

From: [REDACTED]
To: [Norfolk Boreas](#)
Cc: [REDACTED]
Subject: Norfolk Boreas Open Floor Hearing - 13 Nov 19
Date: 23 November 2019 16:35:23
Attachments: [PINS Written Response 23 Nov 19.docx](#)

Your Reference: EN010087

Dear Planning Inspectorate,

Thank you for allowing us the opportunity to make an oral representation at the Open Floor Hearing (OFH) on 13 Nov 19.

Commensurate with our oral representation, please find our written representation attached.

Unfortunately, we missed the deadline to register as an 'Interested Party'. However, we respectfully request that the "Crossing Point" of the Norfolk Boreas Cables in conjunction with those from Norfolk Vanguard, with those planned by the Hornsea Project Three cables, is nominated for inclusion in the ExA site inspections. The Crossing Point is close to domestic properties and the overall site will have a detrimental impact on the environment.

Yours sincerely,

Ray & Diane Pearce

[REDACTED]
Norwich
NR11 6RQ

Email: [REDACTED]

Home: [REDACTED]

Mobile: [REDACTED]

23 November 2019

**NORFOLK BOREAS PROJECT
WRITTEN REPRESENTATION IN SUPPORT OF ORAL STATEMENT MADE AT OPEN
FLOOR HEARING ON 13 NOV 19**

References:

1. Norfolk Boreas Preliminary Environment Information Report (PEIR) dated October 2018.
2. [REDACTED]
3. The Biological Effects of Weak Electromagnetic Fields - Andrew Goldsworthy 2007.
4. DECC Power Lines: Demonstrating compliance with EMF public exposure guidelines –March 2012.
5. Electric & Magnetic Fields & Health - <http://www.emfs.info/> - written by National Grid plc.
6. National Grid Electricity Transmission (NGET) plc - <https://www.nationalgridet.com/connections>

Dear Planning Inspectorate,

I write on behalf of myself and my Wife, Mrs Diane Pearce. Please find below our Written Representation regarding the Norfolk Boreas Offshore Wind Farm. We lived at the property, details at Reference 2, but have since moved and placed [REDACTED] not least for the worry the impact of years of disruption from the construction work will have but for the effect from living close to a very large static Electromagnetic Field (EMF) could have on our health.

We do not accept that there should be another, complete, and separate consultation for the Norfolk Boreas project apart from the Norfolk Vanguard project. We find it disingenuous that Vattenfall make the commercial case for the two projects to be consulted upon by hedging against a failed application for Norfolk Vanguard. The worst case for the environment in the County of Norfolk would be if both projects' applications were to be successful; a single project's success being less damaging. Therefore, it is incredulous that the environmental impact of Norfolk Vanguard and Norfolk Boreas are not being considered and represented as a whole. Further, the burden being placed upon ordinary citizens to either make representations and attend the burgeoning number of windfarm consultations planned to directly impact Norfolk is unprecedented. We understand the need for renewable energy but

We acknowledge that we have had meetings and previous correspondence with Vattenfall but we still have grave and unprecedented concerns for the future of our property, our health and our holiday letting business, precipitated by the proposed plans for the project. However, questions relating to the crossing point of the Norfolk Vanguard and Norfolk Boreas cables with those for Ørsted's Hornsea Three Project, are primary to our concerns, and, have been inadequately addressed during the consultation, especially in the PEIR (Reference 1). Vattenfall will not discuss in detail how their cables will actually cross and interact with those proposed by Ørsted, as the details are subject to a commercial 'None Disclosure Agreement' (NDA). Also, despite the publication of many complex technical plans, there is no plan as to how the huge number of cables will actually cross, that is: HVAC over HVDC or HVAC over HVAC, depth of cables, type of cables, heating, drainage etc. We contend that: the imposition of an NDA is neither in the public's interest, nor acceptable in any public consultation, as many issues will not be suitably discussed, not least, the environmental impact of the proposed cable crossing point. Therefore, some of the questions we have

previously submitted to Vattenfall remain unanswered by: the PEIR, the ES, the public consultation and the personnel we have met. We hope, in all earnest, the Planning Inspectorate will consider our representation.

Cable Routing

We have discussed this issue with Vattenfall's representatives and National Grid (NG) plc but their answers were either elusive or inadequate. The PEIR does not sufficiently explain why the connection points at Walpole and Norwich Main (Swardeston) were disregarded and the Public has been presented with a "fait accompli" regarding the allocated connection point, being at Necton. The later allocation of Norwich Main to the Hornsea Project Three is causal in the Boreas cables having to cross with those of other projects' cables, which are also either in consultation or awaiting the DCO decision; therefore, there is no co-ordination. We hereby contest, through the Planning Inspectorate, that the allocation of connection points under a historic licence, made by NG plc, are neither co-ordinated nor adequate for the future development of offshore wind farms. We consider that: either, a national co-ordinating body separate to the 'for profits' company currently responsible for NETS connections is established, or, the current licence issued to National Grid plc is urgently reviewed to reflect the current UK National requirements for renewable energy, especially when considering the consequential increase in NETS connection applications. By way of example, the extensions to the Dudgeon and Sheringham Shoal windfarms, planned by Equinor, are now also in the pre-application consultation phase and both of these will cross the Norfolk Boreas cables. Hopefully, post the General Election, we will be able to contact the Secretary of State regarding this issue through our own MP. That said, we regard the allocation process of a "first come, first served" lottery, presided over by the NG Group is, neither in the Public's interest, nor the onshore environment as a whole. The problem could be solved by an offshore extension to the NETS with the provision of an 'Off-shore Ring Main' (ORM) exemplified at Attachment 4.

