KEADBY
NEXT GENERATION
POWER STATION
Hydrogen-enabled flexible power

A collaboration between **SSE Thermal** and **Equinor**

The Keadby Next Generation Power Station Project

Document Ref: 7.8

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The Keadby Next Generation Power Station Development Consent Order 202[x]

Land at, and in the vicinity of, the existing Keadby Power Station (Trentside, Keadby, Scunthorpe DN17 3EF)

Greenhouse Gas Reduction Strategy

The Planning Act 2008

The Infrastructure Planning (Environmental Information Assessment) Regulations 2017

Applicant: Keadby Next Generation Limited

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Glossary

Abbreviation	Description
CCGT	Combined Cycle Gas Turbine - a CCGT is a combustion plant where a gas turbine is used to generate electricity and the waste heat from the flue-gas of the gas turbine is converted to useful energy in a heat recovery steam generator (HRSG), where it is used to generate steam. The steam then expands in a steam turbine to produce additional electricity.
CEMP	Construction Environmental Management Plan - a plan to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area.
CH_4	Methane - a potent greenhouse gas (GHG) with a global warming potential (GWP) approximately 28–36 times greater than carbon dioxide (CO_2) over a 100-year period. CH_4 is emitted during the production and transport of coal, oil, and natural gas, among other sources.
CO_2e - gCO_2e - tCO_2e - $MtCO_2e$	Carbon dioxide equivalent – a standard unit for measuring carbon footprints that expresses the impact of each different greenhouse gas (GHG) in terms of the quantity of CO_2 emissions that would have the same global warming potential (GWP). This allows emissions from various GHGs, such as methane (CH_4), nitrous oxide (N_2O), and others, to be compared and aggregated using a common scale. Quantities can be presented in grams (gCO_2e), tonnes (tCO_2e) or megatonnes ($MtCO_2e$) of carbon dioxide equivalent.
CCS	Carbon Capture and Storage - a climate change mitigation technology that involves capturing carbon dioxide (CO_2) emissions from industrial processes or power generation, and

Abbreviation	Description
	permanently storing it underground. CCS helps reduce CO_2 emissions at the source and is considered a critical tool for achieving net-zero targets, especially in hard-to-abate sectors such as cement, steel, and energy.
DCO	Development Consent Order - made by the relevant Secretary of State pursuant to The Planning Act 2008 to authorise a Nationally Significant Infrastructure Project. A DCO can incorporate or remove the need for a range of consents which would otherwise be required for a development.
DESNZ	Department for Energy Security and Net Zero – a UK government department responsible for delivering energy policy, ensuring energy security, and driving the country's transition to net zero greenhouse gas emissions. Established in 2023, DESNZ focuses on promoting clean energy technologies, improving energy efficiency, supporting low-carbon innovation, and overseeing emissions reduction strategies across sectors.
ES	Environmental Statement - a report in which the process and results of an Environment Impact Assessment are documented.
ESO	Environmental Site Officer – a designated individual responsible for overseeing environmental compliance and performance on a project or operational site. The ESO ensures that environmental management plans and requirements are effectively implemented and adhered to.
FTSE	Financial Times Stock Exchange - a collective term used to describe a range of stock market indices managed by FTSE Russell, a subsidiary of the London Stock Exchange Group. Companies listed in FTSE indices may be subject to increasing scrutiny and expectations regarding their climate-related disclosures and greenhouse gas (GHG) reduction commitments.
GHG	Greenhouse Gas - gases in the Earth's atmosphere that trap heat and contribute to the greenhouse effect, leading to global warming and climate change. Key greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). These gases

Abbreviation	Description
	vary in their global warming potential (GWP) and atmospheric lifespans. GHG emissions are typically measured in carbon dioxide equivalents (CO_2e) to allow for comparison across different gases
HGV	Heavy Goods Vehicle - vehicles with a gross weight in excess of 3.5 tonnes.
ICE	Inventory of Carbon and Energy – a database developed by the University of Bath that provides embodied carbon and energy data for a wide range of construction materials. The ICE database is widely used in the built environment sector to estimate the embodied carbon (the total greenhouse gas emissions associated with the extraction, processing, manufacture, transport, and assembly of materials).
kWh	Kilowatt-hour – a unit of energy equal to one kilowatt (1 kW) of power used for one hour. It is commonly used to measure electricity consumption in homes, businesses, and industrial operations. For example, running a 1 kW appliance for one hour consumes 1 kWh of energy.
MJ_{LHV}	Megajoule (Lower Heat Value) – a unit of energy measurement representing the lower heating value (LHV) of a fuel, expressed in megajoules (MJ). The lower heating value refers to the amount of heat released during the combustion of a fuel, excluding the latent heat of vaporisation of water. MJ_{LHV} is commonly used in greenhouse gas (GHG) accounting to quantify the energy content of fuels and calculate emissions from fuel combustion. Using LHV provides consistency with many international emissions reporting protocols, such as the GHG Protocol and IPCC guidelines.
MW	Megawatt – a unit of power equal to one million watts. It measures the rate at which energy is produced or consumed. In the context of greenhouse gas (GHG) management, MW is commonly used to describe the capacity of power plants or energy generation systems, indicating how much electrical power they can supply at a given moment. For example, a 50 MW power plant can produce 50 megawatts of electricity continuously when operating at full capacity.

Abbreviation	Description
MWe	Megawatt electrical - a unit of electrical power output equal to one million watts. It specifically refers to the electrical power generated by a power plant or energy system, as opposed to thermal energy. MWe is commonly used to describe the net electricity output that can be delivered to the grid or end users. In GHG management, MWe is relevant for estimating emissions intensity (e.g. kg CO_2e per MWe generated) and evaluating the efficiency of low-carbon or renewable electricity generation systems.
NGET	National Grid Electricity Transmission – the licensed transmission operator responsible for operating, maintaining, and developing the high-voltage electricity transmission network in England and Wales. NGET is a subsidiary of National Grid plc and plays a key role in ensuring the safe, reliable, and efficient delivery of electricity from generators to distribution networks and large industrial users.
NG	National Gas - the licensed operator responsible for the gas transmission network in Great Britain. NG owns and manages the high-pressure gas transmission system that transports natural gas from entry points (such as terminals and interconnectors) to regional distribution networks and large end users. NG plays a crucial role in maintaining energy security and supporting the decarbonisation of the gas system.
NLC	North Lincolnshire Council
NPS EN-1	National Policy Statement for Energy (EN-1) – a key UK government policy document that sets out the overarching framework for decision-making on major energy infrastructure projects in England and Wales. Part of the National Policy Statements (NPS) series, EN-1 outlines the strategic need for new energy infrastructure to ensure energy security, support economic growth, and meet climate change targets, including the transition to net zero greenhouse gas (GHG) emissions. It provides guidance for developers and informs the planning decisions made by the Secretary of State under the Planning Act 2008.

Abbreviation	Description
NSIP	Nationally Significant Infrastructure Projects - defined by the Planning Act 2008 and covers projects relating to energy (including generating stations, electric lines and pipelines); transport (including trunk roads and motorways, airports, harbour facilities, railways and rail freight interchanges); water (dams and reservoirs, and the transfer of water resources); waste water treatment plants and hazardous waste facilities.
PAS 2080	Publicly Available Specification 2080 – a specification developed by the British Standards Institution (BSI) that provides a framework for managing carbon in infrastructure. PAS 2080 focuses on whole-life carbon management, including capital, operational, and user-related emissions, across the entire value chain of infrastructure projects. It promotes collaborative working between clients, designers, contractors, and suppliers to drive down greenhouse gas (GHG) emissions through smarter design, material selection, construction methods, and operational strategies. PAS 2080 supports alignment with net zero goals and is widely used in the UK and internationally as a standard for low-carbon infrastructure delivery.
PINS	Planning Inspectorate – An executive agency of the UK Government responsible for overseeing the planning appeals process and examining applications for Nationally Significant Infrastructure Projects (NSIPs) in England and Wales.
RICS	Royal Institution of Chartered Surveyors – a professional body that sets standards and provides accreditation for professionals in land, property, construction, and infrastructure. RICS develops best practices and guidance, including in carbon measurement, where RICS plays a key role in advancing consistent methodologies for whole-life carbon assessments, embodied carbon accounting, and sustainable building practices.
SBT	Science Based Targets - GHG emissions reduction targets aligned with climate science and the goals of the Paris Agreement. Set and validated through the Science Based Targets initiative (SBTi), these targets ensure organisations

Abbreviation	Description
	reduce Scope 1, 2, and often Scope 3 emissions in line with limiting global warming to well below 2°C, preferably 1.5°C. SBTs are widely recognised as a benchmark for credible climate action and net zero planning.
SoS	Secretary of State - a UK government minister with the legal authority to make decisions on certain matters, including planning consent for Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008.
SSE	A major UK energy company involved in the generation, transmission, distribution, and supply of electricity and gas. SSE is actively engaged in transitioning to low-carbon energy solutions, including renewable energy projects, and plays a significant role in reducing greenhouse gas (GHG) emissions within the UK's energy sector.

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Executive Summary

1. This Greenhouse Gas (GHG) Reduction Strategy has been developed for the Proposed Development to meet the Overarching National Policy Statement for Energy (NPS EN-1) requirement for the steps taken to minimise and offset emissions to be set out in a GHG Reduction Strategy.
2. This document sets out how the GHG emissions associated with the Proposed Development should be managed and reduced, in accordance with NPS EN-1 requirements.
3. The GHG management process described in this document includes:
   - Identifying governance, roles and responsibilities in terms of GHG management;
   - Developing a GHG assessment and identifying GHG hotspots;
   - Identifying and prioritising GHG reduction opportunities, with the aid of a Decarbonisation Tracker (presented in **Appendix 1)**; and
   - Reviewing GHG reduction progress against relevant GHG reduction targets.
4. Operational fuel use (including upstream emissions) is the main GHG hotspot for the Proposed Development, ranging from 7,031,662 tCO_2e to 22,721,829 tCO_2e. The operational fuel use emissions depend on the blend of hydrogen and natural gas used to generate electricity , which will be determined by the date at and extent to which decarbonisation via switching to hydrogen fuel can be achieved. Higher hydrogen usage results in lower operational emissions.
5. The total lifecycle GHG emissions of the Proposed Development, excluding operational fuel use, are 134,444 tCO_2e with 45% arising from embodied emissions in raw materials and 26% from operational activities other than fuel use.
6. Potential carbon reduction opportunities have been identified for the Proposed Development through a carbon reduction workshop, which was held with representatives from the Applicant and the design team to identify a list of carbon reduction opportunities to be explored through the project design, construction and operation. These opportunities are grouped into the following categories:
   - Strategy and Governance;
   - Innovative Design;
   - Lower Carbon Products; and

- Lean Construction Techniques.

