MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 1, Annex 3.4: 1 Electro-Magnetic Fields (EMF) Compliance Statement

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Glossary

Term	Meaning
400 kV grid connection cables	Cables that will connect the proposed onshore substations to the existing National Grid Penwortham substation.
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
EIA Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this document as the Transmission Assets, for ease of reading.
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023 and adopted in 2024.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substations.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Scoping Opinion	Sets out the Planning Inspectorate's response (on behalf of the Secretary of State) to the Scoping Report prepared by the Applicants. The Scoping Opinion contains the range of issues that the Planning Inspectorate, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment process.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).

Acronyms

Acronym	Meaning
DECC	Department of Energy and Climate Change
DESNZ	Department Energy Security & Net Zero
ELF	Extremely Low Frequency
EMF	Electro-Magnetic Fields
HVAC	High Voltage Alternating Current
ICNIRP	International Commission on Non-ionizing Radiation Protection
NPS	National Policy Statement
PEIR	Preliminary Environmental Information Report
ES	Environmental Statement

Units

Unit	Description
km	Kilometres
m	Metres
µT	Microtesla
V.m-1	Volts per metre
kV.m-1	Kilovolts per metre

1 Electro-Magnetic Fields (EMF) Compliance Statement

1.1 Introduction

1.1.1.1 This Electro-Magnetic Fields (EMF) Compliance Statement has been produced as part of the application for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (referred to hereafter as 'the Transmission Assets').

1.1.1.2 Morgan Offshore Wind Limited (Morgan OWL), a joint venture between bp Alternative Energy Investments Ltd. (bp) and Energie Baden-Württemberg AG (EnBW), is developing the Morgan Offshore Wind Project. The Morgan Offshore Wind Project is a proposed wind farm in the east Irish Sea.

1.1.1.3 Morecambe Offshore Windfarm Ltd (Morecambe OWL), a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd., is developing the Morecambe Offshore Windfarm, also located in the east Irish Sea.

1.1.1.4 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid. The key components of the Transmission Assets include offshore, landfall and onshore elements. Details of the activities and infrastructure associated with the Transmission Assets are set out in Volume 1, Chapter 3: Project Description of the Environmental Statement (ES) (document reference F1.3).

1.2 Overview

1.2.1.1 This annex provides an overview of EMFs; guidelines pertaining to EMFs; how the Transmission Assets' onshore infrastructure has been designed with regard to EMF resulting in the anticipated effect predicted to be negligible; and the Applicant's commitment to comply with EMF exposure public health protection standards guidelines**.**

1.3 EMFs

1.3.1.1 All electrical systems, including natural processes and living organisms generate EMF. Public exposure to power-frequency EMFs comes from a range of sources including household wiring and appliances, low-voltage distribution power lines or underground cables, and high-voltage transmission power lines or underground cables.

1.3.1.2 Typical residential exposure to power-frequency magnetic fields is in the range of 0.01 µT to 0.2 µT. Low-voltage distribution circuits, household wiring and electrical appliances are typically the main sources of residential exposure. Household appliances can sometimes generate higher magnetic fields, albeit typically for a short duration while in use. Examples of magnetic field strengths from household appliances in operation are 6 to 2,000 µT at 3 cm distance from a hairdryer in use, or 2 to 20 µT at 30 cm from a vacuum cleaner or microwave.

1.3.1.3 The earth's natural (static) magnetic field varies between about 30 µT at the equator and 60 µT in high latitudes and is approximately 50 µT in the UK. The earths static atmospheric electric field at ground level is normally about 100 V.m-1 in fine weather and may rise to many thousands of volts per metre during thunderstorms.

1.3.1.4 The strength of the magnetic field decreases rapidly horizontally and vertically with distance from source. EMF effects diminish rapidly with distance, often requiring only a few metres, or less, to reach background levels. Objects such as trees, buildings and earth will reduce the strength further still.

