

# Norfolk Boreas Offshore Wind Farm Applicant's Responses to the Examining Authority's Written Questions Appendices

## Section 9

Appendices 9.5 and 9.6

Applicant: Norfolk Boreas Limited

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*Photo: Ormonde Offshore Wind Farm*

# Norfolk Boreas Offshore Wind Farm

## Appendix 9.5

### National Grid Document ‘The Holford Rules’ Guidance on Routeing Overhead Lines

Written Questions 9.2.7

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*Photo: Ormonde Offshore Wind Farm*

# National Grid Substations and the Environment: Guidelines on Siting and Design

## Section 1

### INTRODUCTION

- 1 The National Grid Company plc's (National Grid's) policy statement on the environment recognises the importance of giving due regard to protecting and enhancing the environment and taking into account the environmental effects of the Company's actions. The Company has statutory duties in relation to preservation of amenity under Schedule 9 of the Electricity Act 1989, and has published a Schedule 9 Statement setting out the manner in which it proposes to meet these duties.
- 2 National Grid has a statutory duty under the Act to develop and maintain an efficient, co-ordinated and economical transmission system of electricity for England and Wales. New transmission lines, new substations, sealing end compounds, line entries, additions and extensions to existing substations may be required to provide new connections for customers or reinforcement of the national grid system arising from changes in the demand for and generation of electricity.
- 3 This document explains the approach National Grid takes towards such developments (Section II) and contains Guidelines (Section III) to assist those responsible for siting and designing substations to mitigate the environmental effects of such developments and so meet the Company's policy. The document complements the Company's Holford Rules guidelines on the routing of high voltage transmission lines and when appropriate should be used in conjunction with them.
- 4 The guidelines are to be used by National Grid staff, their consultants, and contractors in the siting and design of new substations and extensions to substations. They reflect the criteria the company requires its staff, consultants and contractors to satisfy.
- 5 As recognised in its Schedule 9 Statement National Grid places importance on consultation with statutory planning and amenity bodies over its proposals for new developments. National Grid believes that the availability of these guidelines will assist in such discussions by referring to the main considerations relevant to substation siting, and will thereby assist in achieving the most appropriate siting and design solutions.

**Approach to the Environment**

- 6 National Grid's environmental policy recognises the importance of giving due regard to protecting and enhancing the environment and taking into account the effect on the environment of all the Company's actions. Following the principle of integrating environmental considerations into all its activities, National Grid seeks to keep known adverse effects on the environment to a reasonably practicable minimum and, in accordance with its duties under Schedule 9 of the Electricity Act, the Company gives due regard to the preservation of amenity and takes reasonable steps to mitigate the effects of its relevant proposals. To achieve these aims the Company therefore has to balance technical, economic and environmental considerations to reach reasonably practicable development proposals.
- 7 The guidelines (Section III) deal with the amenity issues associated with the siting and design of new substations and major extensions or major modifications to existing substations. They cover a range of key issues from the time options are initially considered to final design, including form, silhouette and colour of the entire development in relation to the surrounding area, and also related issues such as overhead line entries, since these are dominant features in any substation.

**Environmental Report**

- 8 In order to achieve these objectives, the environmental effects of new substations and extensions or modifications to existing substations will be assessed and where appropriate an environmental report prepared describing the effects and mitigative measures. Items to be considered are summarised in Appendix A.

**Integrating Environmental Considerations into Power System Planning**

- 9 The nature of transmission system planning is such that scheme proposals and options may go through various stages before it is finally decided to proceed with construction.
- 10 The purpose of each proposal for substation, sealing end compound or line entry development should be set out in a brief, and a range of system and siting options should be evaluated and documented as part of the selection of the preferred solution. In each case the effects of the overall development on the environment should be assessed, prior to a commitment to a particular site or design.

- 11 When it is clear a project is likely to proceed, an assessment should be made of any additional skills required to deal effectively with the range of environmental, land use, planning and design issues. Consideration should also be given to consultation as soon as reasonably possible with appropriate statutory planning and amenity bodies.

