11 Electric and Magnetic Fields (EMF)

Introduction

EMF

11.1 All equipment that generates, distributes or uses electricity produces Electric and Magnetic Field (EMFs). The UK power frequency is 50Hz which is therefore the principal frequency of the EMFs produced, which are also known as Extremely Low Frequency (ELF) EMFs.

11.2 Electric fields depend on the operating voltage of the equipment producing them and are measured in V/m (volts per metre). The voltage applied to equipment is a relatively constant value. Magnetic fields depend on the electrical currents flowing, which vary according to the electrical power requirements at any given time and are measured in µT (microteslas). Both fields diminish rapidly with distance from the source and are present in all areas where electricity is in use (e.g. office and homes), arising from electric cabling and equipment in the area.

11.3 Substations and sealing end compounds (SECs) do not produce significant EMFs outside their boundaries. In EMF terms, therefore, the principal effect of the Proposed Project is to replace a length of overhead line (the VIP subsection) with a length of underground cable. Unlike OHLs, underground cables produce no external electric fields, but they do produce magnetic fields. Overhead lines and underground cables both produce their highest magnetic fields on, or close to, the route centreline. Which produces the higher magnetic field out of the OHL and the underground cable depends on the details of the design, which have not been finalised yet. However, in both cases, the fields will comply with the relevant exposure limits (see next paragraph). The magnetic fields from both the OHL and the underground cables will fall rapidly with distance to the side of the route. The field from an underground cable falls more rapidly, falling to the levels found in UK homes in general in perhaps 20m compared to perhaps 100m for an OHL, though both these values depend on the specifics of the design.

11.4 Where cables are placed in a tunnel, they will produce even lower fields both directly above the tunnel route and to the sides.

11.5 This means that, in general, the underground cable produces lower exposures to people, but, because all fields from both OHLs and underground cables comply with the relevant exposure limits, no particular significance attaches to this fact.

Electromagnetic Compatibility (EMC)

11.6 Electromagnetic Compatibility (EMC) relates to the possibility that electric and magnetic fields, principally at radio frequencies, emitted by the Proposed Project might interfere with existing electric or electronic equipment in the vicinity, or might itself be vulnerable to interference from other equipment.

Legislation and Policy

EMF

11.7 Whilst there are no statutory regulations in the UK that limit the exposure of the public to power-frequency electric or magnetic fields, responsibility for implementing appropriate measures for the protection of the public from EMFs lies with the UK Government. In 2004, the Government adopted guidelines published in 1998 (International Commission on Non

Ionising Radiation Protection, 1998) by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in the terms of the 1999 EU recommendation (EU Council, 1999) on public exposure to EMFs. This policy of compliance with guidelines was reaffirmed in 2009, when one additional precautionary policy relating to high-voltage power lines, optimum phasing, was introduced. The Department of Energy and Climate Change (DECC) has published three Codes of Practice (Department of Energy and Climate Change, 2012) which have been agreed between the Energy Network Association and the Government, which specify how compliance with these exposure guidelines and with the policy on optimum phasing will be determined.

11.8 It is National Grid's policy as set out in its Public Position Statement (National Grid, 2014) on the subject to "…*as a minimum comply with EMF regulations, guidelines and practices in force in which we operate*". This policy will be applied to the Proposed Project, and all the equipment installed will comply with the guidelines.

11.9 When the EMFs resulting from electrical equipment comply with the relevant exposure guidelines as specified by Government and with the additional precautionary policies, no significant effects from EMFs are expected.

11.10 Given that no significant effects from EMFs from the Proposed Project are expected, it is, therefore, proposed that the assessment of EMFs is scoped out of the Environmental Assessment Report.

