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# Bramford to Twinstead Reinforcement

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**nationalgrid**

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# 1. Greenhouse Gas Assessment

## 1.1 Overview

- 1.1.1 National Grid Electricity Transmission plc (here on referred to as National Grid) is making an application for development consent to reinforce the transmission network between Bramford Substation in Suffolk, and Twinstead Tee in Essex. The Bramford to Twinstead Reinforcement ('the project') would be achieved by the construction and operation of a new electricity transmission line over a distance of approximately 29km (18 miles), the majority of which would follow the general alignment of the existing overhead line network.
- 1.1.2 This Greenhouse Gas (GHG) Assessment has been produced to support the application for development consent and the accompanying Environmental Statement (ES) under the Planning Act 2008.
- 1.1.3 The Scoping Opinion (**application document 6.6**) states at paragraph 3.3.15 that '*the ES should include a description and assessment (where relevant) of the likely significant effects the Proposed Development may have on climate (for example having regard to the nature and magnitude of GHG emissions)*'. In ID 4.15.1, the Planning Inspectorate further states that '*the ES should provide an assessment of GHG emissions during construction and operation*'. The summary is presented in this appendix.

## 1.2 Legislative and Policy Background

- 1.2.1 The Climate Change Act 2008 set in law a long-term target to reduce the UK's GHG emissions to 80% below 1990 levels by 2050, and established the system of UK carbon budgets. In 2019, the UK government furthered the ambition and committed to bring all GHG emissions to net zero by 2050. To meet these targets, the government has set five-yearly carbon budgets which currently run until 2037 (Table 1.1). Each carbon budget restricts the amount of GHG the UK can legally emit in a five year period.

Table 1.1 – The UK Carbon Budgets (Climate Change Committee, 2022)

Budget	Years	Carbon Budget Level	Reduction Below 1990 Levels
First carbon budget	2008-2012	3,018 MtCO <sub>2e</sub>	25%
Second carbon budget	2013-2017	2,782 MtCO <sub>2e</sub>	31%
Third carbon budget	2018-2022	2,544 MtCO <sub>2e</sub>	37% by 2020
Fourth carbon budget	2023-2027	1,950 MtCO <sub>2e</sub>	51% by 2025
Fifth carbon budget	2028-2032	1,725 MtCO <sub>2e</sub>	57% by 2030
Sixth carbon budget	2033-2037	965 MtCO <sub>2e</sub>	78% by 2035

- 1.2.2 The UK emitted 427 million tonnes of carbon dioxide equivalent (MtCO<sub>2e</sub>) in 2021 (Department for Business, Energy and Industrial Strategy (BEIS), 2023). This represented an increase of 5% compared to 2020, though was 5.3% lower than 2019. This variance is influenced by the COVID-19 pandemic restrictions which reduced emissions, particularly during 2020 and to a lesser extent during 2021. The final 2021 results are the most recently available at the time of assessment (07 March 2023).

- 1.2.3 As described in the Need Case (**application document 7.2.1**), the project plays a key role in delivering the UK Government's net zero ambitions and delivering up to 50GW of offshore wind connected by 2030. Addressing the shortfalls in transmission capacity is vital to facilitate the ambitious green targets set by the Government, and to contribute to the growth in renewable energy and the decarbonisation of the UK.

## 2. Methodology

### 2.1 Introduction

- 2.1.1 There are seven main GHG that contribute to climate change, as covered by the Kyoto Protocol. These are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF<sub>6</sub>) and nitrogen trifluoride (NF<sub>3</sub>). Different activities emit different gases, and organisations are advised to report on the Kyoto Protocol GHG produced by activities specific to their activities.
- 2.1.2 The GHG relevant to the project are CO<sub>2</sub> (associated with the embodied carbon within materials or from emissions generated from construction plant and vehicles), and SF<sub>6</sub>, which would be required in the proposed switchgear at the GSP substation and in the proposed circuit breakers at Bramford Substation. National Grid is working with a range of suppliers and manufacturers to develop alternatives to SF<sub>6</sub>. However, there are no suitable or viable alternatives available at the appropriate voltage at present. Further details on why SF<sub>6</sub> is necessary on the project can be found in ES Appendix 4.1: Good Design (**application document 6.3.4.1**).
- 2.1.3 Due to the relative proportion of CO<sub>2</sub> emissions, it is accepted practice that GHG are equated to CO<sub>2</sub> equivalents on the basis of their global warming potential. The BEIS Carbon Factors for reporting GHG emissions uses units of kilograms of carbon dioxide equivalent (kg CO<sub>2</sub>e). CO<sub>2</sub>e is the universal unit of measurement to indicate the global warming potential (GWP) of GHG, expressed in terms of the GWP of one unit of carbon dioxide. Therefore, the assessment references CO<sub>2</sub>e, which includes SF<sub>6</sub>.
- 2.1.4 This assessment considers only the GHG related directly to construction and operation/maintenance of the project. It does not seek to assess the contribution to reducing GHG and reaching net zero, as referred to in paragraph 1.2.3.

