

LIGHTHOUSE GREEN FUELS PROJECT

Preliminary Environmental Information Report

Chapter 11: Greenhouse Gases

The Inspectorate Reference: EN010150

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Volume 1

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11. GREENHOUSE GASES

11.1. INTRODUCTION

- 11.1.1. The purpose of the Proposed Scheme is to help the UK in its trajectory to achieve its net zero target. The Proposed Scheme is set to produce Sustainable Aviation Fuel (SAF) through the use of waste and, if possible, connection to a carbon capture facility to avoid the release of carbon into the atmosphere. The Proposed Scheme's goal is to produce net benefits due to the use of SAF, when compared to the use of the traditional jet fuel.
- 11.1.2. This Chapter reports the preliminary assessment of the likely significant effects of the Proposed Scheme on greenhouse gases (GHGs) during construction and operation and describes:
- Relevant policy, legislation and guidance;
 - Consultation undertaken to date;
 - The methodology for assessment; and
 - Potential effects of the Construction, Operational and Decommissioning Phases.

MATTERS SCOPED OUT

- 11.1.3. The EIA Scoping Report¹ sets out effects that are considered unlikely to be significant and therefore have not been considered further in this assessment. As described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**, the demolition of the existing TV1 and TV2 facilities are not included in the DCO so will not be considered in the GHG assessment. The matters that have been scoped out are:
- Disposal of construction waste (Lifecycle stage A5);
 - Land use, land use change and forestry waste (Lifecycle stage A5);
 - Operational - maintenance, repair, replacement, refurbishment (Lifecycle stages B2-5); and
 - Land use, land use change and forestry (Lifecycle stage B8).

11.2. POLICY, LEGISLATION, AND GUIDANCE

- 11.2.1. The policy, legislation, and guidance relevant to the assessment of GHGs for the Proposed Scheme is detailed in **Appendix 4A: Policy, Legislation and Guidance (Volume 3)**. The policy, legislation and guidance relevant to this Chapter is outlined below:
- Policy:
 - Overarching National Policy Statement (NPS) for Energy (EN-1)¹;
 - NPS for Natural Gas Electricity Generating Infrastructure (EN-2)²;
 - Infrastructure Carbon Review, 2013³;
 - UK Net Zero Strategy⁴;

- Industrial Decarbonisation Strategy⁵;
- Jet Zero Strategy⁶;
- Stockton-on-Tees Local Plan⁷;
- Redcar and Cleveland Local Plan⁸; and
- Net Zero Strategy for Tees Valley⁹.
- Legislation:
 - United Nations Framework Convention on Climate Change¹⁰; and
 - The Climate Change Act (2008), as amended 2019¹¹.
- Guidance:
 - Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA 2022)¹²; and
 - The GHG Protocol¹³.

11.3. SCOPING OPINION AND CONSULTATION

11.3.1. An EIA Scoping Opinion¹⁴ was received by the Applicant from the Planning Inspectorate (The Inspectorate) on behalf of the Secretary of State on 01 September 2023. The responses from the Inspectorate in relation to GHG and how these requirements will be addressed by the Applicant are set out in **Table 11-1** below.

Table 11-1: Summary of the EIA Scoping Opinion in relation to GHG

Secti on ID	Applicant’s Proposed Matters to Scope Out	Scoping Opinion Comments	Response
3.8.1	Emissions from disposal of waste – construction (A5)	<p><i>“The Applicant proposes to scope out greenhouse gas (GHG) emissions arising from the disposal of waste during construction on the basis that these are not expected to be large as the waste will mostly be inert.</i></p> <p><i>The Inspectorate is content that this matter can be scoped out of further assessment on the basis that a significant effect is unlikely. However, the ES should confirm the type and quantity of construction waste.”</i></p>	It is confirmed that the ES will include the types and quantities of construction waste in the Materials and Waste assessment (see Chapter 13: Materials and Waste (Volume 1)).
3.8.2	Emissions from disposal of vegetation – construction (A5)	<p><i>“The Applicant proposes to scope out emissions from the disposal of vegetation on the basis that these are not expected to be large. No further justification is provided, and</i></p>	Quantities and management of waste vegetation arisings will be covered in the Materials and Waste Assessment of the ES and will not be addressed in the GHG Chapter. Further detail on