11.11 National Grid, however, recognises public concern regarding EMFs and therefore proposes to provide all the relevant information on EMFs as part of the application. Comprehensive information on EMFs as they relate to the Proposed Project will be provided in a separate document which will be submitted alongside the Environmental Assessment Report. The Environmental Assessment Report will include relevant information from this document as appropriate. The information provided will include evaluations of the EMFs that will be produced as well as background information on EMFs and the scientific evidence relating to them. The evaluations will be performed according to the provisions of the DECC Code of Practice 'Power Lines: Demonstrating Compliance with Public Exposure Guidelines' (Department of Energy and Climate Change, 2012).

Electromagnetic Compatibility (EMC)

11.12 EMC is controlled by EU Directive 2014/30/EU[1] (the EMC Directive) which replaced Directive 2004/108/EC[2] on 20 April 2016. These Directives are enacted in UK law by Regulations. The current Regulations are the 2016 Regulations[3], which are based on the 2014 Directive.

11.13 The requirements of the EMC Directive are that the electromagnetic disturbance that an apparatus generates should not exceed a level allowing radio and telecommunication equipment and other apparatus to operate as intended; and that the apparatus itself has an adequate level of intrinsic immunity to electromagnetic disturbance to enable it to operate as intended.

11.14 Permanent, fixed infrastructure of the type owned and operated by National Grid is covered by specific provisions in the EMC Directive relating to "fixed installations".

[1] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

[2] Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

[3] The Electromagnetic Compatibility Regulations 2016. Statutory Instrument 2016 No. 1091

11.15 Article 6 of the 2014 Directive requires conformity with Annex 1, Part 2 of that Directive, which in turn requires that "*A fixed installation shall be installed applying good engineering practices*…." in order to avoid EMC problems.

11.16 The main potential source of interference from transmission systems such as the proposed Project arises from radio frequency (RF) emissions caused by corona discharge from overhead lines and substations (underground cables do not in general produce any significant radio-frequency emissions). Corona discharge results from the high voltages on the surface of conductors particularly in wet conditions where water droplets can concentrate the electric field; it is recognisable by the characteristic crackling sound. RF emissions and corona levels are limited by designing to National Grid's technical specifications which include BS5049-3[4], along with other equipment specific standards such as BS EN60437[5] for the insulators on the pylons. Thus, National Grid's Transmission System applies good engineering practices and meets the essential requirements detailed in Annex 1 of the EMC Directive.

11.17 This was initially documented and certified under the provisions of the EMC Directive then in force, the 1989 Directive 89/336/EEC[6], by creating a Technical Construction File (TCF) for the National Grid transmission system. The TCF is based on a combination of extensive on-site testing (overhead lines and substations) and examination of National Grid's technical specifications, policies and standards to ensure that RF noise and corona are adequately addressed. The on-site surveys showed that there were no significant emission problems to address; and equipment technical specifications and policies ensured equipment was designed in accordance with British Standards to limit RF noise and corona. Using the rationale of the TCF it was determined that the National Grid system meets the essential requirements of the EMC Directive and a Certificate of Conformity was issued.

11.18 The subsequent EMC Directive, 2004/108/EC, and the current EMC Directive 2014/30/EU, no longer use the terminology of a TCF and Certification. However, the essential requirements of the Directives have not changed, and the content of the TCF remains a valid method of documenting compliance with the EMC Directive.

11.19 The Project would contain electrical equipment that is the same as or similar to that tested by on-site measurements documented in the TCF and would also be designed to the same technical specifications.

11.20 Given that the provisions of the current EMC Directive are met through using good engineering practice and applying the relevant technical standards, and that the EMC performance of this system has been certificated as compliant by a Competent Body following appropriate on-site testing, the Project would present no issues with TV or radio interference under normal operating conditions.

[4] British Standards Institution. EN BS 5049-3: Radio interference characteristics of overhead power lines and high voltage equipment: Part 3- Code of practice for minimising the generation of radio frequency noise. London: BSI, 1994.

[5] British Standards Institution. BS EN 60437:1998 Radio interference test on high voltage insulators. London: BSI, 1998.

[6] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility