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VATTENFALL

Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 18.6 Letter to Pettywell residents

Applicant: Norfolk Boreas Limited
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Photo: Ormonde Offshore Wind Farm

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Norfolk Vanguard,
51-59 Rose Lane,
Norwich,
Norfolk, NR1 1BY
United Kingdom
Tel: 01603 567995

1.5.18

Dear Pettywell resident,

RE: Vattenfall Norfolk Vanguard Cable Corridor – Our plans and how we will try to minimise impact

Vattenfall are in the process of preparing a Development Consent Order (DCO) to the Planning Inspectorate to be able to build and operate an offshore wind farm some 50km's off the Norfolk coast and connecting into the National Grid at the existing National Grid 400kV substation near Necton. The Norfolk Vanguard project will have an installed capacity equivalent to 5% of the UK's domestic electricity needs and this makes it a Nationally Significant Infrastructure Project (NSIP).

Over the last 18 months we have been consulting on the project and we are grateful to all those who have contributed to shaping our understanding and have influenced our proposals for Norfolk Vanguard. The feedback received has helped to eliminate, reduce and mitigate for the potential environmental impacts we have assessed through the Environmental Impact Assessment (EIA) process.

In this letter we would like to go into detail about how the plans, close to Pettywell, have developed and how we would like to work with residents and other stakeholders to ensure a smooth, safe, efficient project. It should be noted that all the impacts and infrastructure supporting the construction process will be temporary. Our intention is also to combine the Norfolk Vanguard and Norfolk Boreas trenching and duct laying, so as to reduce the overall timescale for the temporary works and reduce the effect of construction on communities.

Firstly, we appreciate that you would like to know why the cable route has moved to the east, thus coming between Pettywell and Reepham, and why this is deemed a better route. There are a number of points;

- In collaboration with the landowner, a shorter, more direct route was envisaged with the significant benefits relating to reduced construction time and traffic.
- The new route has resulted in trenchless crossing techniques under the Marriott's Way and;
- The avoidance of St. Mary's Chapel in Kerdison.

Secondly, we understand that you have questions relating to the construction process, its timing and the use of the temporary mobilisation area;

- The use of the local road network will be minimised by using the mobilisation areas as the access to the running track within the cable corridor (45 m wide in total). This running track will be the way that construction traffic will work on and progress the trenching and laying of ducting.
- The process:
  a)Detailed design, procurement and pre-construction works will take place **2020-2021.** This includes any road modifications needed, hedge and tree netting/removal (seasonal activity), ecological preparation, archaeology surveys, pre-construction drainage. We will access the

cable corridor via the 'Side Assess – Construction' routes. Vehicles are considered negligible for this stage of works.

b)Mobilisation areas will be established in **2022-2023** and machinery and materials will be delivered to the Mobilisation Area (PMA). The mobilisation areas are 100m x 100m and will house office, storage, parking and welfare facilities during the ducting process (**2022-2023**), after this the area will be reinstated and would not be needed for other phases.

c)Within the onshore construction period the trenchless crossing areas will be established. This includes additional temporary works areas to support trenchless crossing methods eg. Horizontal Directional Drilling (HDD). There will be launch areas and receptor areas – each no more than 100m x 50m. The specific locations within the current zones will be determined at detailed design phase, as will the type of trenchless method to be used. As with mobilisation areas, this work will take place in **2022-2023**, after which the areas will be totally reinstated.

d)Starting from the mobilisation areas, a 'work front' will excavate, lay and reinstate approx. 150m of Vanguard and Boreas ducting per week – until the work fronts meet or complete a work section at a trenching crossing 'stop end'. The work front will be accessed via a running track within the cable corridor, being established piecemeal as the work progresses from the mobilisation area. At trenchless crossing locations, the temporary works areas will be established from the running track. There will be no running track between trenchless crossing launch and receptor and no need to excavate the land surface between these areas. It is expected that trenchless crossings will take an average of 8 weeks (including mobilisation and de-mobilisation of trenchless crossing temporary works areas) for ducting installation – though this is dependent on length and complexity.
A maximum of 2 years installation period is allowed for the whole design envelope, however we anticipate that duct installation works for any cable corridor section will be in the order of 1 year (including any reinstatement of mobilisation areas to previous land use) for any single corridor section.
During duct installation there would be a maximum of 40 HGV deliveries per day (5 per hour) per mobilisation area to supply materials and remove excess materials.