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<p><i>the extent of vegetation removal required is not provided.</i></p> <p><i>Nevertheless, considering the location of the Site (the majority of the Site is "urban" land with a small area classified as Grade 5 agricultural land) the Inspectorate is content that significant effects are unlikely to occur from the disposal of vegetation and therefore this matter can be scoped out of further assessment."</i></p>	<p>this can be found in Chapter 13: Materials and Waste (Volume 1).</p>
3.8.3	Emissions from maintenance, repair, replacement, refurbishment – operation (B2-5)	<p><i>"The Applicant proposes to scope this matter out on the basis that the Proposed Development is not designed with the expectation that any significant plant maintenance, repair, or refurbishment will be required.</i></p> <p><i>The Inspectorate is content that this matter can be scoped out of further assessment, however the ES should describe how the Proposed Development has considered the design life of the various components to limit the potential for comprehensive replacement/refurbishment during operation."</i></p>	<p>It is confirmed that the ES will provide information on the various components' replacement/refurbishment cycles during operation. However, in accordance with the comment, this matter will be scoped out of the GHG assessment.</p>
3.8.4	Land use change (B8)	<p><i>"The Applicant proposes to scope this matter out on the basis that the reduction in carbon sequestration due to land use change is not considered to be large.</i></p> <p><i>The extent of vegetation removal, and therefore the impact on carbon sequestration, is not provided within the Scoping Report¹. However, the Inspectorate has considered the characteristics of the Proposed Development Site, and its location on brownfield land, and is content that significant effects resulting from land</i></p>	<p>Quantities and management of waste vegetation arisings will be covered in the Materials and Waste Assessment of the ES and will not be addressed in the GHG Chapter. Further detail on this can be found in Chapter 13: Materials and Waste (Volume 1).</p>

Section ID	Applicant's Proposed Matters to Scope Out	Scoping Opinion Comments	Response
		<p><i>use change are not likely to occur. Therefore, the Inspectorate is content that this matter can be scoped out of further assessment.”</i></p>	
3.8.5	Decommissioning phase (C1-4)	<p><i>“Table 12-6 states that the decommissioning phase is proposed to be scoped out on the basis that uncertainties exist surrounding deconstruction techniques and the carbon intensity of fuels used within these techniques. Contrastingly, paragraph 12.8.2 states that the assessment will consider GHG emissions during the decommissioning phase. It is therefore unclear whether decommissioning is proposed to be scoped out.</i></p> <p><i>For the avoidance of doubt, the Inspectorate does not agree that decommissioning phase effects can be scoped out. Accordingly, the ES should include an assessment of the decommissioning phase, or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effects. Where uncertainty exists regarding decommissioning activities a worst-case scenario should be used.”</i></p>	<p>The decommissioning phase has been scoped into the EIA. A preliminary assessment of GHG impacts associated with the Decommissioning Phase are discussed in this Chapter and an assessment of the emissions will be included within the ES.</p>

11.3.2. No specific consultation activities have or will be undertaken to inform the GHG assessment to date.

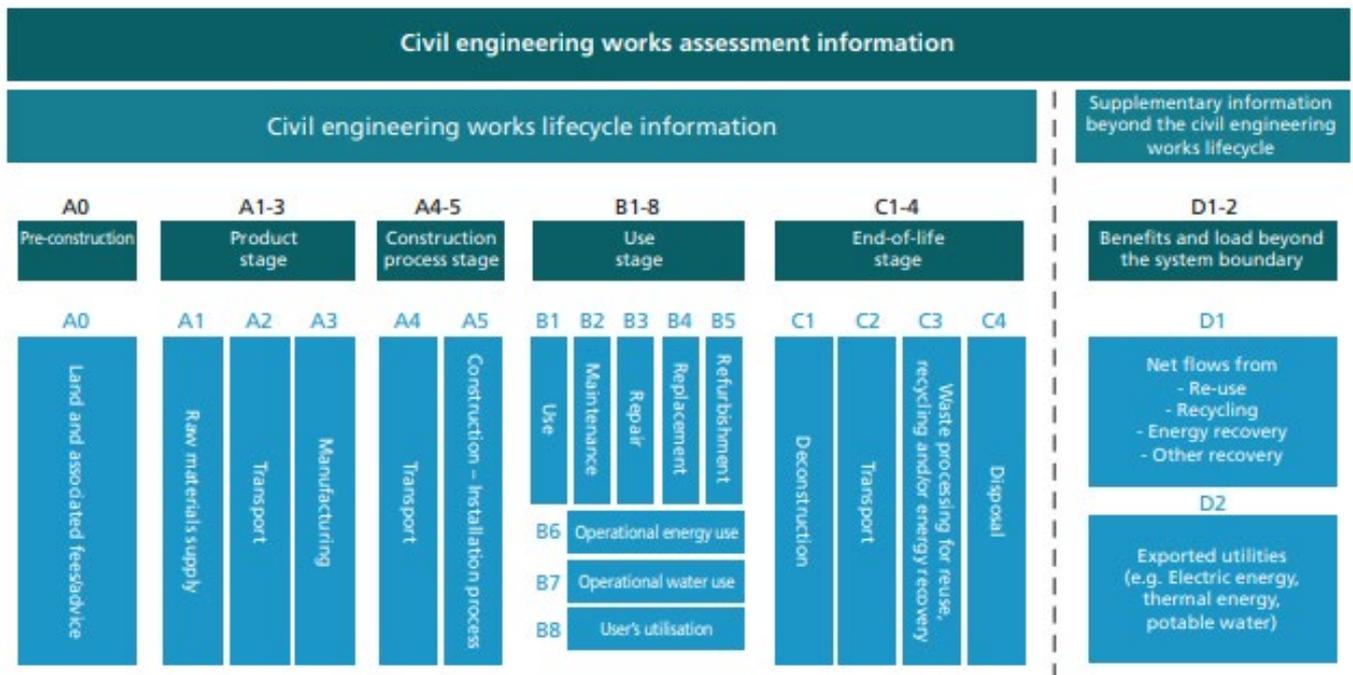
11.4. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