1.4 EMF public exposure guidelines and policy

1.4.1.1 Whilst there are no statutory regulations in the UK with regard to exposure to EMF, the UK Government has adopted the following guidelines published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), 'ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (1-100 kHz) (ICNIRP, 2010), that update the, 'ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (Up To 300 Ghz)' (ICNIRP, 1998).

1.4.1.2 These guidelines, specify reference levels that should not be exceeded to ensure public health protection, taking into account various scenarios and potentially more vulnerable groups.

1.4.1.3 National Policy Statement (NPS) for Energy (EN-5) sets out the UK Government's policy for Electricity Networks Infrastructure (Department Energy Security & Net Zero (DESNZ), 2023). Paragraph 2.9.49 in reference to the ICNIRP guidelines states:

"*The reference levels are such that compliance with them will ensure that the basic restrictions are not reached or exceeded. Exceeding the reference levels does not necessarily mean that the basic restrictions will not be met; this would be a trigger for further investigation into the specific circumstances*".

1.4.1.4 The Applicants consideration of EMF-related requirements in NPS EN-5 is presented in Table 1.1.Table 1.1:

1.4.1.5 In 2012, the then UK Government's Department of Energy and Climate Change, now DESNZ, published, 'Power Lines: Demonstrating compliance with EMF public exposure guidelines A voluntary Code of Practice' (DECC, 2012). The public health protection guideline reference level specified in this document for power frequency magnetic field exposure is 360 µT and for electric field exposure it is 9 kV.m-^{1}.

1.4.1.6 The Applicants will comply with both the ICNIRP guidelines (2010,1998) and the UK Governments voluntary Code of Practice on public exposure guidelines.

Table 1.1: Summary of NPS EN-5 policies relevant to this annex

Summary of NPS EN-5 policies	How and where considered
EN-5 Paragraph 2.11.9: This NPS does not repeat the detail of the ICNIRP 1998 guidelines on restrictions or reference levels. The government has developed with the electricity industry a Code of Practice, 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice', published in February 2011 that specifies the evidence acceptable to show compliance with ICNIRP 1998 guidelines and is also in line with the terms of the 1999 EU Council Recommendation on EMF exposure.	The Transmission Assets will adopt the International Commission on Non-ionizing Radiation Protection guidelines (ICNIRP) (2010,1998) and the UK Government voluntary Code of Practice on EMF public exposure Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice' (DECC, 2012).
EN-5 Paragraph 2.11.10: Before granting consent to an overhead line application, the Secretary of State should be satisfied that the proposal is in accordance with the guidelines, considering the evidence provided by the applicant and any other relevant evidence. It may also need to take expert advice from the Department of Health and Social Care,	The Transmission Assets will adopt the International Commission on Non-ionizing Radiation Protection guidelines (ICNIRP) (2010, 1998) and the UK Government voluntary Code of Practice on EMF public exposure Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice' (DECC, 2012). The Transmission Assets application does not include overhead lines within the application, therefore, this does not apply for this project.
EN-5 Paragraph 2.11.11: Industry currently applies optimal phasing to 275kV and 400kV overhead lines voluntarily wherever operationally possible, which helps to minimise the effects of EMF. The government has developed with industry a voluntary Code of Practice, 'Optimum Phasing of high voltage double-circuit Power Lines – A Voluntary Code of Practice' published in March 2012, that defines the circumstances where industry can and will optimally phase lines with a voltage of 132kV and above.	The Transmission Assets does not include overhead lines within the application, therefore, this guidance does not apply for this project.
EN-5 Paragraph 2.11.12: Where the applicant cannot demonstrate that the line will be compliant with the Electricity Safety, Quality and Continuity Regulations 2002, with the exposure guidelines as specified in the Code of Practice on compliance, and with the policy on phasing as specified in the Code of Practice on optimal phasing then the Secretary of State should not grant consent.	The Transmission Assets will be compliant with Electricity Safety, Quality and Continuity Regulations 2002.

