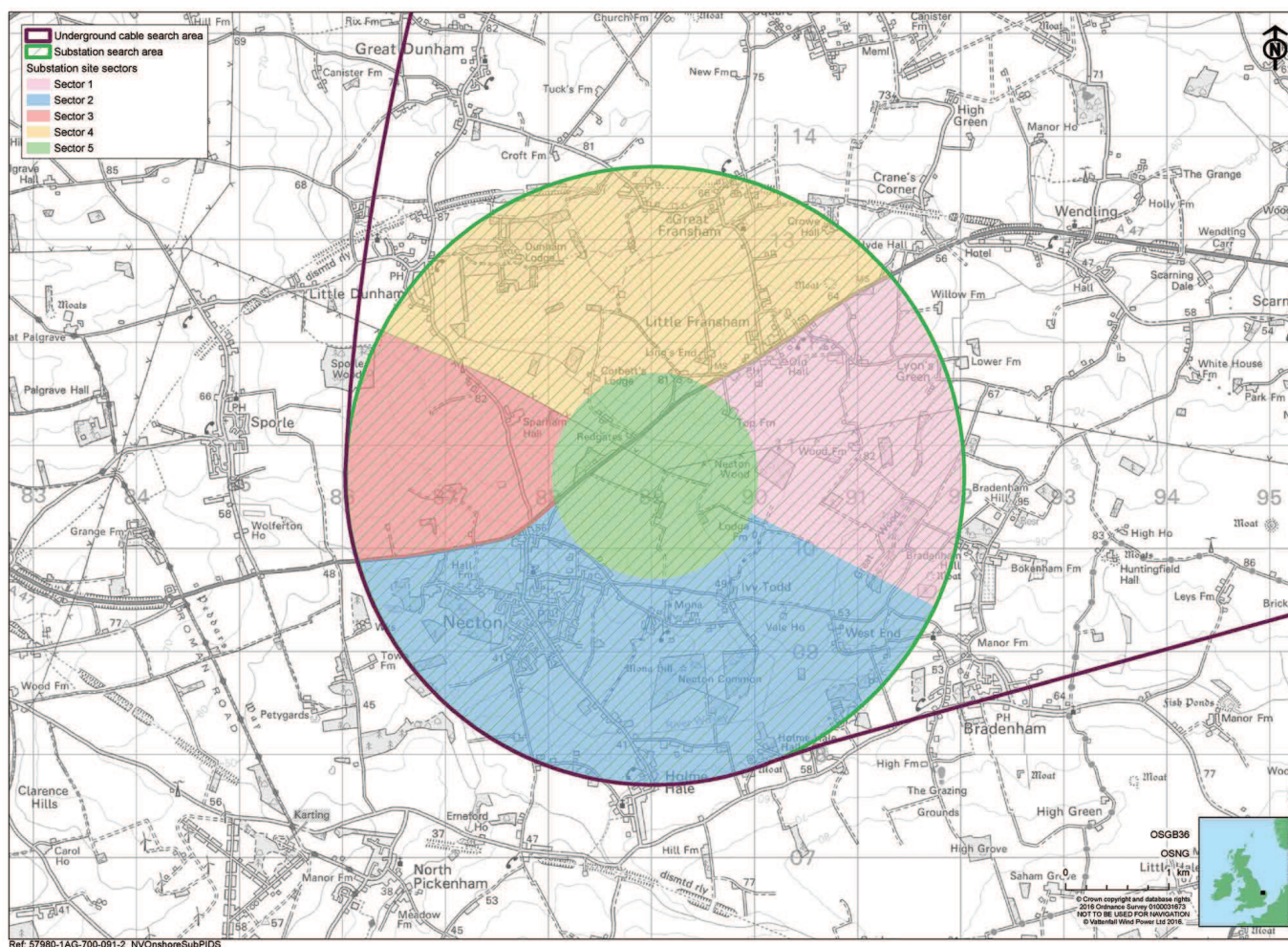
FINDING THE BEST SUBSTATION LOCATION

The map shows the substation search area. We need to find the best possible location for the substation.

Our grid connection offer from the National Grid was accepted in August 2016 for a connection at the existing 400kV Necton National Grid Substation. For technical reasons, our substation should be as close as possible to the National Grid substation. Our sector approach takes into account a core radius of 1km (Sector 5) and a wider 3km radius (Sectors 1 - 4).

Please tell us about any features, concerns or ideas you have relating to any of the five sectors within the substation search area.

You might draw our attention to opportunities, for example, where our work during or after construction can result in sympathetic mitigation or even enhancements of the local environment.