11.4.1. The GHG assessment of the Proposed Scheme has been undertaken in line with the legislation, policy and guidance described in **Section 11.2** of this Chapter.

POTENTIAL SIGNIFICANT EFFECTS

11.4.2. The construction and operation phases of the Proposed Scheme may have potential significant effects, each phase has been considered in relation to the PAS 2080:2023¹⁵ lifecycle stages as seen in **Figure 11-1**.

Figure 11-1: PAS 2080 Life Cycle Stages



11.4.3. As set out in the EIA Scoping Report¹ and agreed with the Planning Inspectorate in their Scoping Opinion¹⁴, the following effects are considered to be potentially significant and therefore have been considered further in this assessment.

- Construction:
 - Product stage (manufacture and transport of raw materials to suppliers) (A1-3);
 - Transport of materials to Site (A4);
 - Plant and equipment use during construction (A5); and
 - Transport of waste (A5).
- Operation:
 - Operational energy use (B6);
 - Operational water use (B7);
 - Solvent used for the operation of the Carbon Capture Facility (B8);
 - End-User Emissions (B8/D) (Storage); and
 - End-user emissions (B8/D) (Transport).
- Decommissioning (C1-4).

11.4.4. Due to the uncertainty about future connectivity to carbon capture (via the Net Zero Teesside (NZE) project or alternative CO₂ Transport and Storage (T&S) Infrastructure)), two scenarios will be assessed:

- Scenario 1 – The Proposed Scheme will not be connected to NZE or alternative CO₂ T&S Infrastructure upon operation of the Proposed Scheme. A delayed connection will be established at a later date, with all emissions to atmosphere for the duration being biogenic as a result of the utilisation of Biocarbon Feedstock.
- Scenario 2 – The Proposed Scheme will be connected to NZE or alternative CO₂ T&S Infrastructure immediately upon operation of the Proposed Scheme.

11.4.5. Net benefits due to the production process (use of SAF) will be reviewed as part of the ES. Where any benefits are identified additional to those within modules A-C these will be reported within Module D (Benefits and loads beyond the system boundary).

- Benefits beyond facility's primary use:
 - Reuse, recycling and energy recovery (D1).

SENSITIVE RECEPTORS

11.4.6. The impacts of GHG emissions relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG contributing to impacts on natural and human systems. The receptor is therefore the global atmosphere.

11.4.7. GHG emissions disperse and therefore result in global effects wherever and whenever they occur. Therefore, the sensitivity of different human and natural receptors is not considered in this preliminary assessment (in line with IEMA Guidance¹³).

BASELINE DATA COLLECTION

11.4.8. In the baseline, without the Proposed Scheme, GHG emissions occur constantly and widely as a result of human and natural activity. This includes emissions related to energy consumption (fuel and power), industrial processes, land use and land use change. **Table 11-2** and **Table 11-3**, below show the contextual baseline for local and national emissions. The GHG assessment will only consider instances in which the Proposed Scheme results in additional or avoided emissions in comparison to the baseline scenario and its assumed evolution. The baseline therefore will focus on those emissions sources subject to change between the baseline and the Proposed Scheme.

11.4.9. Without the Proposed Scheme (Do nothing scenario), construction would not take place, and as such during construction there are no baseline emissions. The future baseline scenario involves no construction activities and therefore the future construction baseline is also zero emissions.

11.4.10. The future operational baseline assumes that the Feedstock Storage & Pre-Processing Area facility will be operational, and in the Do something scenario this is integrated in the SAF Plant, therefore the assessment will consider the emissions from the Feedstock Storage & Pre-Processing Area facility and the SAF Plant.