Summary of NPS EN-5 policies	How and where considered
EN-5 Paragraph 2.11.13: Undergrounding of a line would reduce the level of EMFs experienced, but high magnetic field levels may still occur immediately above the cable. It is the government's policy that power lines should not be undergrounded solely for the purpose of reducing exposure to EMFs.	As detailed in the Volume 1, Chapter 3: Project Description of the ES (document reference F1.3), the Applicants have committed to undergrounding the onshore export cables and the 400 kV grid connection cables (CoT12) (Volume 1, Annex 5.3, document reference F1.5.3), to minimise potential impacts on local communities and avoid, where possible, key environmental and engineering constraints. It can be confirmed that the power lines are not to be undergrounded solely for the purpose of reducing exposure to EMFs. Furthermore, the Transmission Assets will adopt the International Commission on Non-ionizing Radiation Protection (ICNIRP) guidelines (2010,1998).
EN-5 Paragraph 2.11.14: In order to avoid unacceptable adverse impacts of EMFs from electricity network infrastructure on aviation, the Secretary of State will take account of statutory technical safeguarding zones defined in accordance with Planning Circular 01/03, or any successor, when considering recommendations for DCO applications. More detail on this issue can be found in Section 5.5 of EN-1.	The Aviation Chapter of the ES (Volume 3, Chapter 11, document reference F3.11) considers potential impacts of EMFs from the Transmission Assets on aviation receptors. The Applicants are and will continue to engage with relevant stakeholders, to avoid unacceptable adverse impacts on aviation.
EN-5 Paragraph 2.11.15: Where a statutory consultee on the safeguarding of technical facilities identifies a risk that the EMF effect of electricity network infrastructure would compromise the effective and safe operation of such facilities, the potential impact and siting and design alternatives will need to have been fully considered as part of the application.	The potential effects of EMF generated by electricity network infrastructure on the effective and safe operation of technical facilities is considered in Volume 3, Chapter 11: Aviation and radar of the ES (document reference: F3.11). Specifically, Volume 3, Chapter 11: Aviation and radar of the ES (document reference: F3.11) considers the potential impacts from EMFs of onshore export cable on Communication, Navigation and Surveillance (CNS) infrastructure at Blackpool Airport. The Applicants are, and will continue to engage with relevant stakeholders to minimise potential effects. Justification for the location of the Transmission Assets, including the design and/or environmental constraints considered is provided in Volume 1, Chapter 4: Site Selection and Consideration of Alternatives of the ES (document reference: F1.4).
EN-5 Paragraph 2.11.16: The diagram below shows a basic decision tree for dealing with EMFs from overhead power lines.	The Transmission Assets do not include overhead lines within the application, therefore, this does not apply for this project.

1.4.1.7 In 2020, the ICNIRP published “2020: Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz)”. The Transmission Assets infrastructure pertains to what is termed Extremely Low Frequency (ELF) element (1Hz and 3kHz). The 2020 guidelines are, therefore, not concerned with the frequencies relevant to the Transmission Assets power distribution infrastructure.

1.5 Consultation

1.5.1.1 A formal request for a Scoping Opinion was provided to the Planning Inspectorate (PINS) on 28 October 2022, with a subsequent Scoping Opinion provided 08 December 2022 by the Inspectorate on behalf of the Secretary of State in respect of the Transmission Assets.

1.5.1.2 The EIA Scoping Report proposed that the construction and decommissioning stages, and operational infrastructure, are unlikely to generate significant levels of radiation, including EMF, and the infrastructure would be designed to reduce EMF emissions, comply with current guidance, or be inaccessible to the general public. The Inspectorate was in agreement that this can be scoped out of assessment as a specific chapter of the Environmental Statement.

1.5.1.3 At public consultation events held as part of statutory consultation on the Preliminary Environmental Information Report (PEIR), feedback was received highlighting concerns surrounding human health issues arising from EMF associated with the onshore infrastructure.