e)Cable installation will take place in a maximum of 2 phases per project (4 maximum) in **2024-2025** for Vanguard and **2026-2027** for Boreas. This will involve using the 'Side Accesses (construction)' – rights of access over field entry points and across fields to the cable corridor from the public highways network – in strategic locations. This will prevent the requirement to reinstate mobilisation areas and wholescale running track throughout the onshore cable corridor to access joint bay locations. These will be typically 800 m apart.
A pulling/joining location will be established on the cable corridor and excavated to expose the installed duct in this location. The next joint location will also be excavated to allow the cables to be pulled between locations and jointed. Each individual cable pulling location will take approximately 5 weeks (though, as the associated location will also be open to allow the pulling, the location may be influenced for up to 10 weeks).
Cable installation would see a maximum of 16 HGV deliveries per day (2 per hr) during the first week to establish pulling and jointing. Reduced to 5-10 HGV deliveries per day during the pulling/jointing process. There would be up to 5 weeks of deliveries per location

NB. A secure storage site for cable drums and associated materials is proposed at Oulton, as mobilisation areas will no longer exist. Storage will also be available at port facilities, so that the Oulton location is used as a buffer storage for cable drums being delivered to the local area.

Finally, there have also been questions about road closures and how these will be managed;

- Most disruption will happen during the duct installation phase. This will be completed within 24 months across the whole route, but all works local to Reepham should be completed in less than 18 months
- Single track roads that we need to cross will be closed for a short period (very probably under 1 week), during this time there will be short diversions. There will only be one temporary road closure at a time in a locality
- Roads that take 2 way traffic will be closed on 1 side at a time with a traffic light system.
- The specific detail of each crossing will be addressed as part of a detailed design and agreed with the relevant highway authority as part of a Traffic Management Plan. An outline of this will be included in the DCO submission. Safety is a priority, as is maintaining flow of traffic at peak times
- A schedule of road closures will be publicised in advance, with clear routes indicated by temporary signage
- Once the ducts have been installed under the road, the crossing point will continue to be used by construction vehicles travelling along the cable route. The crossing will also continue to be controlled (as will be specified in the Traffic Management Plan)
- There will be no heavy construction traffic at all in Reepham Town Centre

PLEASE NOTE: There have been concerns for the Reepham-Bawdeswell road (B1145); Cawston Road and Dereham Road. Also the Wood Dalling road during term time. Vattenfall consider that it should be realistic to undertake the required trenching across these roads during non-term time in order to minimise issues for the School/College buses.

Furthermore a full assessment with highways experts will take place and if a manned sentry is deemed necessary to maintain safety, then this will be established. Members of the Parish Council thought that this was especially important for the sharp corner on the Bawdeswell road.

Limiting deliveries to the B1145 mobilisation area, so they do not occur between 8-9 or 3-4 on term time weekdays will also be considered – again to limit disruption during the times when school buses and rush hour traffic is at its peak.

We understand that councillors considered HDD under roads to be preferable, however this is not always the least impactful method when drilling preparation, noise and length of time is considered.

We will continue to liaise closely with you regarding our proposed route and inform you in advance of any works taking place. Meanwhile the website would be updated to include schedules of works. Local Liaison Committees would also be established to facilitate two-way communications and to ensure communities are well informed. In addition to ensuring that we have a way of hearing feedback from communities about their experiences and in order to address any issues.

The new FAQ (see link below) includes more information and clarification. We will bring copies of the new FAQ to the meeting mentioned below.

Electro Magnetic Field (EMF)

We also appreciate that there is interest in knowing more detail about Electro Magnetic Fields (EMF) and we have 2 downloadable papers on the Document areas of the Norfolk Vanguard Website; https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/documents/. The first document covers a general assessment of the effects associated with the project and the second summarises a study, commissioned jointly with Ørsted (formerly DONG Energy, the developers of the Hornsea Three project), which relates specifically to the cumulative effects which could occur at the crossing point of the two projects' cable corridors.