7. Although the Proposed Development will generate GHG emissions across its lifecycle, it will play a key role in decarbonising the UK energy sector in line with government policy by providing the capacity to produce low carbon energy from hydrogen, a fuel which emits zero carbon emissions at the point of combustion. The electricity generated will replace higher-carbon sources, actively supporting grid decarbonisation. Increasing the capacity of low-carbon energy available to the grid will facilitate the decarbonisation of the wider economy. The Proposed Development aligns with current and emerging government policy and is crucial to achieving the UK's net-zero trajectory.

1. Introduction

1.1. Overview

1.1.1. This GHG Reduction Strategy (**Application Document Ref. 7.8**) has been prepared by AECOM on behalf of Keadby Next Generation Limited (‘the Applicant’) which is a subsidiary of SSE plc. It forms part of the application for a Development Consent Order (DCO) (‘the Application’), that has been submitted to the Secretary of State (the ‘SoS’) for Energy Security and Net Zero under Section 37 of ‘The Planning Act 2008’ (‘the 2008 Act’).

1.1.2. The Applicant is seeking development consent for the construction, operation and maintenance of a new combined cycle gas turbine ('CCGT') electricity generating station on land at, and in the vicinity of, the existing Keadby Power Station, Trentside, Keadby, Scunthorpe DN17 3EF (‘the Site’).

1.1.3. The Keadby Next Generation Power Station (‘the Proposed Development’) is a new CCGT electricity generating station with a capacity of up to 910MW electrical output. The CCGT electricity generating station will be designed to run on 100% hydrogen and able to run on 100% natural gas or a blend of natural gas and hydrogen and will be located on land to the west of Keadby 1 and Keadby 2 Power Stations. The Proposed Development includes connections for cooling water, electricity, hydrogen and natural gas, and construction laydown areas and other associated development. It is described in full in Environmental Statement (ES) Volume I Chapter 4: The Proposed Development (Application Document Ref. 6.2.4).

1.1.4. The Proposed Development falls within the definition of a ‘Nationally Significant Infrastructure Project’ (NSIP) under Section 14(1)(a) and Sections 15(1) and (2) of the 2008 Act, as it is an onshore generating station in England that would have a generating capacity greater than 50MW electrical output (50MWe). As such, a DCO application is required to authorise the Proposed Development in accordance with Section 31 of the 2008 Act.

1.1.5. The DCO, if made by the SoS, would be known as ‘The Keadby Next Generation Power Station Order' (‘the Order’).

1.2. The Applicant

1.2.1. The Applicant is a subsidiary of the FTSE-listed SSE plc, one of the UK's largest and broadest-based energy companies, and the country's leading developer of renewable energy. Over the last 20 years, the SSE Group has invested over £20 billion to deliver industry-leading offshore wind, onshore wind, CCGT, energy from waste, biomass, battery energy storage, energy networks and gas storage projects. Related SSE companies own and operate the adjacent Keadby 1 and 2 Power Stations and have the benefit of the DCO for Keadby 3 CCS Power Station (herein referred to as the 'Keadby CCS Power Station').

1.2.2. The Proposed Development is being developed with Equinor, one of the country's leading energy providers, supplying natural gas, oil and electricity. Equinor is developing multiple low-carbon hydrogen and carbon capture projects in the Humber, working towards transforming the UK's most carbon intensive industrial cluster into a net zero region.

1.2.3. SSE Renewables Limited operates Keadby Windfarm, which lies to the north and south of the Site and generates renewable electricity from 34 turbines, with a total installed generation capacity of 68MW.

1.2.4. SSE plc has set out a clear commitment to investment in low carbon power infrastructure, working with government and other stakeholders to create a Net Zero power system by 2040. This includes investment in flexible sources of electricity generation and storage for times of low renewable output which will complement other renewable generating sources, either using low carbon fuels and/ or capturing and storing carbon emissions.

1.2.5. The design of the Proposed Development demonstrates this commitment and the Proposed Development will be built with a clear route to decarbonisation, consistent with SSE's Net Zero Acceleration Programme Plus and net zero transition plan which committed to the development and progression of new low carbon flexible power including hydrogen-fuelled generation.

1.3. The Proposed Development

1.3.1. The Proposed Development would comprise a high efficiency gas fired power station with an electrical output capacity of up to 910MWe and associated buildings, structures and plant and other associated development defined in Schedule 1 of the **Draft DCO** (**Application**

Document Ref. 3.1) as Work Nos. 1-11 and shown on the **Works Plans** (**Application Document Ref. 2.3**).

1.3.2. The Proposed Development will include:

- a new-build CCGT electricity generating station fuelled by hydrogen and/or natural gas with a power output of up to 910MW (**Work No. 1**) including:
  - a CCGT plant;
  - cooling infrastructure;
  - natural gas and hydrogen blending equipment;
  - supporting facilities including administration and control buildings, workshops, storage buildings, effluent treatment facilities, fire water storage tank(s), demineralised water treatment plant including storage tank(s), and permanent laydown areas for operation and maintenance activities;
- a hydrogen supply pipeline, including a gas compound for the hydrogen supplier's apparatus and a hydrogen gas compound for the Applicant's apparatus (**Work No. 2**);
- a natural gas supply pipeline including a compound for the natural gas supplier's apparatus and a natural gas compound for the Applicant's apparatus (**Work No. 3**);
- electrical connection works for the export and import of electricity to and from the generating station and the existing 400kV National Grid Electricity Transmission (NGET) substation located adjacent to the Keadby Power Station site, including works within the substation (which would be undertaken by NGET) (**Work No. 4**);
- water supply connection works to provide cooling and make-up water to the generating station, including intake structures and an underground and/or overground water supply pipeline running between the generating station and the Stainforth and Keadby Canal (**Work No. 5**);
- connections to and use of an existing outfall and associated pipework for the discharge of used cooling water, surface water and treated effluent to the River Trent (**Work No. 6**);
- public water connection pipeline from a new connection on Chapel Lane to provide potable water to the generating station (**Work No. 7**);
- new permanent access to the generating station (**Work No. 8**), comprising:

  - maintenance and improvement of an existing private access road from the A18, including replacement of a private bridge (Mabey Bridge) (**Work No. 8A**);
  - installation of layby and gatehouse with barriers, enclosures, drainage and lighting north of the A18 junction (**Work No. 8B**) and associated utilities connections (**Work No. 8C**); and
  - emergency access route comprising the maintenance and improvement of an existing private track running between the generating station and Chapel Lane and including new private bridge crossing over Glew Drain (**Work No. 8D**);
- temporary construction and laydown areas (**Work No. 9A**);
- maintenance and improvement of the existing access routes running between the A18 and construction laydown areas (**Work No. 9B**); and between Skew Bridge adjacent to the A18 and a temporary construction laydown area associated with Mabey Bridge replacement (**Work No. 9C**);
- retention, maintenance and improvement and subsequent removal of existing temporary haul route from the Waterborne Transport Offloading Facility (**Work No. 9D**) and the inspection and repair of the existing jetty, and temporary placement of mobile cranes including the temporary oversailing of crane arms (**Work No. 9E**); and
- landscaping and biodiversity enhancement measures (**Work No. 10**);
- an allocation of land to meet the requirements of the Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013 (**Work No. 11**).

1.3.3. The Applicant will be responsible for the construction, operation (including maintenance) and eventual decommissioning of the Proposed Development including the on-site connections to electricity, cooling water, hydrogen and natural gas supplies.

1.3.4. The Proposed Development will be capable of operating 24 hours per day, 7 days per week with programmed offline periods for maintenance.

1.3.5. The route for the hydrogen supply pipeline to the Proposed Development has not yet been confirmed. The supply pipeline is not included in the Proposed Development and will be progressed by a third party under a separate consent. In line with Government policy, it is recognised that developments such as the Proposed Development are needed to stimulate investment in the development of hydrogen production and supply infrastructure.

1.3.6. Further detail on the components of the Proposed Development is provided in **ES Volume I Chapter 4**: The Proposed Development (**Application Document Ref. 6.2**). The areas within which each numbered Work (component) of the Proposed Development are to be built are defined by the coloured and hatched areas on the **Works Plans** (**Application Document Ref. 2.3**).

1.4. The Proposed Development Site

1.4.1. The Site (which equates to the 'Order Limits') is located within and adjacent to the boundary of the existing Keadby Power Station site near Scunthorpe, Lincolnshire and falls within the administrative area of North Lincolnshire Council ('NLC') (the 'Site'). The Keadby Power Station site currently encompasses the operational Keadby 1 and Keadby 2 Power Stations. The location of the Site, which is approximately centred on national grid reference (NGR) 481961, 412101 is shown on the **Site Location Plan** (**Application Document Ref. 2.1**).

1.4.2. The Site encompasses an area of approximately 77.1 hectares (ha), of which approximately 26.7ha of land is proposed for construction laydown.

1.4.3. The proposal includes multiple land uses with the different areas described in turn below and shown on **ES Volume III Figure 3.3** Indicative Parts of the Site Plan (**Application Document Ref. 6.4**) and the **Works Plans** (**Application Document Ref. 2.3**). These terms have been used to describe land use zones within the Site. Distances to environmental receptors reported within the ES are measured relative to the areas illustrated on these plans.

1.4.4. The Site is divided into the following areas of permanent and temporary land use (the proposed use is described in more detail in **ES Volume I Chapter 3**: Site and Surrounding Area (**Application Document Ref. 6.2**)):

- Main Site;
- Ancillary Facilities;
- Water Connections;
- Electricity Connections;
- Waterborne Transport Off-loading Area;
- Construction Laydown Areas;
- Access routes (emergency, permanent and construction);

- Connections to Keadby 1 and Keadby 2 power stations; and
- Additional areas for landscaping and biodiversity provision.

1.5. The DCO Process

1.5.1. The Proposed Development falls within the definition of a NSIP under Section 14(1)(a) and 15(2) of the 2008 Act as a 'generating station exceeding 50 MW'.

1.5.2. As a NSIP project, the Applicant is required to seek a DCO to construct and operate the generating station, under Section 31 of the 2008 Act. Section 37 of the 2008 Act also governs the form, content and accompanying documents that are required as part of a DCO application. The requirements are implemented through the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended) ('APFP Regulations') which state that an application must be accompanied by an ES, where a development is considered to be 'EIA development' under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (as amended).