National Grid (NG) for Profits

We note, in particular that, in April 2019, NG plc established a new company within the NG Group: 'National Grid Electricity Transmissions' plc (NGET). We understand that NGET will be able to select and purchase assets for management and profit through the Offshore Transmission Owner (OFTO) process. Therefore, we contest that the NG Group has a conflict of interest regarding the allocation of connection points for developers, reinforcing the requirement for an independent, not for profit, organisation to co-ordinate and allocate future connection points for new projects to the NETS.

When considering the huge impact the NG's, and now NGET's, connection decision has, and will have, on each and every windfarm project on the North Sea, we do not understand why, or accept that, there is no representation from this 'for profit' company at the Public consultations. As per our email exchange with NG at Attachment 1, the company remained evasive as to exactly why only certain connection points are offered to developers.

PEIR & Selected Connection Point (Necton)

The PEIR inadequately discusses the NG's connection offer. One example of Boreas' considerations was for: "*A connection to the national grid close to the coast*". Clearly, by using Necton, this aspect was disregarded! The connection point allocation is a documented lottery with Hornsea Three securing Norwich Main just two weeks after Boreas' connection point offer from NG for Necton. We contest that the clearest and least environmentally detrimental connection point is at Walpole.

Walpole is only 6 miles from the coast with the on-shore requirement crossing primarily uninhabited, reclaimed arable land. We have been informed by the Vattenfall that the Walpole connection was discounted purely on the cost for the increased cable length; a fact reiterated by Vattenfall representatives at a Public meeting organised by the MP for North Norfolk (Norman Lamb). However, the alternative of utilising primarily marine cables, on a like for like cost comparison, with the proposed 60km of onshore cables, was not discussed, nor was the effect on the marine versus terrestrial environment compared. Therefore, despite their requirement to do so, the pre-application process does not adequately explore the

alternatives.

We contest that the 'Steps' for planning for the project were more likely to be as follows:

- 1) The nearest area to the coast capable of containing the wind turbines within the Crown Estate's award was identified.
- 2) The most direct route to shore from the wind farm area, avoiding any politically sensitive MCZs and Conservation Areas, was selected. This is exemplified by squeezing through the gap in the MCZ's off the coast of Happisburgh; do marine creatures actually know there is a gap in the MCZ's!?
- 3) The most feasible direct routings for the on-shore cables to NG's offered connection points were costed, and, the cheapest option adopted for consultation.

Therefore, the overriding aspect for the whole plan has been cost, cost and cost. The environmental considerations in the PEIR and EIA were then written to fit the scenario. Without discussion of the alternatives the PEIR is flawed as the Public is unable to review the options available and has merely been presented with the only option suitable to Vattenfall's bottom line profits. Should a DCO be granted then the environment in Norfolk will be the eventual loser.

A copy of our email to NG regarding the connection point for Hornsea Three is at Attachment 1; NG's reply is at Attachment 2. Consequently, we do not accept that the allocation of Necton as being the best and most commercially viable connection point for Norfolk Boreas. Also, with the aim being to consult and inform the Public, other options have neither been explored nor discussed sufficiently during the consultation. We contest that Norwich Main is closer to the Boreas landfall at Happisburgh, and, Necton is closer to the Hornsea Three landfall at Weybourne. Consequently, the allocation process has therefore failed to protect the Public's interests. However, any adverse on-shore environmental impact could have been averted during the allocation process if a sensible decision had been made to utilise Walpole instead of a commercial decision to take the most direct route to the NETS.

Finally, on the connection issue, connecting to the NETS at Necton, via a 60km trench, up to 60 metres wide and up to 1.5 metres deep, across the Norfolk countryside, cannot be less expensive than a marine cable to Walpole and cannot have less impact on the environment. The consultation for the Norfolk Boreas Project does not fully qualify how the decision to utilise the Necton connection point came about, and, offers no alternatives for the public to consider.

Property

Our property (Reference 2), is in a unique position with regards to the project as it is situated within 80m of the proposed cable route and, more importantly, adjacent to the position where the Hornsea Project Three cables cross the Norfolk Vanguard and Boreas cables. Unfortunately, our property was not included for assessment within the PEIR process. However, after campaigning with the Vanguard Project Managers we were granted a survey by an Electro Magnetic Field (EMF) expert provided by NG. Regrettably, as documented in the record to date, the specific design, engineering and construction of the crossing point has yet to be planned. This plan should not be underestimated as having a permanent impact on our property and Furnished Holiday Let (FHL) business. Indeed, such is our anxiety, we have already moved to a rental property in Heydon whilst the planning and construction of these projects plays out; our home of 22 years is now, sadly, an FHL. We did not take this decision lightly and took the opportunity to move out before competition for rentals away from the cable construction sites takes hold.