#### **Liaison with other Electricity Companies**

- 12 National Grid will encourage and recommend other parties such as power generators or regional electricity companies to adopt these guidelines when working with National Grid on proposals for substations, sealing end compounds or line entries.

#### **Post Construction Review**

- 13 Following completion of the project, a review should be undertaken to check that the necessary measures identified in the environmental report have been implemented.

### **Section III**

### **GUIDELINES**

#### **Overall System Options and Site Selection**

- 1 In the development of system options including new substations, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum.

#### **Amenity, Cultural or Scientific Value of Sites**

- 2 The siting of new National Grid substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.

- **Notes:**

- 1 *Internationally and nationally designated areas of highest amenity, cultural or scientific value are:*

*National Parks;*

*Areas of Outstanding Natural Beauty;*  
*Heritage Coasts;*  
*World Heritage Sites;*  
*Ramsar Sites;*  
*Sites of Special Scientific Interest;*  
*National Nature Reserves;*  
*Special Protection Areas;*  
*Special Areas of Conservation.*

- 2 *Care should be taken in relation to all historic sites with statutory protection eg Ancient Monuments, Battlefields and Listed Buildings.*
  - 3 *Account should be taken of Government Planning Policy Guidance and established codes of practice.*
  - 4 *Account should be taken of any development plan policies relevant to the siting or design of substations.*
- 3 **Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable.**

#### **Local Context, Land Use and Site Planning**

- 4 **The siting of substations, extensions and associated proposals should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.**

• **Notes:**

- 1 *A preliminary study should be undertaken to identify the extent of land required to meet both operational and environmental needs.*
- 2 *In some instances it may be possible to site a substation partially or fully enclosed by existing woodlands.*
- 3 *Topographical information should be obtained at an early stage. In some cases a geotechnical survey may be required.*

- 5 **The proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum.**

• **Notes:**

- 1 *Allow sufficient space for screening of views by mounding or planting.*
  - 2 *Consider appropriate noise attenuation measures where necessary.*
  - 3 *Use security measures which minimise visual intrusion from lighting.*
  - 4 *Consider appropriate on-site water pollution prevention measures.*
  - 5 *Consider adjoining uses and the amenity of local inhabitants.*
- 6 The land use effects of the proposal should be considered when planning the siting of substations or extensions.**

- **Notes:**

- 1 *Issues for consideration include potential sterilisation of nationally important land, eg Grade 1 agricultural land and sites of nationally scarce minerals.*
- 2 *Effects on land drainage.*

### **Design**

- 7 In the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum.**

- **Notes:**

- 1 *With outdoor equipment, a preference should be given normally to a low profile design with low height structures and silhouettes appropriate to the background.*
- 2 *Use lightweight narrow section materials for taller structures especially for gantries over about 6 metres in height.*
- 3 *Commission exterior design and colours appropriate to the surroundings.*
- 4 *Materials and colours for buildings, equipment and fencing should be chosen to harmonise with local surroundings.*
- 5 *Where possible avoid the use of prominent insulators by consideration of available colours appropriate to the background.*
- 6 *Where possible site buildings to act as visual screens for switchgear.*
- 7 *Ensure that the design of high voltage and low voltage substations is co-ordinated by early consultation between National Grid and its customers.*
- 8 *Where there are particular technical or environmental*

*constraints, it may be appropriate to consider the use of Gas Insulated Switchgear (GIS) equipment which occupies less space and is usually enclosed within a building.*

*9 Early consideration should be given to the routeing of utility service connections.*

**8 Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.**

**• Notes:**

*1 Assess the benefit of removing redundant substation equipment from existing sites where this would improve their appearance.*

**9 The design of access roads, perimeter fencing, earthshaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings.**

**Line Entries**

**10 In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance.**

**11 The inter-relationship between towers and substation structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.**

**END**



# Norfolk Boreas Offshore Wind Farm

## Appendix 9.6

### National Grid Document ‘The Horlock Rules’ Guidance on Substation Siting

Written Questions 9.2.7

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*Photo: Ormonde Offshore Wind Farm*

Guidelines on overhead line routeing were first formulated in 1959 by Sir William later Lord, Holford, who was a part-time member of the CEGB. National Grid has reviewed these guidelines, known as the 'Holford Rules', and concluded that they have stood the test of time. National Grid therefore intends to continue to employ them as a basis of the company's approach to overhead line routeing.