1.5.3. An application for development consent for the Proposed Development has been submitted to the Planning Inspectorate (PINS) acting on behalf of the SoS. Subject to the application being accepted, PINS will then examine it and make a recommendation to the SoS who will then decide whether to grant a DCO. The acceptance, examination, recommendation and decision stages are subject to fixed timescales and the decision is therefore anticipated to fall in 2026.

1.5.4. A DCO, if granted, has the effect of providing deemed planning permission for a development, in addition to a number of other consents and authorisations where specified within the Order.

1.6. The Purpose and Structure of this Document

1.6.1. This GHG Reduction Strategy has been developed for the Proposed Development in accordance with National Policy Statement (NPS) EN-1 (DESNZ, 2023) as part of the submission of the DCO application.

1.6.2. NPS EN-1 states in paragraph 5.3.6 "Applicants should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning". Paragraph 5.3.7 further states "Steps taken to minimise and offset emissions should be set out in a GHG Reduction Strategy, secured under the Development Consent Order."

1.6.3. This GHG Reduction Strategy should be read in conjunction with **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**).

1.6.4. This GHG Reduction Strategy has been prepared following Publicly Available Specification (PAS) 2080:2023 – Carbon Management in Buildings and Infrastructure (BSI, 2023), the foremost industry standard for carbon management.

1.6.5. Considering the national commitment to achieving net-zero GHG emissions by 2050, it is crucial to effectively address and manage GHG emissions linked to infrastructure during the project optioneering, design, and delivery phases.

1.6.6. This GHG Reduction Strategy provides a routemap, setting out how the GHG emissions associated with the Proposed Development should be managed and reduced. Key national and local legislation, policies and commitments requiring GHG emission reductions over the lifetime of the Proposed Development have informed the development of this GHG Reduction Strategy (see **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**)).

1.6.7. Throughout this GHG Reduction Strategy, the term 'GHG' includes the seven Kyoto Protocol GHGs (WRI and WBCSD, 2015). Emissions of GHGs are expressed in tonnes of carbon dioxide equivalent (tCO_2e), i.e. the mass of CO_2 resulting in equivalent global warming potential.

1.6.8. This GHG Reduction Strategy presents the overarching GHG management principles and foundational GHG management requirements to reduce and manage GHG emissions related to the project. This process helps maintain consistency, clarity, and collaboration, as well as a clear audit trail of applying best practices across the Proposed Development lifecycle. This GHG Reduction Strategy helps inform actions that should be undertaken at each relevant work stage.

1.6.9. This GHG Reduction Strategy should be read in conjunction with the Decarbonisation Tracker in **Appendix 1**, which contains a log of key carbon reduction opportunities identified for the Proposed Development. As the detailed design has not yet been finalised, these potential GHG reduction opportunities are not committed to through the DCO to allow for flexibility in approach. To maximise carbon reductions, it is important at this stage to consider a wide range of carbon reduction opportunities and explore their feasibility over time, and not be limited only to those that can be committed to at this stage.

2. Benefits of this GHG Reduction Strategy

2.1.1. This GHG Reduction Strategy has been produced to meet the NPS EN-1 (DESNZ, 2023) requirement for a GHG Reduction Strategy where steps are proposed to minimise and offset emissions .

2.1.2. This GHG Reduction Strategy describes how the Applicant should effectively manage GHG emissions throughout the Proposed Development lifecycle in line with SSE's corporate low carbon policies and ambitions. This strategy encourages early consideration of GHG emissions and creation of appropriate governance structures and processes. Considering the GHG impacts associated with the project early in the design process is critical to minimising associated GHG emissions and realising the greatest benefits.

2.1.3. **Plate 1**, from PAS 2080 (BSI, 2023), demonstrates how there is a decrease in GHG reduction potential over a project's lifecycle

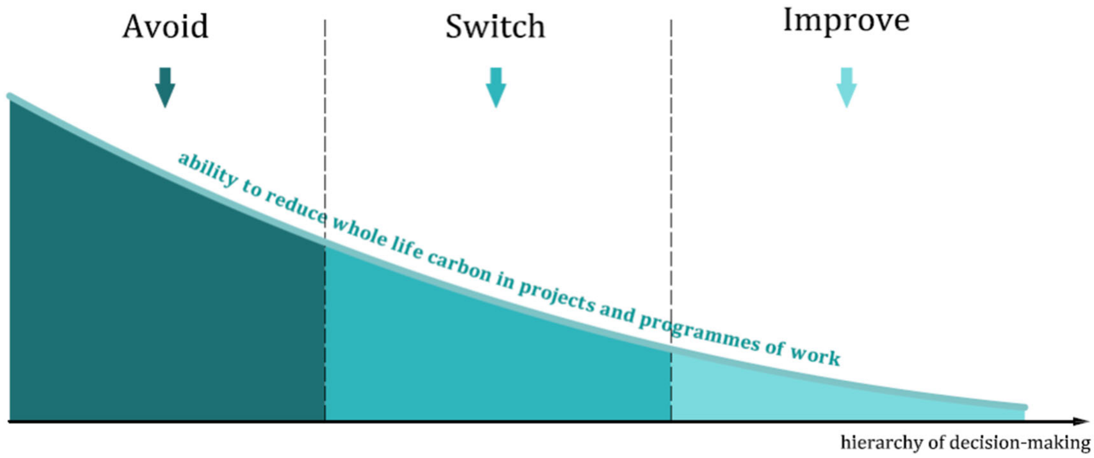

Plate 1: PAS 2080:2023 Carbon Reduction Hierarchy

2.1.4. Plate 1 demonstrates that the most significant GHG savings are achievable during the early stages of a project, as it is possible to implement more fundamental and transformative measures. For example, some cases include avoiding project components altogether, and switching mode, method or material.

2.1.5. As a project moves beyond the design stage to the delivery and operation phases, reducing GHG emissions is possible by making processes more efficient. However, while there is less scope for high-impact reduction measures at the later stages, it is still important to consider reduction measures across all lifecycle stages. In addition to mitigating climate change, effective GHG management can also provide the following benefits:

- Increasing client, designer and contractor collaboration;
- Unlocking innovation and driving better solutions;
- Assisting commercial goals through cost savings, realised by increased efficiency, design and procurement choices;
- Meeting stakeholder and consumer aspirations through more ambitious climate and sustainability action; and
- Supporting wider sustainability goals, e.g., resource efficiency and waste reduction, biodiversity protection and training opportunities for staff.

2.1.6. Consistency and continuity across the project lifecycle are crucial for effective GHG management in any project. By implementing a proactive systems thinking and whole-life approach early on, the Applicant can integrate GHG management throughout the Proposed Development, resulting in more efficient GHG mitigation and improved sustainability outcomes in line with the UK's net-zero goals.

3. GHG Management Approach

3.1. GHG Reduction Strategy Objectives

3.1.1. This document describes how GHG emissions associated with the Proposed Development should be managed, in accordance with NPS EN-1 (DESNZ, 2023a). The strategy describes GHG reduction opportunities to be considered during infrastructure delivery. The objectives of this GHG Reduction Strategy are to:

- Describe indicative governance, roles and responsibilities associated with GHG management;
- Provide an overview of the GHG emissions associated with the Proposed Development[1];
- Facilitate early identification of potential GHG reduction opportunities; and
- Describe the indicative process for ongoing GHG management, future review, communication of the outcomes and appropriate training.

3.2. GHG Reduction Strategy Coverage

3.2.1. The scope and boundary of this GHG Reduction Strategy has been defined in line with best practice principles set out in the PAS 2080:2023 Carbon Management in Buildings and Infrastructure guidelines (WRI and WBCSD, 2015) and RICS Whole Life Carbon Assessment guidelines (RICS, 2023).

3.2.2. The RICS Whole Life Carbon Assessment (RICS, 2023) guidelines stipulate that as a minimum, whole life carbon assessments should account for all components relating to the Proposed Development during all lifecycle stages. As such, the PAS 2080 lifecycle modules included in this GHG Reduction Strategy have been selected based on relevance and materiality as informed by industry best practice and constraints in the practical availability of data.

[1] Please note, a summary of the GHG emissions associated with the Proposed Development are provided in the GHG Reduction Strategy. For a full assessment of GHG emissions and consideration of the impact of the Proposed Development in the context of the UK carbon reduction ambitions, please refer to **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**).

3.2.3. The timescale and boundary of the GHG Reduction Strategy includes the GHG-emitting activities associated with the following PAS 2080 lifecycle modules, as illustrated in Plate 2:

- Product Stage (A1-3);
- Material Transport (A4);
- Construction – Installation Process (A5);
- Use (B1);
- Maintenance, Repair, Replacement and Refurbishment (B2-5);
- Operational Energy Use (B6);
- Operational Water Use (B7); and
- End of Life (C1-4).

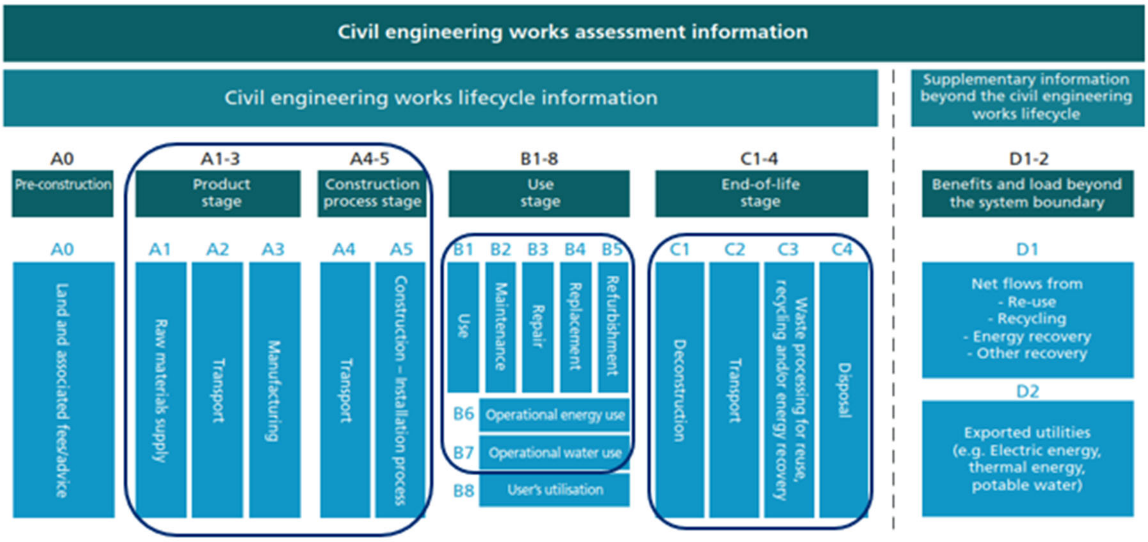

Plate 2: PAS 2080:2023 lifecycle stages

3.2.4. Sources of GHG emissions associated with the whole lifecycle of the Proposed Development are listed in Table 1. The GHG emissions calculations focus on quantifiable key emissions sources. The availability of accurate activity data determines quantifiable emissions.