11.4.11. As the Existing Combined Cycle Gas Turbine (CCGT) Power Plant associated with the TV1 and TV2 facilities are not operational, they do not form part of the emissions baseline.

ASSESSMENT METHODOLOGY

11.4.12. The assessment approach for the ES will consider the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline, without the Proposed Scheme. It considers emissions throughout the in-scope lifecycle stages and sub-stages (in line with PAS 2080:2023¹⁶) of the Proposed Scheme. The associated emissions will be calculated through the collection of available data/information from the design team on the scale of GHG emitting activities (e.g. tonnes of concrete, litres of fuel, kWh of electricity) and GHG capturing activities for the baseline scenario and for the Proposed Scheme. Where available, primary raw data will be used in calculations. Where this information is not available, proxies or industry benchmarks will be applied to estimate emissions. For example, when material specific information is not available the Applicant will use the most appropriate emission factor or, when material/structure dimensions are not available, industry standard measurements may be used. In each case this will cover the Proposed Scheme lifecycle (minimum design life of 50 years, as described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**).

11.4.13. Calculation of the GHG emissions will be made by applying a suitable emissions factor of tonnes of CO₂ equivalent (tCO₂e) or tonnes of CO₂ (tCO₂) per unit of emissions generating activity. The sources of activity and emissions data, alongside the methodology are outlined below.

11.4.14. The assumptions expected to inform the assessment in the ES are presented in **Section 11.13**.

11.4.15. Construction and operational emissions will be calculated and presented in the ES when data becomes available.

Construction Phase

11.4.16. When data becomes available, quantification of construction emissions will be calculated from a Bill of Quantities (BoQ) consistent with the level of detail available for the Proposed Scheme at the ES stage. The quantification process will cover the following emission sources with reference to PAS 2080:2023¹⁶:

- Product Stage (manufacture and transport of raw materials to suppliers) (embodied' emissions associated with the 'cradle to gate' of the construction materials) (A1-3);
- Transportation of materials to Site (A4);
- Plant use onsite during construction (A5);
- Transportation of construction waste away from Site (A5); and
- Land use, land use change and forestry (A5).

11.4.17. The CO₂ quantification will be undertaken using best practice carbon management methods, professional judgement, and guidance including but not limited to the GHG Protocol¹⁴ and PAS 2080:2023¹⁶. The construction carbon footprint will be divided into four main categories: embodied carbon; transport of materials; plant equipment; and transport of construction waste.

11.4.18. The carbon quantification will involve reviewing the material quantities and activity data for the Proposed Scheme. It will also make use of the Inventory of Carbon and Energy (ICE)¹⁶ and other industry recognised carbon reporting tools (such as the National Highways Tool¹⁷), to apply the most accurate densities and emission factors practicable.

A1-A3 – Product Stage (manufacture and transport of raw materials to suppliers)

11.4.19. Emissions 'embodied' within the construction materials will be calculated as follows:

- Quantity of material (t) X emissions factor (tCO₂e/t) = Emissions (tCO₂e).

11.4.20. However, for some construction materials emissions factors may only be available on a mass or volume basis. Where only dimensions are available, volumes may need to be calculated; or where mass is required, volumes will be converted to mass using densities.

11.4.21. The quantity of materials will be taken from the BoQ for the Proposed Scheme.

A4 and A5 – Transport of Materials to Site and Transport of Waste

11.4.22. Transportation of construction materials to the Site and waste off the Site will be calculated as follows:

- Quantity of material / waste (t) X Distance (km) X emissions factor (tCO₂e/t.km) = Emissions (tCO₂e).

11.4.23. However, some construction materials emissions factors may only be available on a volume basis. Where only dimensions are available, volumes will be calculated; or where mass is required, volumes will be converted to mass using densities.

A5 - Plant and Equipment Use

11.4.24. If there is unavailability and uncertainty of plant and equipment usage for construction at the time of the ES writing, an estimate of GHG emissions will be calculated using the Royal Institute of Chartered Surveyors¹⁸ assumption which is based on the estimated construction cost (adjusted for inflation) of the Proposed Scheme as follows:

- Construction cost (£) X RICS Assumption (1400 kgCO₂e/£100k of construction cost) (tCO₂/£) = Emissions (tCO₂e).

Operation Phase

11.4.25. When data becomes available, quantification of operational emissions consistent with the level of detail available for the Proposed Scheme at the ES stage, will cover the following emission sources with reference to PAS 2080:2023¹⁶ lifecycle stages:

- Operational energy use (B6);

- Operational water use (B7);
- Solvent used for the Carbon Capture Facility (B8);
- End-user Emissions (B9/D) (Storage); and
- End-user Emissions (B9/D) (Transport).