The Norfolk Boreas project has already had a 'High Impact' on our property which has been 'blighted' by the proximity of the plans. Our holiday lettings business will suffer going forward by being disrupted with a prolonged and intrusive construction phase, especially when coupled with those for Norfolk Vanguard and Hornsea Three. The Boreas consultation makes no specific reference to our situation despite other residences and businesses being individually referenced. We are ordinary members of the Public but our lives have already been detrimentally effected by these infrastructure plans.

Construction Compounds

The cumulative effects of the location of construction compounds on private residents and members of the Norfolk public has not been adequately considered. Both Ørsted and Vattenfall are planning their own compounds, additional roads and access points without any regard for each other or a co-ordinated plan. The disruption to our FHL business, with a planned secondary construction compound from Hornsea Three within 100 meters and two developers trenching cables within 80 meters, will be untenable and would be for a prolonged period if Boreas and Vanguard gain separate approvals. Clearly, there will also be an environmental impact on the location of construction compounds, not least on Oulton Airfield, for which the consultation, thus far, is woeful.

The proposed construction compounds, in general, will have an impact on the appearance and character of the planned areas with implications in respect of tourism and visitors to Norfolk, especially during a prolonged construction phase, not evidenced in the Boreas consultation. A prolonged period of disruption would ensue if the construction phase for the project is not time limited. More importantly, if the construction phases for both Vanguard and Boreas are concurrent with the Hornsea Three project, without co-ordination, the Norfolk countryside and environment could be disrupted for over a decade which will definitely have a detrimental effect on Norfolk tourism, with a direct disruptive impact on our FHLs. Our Holiday Lettings Agents will not market our properties under these circumstances and we could be left with no income whatsoever. The current plans will place traffic lights either side of our property on the B1145 making access problematic and the planned construction traffic would likely operate 24 hours per day; why would anybody want to go on holiday to a building site!

Cumulative Effects Assessment

We welcomed Vattenfall's early decision to utilise HVDC for its transmission system especially as this will have a much lesser impact on the environment than HVAC. That said, there will still be a cumulative effect from crossing the Vanguard and Boreas cables with those from the Hornsea Project Three cables. The cumulative effects of co-locating multiple High Voltage (HV) cables, carrying up to 6 GW of electrical energy, should not be underestimated. To quantify, 6GW is five times the maximum output of Sizewell B Nuclear Power Station! Vattenfall have still to specifically address the environmental issues and local heating effects of the crossing point. We reiterate that they cannot do so as the final design of whether the Hornsea Three cables pass over or under the Vanguard / Boreas cables has yet to be decided. The other issue being the selection of either HVDC or HVAC for the Hornsea Three transmission system which we accept is beyond Vattenfall's influence.

Neither the inter-relationships, nor cumulative impacts of the cable crossing point for each option - HVDC v HVAC or HVDC v HVAC, above or below Vanguard's cables - have been included in the consultation to date and are a glaring omission. We have been informed verbally, and by email, that there are regular discussions between the Boreas and Hornsea Three project teams regarding how they intend to cross the cables; none of which have been disclosed for ES or Public scrutiny. This is a scandalous disregard of the NSIP planning and indicative of how incomplete the planning of the crossing point is, which remains an important area of concern. We contest, very strongly, that there will be an "inter-relationship" between the cables at the crossing point, electrically, thermally and physically, and, these details should, by now, be available for Public consultation. Both Vattenfall and Ørsted will claim that a commercial NDA is "normal procedure" but we will argue that it is neither warranted nor required in the consultation.

By way of example: the minimum depth of the proposed HV cables will be 1.2m and the maximum 2.0m. Therefore, considering the significant number of cables, and, the limited depth to which HV cables can be buried before they are unable to efficiently dissipate heat, there will be a significant and potentially detrimental impact on the local environment for soils, principle and secondary aquifers, substrates and groundwater, especially with respect to any thermal effects. Considering the depth and comprehension of the cumulative effect assessment for the off-shore environment, we question why the on-shore environment has not been afforded the same level of detail, during the consultation, detail which should have been reported in the PEIR and included in the ES? Accordingly, there is a requirement for there to be a co-

ordinated plan which will affect the relative depth of either Vanguard and Boreas' cable trench or Hornsea Three's, which will have a consequence for the environment especially regarding Hornsea Three's lack of decision regarding HVAC versus HVDC.

From the Planning Inspectorates directive, as follows:

"... the Overarching NPS [National Policy Statement] for Energy (EN-1) paragraph 4.2.5 states that: 'When considering cumulative effects, the ES [Energy Supplier] should provide information on how the effects of the applicant's proposal would combine and interact with the effects of others already in existence'."

We contest that the crossing of the Hornsea Project Three cables with the Vanguard and Boreas cables, will have detrimental effects on the environment, the ecology, the population and potentially human health (see EMFs). However, most importantly, there will be '*cumulative effects*' and the Boreas's assessment of these effects has been understated.

Non-Disclosure Agreement (NDA)

Vattenfall and Ørsted have agreed a commercial NDA which will undoubtedly restrict what can be placed in the public domain. We insist that the NDA cannot be in the best interest of the environment, the residents of Norfolk, or the consultation process as a whole. This has been further complicated by the proposal of Equinor to extend the Dudgeon and Sheringham Shoal windfarms. Why are the discussions and plans between the developers not disclosed or co-ordinated?