3.2.5. The GHG emissions covered by the GHG Reduction Strategy align with those assessed in **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**). For more details on the GHG assessment methodology and the evaluation of GHG impacts, refer to **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**).

Table 1: GHG emission sources considered within the scope of the GHG Reduction Strategy

Lifecycle Stage	PAS 2080: 2023 Module	Activity	Primary Emission Sources
Production phase	A1-A3	Raw material extraction and manufacturing of products required to build the equipment and infrastructure for the Proposed Development.	Embodied GHG emissions from energy use in the extraction of materials and manufacture of components and equipment.
		Transportation of materials for processes/ manufacturing (where available).	GHG emissions from transportation of equipment and materials during their processing and manufacture. Due to the nature of the equipment, this could require shipment of certain aspects over significant distances. Transport of materials from the manufacturing facility to the Site is included under construction phase.
Construction phase	A4	Transportation of construction materials to the Site. Due to the nature of the equipment required, this could require shipment of certain aspects over significant distances.	Transport of construction materials is included under the construction process stage, where these are not included in embodied GHG emissions.

Lifecycle Stage	PAS 2080: 2023 Module	Activity	Primary Emission Sources
	A5	On-site construction activity including emissions from construction compounds.	Energy (electricity, fuel, etc.) consumption from plant, vehicles and generators on-site.
		Transportation of construction workers to and from the Site.	GHG emissions from transportation of workers to and from the Site.
		Disposal of any waste generated by the construction phase.	GHG emissions from disposal of waste.
Operation and Maintenance phase B1-B8		Operation of the Proposed Development.	GHG emissions from electricity consumption, provision of potable water, treatment of wastewater, and worker transportation. GHG emissions from fuel consumption during operation (both direct emissions to the atmosphere from the Proposed Development, and also indirect, upstream emissions from the natural gas and hydrogen supply chains).

Lifecycle Stage	PAS 2080: 2023 Module	Activity	Primary Emission Sources
			Emissions from leakage of hydrogen on the transmission network[2] and within the gas turbines (non-GHG impact).
		Maintenance of the Proposed Development.	GHG emissions from energy consumption, transportation of maintenance workers and materials, material use and waste generation as a result of site maintenance.
Decommissioning phase	C1-C4	On-site decommissioning activities.	Energy (electricity, fuel, etc.) consumption from plant, vehicles and generators within the Site Boundary.
		Transportation and disposal of waste materials.	GHG emissions from disposal and transportation of waste.
		Transportation of workers.	GHG emissions from transportation of workers to and from the Site.

[2] The equivalent leakage of natural gas on the transmission network is also considered within the assessment, but is included within the indirect, upstream emissions from the natural gas supply chain. Hydrogen leakage is considered separately as it is a non-GHG impact (i.e. it contributes to climate change, but is not one of the seven Kyoto Protocol GHGs).

3.3. GHG Management Process

3.3.1. This section describes the key elements of the GHG Reduction Strategy, which provide a framework for effectively integrating project-specific GHG reduction priorities across the project lifecycle.

3.3.2. The key elements of the GHG management process include:

- Developing a GHG Assessment – based on preliminary design information available at time of GHG Reduction Strategy preparation, this provides expected whole-life GHG emissions. For the purposes of this GHG Reduction Strategy, the assessment (in tCO_2e) already accounts for the GHG reduction measures presented at the Proposed Development concept phase.
- Holding a GHG Workshop – conducted in collaboration with the Applicant, the design team, and buildability advisors to identify, review, assess, and prioritise additional GHG reduction opportunities beyond those outlined in the previous bullet point.
- Producing a Decarbonisation Tracker – developed to record GHG reduction opportunities identified during discussions with the Proposed Development team, and to support effective GHG reduction by assigning responsibility. This includes a mechanism that can be used to track progress against opportunities throughout the Proposed Development lifecycle.
- Developing a GHG Reduction Strategy (this document) – developed to support the delivery of GHG reduction opportunities across the Proposed Development lifecycle.

4. Governance, Roles and Responsibilities

4.1.1. The Applicant is ultimately responsible for assigning responsibility to individual stakeholders for the investigation and implementation of each of the carbon reduction opportunities presented in the **Decarbonisation Tracker** in **Appendix 1**, and making sure the **Decarbonisation Tracker** is kept up to date.

4.1.2. Where implementation of a particular opportunity is challenging, a collaborative approach between all involved in implementation (e.g. the Applicant, design consultant, contractor, procurement, etc.) is necessary to identify additional/alternative actions to overcome such challenges.

4.1.3. SSE's Sustainable Procurement Code Version 1.4 (SSE, 2024) provides a comprehensive framework that supports the establishment of clear governance structures and delineation of roles and responsibilities for achieving GHG reduction on infrastructure projects. By integrating sustainability into procurement processes and engaging with aligned suppliers, SSE facilitates the achievement of GHG reduction goals and promotes a culture of accountability and continuous improvement.

4.1.4. The 'Suppliers and Contractors Requirements' section specifies SSE's expectations for their suppliers and contractors to support decarbonisation and net zero goals. This includes regular and robust GHG reporting, managing carbon emissions at the project level, and establishing clear carbon reduction targets.

4.1.5. An **Outline Construction Environmental Management Plan (CEMP)** has been prepared to accompany the DCO application (**Application Document Ref. 7.4**). This will be developed into a final CEMP by the appointed Contractor as a Requirement of the **Draft DCO** (**Application Document Ref. 3.1**). The CEMP supports the implementation of the measures presented in this GHG Reduction Strategy.

4.1.6. As part of the monitoring process, the Engineering, Procurement and Construction contractor(s) will allocate a designated Environmental Site Officer(s) ('ESO(s)') who will be present on-site throughout the construction process and at the commencement of new construction activities. The ESO(s) will observe activities within the Proposed Development Site and report any deviations from the CEMP in a logbook, along with the action taken and general conditions at the time. The Applicant will be informed of such deviations as soon as possible following identification.

4.1.7. During construction, the ESO(s) will conduct daily walkover surveys to ensure all requirements of the CEMP are being met. Action from these surveys will be documented on an Environmental Action Schedule, discussed with the Site Foreman for programming requirements and issued weekly for actioning.

4.1.8. The ESO will arrange regular formal inspections to ensure the requirements of the CEMP are being met. After completion of construction activities, the ESO(s) will conduct a final review.

4.1.9. The ESO will retain records of environmental monitoring and implementation of the CEMP. This will allow provision of evidence that the CEMP is being implemented effectively.

5. GHG Footprint

5.1. Approach

5.1.1. The GHG footprint presented in this GHG Reduction Strategy aligns with the GHG emissions assessed in **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**). For more details on the GHG assessment methodology and the evaluation of significance, refer to **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**).

5.1.2. PAS 2080 notes that depending on the lifecycle stage at which quantification is made, either part or all the quantification may be based on predictive data (i.e., something forecasted or planned to occur) rather than actual activity data (e.g., recorded consumption amounts).

5.1.3. The GHG footprint presented within this GHG Reduction Strategy provides estimated project lifecycle emissions in tonnes of carbon dioxide equivalent (tCO_2e). This assessment has been developed based on predictive data and estimates.

5.1.4. The GHG footprint is presented to highlight which stages or activities associated with the Proposed Development are key sources of GHG emissions and to provide a basis against which GHG reduction measures can be identified and future GHG quantifications can be compared.

5.1.5. GHG emissions across the various lifecycle stages were calculated following the GHG Protocol's method, represented in the following equation

Activity Data x GHG Emissions Factor = GHG emissions value

5.1.6. Activity data refers to data collected which represents activities which result in GHG emissions, for example, litres of diesel consumed, kilowatt-hour (kWh) of electricity consumed etc.

5.1.7. Emission factors refer to factors which convert activity data into corresponding GHG emissions. The activity data obtained, and emission factors used are detailed in Table 2.

5.2. GHG calculation method and assumptions

5.2.1. Project data, industry benchmarks and proxies, and professional judgement have been used to estimate the capital and operational GHG emissions associated with the Proposed Development. In accordance with the **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**) and asset lifespans, a reference operational period of 25 years is assumed.

Table 2: GHG calculation methods and assumptions

PAS 2080 lifecycle stage		GHG calculation method and assumptions
Before Use Stage	Preconstruction stage (A0)	Represents the preliminary studies and works such as strategy and brief development, design efforts, Environmental Impact Assessment, and cost planning. It has been assumed to be minimal and therefore not a material contributor to the overall footprint (scoped out).
	Product Stage (A1-3)	Estimated material quantities for electrical equipment, steel, concrete, etc were obtained from an RFI and follow up discussions with the design team. Emission factors were obtained from the Bath University Inventory of Carbon and Energy (ICE) (BUICE, 2019). Material quantities were uplifted by respective wastage rates for each material type (accounting for spillages, breakages, offcuts, etc.), based on industry standard wastage rate assumptions from the Royal Institution of Chartered Surveyors (RICS) Whole Life Carbon Assessment for the Built Environment, 2nd edition guidelines (RICS, 2023).
	Material Transport (A4)	Distances of material transport to the construction site from the point of production, and mode of transport, have been assumed based on the RICS guidance. Emission factors from DESNZ (DESNZ, 2024) have been used (Rigid HGV, Average Laden and Cargo Ship, Average Size).
	Construction Installation process (A5)	*Waste* Material wastage quantities were provided by the design team, in addition to the industry standard wastage rates calculated for A1-3 Product Stage, and end-of-life scenarios were assumed based on RICS guidance. *Construction Activities* In the absence of activity data for construction activities, a RICS benchmark for construction activities was used to estimate the construction activity emissions for the Proposed Development.