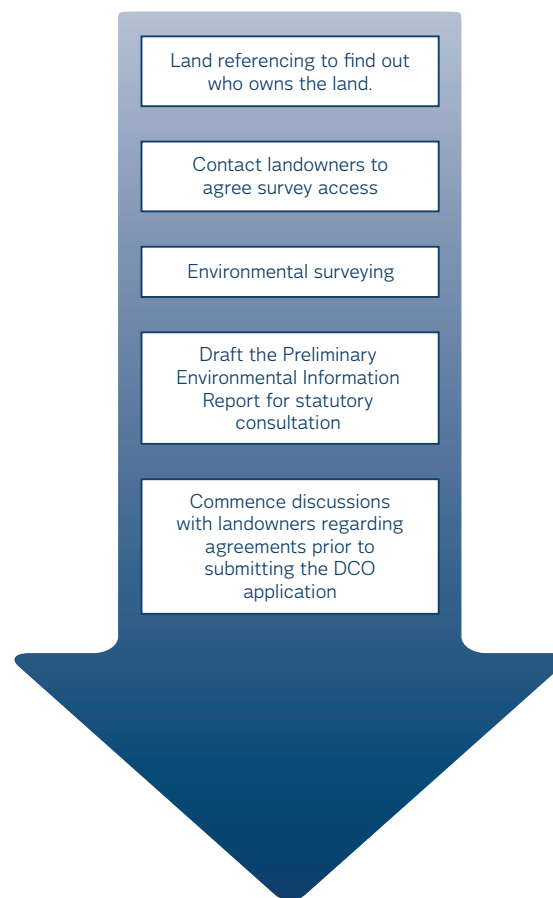


LAND SURVEYS AND LANDOWNER CONTACT

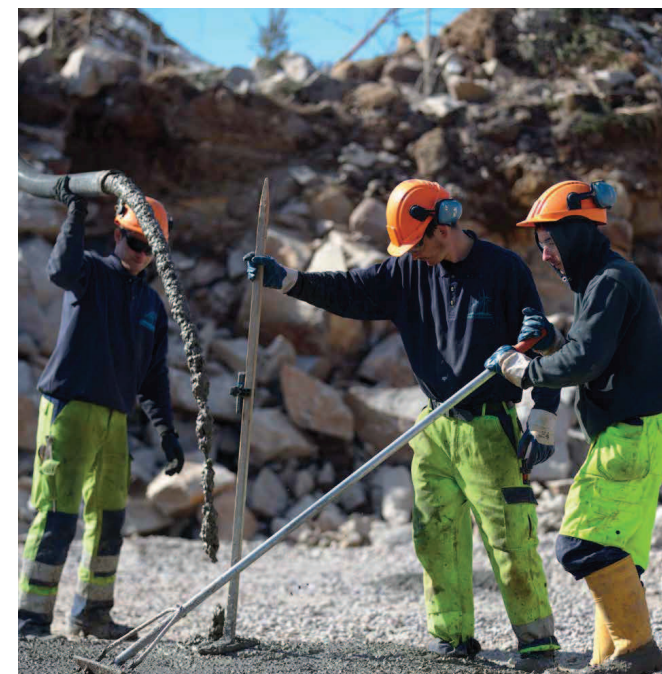
Following a full review of the feedback we receive at this stage, we will refine our substation, landfall, cable relay station and cable corridor location options.

If you are a landowner, or a land occupier what can you expect?

- Vattenfall commission searches to understand who owns the land that we will need to survey.
- Our land referencing consultants – Ardent – may be in contact in the near future. The purpose is to help us understand land ownership and occupation and ensure all parties with an interest in the preferred cable corridor have been identified and can be included in consultation and discussions.
- Local land agent – Bob McCarthy of Consent Solutions Ltd – will make contact with you to discuss the survey access and arrange any site specific requirements.
- We will be holding events in 2017 specifically for those parties with an interest in the land affected.



Q4 2016 - 2018, ongoing dialogue and consultation with landowners regarding route alignment and land use (Consent Solutions)

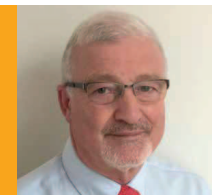


Key Landowner contact:

Bob McCarthy

T. 07787 783517

bobmccarthy@
consentsolutions.com



BRINGING VALUE AND OPPORTUNITIES TO THE AREA

Over the coming months we want to explore with you what's possible. To begin with, we'd like to understand and hear your initial ideas about the benefits you envisage this project can bring.

There are key priorities for the project:

- Technical considerations – designing the best project from an engineering and environmental perspective that satisfies the planning process and consultees.
- Reducing the cost of energy to UK consumers by delivering an affordable energy project.
- Bringing value and opportunities to the area through our investment.