B6 - Operational Energy Use

11.4.26. To calculate the operational energy use of the Proposed Scheme, the electricity and fuel used for the operation of the Proposed Scheme will be required. At the time of writing, due to the preliminary stage of the design, further clarity on the electricity and gas demand is needed; this will be assessed and presented in the ES when data becomes available. The electricity will be sourced from national grid connectivity and the on Existing CCGT Power Plant and Auxiliary Boiler (identifier 20 and 11 respectively, as described in **Table 2-1 of Chapter 2: Site and Proposed Scheme Description (Volume 1)**).

11.4.27. Emissions resulting from the use of electricity and gas onsite will be calculated as follows:

- Energy (kWh) X Emissions factor (kgCO₂e/kWh) = Emissions (kgCO₂e).

11.4.28. Emissions resulting from the use of fuel onsite will be calculated as follows:

- Amount of diesel fuel (l) X Emissions factor (kgCO₂e/l) = Emissions (kgCO₂e).

B7 – Operational Water Use

11.4.29. Emissions resulting from the water consumption will be calculated as follows:

- Amount of water (l) X Emissions factor (kgCO₂e/million litres) = Emissions (kgCO₂e).

B8 – Solvent used for the Operation of the Carbon Capture Facility

11.4.30. Emissions 'embodied' within the solvents will be calculated as follows:

- Quantity of solvents (t) X Emissions factor (tCO₂e/t) = Emissions (tCO₂e).

B8 – End-user Emissions (Storage)

11.4.31. Emissions associated with the storage of the SAF/Naphtha will be calculated as follows:

- Amount of SAF/Naphtha (tonnes) X Emissions factor (tCO₂e/t) = Emissions (tCO₂e).

B8 – End-user Emissions (Transport)

11.4.32. Emissions associated with the transportation of the SAF/Naphtha offsite to its end use (storage) will be calculated as follows:

- Amount of SAF/Naphtha (tonnes) X Distance (km) X Emissions factor (tCO₂e/t.km) = Emissions (tCO₂e).

11.4.33. Information on the location of the transported SAF/Naphtha is presented in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**.

Decommissioning Phase

11.4.34. Due to the preliminary stage of the design, data is not available for decommissioning. When data becomes available, the quantification of decommission emissions covers the following emission sources with reference to PAS 2080:2023 lifecycle stages.

C1 – DECONSTRUCTION AND DEMOLITION EMISSIONS

11.4.35. Emissions arising from any onsite or offsite deconstruction and demolition activities, including any energy consumption for Site accommodation and plant use.

C2 – TRANSPORT OF DECONSTRUCTED AND DEMOLISHED ARISING

11.4.36. Emissions arising from transport of deconstruction and demolition arising to the appropriate disposal Site.

C3 – WASTE PROCESSING FOR REUSE, RECOVERY OR RECYCLING

11.4.37. Emissions associated with materials which are intended to be recovered and reused or recycled after the end of life of the built asset.

C4 – DISPOSAL EMISSIONS

11.4.38. Module C4 captures emissions resulting from any processing required prior to disposal and from the degradation of landfilled materials, or incineration without energy recovery or with an R1 efficiency less than 60%. This is only applicable for items not being recovered for reuse, recycling or other recovery. For elements not expected to be reused, recycled or recovered, but intended for final disposal either in landfill or incineration, an allowance for the emissions from their disposal must be included in C4.

11.4.39. Given the Proposed Scheme's design life of 50 years there are uncertainties around aspects relating to GHG emissions for the decommissioning phase (e.g. quantities of materials re-used, recycled or disposed, waste management options or the carbon intensity of fuels for deconstruction or transport). Therefore, an estimate of the GHG emissions for the decommissioning phase will be based on the emissions calculated for the Construction Phase.

Benefits and Loads Beyond the System Boundary

D1 – REUSE, RECYCLING AND ENERGY RECOVERY

11.4.40. Module D captures emissions outside the scope of the normal operation of the project.

11.4.41. Emissions associated with the annual production of SAF will be compared with the emissions that would be emitted by traditional aviation fuel.

SIGNIFICANCE CRITERIA

11.4.42. Any magnitude of emitted or avoided GHG emissions makes a cumulative contribution to climate change (adverse or beneficial respectively).

11.4.43. Significance of GHG impacts is assessed in line with IEMA Guidance¹³; a development's emissions should be based on its net impact over its lifetime, which may be beneficial, adverse or negligible. The evaluation of significance should not just focus on GHG emissions, or the magnitude of those emissions, but whether the Proposed Scheme contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.