### 2.2 Methodology for Assessing Carbon on Projects

- 2.2.1 National Grid has processes in place for quantifying its CO<sub>2</sub>e emissions on its projects. These are proportionate to the stage of the project and the data available at that time. The three key stages are:
- Cost Book – this is used at the optioneering stage to compare the CO<sub>2</sub>e associated with different options. This includes a high level assessment of the capital (construction) and draws on generic assumptions around embodied CO<sub>2</sub> within raw materials. It also includes some operational CO<sub>2</sub>e with additional SF<sub>6</sub> CO<sub>2</sub>e calculations and CO<sub>2</sub>e of operational line loss data. The CO<sub>2</sub>e that is identified within the Cost Book can be factored into decisions about which option to take forward;
  - E-Hub database – this is used when a preferred option has been identified and allows a more detailed assessment of the baseline CO<sub>2</sub>e. This is focused on the capital (construction) carbon but includes more specific information regarding the materials than the Cost Book. This also includes a red, amber, green (RAG) status based on historical construction carbon data; and
  - Carbon Interface Tool (CIT) – this is provided to the contractors tendering for the project as they are required to provide a more detailed breakdown of materials, assets, equipment and energy that they propose to use in construction of the project. The CIT also considers the origin of materials, the transport distances, opportunities for reuse

of materials and low carbon alternatives. The CIT of all bidders are compared at tender to inform the evaluation and scoring of the tender.

- 2.2.2 The Carbon Asset Database underpins the GHG calculations in the Cost Book, E-Hub database and the CIT. Data within the Carbon Asset Database comes from a range of sources including the Inventory of Carbon and Energy database (Circular Ecology, 2019), plus Department for Environment, Food and Rural Affairs (Defra) emission factors (updated annually) and main equipment supplier data.
- 2.2.3 The Carbon Asset Database also includes a mix of 'before use stage' emissions (A1-5, which covers raw material supply, manufacture, transport to works site and construction) and 'use stage' emissions (including B6 Operational Energy Use and B8 Other Operational Processes).
- 2.2.4 National Grid has currently used the outputs of the Cost Book to estimate the CO<sub>2e</sub> associated with the project.

## 2.3 Cost Book

- 2.3.1 National Grid has used the Cost Book to complete a proportionate assessment on the embodied CO<sub>2e</sub> associated with construction and operation. As the main works contractor is not yet appointed, the assessment has been based on estimates of materials, using numbers built into the Cost Book excel tables. As the database contains commercial data, it is not appropriate to present the raw information that sits within the system.
- 2.3.2 Each project component is assessed as a line item and the CO<sub>2e</sub> associated with the component is automatically calculated using in-built values within the Cost Book. The Cost Book considers the embodied carbon of a range of materials necessary for construction of the project, including the aluminium and steel associated with the pylons, conductors and cables. It also includes aspects of construction including aggregates and hardstanding associated with the construction compounds and temporary access routes, fencing, trackway matting and an allowance for items such as vegetation removal.
- 2.3.3 The operational CO<sub>2e</sub> has also been estimated within the Cost Book. This includes the CO<sub>2e</sub> resulting from the energy used to enable the project to deliver its service during operation. It includes the CO<sub>2e</sub> associated with the operational transmission losses associated with the overhead line and SF<sub>6</sub> leakage over the asset life. The design life of the project is 40 years and therefore this period has been used for the purposes of the assessment.
- 2.3.4 The assessment does not take into account the current energy consumption of UK Power Networks to operate the existing 132kV overhead line (that would be removed as part of the project) and therefore the estimates within the operational assessment represent an overestimate of the carbon that would be consumed compared to the existing baseline.