1.5.1.4 In response the Applicants have made the following commitment, CoT106, (see Volume 1, Annex 5.3: Commitments Register, document reference F1.5.3):

“The EMF Compliance Statement has been prepared and submitted with the application for development consent. The Applicants will design the Transmission Assets to ensure compliance with relevant electro-magnetic field (EMF) exposure public health protection standards, where appropriate, as specified in the International Commission on Non-ionizing Radiation Protection publication ‘Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (Up To 300 Ghz) (1998)’ and the Department for Energy and Climate Change publication ‘Power Lines: Demonstrating compliance with EMF public exposure guidelines A voluntary Code of Practice (2012)’”.

1.5.1.5 This annex seeks to provide further detail on this topic, including the commitment to comply with EMF exposure public health protection standards guidelines set out in section 1.4, above. It also supplements Volume 1, Annex 5.1: Human health (document reference F1.5.1).

1.6 Transmission Assets onshore electricity infrastructure

1.6.1.1 The Applicants have made the following commitment, CoT12, (see Volume 1, Annex 5.3: Commitments Register, document reference F1.5.3):

"The onshore export cables and the 400 kV grid connection cables will be completely buried underground for the entire length. No overhead pylons will be installed as part of the Transmission Assets."

1.6.1.2 The onshore transmission infrastructure associated with the Transmission Assets, that is High Voltage Alternating Current (HVAC) infrastructure, will generate EMFs when in operation. These will comply with the guidelines discussed in **section 1.4**, above.

1.6.1.3 The onshore export cable corridor will be approximately 17 km in length. Onshore export cables will be installed in cable circuits (with each circuit typically comprising three cables). The cable circuits will be buried in up to six separate trenches along the onshore export cable corridor (up to four for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets). The cable circuits will be separated from each other to prevent heat build-up which increases resistivity in the cables and reduces transmission efficiency.

1.6.1.4 Each trench would have a typical depth of approximately 1.8 m. This burial depth may be exceeded where the route crosses features such as pipelines and land drains. It is also noted that the trench depth may vary according to ground conditions.

1.6.1.5 The 400 kV grid connection cables will be connected to the National Grid substation at Penwortham. The 400 kV grid connection cable corridor will be approximately 13 km in length. Installation of the 400 kV grid connection cables within the grid connection area will take place in the same manner as the onshore export cable corridor. The cable circuits will be buried in up to four separate trenches along the onshore export cable corridor (up to two for the Morgan Offshore Wind Project: Transmission Assets and two for the Morecambe Offshore Windfarm: Transmission Assets).

1.6.1.6 The cables would not produce an external electric field at ground level due to the shielding of the cable sheath and burial material.

1.6.1.7 The onshore electrical infrastructure would not be energised during construction or decommissioning (no electricity transmitted) and therefore there would be no EMFs generated at those times.

1.7 Conclusion

1.7.1.1 The Applicants made the decision to underground all onshore electrical cables. As a result, the EMFs they produce are not capable of reaching levels which exceed the public health exposure guideline limits.

1.7.1.2 Whilst the Applicants have not completed a detailed design and EMF modelling exercise, in line with the Scoping Opinion, the Transmissions Assets underground cables can be expected to produce magnetic fields of up to 96 µT at the ground's surface. The strength of these fields is below the guideline level of 360 µT and is, therefore, deemed not to have an impact on public health.

1.7.1.3 The Applicants have committed (CoT106) that in line with NPS EN-5, all onshore electricity infrastructure built as part of the Transmission Assets will be designed to comply with both the ICNIRP (2010, 1998) guidelines and UK

Government voluntary Code of Practice (DECC, 2012) on levels of public exposure, to ensure the threshold for impacts to humans is not met and or exceeded.

1.8 References

ICNIRP. (1998). *ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (Up To 300 Ghz)*. International Commission. Available: [redacted]. Accessed 7 March 2024.

ICNIRP. (2010). *ICNIRP Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic And Electromagnetic Fields (1-100 kHz)*. International Commission. Available: [redacted] Accessed 7 March 2024.

ICNIRP. (2020). *Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz).* International Commission. Available: [redacted] Accessed 7 March 2024.

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