11.4.44. The following terms have been used to define the significance of the effects identified as set out in IEMA Guidance¹³:

- **Major adverse (significant):** the GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy nor make a meaningful contribution to the UK's trajectory towards net zero.
- **Moderate adverse (significant):** the GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals, falling short of fully contributing to the UK's trajectory towards net zero.
- **Minor adverse (not significant):** the GHG impacts are fully consistent with applicable existing and emerging policy requirements and good practice design standards; they are fully in line with measures necessary to achieve the UK's trajectory towards net zero.
- **Negligible (not significant):** the GHG impacts are reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
- **Beneficial (significant):** the net GHG impacts are below zero, causing a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline, substantially exceeding net zero requirements with a beneficial climate impact.

11.4.45. To provide context to the GHG emissions, as set out in the IEMA Guidance¹³, the estimated GHG emissions arising from the Proposed Scheme will be compared with the respective UK carbon budgets, shown in **Table 11-2**, which have been set by the UK Government covering 2023 to 2037.

Table 11-2: GHG UK Carbon Budgets^{19,20}

Carbon Budget Period	UK Carbon Budget
Fourth: 2023-2027	1,950 MtCO _{2e}
Fifth: 2028-2032	1,725 MtCO _{2e}
Sixth: 2033-2037	965 MtCO _{2e}

11.4.46. To provide additional context, a breakdown of GHG Emissions for 2021 within Stockton-on-Tees, North-East and the UK are presented in **Table 11-3**.

Table 11-3: GHG Emissions Sources for Stockton-on-Tees, North-East and the UK (2021)²¹

Emissions Sources	Stockton-on-Tees (ktCO₂e)	North-East (ktCO₂e)	UK (ktCO₂e)
Industry Electricity	136.7	853.7	17,109.1
Industry Gas	164.8	1,159.4	20,037.1
Large Industrial Installations	1,075.2	1,702.3	29,267.6
Industry 'Other'	51.2	594.1	17,927.3
Industry Total	1,427.9	4,309.5	84,341.1

11.5. STUDY AREA

11.5.1. The GHG assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the Proposed Scheme, wherever that may be. This includes:

- Construction emissions within the Site, but also related to the transport of materials to and from the Proposed Scheme and their manufacture (this may be distant from the Proposed Scheme location).
- Operation emissions (increase or reduction) which result from the operation of the Proposed Scheme. In this case, GHG emissions include those for embodied emissions arising from materials and waste for the operation of the Proposed Scheme, carbon capture and operational energy and water use.
- Decommissioning emissions which result from the dismantling of the Proposed Scheme.

11.6. BASELINE CONDITIONS AND FUTURE BASELINE

EXISTING BASELINE

11.6.1. In the baseline, GHG emissions occur constantly and widely as a result of natural and human activity, including land use and land use change, energy consumption (e.g. fossil fuels, purchased energy from the grid and/or other sources) and industrial processes. The GHG assessment would only consider the scenario in which the Proposed Scheme results in additional or avoided emissions in comparison to the baseline. The baseline

therefore focusses on those sources of emissions subject to change between the baseline and the Proposed Scheme.

- 11.6.2. The existing baseline involves no construction activities and therefore the construction baseline is zero emissions.

FUTURE BASELINE

- 11.6.3. The future construction baseline is zero GHG emissions as this scenario involves no construction activities if the Proposed Scheme does not proceed.
- 11.6.4. The future baseline comprises the 'Do Nothing' scenario, under the existing conditions the future operational baseline includes any independent land-use changes in relation to the Site, such as the NTL land infilling scenario (for more information refer to **Chapter 2: Site and Proposed Scheme Description (Volume 1)** and **Chapter 3: Approach to EIA (Volume 1)**).
- 11.6.5. Existing baseline and future baseline results for the Proposed Scheme will be presented when data becomes available at the ES stage.
- 11.6.6. An assessment of other developments and the potential for cumulative effects is discussed in **Chapter 19: Cumulative Effects (Volume 1)**.

11.7. EMBEDDED DESIGN, MITIGATION AND ENHANCEMENT MEASURES

- 11.7.1. When data becomes available at the ES stage, this section will lay out the embedded design, mitigation and enhancement measures relevant to the GHG assessment, for the construction, operation and decommissioning phases.
- 11.7.2. Some common embedded design, mitigation and enhancement measures that may be included are as follows:

CONSTRUCTION PHASE

- Excavated arisings will be reused on the Proposed Scheme, where suitable.
- Environmental mitigation required during construction will be recorded in an Outline Code of Construction Practice (OCoCP) to be submitted as part of the application for a development consent. The OCoCP will provide a tool to ensure the successful management of the likely environmental effects as a result of construction activities.
- An Outline Construction Traffic Management Plan will be prepared as an appendix to the OCoCP.
- Designers and contractors must demonstrate how PAS 2080 and the carbon reduction hierarchy has been considered in the design and decisions made.
- Creation of a GHG Reduction Strategy.
- Reducing any loss of habitats if there are any expected. Further embedded measures on material reuse and recycling are discussed in **Chapter 13: Materials and Waste (Volume 1)**.

OPERATION PHASE

- Maximising energy efficiencies where possible; and
- Upon connection with NZT or an alternative CO₂ T&S Infrastructure, capture of CO₂ emissions.

11.8. PRELIMINARY ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

- 11.8.1. The project's purpose is to help the UK achieve its net zero target. For that purpose, the Proposed Scheme is set to produce SAF through the use of Biocarbon Feedstock and, when possible, connect to a carbon capture facility to avoid the release of carbon into the atmosphere.
- 11.8.2. A preliminary assessment of impacts and effects for the Proposed Scheme during the construction, operation and decommissioning phases has not been carried out as part of this PEIR due to a lack of construction, operational and decommissioning data that would be required to carry out said assessment.
- 11.8.3. Construction, operation and decommissioning data will become available at the ES stage and a full GHG assessment will be completed as part of the ES based on the information provided, at which point we'll be able to present a conclusion about the impact of the scheme.

CONSTRUCTION PHASE

- 11.8.4. The Construction Phase is expected to result in an increase in GHG emissions compared to the baseline 'do nothing' scenario. IEMA guidance³ suggests that all GHG emissions are significant in the absence of any significance criteria or defined threshold.
- 11.8.5. In the absence of agreed thresholds for what level of GHG emissions is considered significant in an EIA context, IEMA guidance¹³ and professional judgement including previous experience of similar schemes will be used to assess the magnitude of change based on schemes of a similar size and nature. This will be confirmed at ES stage and five distinctive levels of significance will be used:
- Major adverse (significant).
 - Moderate adverse (significant).
 - Minor adverse (not significant).
 - Negligible (not significant).
 - Beneficial (significant).

OPERATION PHASE

- 11.8.6. The impact magnitude of the operational phase compared to the baseline 'do nothing' scenario will be assessed at the ES stage. In the absence of agreed thresholds for what level of GHG emissions is considered significant (either beneficial or adverse) in an EIA context, IEMA guidance¹³ and professional judgement will be used to assess the magnitude of change based on schemes of a similar size and nature. Potential carbon

savings of the generated SAF compared to conventional aviation fuel over the lifecycle of the Proposed Scheme will be provided as part of the ES assessment.

DECOMMISSIONING

11.8.7. The impact magnitude of the decommissioning phase compared to the baseline 'do nothing' scenario will be assessed at the ES stage. In the absence of agreed thresholds for what level of GHG emissions is considered significant (either beneficial or adverse) in an EIA context, IEMA guidance and professional judgement will be used to assess the magnitude of change based on schemes of a similar size and nature.

BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY

11.8.8. The impact magnitude of this stage compared to the baseline 'do nothing' scenario will be assessed at the ES stage. In the absence of agreed thresholds for what level of GHG emissions is considered significant (either beneficial or adverse) in an EIA context, IEMA guidance and professional judgement will be used to assess the magnitude of change based on schemes of a similar size and nature.

11.9. ADDITIONAL DESIGN, MITIGATION AND ENHANCEMENT MEASURES

11.9.1. In the absence of a full preliminary assessment of GHGs. This section sets out the additional design, mitigation or enhancement measures that could be considered to reduce potential GHG emissions. A full set of additional design, mitigation and enhancement measures will be identified as part of the ES assessment.

DESIGN EVOLUTION

11.9.2. The Applicant will investigate measures to reduce GHG emissions during the design of the Proposed Scheme to DCO application and these may include:

- Detailed design optimisation to reflect the PAS 2080:202316 carbon reduction hierarchy.
- Reduce the requirement for construction materials (designing out material redundancy), where practicable.
- Substitute construction elements for lower-carbon alternatives where practicable.
- Consider the specification of materials and products with reduced embodied GHG emissions including through material substitution, recycled or secondary content and from renewable sources.
- Consider the sustainability credentials of material suppliers and construction contractors and, where practicable, to consider their policies and commitments to reduction of GHG emissions, including embodied emission in materials.
- Designing, specifying and constructing the Proposed Scheme with a view to maximising the operational lifespan and minimising the need for maintenance and refurbishment (and all associated emissions).

- Designing, specifying and constructing the Proposed Scheme with a view to maximising the potential for re-use and recycling of materials/elements at the end-of-life stage.
- Consider opportunities to minimise operational energy use, including the specification of efficient plant and ancillary infrastructure.