The findings of this study support Vattenfall's decision to commit to adopting HVDC technology to transmit power from the proposed Norfolk Vanguard and Norfolk Boreas Offshore Windfarms to the National Grid, by effectively eliminating health risks associated with EMF from our transmission cables and very considerably reducing cumulative effects at the crossing point regardless of whether Ørsted deploy HVDC or HVAC (High Voltage Alternating Current) transmission technology.

Meeting on the 9th May in Reepham

We have been asked by the Town Council to offer residents of Pettywell an opportunity to discuss the project and construction implications in a short meeting ahead of the scheduled pre-arranged Town Council meeting and so Sue Falch-Lovesey will attend the next council meeting on the 9th May. We would be very pleased to see you and will be able to clarify any points or plans made within this letter.

Thank you for your interest in this project, we very much appreciate your continued inputs and look forward to seeing you on the **9th May at 7pm at Reepham Town Hall.**

Yours sincerely,

[redacted]

Ruari Lean

Project Manager, Norfolk Vanguard

Attached paper copies:

-Pettywell Map

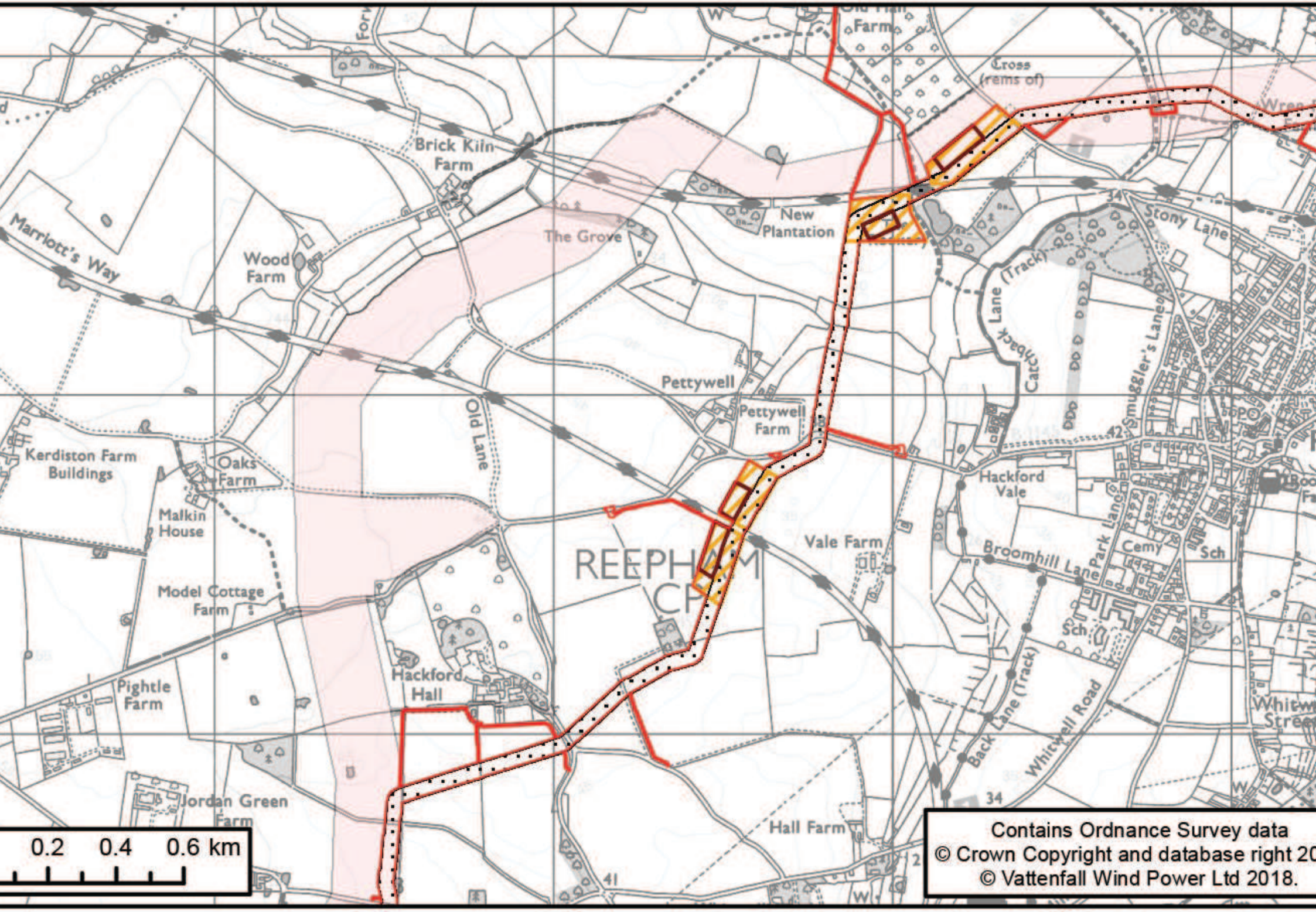
-EMF sheet (Vattenfall and Ørsted crossing information)