We contest that the imposition of an NDA is limiting the Boreas Project managers from providing information on the design engineering of how the cables will cross and interact. The Project's representatives have claimed that they have had: "regular and detailed discussions" with Hornsea Three on the crossing issue. However, without the imposition of an NDA, these discussions could have, and should have, been made public within the respective public consultations, as exemplified by the discussions with other inter-related bodies, such as: the Marine Environment report contained in the PEIR. Therefore, we contest that the Norfolk Boreas consultation has failed in its duty of care to the Public.

We also question why the location and construction of cable bonding pits and their interaction with the environment is not evident in the project planning. Due to the length of the proposed transmission system, there will be a significant number of bonding pits, with a significant impact on the environment during the construction, operational, and post operational phases.

Electro-Magnetic Fields (EMFs)

The EMF issue is difficult, highly technical and open to conjecture. We have discussed, at length, the EMF issues with the Vanguard representatives and their selected specialists from National Grid plc., especially regarding the crossing point. Despite the depth of our discussion with the representatives, and theoretical provision of figures from National Grid plc (Attachment 3), we still have reservations about the level of chronic exposure we could have to the Extra Low Frequency (ELF) EMFs generated by the Hornsea Three Project cables if they opt for the HVAC option where they cross with the HVDC cables of Vanguard and Boreas. According to NG, there would be no public health issue whatsoever if Hornsea Three were to agree with Vanguard/Boreas and adopt the HVDC option. It was not until 6th May 2018 that any theoretical figures were provided, and not before considerable, significant effort, and direct campaigning from us, to gain any details regarding proposed EMFs from either Company. As a point of order, these details should have been contained within the respective PEIRs. We are relieved by Vattenfall's decision that Vanguard and Boreas will employ HVDC transmission systems thereby allowing a significant reduction in harmful EMFs (Reference 3). If there was a Public body capable of co-ordinating the plans, we could contest that Ørsted should also be required to utilise HVDC as it will have less environmental impact, with no ongoing public health implications regarding EMFs. That said, we, as members of the Public, should not have to seek information from the Project's representatives, the details should have been provided within the consultation documents and raises suspicions of what else is being hidden by the NDA.

The DECC Code of Practice is a 'Voluntary Code of Practice' which means it holds no legal substance. Should a developer install a transmission system that 'theoretically' meets the "voluntary guidelines" but, in practice, the measured field strengths exceed them, how would we, as members of the public, be able to challenge the developer? By way of example, the cladding on Grenfell Tower was installed with the installers and the developers following a "Voluntary Code of Practice" but the cladding was sadly, in all likelihood, the cause of grievous harm and death. Furthermore, the Code of Practice requires the developer to provide: "*A calculation or measurement of the maximum fields directly above the cable.*" That is a 'calculation' and not just a list of figures which are not open to scrutiny.

We have been supplied with a theoretical assessment of the EMFs at the crossing point for HVAC v HVAC and HVDC v HVDC (Attachment 3). However, now Vattenfall have elected to utilise HVDC, there are two further options which need to be modelled, that is: HVAC, 6 Circuits 'On Top' of HVDC 4 Circuits, and, HVAC 6 circuits 'On Bottom' of HVDC 4 Circuits. Both of the recent representations from Ørsted and Vattenfall for Hornsea Three and Norfolk Vanguard respectively, claimed that HVDC fields do not interact with the HVAC fields; these were absolutely false representations. However, there is now an opportunity with Norfolk Boreas to set the record straight and provide the facts and calculations required of a full and in-depth consultation. We ask the Inspectorate to make sure we are provided with the full picture for all the possible combinations of cables at the crossing point.

The strength of any HVDC (Static Field) will be dependent on its orientation with the Earth's Static Field and can be cumulative or reductive. Therefore, the Static Field from Vanguard/Boreas' cables can be calculated as the orientation of the cables is roughly known. However, and importantly, as stated in the NG's own document EMFs & Health (Reference 5) the HVAC (Electric Field) can be lifted to oscillate about the mean of any Static Field. The example used is that the UK's Earth's Static Field, which is approximately $50\mu\text{T}$ so an Electric Field (AC Field) of the same magnitude ($50\mu\text{T}$) would oscillate from $0\mu\text{T}$ to $100\mu\text{T}$. Therefore, in the modelled example, the full picture of what the EMF's at the crossing point would theoretically be, has still to be provided.

Also, from basic physics, placing a large conductor with a static magnetic field in an oscillating field will induce currents and have an effect on the conductor. There will be localised heating and the position of the HVAC cables, above or below the HVDC cables, will be significant and should be modelled accordingly. There are many questions regarding Public Health and the mix of HVDC with HVAC as can be read about in References 3, 4 and 5.