PAS 2080 lifecycle stage		GHG calculation method and assumptions
		Worker transport Emissions from transportation of workers to the work site (i.e. commuting) was calculated based on estimated car movement figures provided by the design team, and an estimated commute distance of 50km. It was assumed workers commute via car. *Land use* The current land use within the Site will have negligible levels of associated GHG emissions. Therefore, for the purpose of the GHG footprint, existing land use emissions are considered zero.
Use Stage	B1 Use	Emissions associated with ammonia and nitrogen use during operation were calculated using assumptions provided by the design team.
	Maintenance, repair, replacement, refurbishment (B2-B5)	Emissions from maintenance and repair activities have been estimated in line the RICS guidance. Based on asset lifetimes, no significant replacement is anticipated to occur before 25 years, and therefore no replacement emissions have been calculated for the 25-year reference period.
	Operational energy use (B6)	*Hydrogen leakage* Hydrogen is not classified as a greenhouse gas under the Kyoto Protocol but indirectly impacts climate by extending methane's (CH_4) atmospheric lifetime (Warwick et al., 2022). Its direct GHG effect is excluded from the Low Carbon Hydrogen Standard's emissions intensity threshold (DESNZ, 2023). A Global Warming Potential (GWP) of 11 is applied to hydrogen leakage estimates for gas turbines and transmission networks (Warwick et al., 2022).

PAS 2080 lifecycle stage	GHG calculation method and assumptions
	Using Frazer-Nash Consultancy (2022) estimates, at a 99% confidence level, the GHG calculations suggest worst-case hydrogen leakage emissions could account for up to 2.2% of operational fuel emissions. *Upstream Natural Gas Emissions and Decarbonisation* Upstream GHG emissions include venting, flaring, and fugitive CH_4 emissions (Bauer et al., 2022). While future leakage reductions are possible, there are no reliable projections to confirm this. Currently, 14% of operational GHG emissions arise from well-to-tank processes. The UK Government's well-to-tank factor for natural gas is applied throughout the assessment period to 2050, assuming no supply chain decarbonisation over time. This is considered a conservative assumption. *Operational GHG Emissions* Assumptions: • 892 MW grid export capacity; • 63% lower heating value (LHV) efficiency; and • 1,416 MW fuel input requirement Hydrogen has 3.46 times lower volumetric energy density than natural gas (DNV, 2024), requiring a greater volume of hydrogen to produce the same energy output. Scope 1 (direct) and Scope 3 (upstream) emissions for natural gas are estimated using UK Government DESNZ (2024) factors. Hydrogen's carbon intensity follows the Low Carbon Hydrogen Standard (DESNZ, 2023b), assuming a maximum of 20 gCO_2e/MJ_{LHV}. The GHG calculation methodology does not account for potential decarbonisation of hydrogen production over time, which is considered to represent a worst-case assumption. Hydrogen combustion does not generate Scope 1 emissions. *Fugitive Hydrogen Emissions* Fugitive emissions from hydrogen leaks in the supply chain and onsite are accounted for.

PAS 2080 lifecycle stage		GHG calculation method and assumptions
	Users' utilisation (B8)	This lifecycle stage has been scoped out as it is not relevant for a development of this type. All energy and water use for site operations are captured within B6 and B7, and the use and transportation of major goods and waste to and from site are included in B1.
End of Life Stage	Deconstruction, transport, waste processing for recovery and disposal (C1-4)	Emissions from the decommissioning process at the end of the Proposed Development’s operational life are difficult to estimate due to the substantial uncertainty surrounding decommissioning methodologies and approaches so far into the future. It has been assumed that GHG emissions from activities during the decommissioning phase (e.g. on-site fuel use and employee commuting) will be equivalent to those required for construction. This is considered to reflect a worst-case scenario, as future developments in methodologies and technological advances are likely to reduce the carbon impact of decommissioning activities considerably in line with UK Government decarbonisation commitments.

5.3. GHG Hotspots

5.3.1. This section presents the GHG footprint for the Proposed Development over its anticipated lifecycle (construction, operation and decommissioning).

5.3.2. Table 3 presents the GHG assessment for the Proposed Development, excluding the B6 Operational Energy Use due to the considerable uncertainty around the overall impact of fuel use depending on the operational scenario applied.

5.3.3. GHG emissions associated with B6 Operational Energy Use are presented in Table 3.

Table 3: GHG Footprint (excludes B6 Operational Energy Use)

Lifecycle Module		Emission Source	Total GHG emissions (tCO_2e)	Percentage of each lifecycle stage (%)
A: Before Use Stage	A1-3 Product Stage	A1-3 Raw materials supply and manufacture	60,631	75%
	A4-5 Construction Process Stage	A4 Material transport	6,467	8%
		A5.2 Construction activities	6,016	8%
		A5.3 Waste	1,538	2%
		A5.4 Worker transport	5,705	7%
Total tCO_2e over Before Use Stage			**80,357**	
		B1 Use	17,888	52%

Lifecycle Module	Emission Source	Total GHG emissions (tCO_2e)	Percentage of each lifecycle stage (%)
B: Use Stage	B2-5 Maintenance, Repair & Replacement	16,462	48%
	B6-7 Operational energy and water use	12	<1%
Total tCO_2e over the Use Stage		**34,362**	
C: End of Life	C1-4 Decommissioning	19,725	100%
Total tCO_2e over the End of Life Stage		**19,725**	
Total tCO_2e over the whole life cycle		**134,444**	

5.3.4. The GHG footprint (excluding B6 Operational Energy Use) is presented graphically in Plate 3.

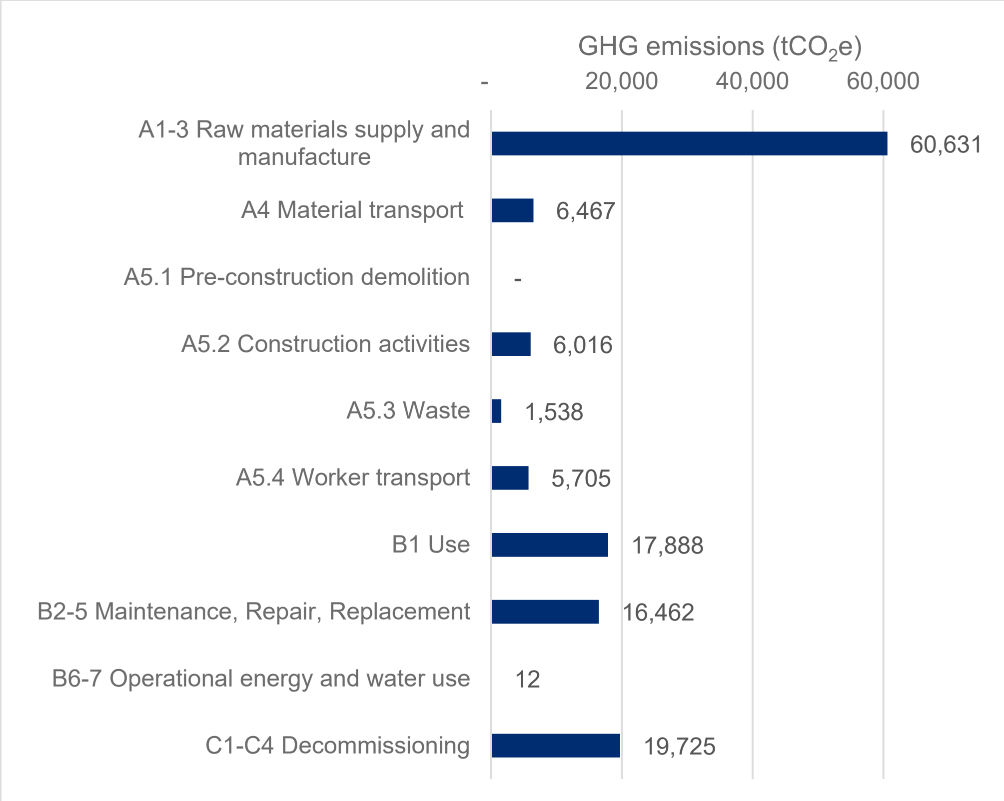

Plate 3: GHG Hotspots Overview (excludes B6 Operational Energy Use)

5.3.5. The main GHG hotspot here is the embodied GHG emissions from raw materials (A1-3), which accounts for 45% of the Proposed Development's total lifecycle emissions (excluding B6 Operational Energy Use). Other major hotspots include B1 (Use), B2-5 (Maintenance, Repair, and Replacement) emissions, and Decommissioning (C1-C4), which collectively account for 40% of the Proposed Development's lifecycle emissions.

5.3.6. Since A1-3 emissions embodied in materials are a key GHG hotspot associated with construction of the Proposed Development, this is broken down into more detail in Plate 4.

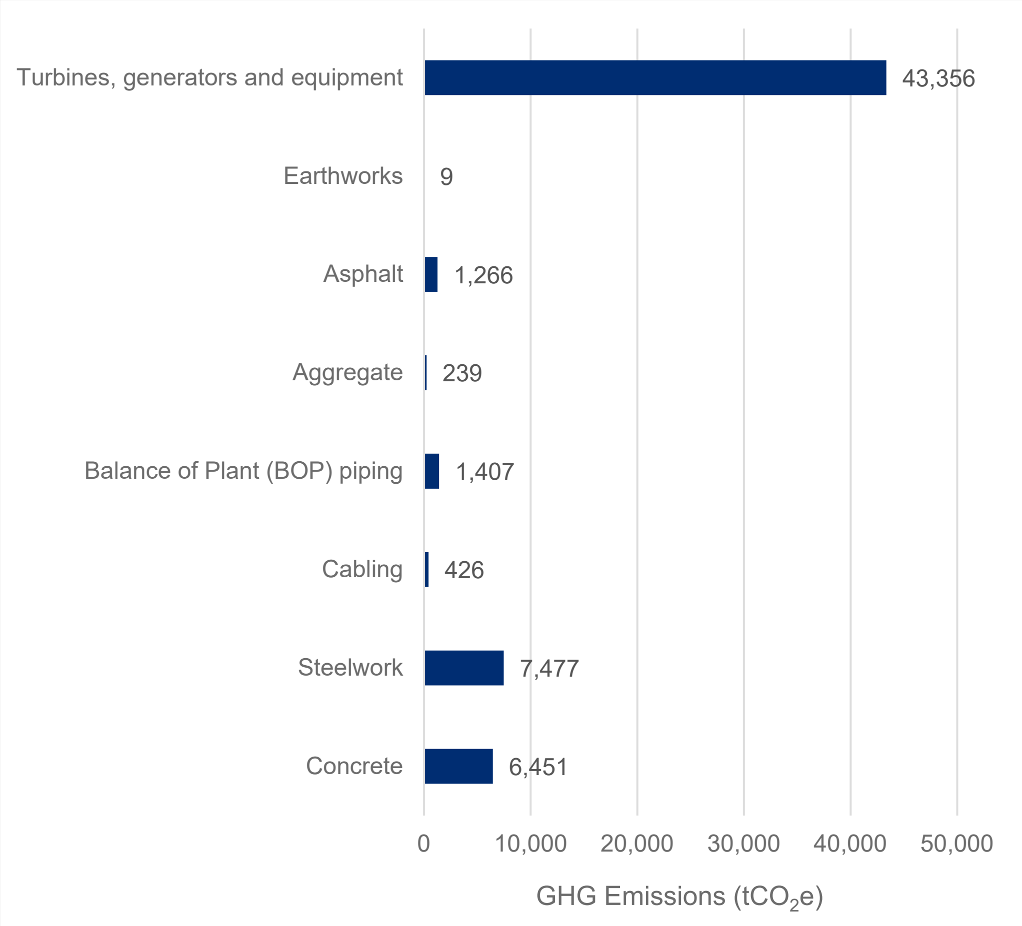

Plate 4: Embodied GHG emissions (A1-3) per material type

5.3.7. The A1-3 emissions breakdown presented in Plate 4 highlights turbines, generators, and equipment as the dominant source of A1-3 emissions at 43,356 tCO_2e, considerably outweighing other A1-3 emissions sources. Steelwork (7,477 tCO_2e) and concrete (6,451 tCO_2e) are also major hotspots, reflecting the large quantities and carbon-intensive nature of these materials. Additional GHG emissions sources include pipework (1,407 tCO_2e), asphalt (1,266 tCO_2e), and cabling (426 tCO_2e), aggregate (239 tCO_2e) and earthworks (9 tCO_2e).