Skills, jobs and supply chain:

This project, along with Norfolk Boreas, has the potential to create significant employment opportunities. To build and operate the wind farm, we will need a skilled, trained workforce. We will need to work with the local and UK supply chain so they contribute to and benefit from involvement in Norfolk Vanguard and Boreas. This could create many training and education opportunities, as well as a route into a major global industry for companies.

A port to service the project

Building and maintaining an offshore wind farm requires shore side support and there is significant potential for our investment to bring value and opportunities to a suitable port facility and coast-to-sea service providers on the Norfolk or Suffolk coast.

During construction of Norfolk Vanguard, there will be a requirement for dockside space and facilities, where components for the offshore infrastructure will be stored prior to loading onto construction vessels.

Vattenfall is developing a maintenance strategy that draws on the industry's growing experience of operating wind farms at greater distances offshore. We are starting exploratory discussions with Peel Ports, the Great Yarmouth Harbour owners, to understand the potential of its infrastructure to help service our planned wind farms off Norfolk. We will have similar discussions with other regional ports.



Mark Donovan For the last two years I've been part of a team of twelve who maintain and keep Vattenfall's Kent offshore wind cluster of 145 turbines producing energy. After leaving school, I trained as an electrician, and since joining the wind industry I have gained lots of new skills, from working offshore to new electrical and mechanical

engineering skills that can be used in wind farms around the world. It's an exciting line of work! For me, having a job that encourages me to progress and develop, and one where potentially I can do that over the operating life of the wind farm – more than 20 years – is a huge deal! It allows me to plan for my future.



EXPLORING FUTURE OPPORTUNITIES

Vattenfall has a track record of working with communities and stakeholders to make sure that our investment brings benefit to the area hosting the wind farm infrastructure.

Our aim is to develop a local wind energy project that can add to your community as an asset for the future. We will work with you to see how we can bring lasting benefits and opportunities for you and your family. A project that supports a sustainable, vibrant community.

This has happened in many different ways across our sites in the UK and beyond. However, we can only develop the right package for you with your feedback on what's important to you.

How do you think Norfolk Vanguard can make a positive contribution to Norfolk's future?

Perhaps some of the key words below will help to inspire you to start to think about the types of benefits you'd like to see the project deliver. What contributions can the project make, on these or other themes, and how?

- Services
- Health
- Enterprise
- The coast and marine environment
- Fairness
- Family
- Community life
- Equality
- Young people
- Environment and wildlife
- Wellbeing
- Opportunities
- Education, skills and employment

Tell us your ideas for how Norfolk Vanguard can add value and create opportunities that are important to you?

Who we are

Vattenfall is a company of Swedish heritage, which is important to the way we approach our business and our work with communities. The company started its life 100 years ago working in hydro energy and has grown into a company that employs 35,000 people across six countries and across different energy sources. To this day, we remain fully state owned.

We have clear values and an ethos that places emphasis on working closely with local communities to make sure we are developing projects that can bring lasting, sustainable benefits to you and future generations.



Enterprise

We recognise this can bring sustainability to communities – supporting their economic wellbeing, and making them resilient for the future.



Fairness and Equality

Everyone should be able to benefit and access opportunities.



Wellbeing

It is our most important asset. Living in a community that supports our health and wellbeing is one of the most important services it can provide.



Sustainability

We should think about the needs of future generations – shaped by consideration of the environment, society and economy we pass onto them.



HOW HAVE YOU FOUND TODAY?

Thank you for attending today and for sharing your ideas and concerns about our initial investigations (scoping).






This is just the first opportunity to get involved. We want to hear from as many people as possible through this process to help us to develop the best possible proposal.

This final board is your chance to give us any thoughts you have on how we can improve our way of working with you.

Is there anything you think we should consider that we haven't?

1. How can we get more people involved in the process?
2. Would you like more information on certain aspects of our investigations?
3. Would you care to suggest more / different locations?
4. What kinds of people do we need to reach out to who can provide additional perspectives and insights?
5. How can we best communicate with you? Are there any channels that you would particularly like us to consider using (e.g. social media, email, newsletters, etc)?

You can get in touch in a number of ways:

-  Give us your feedback today on the questionnaire.
-  You can write to us at **Norfolk Vanguard, The Union Building, 51-59 Rose Lane, Norwich, Norfolk, NR1 1BY**
-  All of the information here today is available on our website. You can register your interest in the project via **norfolkvanguard.vattenfall.co.uk** to receive project news.
-  Email us **info@norfolkvanguard.co.uk**
-  Phone us: **01603 567995**

By signing up you will receive the interim consultation report from these events and other project news