CONSTRUCTION PHASE

11.9.3. Measures to reduce GHG emissions during the construction of the Proposed Scheme will be set out in an OCoCP included as part of the DCO for the Proposed Scheme. The full CoCP will be produced by the Contractor and will provide a review, monitoring and audit mechanism to determine the effectiveness of, and compliance with, environmental control measures, which include the consideration of manufacture, transport and supply of materials. Measures incorporated into the OCoCP may include:

- Use of efficient construction processes, such as design for manufacture and assembly.
- Implementation of a Site Waste Management Plan (SWMP) and Materials Management Plan (MMP) by the Contractor; and re-use of material resources where practicable.
- Specification of materials and products with reduced embodied GHG emissions including through material substitution, recycled or secondary content and from renewable sources.
- Recovery and re-use/recycling of Site arisings (ideally, onsite).
- Selection and engagement of materials suppliers and construction contractors taking into account their proximity to the Proposed Scheme, as well as policies and commitments to reduction of GHG emissions, including embodied emission in materials.
- Use of efficient plant, including hybrid and electric plant as appropriate.

OPERATION PHASE

11.9.4. Operational measures to reduce GHG emissions during operation of the Proposed Scheme will include:

- Selection of best available techniques (BAT) for equipment and technology specifications which will optimise operation; and
- Development and implementation of a planned and preventative maintenance and replacement regime to ensure operation of the Proposed Scheme remains efficient for the minimum design life.

DECOMMISSIONING

11.9.5. Emissions from decommissioning can be reduced by following methods to be implemented via a Decommissioning Plan:

- Reduction in the waste generated on site due to it being locally reused;

- These emissions can also reduce if the waste is transported to the local recycling units; and
- Reduction in the quantities of carbon intensive materials during construction in order to indirectly reduce the emissions from decommissioning.

11.10. MONITORING

11.10.1. Monitoring of GHG effects will be outlined in the OCoCP and is expected to be proportionate or to be required.

11.11. RESIDUAL EFFECTS

11.11.1. Residual effects will be presented as part of the GHG assessment in the ES.

11.12. NEXT STEPS

11.12.1. Further work to be completed and included in the ES comprises:

11.12.2. The GHG assessment will be developed based on available data and any relevant responses to the Statutory Consultation. An assessment of:

- Product Stage Emissions – A1-A3 (manufacture and transport of raw materials to suppliers).
- Transport of Materials to Site – A4.
- Transport of Waste – A5.
- Plant and Equipment Use – A5.
- Land use, land use change and forestry A5.
- Operation – B1 (Operation Phase): Emissions from operational waste and refrigerant use will be calculated.
- Operational energy consumption – B6.
- Operational Water use – B7.
- Solvent used for the Carbon Capture process – B8: Additional solvents such as amine will be included in the ES assessment.
- Land use, Land Use Change and Forestry B8.
- End-User Emissions – B8 (Storage).
- End-User Emissions – B8 (Transport).
- Decommissioning – C1-4.
- Benefits beyond the project's normal operation – D1.

11.12.3. Overall, good practice opportunities to mitigate, minimise and manage GHG emissions during the construction, operation and decommissioning phases will be further outlined in the ES.

11.13. LIMITATIONS AND ASSUMPTIONS

11.13.1. Limitations on the availability of data may require assumptions to be made for the purposes of the assessment. This data may include:

- Limited availability of a comprehensive BoQ to reflect the design for the Proposed Scheme.
- Data which relates to emissions at the Site during operation of the Proposed Scheme may also be limited.
- The assessment is expected to take place before the detailed design is finalised and a contractor selected, where data or information is unknown, assumptions will be made, and industry standard benchmarks may be used if appropriate.
- The most accurate and representative emission factors will be used where practicable, however in some circumstances (e.g. where that level of detail is not available, or if the exact emission factors were not available) a suitable representative emission factor may be chosen using professional judgement.
- Some items in the BoQ may not be available in the format required for the selected emission factor to be applied. In these instances, assumptions will be made with regards to dimensions or specification to obtain the correct values, based on publicly available information of similar products or industry standard.
- Significance will be assessed against the IEMA guidance and the assessment of this will be based, in part, on professional judgement.

11.14. REFERENCES

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- ¹¹ UK Government. (2019). 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'. Available at: <https://www.legislation.gov.uk/ukdsi/2019/9780111187654>
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The logo for Lighthouse Green Fuels, featuring the company name in a bold, sans-serif font. The text is white and is contained within a white rectangular box. The background of the top half of the page is a solid green color, with a blue diagonal stripe running from the bottom left towards the top right, partially overlapping the green area.

**Lighthouse
Green Fuels**

Lighthouse Green Fuels Limited

1 Cornhill
London
EC3V 3ND

www.alfanar.com