Operational Scenarios

5.3.8. The seven operational scenarios that form the basis of the GHG assessment presented in **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2.18**) are presented below. These scenarios have been presented here to demonstrate the range of potential operational GHG emissions associated with the Proposed Development.

5.3.9. All scenarios assume operating hours of 3,500 hours for the first 15 years of operation, and 1,500 hours thereafter. This stepped operating hours forecast is considered to represent a reasonable overall worst case, reflecting the expected reduction in dispatchable plant use over time. However, in reality, the Proposed Development is expected to operate below this level for many of the years of operation.

- **Scenario A – H_2 Full Lifetime**: 25 years of operation with 100% hydrogen.
- **Scenario B – Early Full Decarbonisation**: 2 years of operation with 100% natural gas, followed by 23 years of 100% hydrogen.
- **Scenario C – Full Decarbonisation by 2035**: 5 years of operation with 100% natural gas, followed by 20 years with 100% hydrogen.
- **Scenario D – Blending Ramp-up**: 3 years of operation with 100% natural gas, followed by 2 years of 20% hydrogen, then 10 years with 50% hydrogen, and 10 years with 100% hydrogen.
- **Scenario E – Late Full Decarbonisation**: 15 years of operation with 100% natural gas, followed by 10 years with 100% hydrogen.
- **Scenario F – Late Partial Decarbonisation**: 15 years of operation with 100% natural gas, followed by 10 years with 50% hydrogen.
- **Scenario G – Natural Gas Full Lifetime**: 25 years of operation with 100% natural gas.

5.3.10. GHG emissions associated with B6 Operational Energy Use for the seven operating scenarios, and their resulting GHG intensities, are presented in Table 4. Emissions for each scenario have been categorised by Scope 1[3] and Scope 3[4]. Scope 1 emissions represent those directly controlled by the Proposed Development (associated with operational fuel use), while Scope 3 emissions represent those outside the direct control of the Proposed Development (associated with fuel supply chains).

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[3] Scope 1 emissions: Direct GHG emissions originating from sources that are owned or directly controlled by an organisation. These typically include emissions from fuel combustion (e.g., boilers, company vehicles) and process-related emissions.
[4] Scope 3 emissions: Indirect GHG emissions that occur outside an organisation's direct operational control. These emissions result from the organisation's value chain activities, including purchased goods and services, transportation, waste disposal, and employee business travel.

Table 4: B6 Operational Energy Use: GHG emissions and intensities

Lifecycle Module	Operating scenario	Description	Scope 1 operational GHG emissions (tCO_2e) – operational fuel use	Scope 3 operational GHG emissions (tCO_2e) – operational fuel supply	Total emissions (Scope 1 & 3 (tCO_2e) emissions combined	Total lifecycle GHG emissions intensity ($kgCO_2e/kWh$)
B6 (Operational Fuel Use)	A	H_2 Full Lifetime[5]	3,072	7,028,590	7,031,662	0.117
	B	Early Full Decarbonisation	2,028,584	6,630,206	8,658,790	0.144
	C	Full Decarbonisation by 2035	5,066,853	6,032,630	11,099,483	0.184
	D	Blending Ramp-up	12,786,660	4,514,274	17,300,934	0.287
	E	Late Full Decarbonisation	15,194,416	4,040,709	19,235,125	0.319
	F	Late Partial Decarbonisation	18,561,415	3,378,477	21,939,892	0.364
	G	Natural Gas Full Lifetime	19,534,800	3,187,029	22,721,829	0.377

[5] The majority of these emissions originate from H_2 leakage.

5.3.11. The Operational GHG emissions from B6 Operational Energy Use are presented in Plate 5 for the seven operational scenarios, broken down into scope 1 and scope 3 emissions.

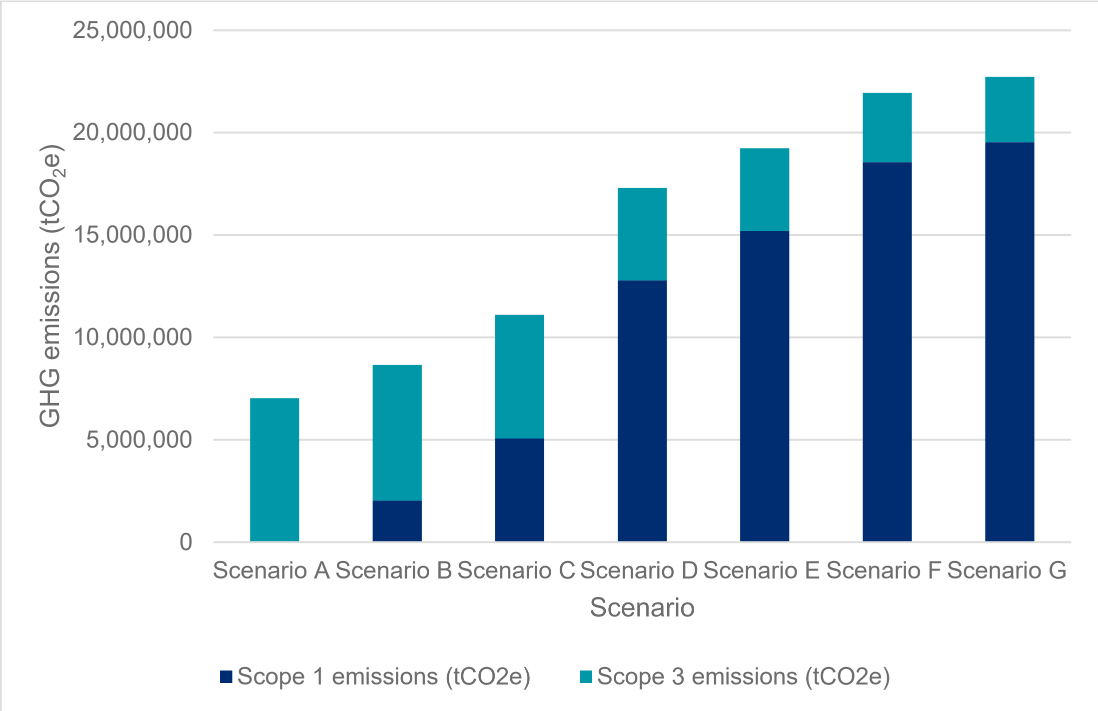

Plate 5: B6 Operational GHG Emissions of the Modelled Operating Scenarios for the Proposed Development Broken Down by Emissions Source

5.3.12. The scenarios with the greatest hydrogen uptake represent the lowest carbon options, while those with the greatest use of natural gas are the highest carbon options.

5.3.13. Also, as hydrogen is a fuel which emits zero carbon emissions at the point of combustion, the vast majority of emissions from the 100% hydrogen scenario are scope 3 emissions (e.g. from upstream hydrogen production and transmission) and are therefore outside the direct control of the Proposed Development.

5.3.14. For the 100% natural gas scenario, the majority of emissions are scope 1 emissions as they occur at the point of combustion, and are considered to be within the direct control of the Proposed Development.

6. GHG Reduction Opportunities

6.1.1. Opportunities for the reduction of GHG emissions are identified in the Decarbonisation Tracker in **Appendix 1** and focus on reducing GHG emissions from key emission sources. As the detailed design is yet to be finalised, these potential GHG reduction opportunities are not committed to through the DCO to allow flexibility. It is important at this stage to consider a wide range of carbon reduction opportunities and explore their feasibility over time, and not be limited only to those that can be committed to at this stage.

6.1.2. Identification of GHG reduction opportunities is a key part of the GHG management process and the Decarbonisation Tracker provides a framework for how opportunities can be identified and prioritised. These identified GHG reduction opportunities include consideration of nature-based solutions where applicable, as per NPS EN-1 requirements (DESNZ, 2023a).

6.1.3. Opportunities are identified in terms of the following four categories:

- Strategy and Governance;
- Innovative Design;
- Lower Carbon Products; and
- Lean Construction Techniques.

6.1.4. These categories extend across the Proposed Development lifecycle, from planning and design through delivery. By identifying and developing GHG reduction opportunities within these categories, all aspects of the Proposed Development should be considered, including management processes, procurement and culture, and technical solutions.

6.1.5. The initial list of GHG reduction opportunities was developed during a GHG-focused workshop with representatives from the Applicant and the design team.

6.1.6. The Decarbonisation Tracker (**Appendix** 1) is a live document, which will be continually updated throughout the Proposed Development lifecycle as further opportunities and actions are identified, as decisions are made concerning their feasibility, and as such opportunities are implemented.

6.1.7. Operational emissions account for the majority of total emissions. These are largely Scope 1 and Scope 3 emissions or fall outside the control of the Proposed Development, particularly in the case of hydrogen. Therefore, the main opportunities for GHG reduction lie in:

- UK Government policy, which highlights hydrogen's role in the energy transition, as set out in the UK Hydrogen Strategy (BEIS, 2021), British Energy Security Strategy (BEIS, 2022), and NPS-EN1 (DESNZ, 2023a). Market forces, such as the UK Emissions Trading Scheme, are increasing costs for unabated natural gas generation, making hydrogen a more economically viable option. The development of unabated CCGT does not align with UK Government policy (NPS-EN1) (DESNZ, 2023a). Hydrogen-ready projects like the Proposed Development are crucial for encouraging investment in hydrogen production and infrastructure. Additionally, even low-hydrogen usage scenarios offer a lower-carbon alternative to the existing stock of CCGT power stations in the UK due to increased efficiency, as outlined in **ES Volume I Chapter 18**: Climate Change (**Application Document Ref. 6.2**).
- Reducing emissions though implementing the mitigation measures detailed in the Decarbonisation Tracker (**Appendix 1**).

