# EMF assessment of proposed Margam substation extension

National Grid

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| **Author** | William Grey | | |
| **Approved by** | Hayley Tripp | | |
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# 1. Introduction

1.1.1 This report provides an assessment of the electric and magnetic fields (EMFs) associated with the proposed Margam substation extension. This report comprises of a desktop analysis and is based upon site specific design information.

1.1.2 National Grid has a very clear policy on EMFs, as set out in its Public Position Statement[1] which states "*…In all our operations, as a minimum we comply with EMF regulations, guidelines or practices in force in the countries and different jurisdictions in which we operate.*" and this policy would be applied to this Proposed Project.

1.1.3 The Margam substation extension comprises of a 275kV Gas Insulated Switchgear (GIS) design that will connect to the transmission network through the existing overhead line.

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

### Electric fields

1.1.5 Electric fields depend on the operating voltage of the equipment producing them and are measured in volts per metre, symbol V/m. The operating voltage of most equipment is a relatively constant value. Electric fields are shielded by most common building materials, trees, fences, and the earth when buried underground, and diminish rapidly with distance from the source.

1.1.6 Substations are enclosed within a metal fence for the purpose of access control and security. Electric fields are shielded by these fences typically resulting in the majority of the electric field outside of a substation being produced by any connecting overhead lines.

### Magnetic fields

1.1.7 Magnetic fields are measured in microteslas, symbol μT, and depend on the electrical currents flowing, which vary according to the electrical power requirements at any given time.

1.1.8 Magnetic fields are not significantly shielded by common building materials, but they do diminish rapidly with distance from the source.

# 2. EMF policy and exposure limits

2.1.1 Whilst there are no statutory regulations in the UK that limit the exposure of the public to power-frequency EMFs, responsibility for implementing appropriate measures for the protection of the public lies with the UK Government. In 2004, the Government adopted guidelines published in 1998 by the International Commission on Non-Ionizing Radiation

[1] National Grid's Public Position Statement on Electric and Magnetic Fields
https://www.nationalgrid.com/electricity-transmission/document/137286/download

Protection (ICNIRP)[2] in line with the terms of the 1999 EU recommendation[3] on public exposure to EMFs. This policy is set out in National Policy Statement EN-5[4].

2.1.2 The ICNIRP guidelines[2] are explained, together with details of how to apply them, in the DECC Code of Practice 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice'[5]. It is the electricity industry's policy to comply with Government policy on EMFs, and this Code of Practice forms an integral part of this. The assessment included in this report has been undertaken in line with the principles of this Code of Practice[5].

2.1.3 The ICNIRP public exposure limits which apply in the UK are documented in Table 2.1. Occupational exposure limits are significantly higher than those in place to protect members of the public.

**Table 2.1: Recommended Public Exposure Limits Values for Power Frequencies**

| Public Exposure Levels | Magnetic Fields | Electric Fields |
|---|---|---|
| Basic restriction (induced current density in central nervous system) | 2mA/m$^2$ | |
| Reference level (external unperturbed field) | 100μT | 5kV/m |
| Field corresponding to the basic restriction | 360μT | 9kV/m |

2.1.4 The EMF policies applied to this installation ensures compliance with the exposure guidelines in Table 2.1.

# 3. Assessment of Substation Extension

3.1.1 This assessment considers the electric and magnetic fields produced by the proposed substation extension.

3.1.2 The proposed substation compound will be enclosed in a security fence which will act to prevent access to any equipment on site. These fences also prevent the public from approaching any equipment close enough to experience electric or magnetic fields that exceed the public ICNIRP guidelines. As part of the Code of Practice[5], the Energy Networks Association produce a list of types of equipment where the design is such that it is not capable of exceeding the ICNIRP exposure guidelines[6], i.e. a list of equipment that is therefore compliant with the guidelines.

[2] International Commission on Non Ionising Radiation Protection (1998) Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields, Health Physics
[3] EU Council (1999) Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC)
[4] Department for Energy Security & Net Zero (2023) *National Policy Statement for Electricity Networks Infrastructure (EN-5)*
[5] Department of Energy and Climate Change. Power Lines: Demonstrating compliance with EMF public exposure guidelines. A voluntary Code of Practice. London, 2012.
[6] https://www.emfs.info/compliance/public/

3.1.3 The proposed substation extension will contain air cored reactive equipment. These will be designed in accordance with National Grid technical specifications to ensure that maximum magnetic field levels at the public boundary remain within the established public exposure limits.

# 4. Conclusions

4.1.1 The Government, acting on the advice of authoritative scientific bodies, has put in place appropriate measures to protect the public from EMFs. These measures comprise compliance with the relevant exposure limits. These measures are set out in a Written Ministerial Statement, National Policy statement EN-5[4], and the Code of Practice[5].

4.1.2 The design of the proposed substation is fully compliant with the Government policies on EMFs. Specifically, all the fields produced by the substation are below the relevant exposure limits.