Key Links:

New April '18 FAQ https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/documents/

EMF (Electro Magnetic Field) fact sheets are also available on the website above.

Main link to live, interactive map: https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/about-the-project/


Brick Kiln Farm
Marriott's Way
Wood Farm
The Grove
New Plantation
Pettywell
Pettywell Farm
Old Lane
Kerdiston Farm Buildings
Oaks Farm
Malkin House
Model Cottage Farm
Pightle Farm
Hackford Hall
Jordan Green Farm
Hall Farm
Vale Farm
Hackford Vale
Broomhill Lane
Park Lane
Cemy
Sch
Stony Lane
Smuggler's Lane
Catchback Lane (Track)
Back Lane (Track)
Whitwell Road
Cross (rems of)
0.2 0.4 0.6 km
Contains Ordnance Survey data
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Vattenfall and Ørsted Circuit Crossings- EMF Information

In response to local concerns, Ørsted and Vattenfall have jointly commissioned an independent study and resulting report which explores the 'worst case' electric and magnetic fields (EMFs) which may result where it is proposed the power cables from the large wind farms will cross.

Onshore, buried cables from offshore wind farms will necessarily cross other infrastructure, including other power cables. This summary report provides information on the electric and magnetic fields (EMFs) which could occur where power cable circuits cross, specifically assessing the crossing of Ørsted's Hornsea Project Three and Vattenfall's Norfolk Vanguard and Norfolk Boreas offshore wind farms, which are typical of the next generation of offshore wind projects in development by Vattenfall and Ørsted. It represents a conservative assessment of EMFs at such crossings, assessing the worse case parameters for this case study.

Summary of results

- The study found that the maximum calculated AC magnetic fields were 50.7 microtesla (μT) which is 14% of the UK exposure limit values; the maximum calculated DC magnetic fields were 60.8 μT which is less than 1% of the UK exposure limit.
- All of the cable crossing scenarios irrespective of whether DC or AC cable connections are used will be compliant with the UK exposure limits set to protect the health of members of the public against electric and magnetic field exposure.
- As the magnetic field is mainly dependant on cable rating, burial depth and phase separation, all cable crossings with similar or less onerous design parameters will also be compliant.

What are electric and magnetic fields and what policies and exposure limits apply?

EMFs are produced wherever electricity is used. Underground cables, irrespective of frequency, have an earthed metallic shield, which protects them from damage but also prevents electric fields escaping from the cable. Magnetic fields are not shielded in the same way as electric fields and will be produced outside the cables.

Electricity can be transmitted either via High Voltage Direct Current (HVDC) or High Voltage Alternating Current (HVAC) technology producing EMFs of the same frequency.

The UK has a carefully thought-out set of policies for managing EMFs, which includes numerical exposure limits to protect against established effects of EMFs. Public Health England (PHE), formerly the Health Protection Agency, (HPA) recommends limits for exposure to EMFs based on those from the International Commission on Non-Ionizing Radiation Protection (ICNIRP – 1994 & 1998)[1,2]. These guidelines are based on reviews of all the science regarding potential health effects of EMFs and provide limits for continuous public and occupational exposures. DC and AC EMFs have different effects on humans; therefore, each has a separate and distinct set of exposure limits to protect against exposure. PHE issued guidance on the application of exposure limits, which stated that the public exposure limit is 360 μT for 50 Hz AC magnetic fields, and 40,000 μT for DC magnetic fields[3]. In the UK the Earth's DC magnetic field measures around 50 μT, and the background AC magnetic field in a home ranges between 0.01- 0.2 μT.

More information on the science, exposure limits and policies can be found at www.emfs.info.

[1] https://www.icnirp.org/cms/upload/publications/ICNIRPstatic.pdf
[2] http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf
[3] http://webarchive.nationalarchives.gov.uk/20140713082604/http://www.hpa.org.uk/Publications/Radiation/NPRBArchive/DocumentsOfTheNRPB/Absd1502/

National Grid has been engaged by Vattenfall and Ørsted to assess the EMF aspects of this case study, as described in this summary report. The projects as a whole and all other aspects of them remain the responsibility solely of Vattenfall and Ørsted.

Where onshore wind farm circuits cross onshore, will these be compliant with exposure limits?

The electricity industry's policy is only to design and install equipment that is compliant with the relevant exposure limits. To ensure electricity Industry remain with the exposure limits the Government produced a Code of Practice on EMF compliance which sets out the approved calculation methodology for assessing compliance for new and existing electricity assets. This methodology takes account of maximum power flows and minimum burial depth to ensure that the calculated magnetic fields represent the maximum magnetic field that the electrical infrastructure could possibly produce.

There are multiple possibilities for cable crossing points i.e. AC or DC, which cables are on top, where they cross, the crossing angle – so the calculations in this summary report are the worst-case scenarios typical of the next generation of Vattenfall and Ørsted offshore wind projects in development in the UK.

If both cable routes that cross use the same power transmission technology, i.e. AC and AC or DC and DC, the fields can combine to add or subtract from one another. However, if different technologies are used, i.e. AC and DC, the magnetic fields do not interact with one another. In that scenario, the installations of the HVAC and HVDC cables can be considered separately.

These assessments represent the worst-case scenario for two crossing points, one where both transmission systems use HVAC technology and the other where both use HVDC technology. The parameters modelled are included in the tables below and are conservative as maximum rating, minimum burial depth and most acute crossing angle (45°) were taken and the most highly loaded circuits were located on top which produced the highest magnetic fields.

The calculated fields are shown below and are a small fraction of the AC and DC ICNIRP limits.

Cable design parameters

	2 x HVAC routes		2 x HVDC Routes	
	'On Top'	**'On Bottom'**	**'On Top'**	**'On Bottom'**
Number of circuits	6	12	2	4
Maximum load current per circuit	1620A	900A	2220A	1400A
Maximum circuit spacing at crossing	15.0m	10.0m	15.0m	10.0m
Spacing between phase centres	0.313m	0.25m	0.43m	0.25m
Cable formation in trench	Flat	Trefoil	Flat	Flat
Depth of burial, to circuit centres	0.8m	2.8m	0.8m	2.8m

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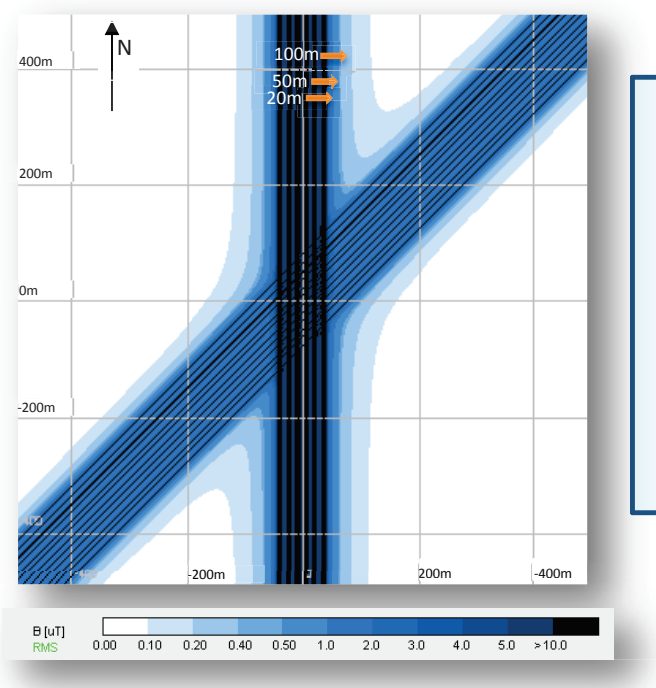
AC magnetic field calculations for HVAC cable crossings