In conclusion to the EMF issue, the detail for the effect of magnetic fields at the crossing point of the Hornsea Three, Vanguard and Boreas cables is deficient. The theoretical figures provided subsequently to the PEIR, are not open to scrutiny. The 'Code of Practice' (Reference 4) is voluntary and therefore not necessarily legally binding. We reiterate that: where there is doubt, and more importantly, there is a lack of scientific evidence to support the argument, the Definitions of Precautionary Principle should be invoked. Within the principle, the World Commission on the Ethics of Scientific Knowledge and Technology under the auspices of UNESCO (amongst other World and European bodies) states:

"When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm ..." and goes on to say that:

"The judgement of plausibility should be grounded in scientific analysis."

Therefore, planning to create a potentially harmful environment, without plausible scientific research and analysis, could be deemed to be unethical and we will continue to challenge Vattenfall on this principle.

Environmental Impact Assessment

"The EIA Directive states that Environmental Statements should include a description of "interrelationships" between environmental aspects likely to be significantly affected by a proposed development. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Paragraph 5) states that "the EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant impacts of the proposed development on the

following factors: a) population and human health; b) biodiversity.....; c) land, soil, water, air and climate; d) material assets, cultural heritage and the landscape; e) the interaction between the factors referred to in sub-paragraphs a) to d).” ”

By omitting the interrelationship of routing the Hornsea Three transmission cables across those of Vanguard and Boreas the conditions of EIA Directive have not been met during the consultation. We ask that the Planning Inspectorate seriously considers why the crossing point was omitted from the PEIR. Also, why are the discussions between Ørsted, Vattenfall and National Grid plc regarding an NSIP, have not fully divulged for public scrutiny?

Conclusion

The Norfolk Boreas consultation is incomplete and flawed. The allocation of the connection point for the developer to connect to the UK NETS is arbitrary and has been left to another ‘for profit’ company, namely, National Grid plc, to make a nationally important decision which has far reaching consequences and dubious commercial intent. There is a lack of detail and discussion surrounding how and why it is necessary for two competing projects to cross their transmission systems. Most importantly, the Norfolk Boreas Project consultation allows insufficient consideration for any cumulative effects, interrelated effects, or, more importantly, any environmental impact for the cable crossing point. We implore the Planning Inspectorate to reconsider and co-ordinate the routing of off-shore wind farm transmission cables before rural Norfolk is subjected to a prolonged, damaging and disruptive programme of cable laying by successive developers intent on profiteering from permissive legislation. We ask that any DCO decision for the Norfolk Boreas Project whilst due consideration is given to the provision of an ORM (exampled at Attachment 4). For the provision of off-shore renewable energy generation to achieve its stated aim to “save the environment” then the infrastructure could and should remain off-shore.

Yours sincerely,

Ray & Diane Pearce

Attachments:

1. Email to National Grid – Hornsea 3 Project Connection Points – 7 August 2017.
2. Email reply from National Grid – Hornsea 3 Project Connection Points – 4 September 2017.
3. Vattenfall & Ørsted Circuit Crossings – EMF Information
4. Graphic of ORM.

Attachment 1 - Email to National Grid – Hornsea 3 Project Connection Points – 7 August 2017.

Dear Mr. Knight-Gregson,

We are now in possession of the Preliminary Environmental Impact Report (PEIR) for Dong Energy's Hornsea Three Project. We find the process unclear whereby the Norwich Main connection point was allocated to the developer.

In your previous email on the issue, you described the selection process as follows:

"Vattenfall applied first and through that joint assessment Necton was identified as their connection location. Norwich Main and Walpole were also considered. Necton was favoured over Norwich Main because of the comparative engineering and environmental challenges of routing connecting cables either north around Norwich close to the city or south through the National Park. Walpole was discounted because the longer connecting cables make that a less economic and efficient option for the Vattenfall projects. DONG Energy then subsequently applied and the same joint evaluation process was undertaken, with Norwich Main being identified for that connection through that process. The agreements for those connections could only be re-opened and options re-evaluated if the wind farm developers were to request that."

The PEIR discusses the National Grid connection offer at Volume 1, Chapter 4, 4.8.3 as follows:

"The aim of the CION is to provide an assessment of the options to connect a project to the National Electricity Transmission System (NETS). The process facilitates an appraisal of a variety of options and identifies the preferred onshore connection points and offshore transmission network configuration for the project. The CION is developed to initially make a representative Connection Offer to an applicant and subsequently develop the most economic and efficient design option for the connection of a project. This is assessed by both National Grid and the Developer from an economic and strategic perspective, in terms of the additional costs and investments required for the connection, based on the capacity requested and the timing of when the developer predicts that the connection will be required. An important element of this assessment is the cost that will be passed on to the consumer (the public and businesses) as a result of the works which will be required to ensure the network can accommodate the project. As part of the economic assessment, the CION considers the total life cost of the connection – assessing both the capital and projected operational costs to the onshore network (over a project's lifetime) to determine the most economic and efficient design option. Whilst a developer inputs into this process in terms of the comparative costs for different options which National Grid may consider, the eventual offer is determined by National Grid. "