6.2. Prioritisation of Opportunities

6.2.1. To understand the potential value of GHG reduction opportunities identified, each opportunity has been assigned a prioritisation rating based on a combination of its GHG reduction effectiveness and ease of implementation using the matrix shown in Plate 6.

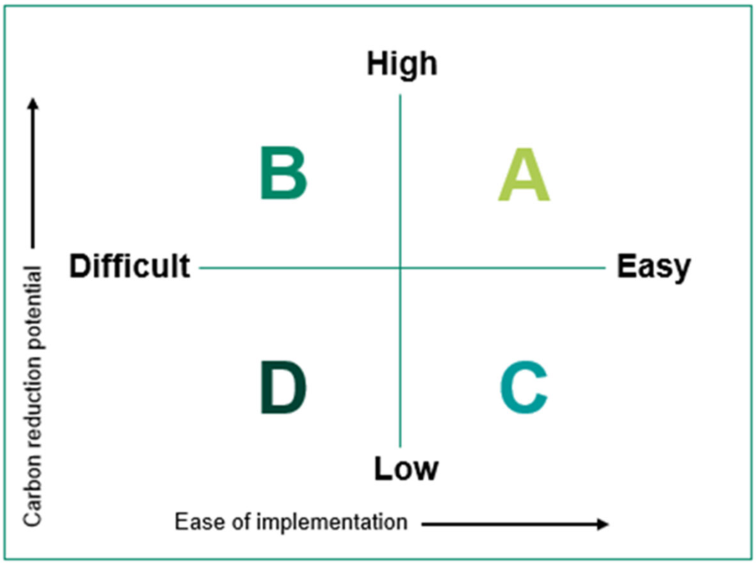

Plate 6: GHG reduction opportunity prioritisation matrix

6.2.2. The 'carbon reduction potential' aspect of the matrix is determined considering by the following:

- additionality to business-as-usual (decarbonisation policy and market drivers);
- minimising negative GHG impacts;
- maximising GHG benefits; and
- level of confidence in the effect.

6.2.3. The 'ease of implementation' aspect of the matrix is determined by considering the following:

- resource capacity and capability;
- technological impacts – enablers or constraints;
- legislation – drivers or restrictions;
- time limitations;
- cost implications – positive or negative;
- whether the opportunity fits with existing priorities and commitments; and
- wider sustainability impacts – as enablers or constraints.

6.2.4. The ratings assigned to each opportunity should be seen only as an initial screening and will be reviewed periodically following further discussions and feasibility analysis as the Proposed Development progresses. Prioritisation ratings will also be assigned to any further measures identified and recorded within the Decarbonisation Tracker. This will be the responsibility of the Applicant's project management team, unless delegated to a suitably qualified carbon practitioner or the owner assigned to each opportunity as appropriate.

6.2.5. Within the Decarbonisation Tracker, owners and key actions will be identified for each opportunity throughout the Proposed Development lifecycle. This enables specific responsibilities to be assigned within the Proposed Development's organisational structure. The actions listed, and any further feasibility analysis, are the responsibility of the owner assigned to each opportunity. Any opportunities without an assigned owner will rest with the Applicant's project management team until an owner is identified.

6.2.6. The progress of each opportunity is reflected by the assigned status, which identifies the opportunities that have been implemented, those under consideration, those requiring further exploration, and those not being taken forward.

7. Emissions Reduction Commitments

7.1.1. No specific decarbonisation targets have been set for the Proposed Development. However, the following SSE targets highlight the Applicant's commitment to reducing carbon emissions.

7.1.2. SSE aims to achieve net-zero GHG emissions across its Scope 1 and Scope 2 emissions by 2040 and for remaining Scope 3 emissions by 2050. This net-zero target is supported by commitments that have been submitted to and approved by the Science Based Targets Initiative (SBTi):

- Reduce Scope 1 GHG emissions intensity by 80.2% (from 307 gCO_2e/kWh to 61 gCO_2e/kWh) between 2017/18 and 2030[6].
- Reduce absolute Scope 1 and 2 GHG emissions by 72.5% (from 11.06 $MtCO_2e/yr$ to 3.04 $MtCO_2e/yr$) between 2017/18 and 2030.

7.1.3. These targets are supplemented by SSE's existing interim Scope 3 targets, also verified by the SBTi:

- Reduce absolute GHG emissions from the use of sold products by 50% (from 2.5 $MtCO_2e$ to 1.25 $MtCO_2e$) between 2017/18 and 2034.
- Engage with suppliers accounting for 50% of spend to set Science-Based Targets (SBTs) by 2024.

7.1.4. Over its lifetime, the Proposed Development will support the UK to fulfil its net zero policy and transition away from fossil fuels. By adding a reliable source of low-carbon electricity, the Proposed Development will facilitate the decarbonisation of the UK Grid. The Proposed Development plays a role in decarbonising the electricity grid and transition to net zero by 2050.

7.1.5. While the Proposed Development has a role to play in helping the UK's electricity grid to decarbonise, it is still important to reduce GHG emissions associated with the Proposed Development where possible. These GHG reductions can be driven by implementation of this GHG Reduction Strategy, in particular implementation of the opportunities outlined in the Decarbonisation Tracker.

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[6] Target boundary includes biogenic emissions and removals from bioenergy feedstocks.

8. Review

8.1.1. The Applicant will be supported through the design and planning stage by the Proposed Development's design consultant, and during the construction stage by the principal contractor and other contractors. With specific regard to GHG emissions, review activities to facilitate the successful implementation of the GHG Reduction Strategy will include:

- Review and update of the Decarbonisation Tracker (at periodic intervals):
  - Review progress of GHG reduction opportunities implementation;
  - Identify new GHG reduction opportunities;
  - Assess feasibility of GHG reduction opportunities; and
  - Incorporate feasible GHG reduction opportunities into design and construction plans and procurement.
- Quantification of GHG emissions (at the end of each lifecycle stage or more frequently as appropriate):
  - Update GHG emissions calculations associated with the Proposed Development, to reflect changes related to more accurate activity data and implementation of GHG reduction opportunities.

9. Communication and Training

9.1.1. To support this GHG Reduction Strategy, the Decarbonisation Tracker can be used to help communicate and report progress against carbon reduction opportunities. This can be used to track performance throughout design, construction and operation and support evidencing of progress in line with emissions reduction ambitions.

9.1.2. The GHG Reduction Strategy will be shared and communicated with key stakeholders (including the Applicant, the design consultant and the principal contractor) throughout the delivery of the Proposed Development.

9.1.3. The Proposed Development team will undertake the necessary training to enable them to manage GHG emissions across the Proposed Development. National initiatives such as the Carbon Literacy Project or equivalent provide existing GHG training courses.

9.1.4. The design consultant will undergo training to ensure all designers on the Proposed Development understand their role in minimising GHG emissions. This can be achieved through relevant in-house training or through external projects provided through professional bodies such as the Institution of Civil Engineers.

9.1.5. Toolbox Talks will be provided to all operatives on site to assist with the identification and implementation of specific task-related GHG reduction opportunities during construction delivery.

9.1.6. Training needs will be identified through the building of the Proposed Development team following training needs analysis and implemented as appropriate.

10. References

- Department for Energy Security and Net Zero (DESNZ). (2023a). Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/media/64252f3b60a35e00120cb158/NPS_EN-1.pdf [Accessed 05 June 2025].
- British Standards Institute (BSI). (2023). PAS 2080:2023 Carbon Management in Buildings and Infrastructure. Available at: https://knowledge.bsigroup.com/products/carbon-management-in-buildings-and-infrastructure?version=standard [Accessed 05 June 2025].
- WRI & WBCSD. (2015). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf [Accessed 05 June 2025].
- Royal Institution of Chartered Surveyors (RICS). (2023). Whole life carbon assessment for the built environment, 2nd edition. Available at: https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment [Accessed 05 June 2025].
- SSE. (2024). Sustainable Procurement Code Version 1.4. Available at: https://www.sse.com/media/44ip30h0/sustainable-procurement-code-2024-1.pdf [Accessed 05 June 2025].
- Bath University Inventory of Carbon and Energy. (2019). Embodied Carbon - The ICE Database. Available at: https://circularecology.com/embodied-carbon-footprint-database.html [Accessed 05 June 2025].
- Department for Energy Security and Net Zero (2024). Greenhouse gas reporting: conversion factors (2024). Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024 [Accessed 05 June 2025].
- Warwick, N., Griffiths, P., Archibald, A., Pyle, J., & Shine, K. (2022). Atmospheric implications of increased hydrogen use. Department for Business, Energy & Industrial Strategy. Available at: https://assets.publishing.service.gov.uk/media/624eca7fe90e0729f4400b99/atmospheric-implications-of-increased-hydrogen-use.pdf [Accessed 05 June 2025].
- Department for Energy Security and Net Zero (2023b) UK Low Carbon Hydrogen Standard: Greenhouse Gas Emissions Methodology and Conditions of Standard Compliance version 3. December 2023 (online) Available at: https://assets.publishing.service.gov.uk/media/6584407fed3c3400133bfd47/uk-low-carbon-hydrogen-standard-v3-december-2023.pdf [Accessed 05 June 2025].

- Frazer-Nash Consultancy (2022) Fugitive Hydrogen Emissions in a Future Hydrogen Economy (online). Available online: https://assets.publishing.service.gov.uk/media/624ec79cd3bf7f600d4055d1/fugitive-hydrogen-emissions-future-hydrogen-economy.pdf [Accessed 05 June 2025].
- Bauer, S. E., Tsigaridis, K., Faluvegi, G., Nazarenko, L., Miller, R. L., Kelley, M., & Schmidt, G. (2022). The turning point of the aerosol era. Journal of Advances in Modeling Earth Systems, 14(12), e2022MS003070. This study examines trends in aerosol forcing using the NASA GISS ModelE, identifying a shift from increasing to decreasing aerosol influence in the early 21st century.
- DNV (2024) GasVLe - Thermophysical Properties Calculator. Available at: https://store.veracity.com/gasvle [Accessed 05 June 2025].
- Department for Business, Energy & Industrial Strategy (2021). UK Hydrogen Strategy. HM Government, London. Available at: https://www.gov.uk/government/publications/uk-hydrogen-strategy [Accessed 05 June 2025].
- Department for Business, Energy & Industrial Strategy (2022). British Energy Security Strategy. HM Government, London. Available at: https://www.gov.uk/government/publications/british-energy-security-strategy [Accessed 05 June 2025].