Since the formulation of the original Rules, formal requirements for environmental assessment have been introduced. Whilst environmental assessment for overhead lines addresses wider topics than the visual amenity issue on which the Rules concentrate, they remain a valuable tool in the selecting and assessing potential route options as part of the environmental assessment process. The original Rules and their added notes of clarification are set out below.

## **GUIDELINES FOR THE ROUTEING OF NEW HIGH VOLTAGE OVERHEAD TRANSMISSION LINES**

### **Rule 1:**

**Avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the first line in the first place, even if the total mileage is somewhat increased in consequence.**

#### Note on Rule 1

Investigate the possibility of alternative routes, avoiding if possible the areas of the highest amenity value. The consideration of alternative routes must be an integral feature of environmental statements.

Areas of highest amenity value are:

Areas of Outstanding Natural Beauty  
National Parks  
Heritage Coasts  
World Heritage Sites

### **Rule 2:**

**Avoid smaller areas of high amenity value, or scientific interests by deviation; provided that this can be done without using too many angle towers, ie the more massive structures which are used when lines change direction.**

#### Note on Rule 2

Some areas (e.g. Site of Special Scientific Interest) may require special consideration for potential effects on ecology (e.g. to their flora and fauna).

Where possible choose routes which minimise the effects on the setting of areas of architectural, historic and archaeological interest including Conservation Areas, Listed Buildings, Listed Parks and Gardens and Ancient Monuments.

**Rule 3:**

**Other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers.**

Note of Rule 3

Where possible choose inconspicuous locations for angle towers, terminal towers and sealing end compounds.

**Rule 4:**

**Choose tree and hill backgrounds in preference to sky backgrounds wherever possible; and when the line has to cross a ridge, secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees.**

**Rule 5:**

**Prefer moderately open valleys with woods where the apparent height of towers will be reduced, and views of the line will be broken by trees.**

Note on Rules 4 & 5

Utilise background and foreground features to reduce the apparent height and domination of towers from pan viewpoints.

Minimise the exposure of numbers of towers on prominent ridges and skylines.

Where possible avoiding cutting extensive swathes through woodland blocks and consider opportunities for skirting edges of copses and woods.

Protecting existing vegetation, including woodland and hedgerows, and safeguard visual and ecological links with the surrounding landscape.

**Rule 6:**

**In country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concentration or 'wirescape'.**

Note on Rule 6:

In all locations minimise confusing appearance.

Arrange wherever practicable that parallel or closely related routes are planned with tower types, spans and conductors forming a coherent appearance; where routes need to diverge, allow where practicable sufficient separation to limit the effects on properties and features between the lines.

**Rule 7:**

**Approach urban area through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach line and the substation, go carefully into the comparative costs of the undergrounding, for lines other than those of the highest voltage.**

Note on Rule 7

When a line needs to pass through a development area, route it so as to minimise as far as possible the effect on development.

Alignments should be chosen after consideration of effects on the amenity of existing development and on proposals for new development.

When siting substations take account of the effects of the terminal towers and line connections that will need to be made and take advantage of screening features such as ground form and vegetation.

## **SUPPLEMENTARY NOTES**

### **Residential Areas**

Avoid routing close to residential areas as far as possible on grounds of general amenity.

### **Designations of County, District and Local Value**

Where possible choose routes which minimise the effect on Special Landscape Areas, areas of Great Landscape Value and other similar designations of County, District or Local value.

## **Alternative Tower Designs**

In addition to adopting appropriate routeing, evaluate where appropriate the use of alternative tower designs now available where these would be advantageous visually, and where the extra cost can be justified.