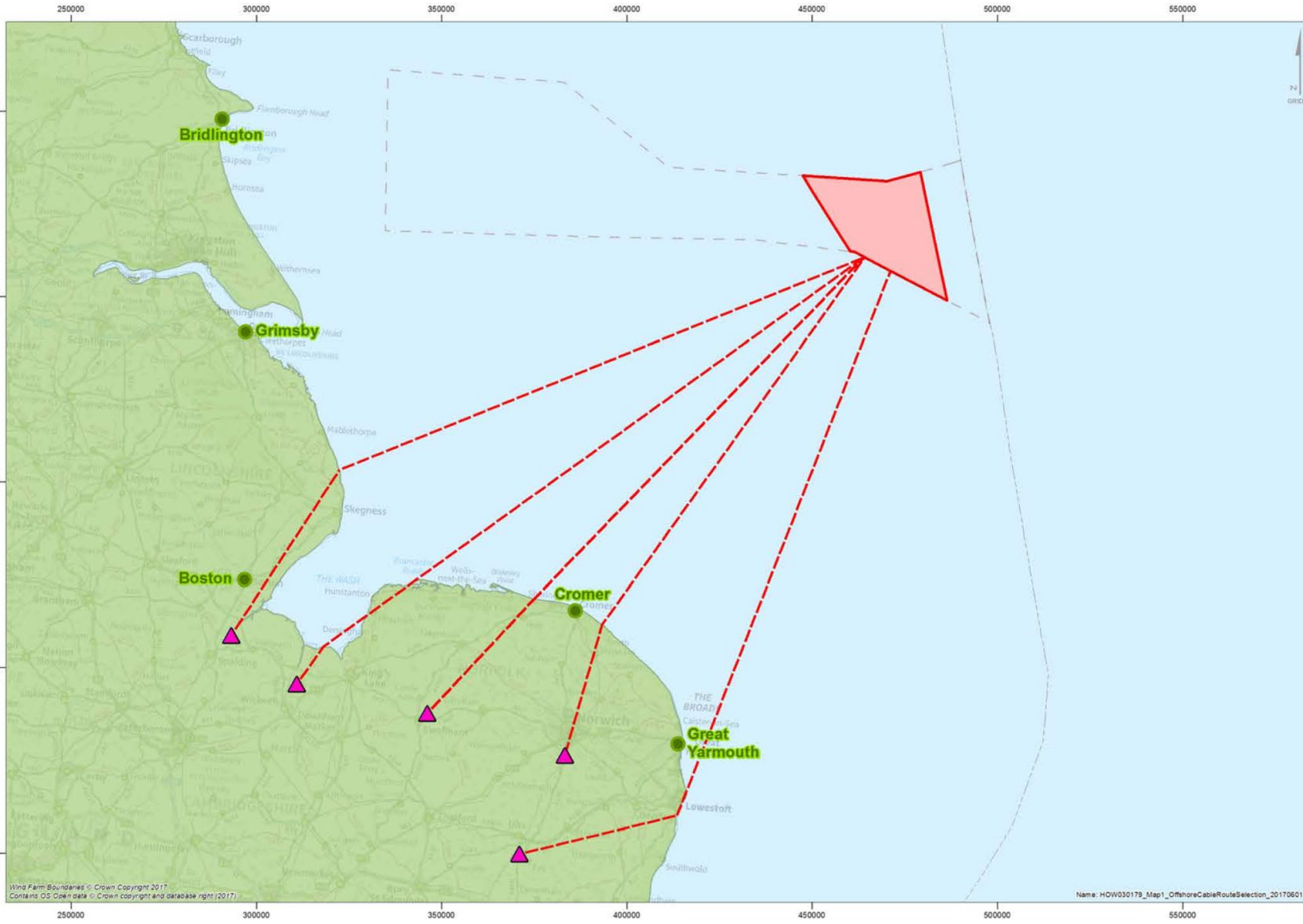
Therefore, contrary to your previous assertion that the connection offer is on a "first come, first served non-discriminatory" basis, for any connection point, Dong Energy assert that "the eventual offer is determined by National Grid"? Also, please clarify, who makes the decision on where the connection point is made, National Grid or the Developer?

The Hornsea Three Project explored five options: Norwich Main, Walpole, Newton, Bicker Fen and Eye (See attached). Accepting that Necton had been previously offered to Vattenfall, why was Walpole so easily discounted? Dong's Race Bank Project is routed through the Wash to Walpole and sets a precedence for any environmental impact. There is nothing in either the PEIR, or the details provided by yourself, that would discount Walpole as not being more cost effective than Norwich Main. The cable length would be approximately the same when considering the need to route an on-shore cable around Norwich from landfall at Weybourne, and, would be primarily a Marine Cable with approximately a 6 mile on-shore requirement. We contest that the cost of excavating 55km's of land, with a 60m trench, 1.5m deep, as in the current plan, will be significantly more expensive than routing the cables through the Wash to connect at Walpole. We do not accept that this decision was made on comparative costs and believe that there is a different underlying issue which is not being placed for scrutiny in the public consultation process.

We respectfully ask on what criteria was Norwich Main offered by National Grid as the only connection point for the Hornsea Three project?

Yours sincerely,

Ray & Diane Pearce



▲ Grid Connection Options
 --- Indicative Cable Route Options
Hornsea Three
 ■ Turbine Array Area
 - - - Former Hornsea Zone Boundary
Jurisdictional Boundaries
 --- Jurisdictional Boundaries

Reference System : ETRS89 Scale@A3:1:1,250,000
 Projection : UTM Zone 31N Vertical reference: LAT

| REV | REMARK | DATE |
|-----|---------------|----------|
| 00 | Initial Issue | 01/08/17 |
| | | |
| | | |

Hornsea Project Three
Grid Connection and Indicative Route Options

Doc no: HOW030179_Map1
 Created by: XAMUJ
 Checked by: KIEBE
 Approved by: JULCA

Wind Farm Boundaries © Crown Copyright 2017
 Contains OS Open data © Crown copyright and database right (2017)

Attachment 2 - Email reply from National Grid – Hornsea 3 Project Connection Points – 4 September 2017.

Dear Mr and Mrs Pearce,

Thank you for your email of 7 August and apologies for not getting back to you sooner.

The assessment of connection options for an offshore wind farm is a joint assessment. The offshore wind farm developer inputs to that assessment with offshore and onshore cable routeing considerations for the wind farm connection cables. National Grid looks at the onshore transmission network implications of connecting at different locations. Ultimately National Grid does have to make an offer in response to the connection application, but the assessment of options is a collaborative one whereby the connection point is agreed between the parties. The connection offer is then made by National Grid reflecting the outcome of the joint assessment process. The assessment of options and connection offer for the Vattenfall projects was made first because Vattenfall made their application first. The connection application process is a first come, first served process.

For the Hornsea Three project, a range of options were jointly considered with DONG Energy, including Walpole amongst others as you point out. Connecting at Walpole would involve a longer cable connection and consenting challenges for DONG Energy, that they are best placed to expand on. A new substation would also be needed somewhere in the vicinity of the existing Walpole substation. We wouldn't be able to simply extend the existing Walpole substation because that would give rise to system issues. Norwich Main was identified as the preferred connection option by DONG Energy and National Grid as it presented the shortest overall cable route and the lowest environmental risk.

I hope that's helpful to you. Thank you again for your questions. I will forward a copy of my response to the DONG Energy project team should you wish to discuss any aspects with them.

Yours sincerely

Steve Knight-Gregson

Regional External Affairs Manager



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 fields³. 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.

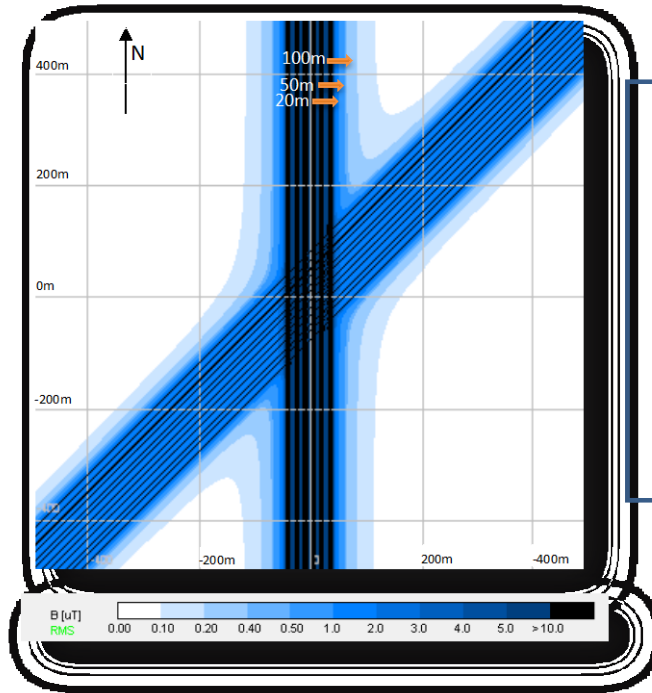
The calculated fields are shown below and are a small fraction of the AC and DC ICNIRP limits.

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 |

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.

AC magnetic field calculations for HVAC cable crossings



Calculated worst-case AC Magnetic Fields

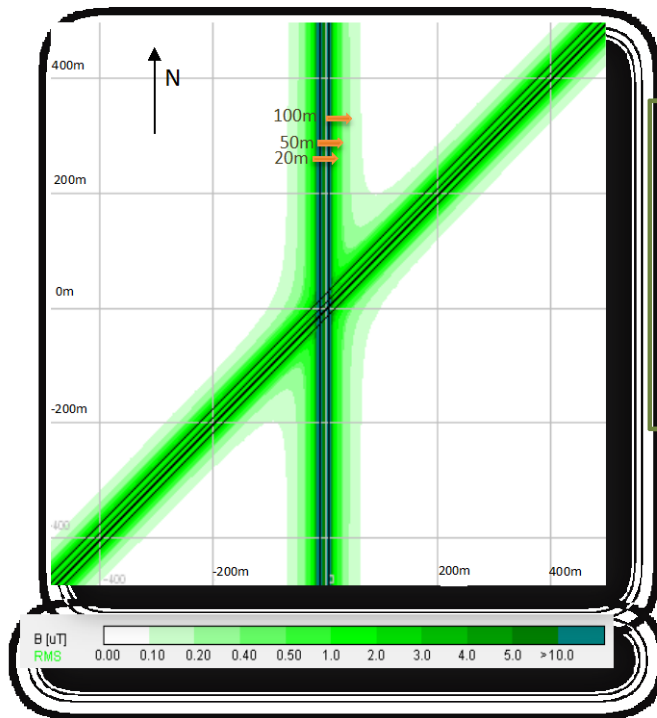
| | Distance perpendicular from outer cable (m) | | | |
|----------------------------------|---|------|------|------|
| | Peak | 20m | 50m | 100m |
| Magnetic field (μT) | 50.7 | 1.14 | 0.49 | 0.23 |
| % ICNIRP exposure limit* | 14% | <1% | <1% | <1% |

*AC public exposure limit of 360 μT

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

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.