Calculated worst-case AC Magnetic Fields

	Distance perpendicular from outer cable (m)			
	Peak	20m	50m	100m
Magnetic field (μT)	50.7	1.14	0.49	0.23
% ICNIRP exposure limit*	14%	<1%	<1%	<1%

*AC public exposure limit of 360μT

Worst-case calculated magnetic fields from AC circuits: The two cable routes modelled include 6 circuits running in a North-south direction with each circuit rated at 1620A; and 12 circuits which run underneath in a North East-South West direction with 900A rated circuits. Coloured bands represent magnetic field. Each square represents 200m distance. The orange arrows indicate the distance perpendicular from the outer cables that correspond to the table above.

The maximum calculated magnetic fields at various distances from the outer cable are included in the table and demonstrate that all AC magnetic fields are below the UK exposure limits

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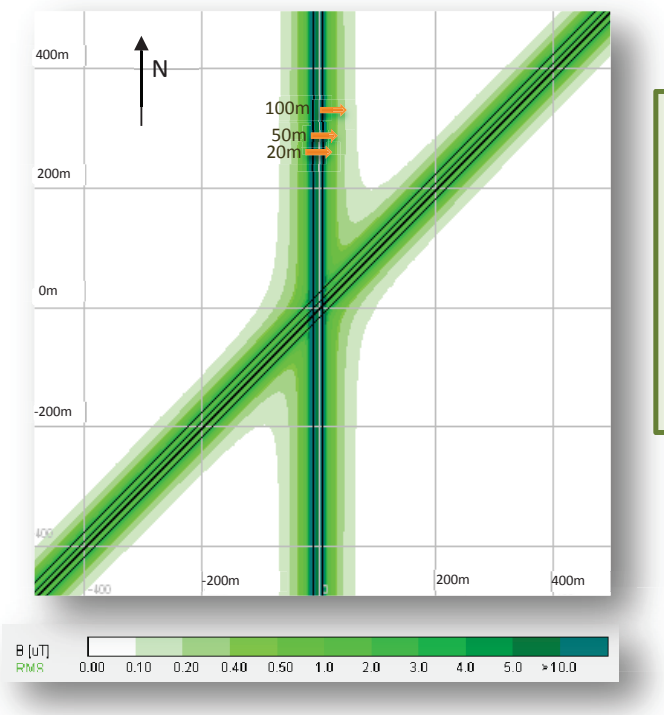
DC magnetic field calculations for HVDC cable crossings



Calculated worst-case DC Magnetic Fields

	Distance perpendicular from outer cable (m)			
	Peak	20m	50m	100m
Magnetic field (μT)	60.8	1.46	0.57	0.23
% ICNIRP exposure limit*	<1%	<1%	<1%	<1%

*DC public exposure limit 40,000μT

Worst-case calculated magnetic fields from DC circuits: The two cable routes modelled include 2 circuits running in a North-south direction with each circuit rated at 2220A; and 4 circuits which run underneath in a North East-South West direction with 1400A rated circuits. Coloured bands represent magnetic field. Each square represents 200m distance. The orange arrows indicate the distance perpendicular from the outer cables that correspond to the table above.

The maximum calculated magnetic fields at various distances from the outer cable are included in the table and demonstrate that all DC magnetic fields are below the UK exposure limits.

Where can I get further information?

More information is available from National Grid's website at www.emfs.info or from the EMF helpline on 0845 702 3270 or emfhelpline@nationalgrid.com.

Alternatively you can contact the Norfolk Vanguard project team directly on info@norfolkvanguard.co.uk or 01603 567995 or Hornsea Project Three on contact@hornsea-project-three.co.uk or 0800 0288 466.

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