# 3. Results and Discussion

## 3.1 Results and Discussion

- 3.1.1 The total CO<sub>2</sub>e estimated on the project is 111,484 tCO<sub>2</sub>e. This is split into 84,050 tCO<sub>2</sub>e for capital (construction) carbon (which would be spread over the whole construction duration), 26,133 tCO<sub>2</sub>e for transmission losses during 40 years of operation and 1,301 tCO<sub>2</sub>e for SF<sub>6</sub>.
- 3.1.2 There is currently no standard guidance for assigning significance in relation to a GHG/carbon emissions assessment. However, National Grid has been measuring carbon for many years and has developed RAG tables based on project type to identify if the emissions are above or below the average emissions for a project of the same type.
- 3.1.3 National Grid has also compared the estimated carbon emissions from the construction and operation of the project against the UK total emissions in 2021, to assess whether they represented a significant proportion of total UK emissions and therefore could have a material impact on the ability of the Government to meet its carbon reduction targets.
- 3.1.4 The project's construction phase is assumed to span the UK's fourth (2023 to 2027) and fifth (2028 to 2032) Carbon Budgets. These budgets provide a legal limit for the total volume of GHG emissions the UK can emit. As set out in Table 1.1, the fourth Carbon Budget is 1,950 million tonnes of CO<sub>2</sub>e (which equates to a 51% reduction from 1990 by 2025) and the fifth Carbon Budget is 1,725 MtCO<sub>2</sub>e (which equates to a 57% reduction from 1990 levels by 2030).
- 3.1.5 The UK's 2021 carbon emissions have been used as a guide, as this is the most recent data available at the time of the assessment. The final results for 2021 are available from the Government website (BEIS, 2023) and state that 427 Mt CO<sub>2</sub>e were emitted by the UK in 2021. The total carbon for construction of the project (84,050 tCO<sub>2</sub>e) is the equivalent of 0.02% of the 427 MtCO<sub>2</sub>e emitted by the UK as a whole in 2021 and also the equivalent of 0.02% for the average annual amount in the fifth carbon budget of 345 MtCO<sub>2</sub>e (1,725 MtCO<sub>2</sub>e divided by a five-year period).
- 3.1.6 Using the 2021 number, or future forecasts in the context of upcoming carbon budgets, the project emissions are immaterial to the UK meeting its future carbon budget targets or its overall 2050 net zero target.
- 3.1.7 The operation stage carbon has been estimated to be 26,133 tCO<sub>2</sub>e. Using the 2021 carbon emissions, during each year of operation, the transmission losses are estimated to be average CO<sub>2</sub>e equivalent emissions of 653 CO<sub>2</sub>e (26,133 tonnes divided by an estimated 40 year design life), representing 0.0002% of the UK 2021 CO<sub>2</sub>e emissions.

## 3.2 Further Measures

- 3.2.1 National Grid follows the principles of PAS 2080 throughout the project development process and require this of its contractors. PAS 2080 is a global standard for managing infrastructure carbon. This framework looks at the whole value chain, aiming to reduce carbon and reduce cost through more intelligent design, construction and use.
- 3.2.2 National Grid would request the tendering contractors to propose low carbon alternative materials as part of their response to the main works package. The tendering contractors would also complete National Grid's CIT, where they provide a more detailed breakdown

of materials, assets, equipment and energy that they propose to use in construction of the project. The CIT also considers the origin of materials, the transport distances, opportunities for reuse of materials and low carbon alternatives. The CIT of all bidders are compared at tender to inform the evaluation and scoring of the tender.

- 3.2.3 On tender award this CIT would become the 'carbon baseline' for the project and the contractor is incentivised to demonstrate a reduction in capital carbon over the duration of construction of the project. The CIT and carbon footprint is reviewed on a monthly basis and there would be key performance indicators in place that incentivise the contractor to reduce the carbon footprint against the initial baseline.
- 3.2.4 National Grid has committed to deliver Carbon Neutral construction by end 2025/26, with the focus on the absolute reduction of impacts associated with the delivery for the project and measured via the CIT. Residual emissions of all National Grid projects within the portfolio at the end of 2025/26 (and future years) would be aggregated and offsets delivered in line with National Grid's Offsetting policy guidelines.

## 4. Conclusion

- 4.1.1 This appendix summarises the GHG assessment that has been undertaken on the project. It has calculated the CO<sub>2</sub> equivalent (CO<sub>2</sub>e) comprising both CO<sub>2</sub> and SF<sub>6</sub> for the project for the construction and operational phases, and compared them against relevant carbon budgets and emissions. This addresses the Scoping Opinion request from the Planning Inspectorate to include consideration of the nature and magnitude of GHG emissions within the application for development consent.
- 4.1.2 As noted in paragraph 2.1.2, SF<sub>6</sub> is required in the switchgear at the GSP substation and in the proposed circuit breakers at Bramford Substation. National Grid is working with a range of suppliers and manufacturers to develop alternatives to SF<sub>6</sub>. However, there are no suitable or viable alternatives available at the appropriate voltage at present. Further details on why SF<sub>6</sub> is necessary on the project, alternatives considered and monitoring proposed can be found in ES Appendix 4.1: Good Design (**application document 6.3.4.1**).
- 4.1.3 The construction and operational CO<sub>2</sub>e numbers are not considered to have a material impact on the ability of the Government to meet its carbon reduction targets and therefore are not significant. This also has a degree of conservatism in it associated with steel and other materials that are likely to be imported from outside of the UK. The UK Carbon Budget would not be affected by embodied carbon from imported materials as the Carbon Budget only applies to domestic emissions, therefore should steel and other material be imported, the contribution would be significantly lower. The numbers in this assessment are therefore considered to represent a worst case.
- 4.1.4 As noted in Chapter 2: Methodology, the assessment considered only the GHG related directly to construction and operation/maintenance of the project. The project would, however, make an important contribution to reducing GHG and reaching the UK government's target of net zero by 2050, by supporting the distribution of greener energy.

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