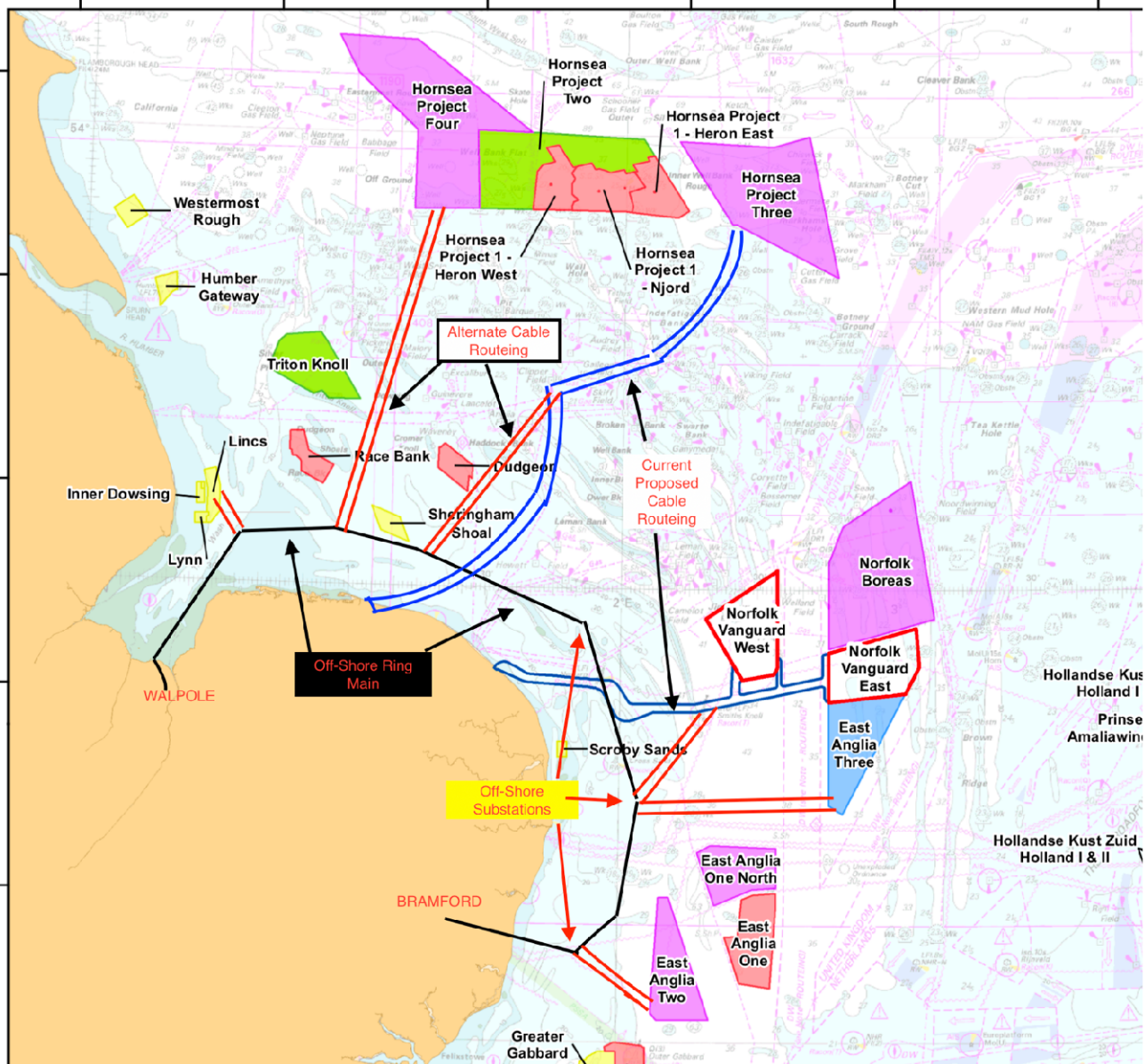
Where can I get further information?

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.

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.

Off-Shore Ring Main (ORM) Graphic



Notes:

1. Not to scale.
2. Off Shore SubStations on platforms as per current plans for Norfolk Vanguard.
3. Minimal On-shore impact with minor NETS extentions exemplared at Walpole and Bramford or other suitable coastal substation e.g – Sizewell or Bradwell.
4. Positive impacts.
 - a. Minimal On-shore infrastructure impact on the environment.
 - b. Shortened Marine Cable Routes for Developers.
 - c. Upgrade to NETS infrastructure.
 - d. No on-shore disruption.
 - e. Pooled resource.
 - f. Reduced overall costs for individual projects.