



One Earth Solar Farm

Volume 6.0 Environmental Statement [EN010159]

Volume 3: Technical Appendices Supporting ES Volume 2

Appendix 18.4: High Marnham Substation Cumulative Carbon Emissions

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A.18 Climate Change (GHG Emissions)

A.18.1 Background

- A.18.1.1. The Proposed Development was to connect to the existing High Marnham 275kV substation. NESO has developed plans to upgrade the High Marnham substation and the Chesterfield to High Marnham 275kV circuit to bring offshore wind power generation to the Midlands and beyond. The Proposed Development is not the triggering party for that proposed upgrade (hereafter referred to as the 'proposed National Grid High Marnham Substation') but has accepted an offer to connect to the upgraded infrastructure, once delivered.
- A.18.1.2. Although GHG emissions associated with the proposed National Grid High Marnham Substation are outside the scope of the GHG assessment for the Proposed Development, it is considered that it may be helpful to provide further information on potential emissions associated with the proposed National Grid High Marnham Substation into which the Proposed Development is likely to connect. Therefore, for contextual purposes, this section provides an outline of the GHG emissions associated with the proposed National Grid High Marnham Substation and an evaluation of the associated likely cumulative GHG effects.
- A.18.1.3. It should be noted that the High Marnham Substation has the potential to support multiple future renewable energy development in the region, additional to the Proposed Development. As such, no judgement has been made as to the percentage of these emissions which should be apportioned to the Proposed Development and figures have been provided here for the full proposed National Grid High Marnham Substation based on the available information.

A.18.2 Impact Assessment

- A.18.2.1. In the absence of any technical information about the Substation, whole lifecycle emissions for the proposed National Grid High Marnham Substation have been estimated by applying the same assumptions as those used for the calculation of emissions for the on-site substations within the Proposed Development, scaled to the size of the proposed National Grid High Marnham Substation (220 m x 490 m) .
- A.18.2.2. The predicted whole lifecycle GHG emissions of the proposed National Grid High Marnham Substation, as well the whole lifecycle GHG Emissions are presented in Table 1 below and consider emissions from all lifecycle modules (A1 – C4).

Table 1: Whole Lifecycle GHG Emissions Summary

Component	Lifecycle GHG Emissions (TCO ₂ e)
Proposed Development (total footprint)	1,972,166
Proposed National Grid High Marnham Substation	66,462
Proposed Development with proposed National Grid High Marnham Substation	2,038,628

A.18.2.3. The net lifetime emissions and carbon intensity of the Proposed Development in conjunction with the proposed National Grid High Marnham Substation are presented in **Table 2**. These values take account of the energy offset of the Proposed Development compared to natural gas-fired electricity generation (i.e. counterfactual scenario). The net lifetime emissions and carbon intensity of the Proposed Development in isolation (i.e. without the proposed National Grid High Marnham Substation) are also presented for comparison.

Table 2: Lifecycle Emissions and Carbon Intensity

Component	TCO ₂ e		Lifecycle Carbon Intensity (gCO ₂ e/kWh)
	Gross Lifecycle GHG Emissions	Net Lifecycle GHG Emissions	
Proposed Development	1,972,166	-2,105,192	32.6
Proposed Development with proposed National Grid High Marnham Substation	2,038,628	-2,038,730	33.7

A.18.2.4. Overall, the Proposed Development (both in isolation and in conjunction with the proposed National Grid High Marnham Substation) will lead to avoided GHG emissions (i.e. a net emissions reduction) by replacing electricity currently generated by more carbon intensive methods (such as natural gas Combined Cycle Gas Turbine (CCGT)) and enable the removal of fossil fuel generation from the UK electricity grid.

A.18.2.5. A comparison of the carbon intensity value of the Proposed Development in conjunction with the proposed National Grid High Marnham Substation (as presented in **Table 2** above) against the carbon intensity values presented in **Table 14.2 of ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]**, shows the carbon intensity to fall toward the lower end of the range for that generated from the poly-silicon, ground mounted solar energy sources, and is therefore indicative of good practice for a ground-mounted solar PV system. It also falls considerably below the carbon intensity

values for electricity generated by fossil fuel power stations, even when taking account of Carbon Capture and Storage (CCS).

- A.18.2.6. As such, the effects of the Proposed Development in conjunction with the High Marnham Substation are consistent with those presented in **ES Volume 2, Chapter 14: Carbon and Climate Change [EN010159/APP/6.14]** of the ES, which are '**Significant Beneficial**'.



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