Appendix 1 Decarbonisation Tracker

KEADBY NEXT GENERATION POWER STATION
Hydrogen-enabled flexible power

Ref.	Opportunity	Description	Impact potential: - Low - High	Ease of implementation: - Difficult - Easy	Prioritisation rating (impact vs ease of implementation)	Delivery timeframe (short, medium or long term)
O-1	Low-carbon hydrogen utilisation	Maximise the use of low-carbon hydrogen to operate the power station, subject to availability of supply. This is largely expected to be a passive process, driven by government policy and market forces as higher carbon forms of electricity generation become more expensive. However, proactive steps should be taken wherever possible and appropriate.	Very High	Easy	A	Long term (during operation)
O-2	Hydrogen supplier requirements	Require compliance with the UK Low Carbon Hydrogen Standard (LCHS) within the agreement with the hydrogen supplier, including improvement on the LCHS threshold wherever possible and appropriate.	Very High	Easy	A	Long term (during operation)
O-3	Embed carbon limits in procurement	Embed product-stage carbon limits in sub-contractor clauses to encourage improved specifications for procurement of major products. Tender documents should encourage low-carbon innovations.	High	Easy	A	Medium term (during construction)
O-4	Embed roles for implementation of the GHG Reduction Strategy into contracts.	Write requirements and responsibilities necessary for implementing the GHG Reduction Strategy into relevant contractual agreements where required, including suppliers and service providers. This includes documentation of key contractual clauses within the specification and contract documents issued to the contractor at the tender stage.	High	Easy	A	Short term (during design)
O-5	Supply chain sustainability assessments	Require contractors to review the sustainability and carbon credentials of materials used and apply value engineering principles, with specific consideration of supply chain emissions down to tier 2, 3, and 4 suppliers.	High	Easy	A	Medium term (during construction)
O-6	Maximise recycled content	Maximise the use of recycled materials. This should be treated as a key design decision and explicitly included in specifications to drive implementation.	High	Easy	A	Medium term (during construction)
O-7	Carbon management process	Implement a carbon management process in line with PAS2080 and other relevant industry standards.	High	Easy	A	Short term (during design)
O-8	Lightweight structural design	Where feasible, adopt lightweight building designs to reduce structural demands and therefore material quantities required. Cooling towers may present a strong opportunity for this approach.	High	Easy	A	Short term (during design)
O-9	Lower carbon multi-component concrete	Reduce Portland cement content in concrete by using multi-component, lower-carbon mixes (e.g. CEM VI + limestone), in line with BS 8500:2023, which permits the use of multi-component cements under the updated British Standard.	High	Easy	A	Short term (during design)
O-10	Use of green ammonia and urea	Investigate options to source ammonia and other chemicals locally to reduce transportation emissions, and explore the use of lower-carbon alternatives such as green ammonia or green urea.	High	Easy	A	Long term (during operation)
O-11	Lower carbon concrete element selection	Undertake low-carbon concrete element design analysis, comparing embodied carbon against structural performance. Concrete grade C40/50 elements often offer the lowest carbon per unit volume.	High	Easy	A	Short term (during design)
O-12	Use local, low-carbon cement substitutes	Use locally available, lower-carbon materials to replace natural aggregates and cement, where feasible — such as Incinerator Bottom Ash Aggregate (IBAA), Fly Ash, Scunthorpe steelworks slag aggregates, and Ground Granulated Blast-furnace Slag (GGBS).	High	Easy	A	Medium term (during construction)
O-13	Pilot low carbon solutions	Implement low-volume pilot projects to demonstrate low-carbon, innovative products and techniques which could then be rolled out at a larger scale on future projects.	High	Easy	A	Medium term (during construction)
O-14	Design for decommissioning	Design infrastructure to facilitate ease of decommissioning at end of life, to reduce emissions during decommissioning and deconstruction.	High	Easy	B	Short term (during design)
O-15	Smaller pipeline diameter	Minimise the diameter of supply pipelines where feasible, to reduce material use and associated emissions.	High	Difficult	B	Short term (during design)
O-16	Existing pipeline reuse for hydrogen supply	Explore opportunities to repurpose existing natural gas pipeline infrastructure for hydrogen transport, rather than constructing new pipelines along the entire route. Whether or not the existing pipework is reusable for hydrogen depends whether or not stainless steel is specified as a requirement.	High	Difficult	B	Short term (during design)
O-17	Ash tip for concrete fill	Consider using the adjacent ash tip as a source of fill material or concrete binder to reduce material demand and associated embodied carbon, subject to the findings of an ecological survey, noting that ash tips are often high value ecologically which could act as a blocker here.	High	Difficult	B	Medium term (during construction)

Ref.	Opportunity	Description	Impact potential: - Low - High	Ease of implementation: - Difficult - Easy	Prioritisation rating (impact vs ease of implementation)	Delivery timeframe (short, medium or long term)
O-18	SCR retrofit for reduced chemical use	Design out Selective Catalytic Reduction (SCR) systems to reduce ammonia and chemical use, or design it to allow future adjustment or retrofitting. An assessment of associated water impacts is required.	High	Difficult	B	Long term (during operation)
O-19	Reduce system start-stop frequency	Optimise operational modes by reducing start-stop cycles, and use auxiliary boilers when appropriate to keep the system warm between cycles.	High	Difficult	B	Long term (during operation)
O-20	Virtual biomethane contract	Consider contracting for virtual biomethane supply to drive the use of lower carbon fuels, recognising the challenges of implementing this approach at scale.	High	Difficult	B	Long term (during operation)
O-21	Optimisation of spans for industrial buildings	Consider shape & structure of any proposed mezzanines to optimise material use and avoid overengineering.	High	Difficult	B	Short term (during design)
O-22	Carbon-negative aggregates	Explore the use of carbon-negative aggregates for car park construction. However, limitations in availability and cost implications will need to be considered.	High	Difficult	B	Medium term (during construction)
O-23	Adopt sector best practice in buildings	Implement best practice low-carbon building design from other sectors – e.g. building fabric and thermal mass optimisation, passive lighting and ventilation, low carbon heating and power, and green infrastructure. Green building certifications e.g. LEED or BREAMM could be explored.	Low	Easy	C	Short term (during design)
O-24	Encourage active travel or lower carbon commuting	Promote cycle-to-work schemes and car-sharing initiatives during both construction and operational phases to reduce transportation emissions.	Low	Easy	C	Short term (during design)
O-25	Improve site plant efficiency	Optimise construction plant use to minimise idle time and reduce unnecessary fuel consumption. This could include training and awareness sessions for plant operatives.	Low	Easy	C	Medium term (during construction)
O-26	Fuel use for generator cooling	Use green hydrogen for generator cooling, which requires relatively small volumes.	Low	Easy	C	Long term (during operation)
O-27	Climate resilience measures	Investigate climate resilience measures that support long-term carbon savings by reducing future maintenance and repair requirements as a result of climate change impacts.	Low	Easy	C	Short term (during design)
O-28	Utilisation of the river for material transport	Optimise vehicle logistics and reduce fuel consumption by using the river for material transport where feasible, rather than HGV transport.	Low	Easy	C	Medium term (during construction)
O-29	Material reuse from site	Reuse site-won materials wherever possible to reduce waste and minimise the need for imported materials.	Low	Easy	C	Medium term (during construction)
O-30	Innovative temporary construction materials	Use non-standard temporary works solutions, including BSI Flex concretes and alternative aggregates, where appropriate, to reduce construction material requirements. If only required for temporary works, then the assets might not need to be built to design standards as they don't need to be as durable.	Low	Easy	C	Medium term (during construction)
O-31	Local worker accommodation	Provide temporary worker accommodation near to site to reduce GHG emissions from worker transport. The potential option for future conversion to permanent housing could also be explored.	Low	Easy	C	Medium term (during construction)
O-32	Eco-friendly site office containers	Use eco-friendly or zero-emission site office containers and welfare units, such as Groundhog units, to reduce energy consumption and associated GHG emissions.	Low	Easy	C	Medium term (during construction)
O-33	Low-carbon generator fuel	For the emergency diesel generator, consider using Hydrotreated Vegetable Oil (HVO) or biodiesel as lower-carbon alternatives. However, consider the feedstock of HVOs - for example HVOs from waste oil are very low carbon as they use a waste product, whereas HVOs from crop plants are higher carbon and can have wider sustainability impacts to consider.	Low	Easy	C	Medium term (during construction)
O-34	Fill material reuse	Reuse spoil from nearby projects for fill and land raising where appropriate to reduce GHG associated with the production and transportation of virgin materials. Also use site-won or locally sourced material to infill drains and ditches, where suitable.	Low	Easy	C	Medium term (during construction)
O-35	Low carbon construction plant	Use low- or zero-emission construction plant where feasible.	Low	Easy	C	Medium term (during construction)
O-36	Early utilities and electric vehicle chargers	Install future site utilities early, including electric vehicle charging points, so they can be utilised by the construction workforce as well.	Low	Easy	C	Medium term (during construction)
O-37	Alternative power supply for site	Explore sourcing power from Keadby 1 or Keadby 2 instead of diesel generators, and consider alternative technologies such as fuel cells (e.g. GeoPura).	Low	Easy	C	Medium term (during construction)
O-38	Efficient vehicle movements	Consider optimising worker transport through measures such as shuttle buses, car sharing, and other low-emission travel options.	Low	Easy	C	Medium term (during construction)
O-39	Greywater reuse in admin facilities	Use rainwater for greywater purposes in administrative facilities during both construction and operational phases. Also explore additional water recycling opportunities.	Low	Easy	C	Medium term (during construction)

Ref.	Opportunity	Description	Impact potential: - Low - High	Ease of implementation: - Difficult - Easy	Prioritisation rating (impact vs ease of implementation)	Delivery timeframe (short, medium or long term)
O-40	Track carbon targets and performance	Monitor supply chain sustainability KPI performance and drive continuous improvement.	Low	Easy	C	Medium term (during construction)
O-41	Use local suppliers to cut emissions	Utilise the local supply chain where feasible to reduce transport-related emissions and support regional sustainability. However, it is recognised that this is unlikely to be possible for some specialist assets or components.	Low	Easy	C	Medium term (during construction)
O-42	Combined Heat and Power steam capture	Utilise Combined Heat and Power (CHP) steam or hot water offtake for heating applications.	Low	Difficult	D	Short term (during design)
O-43	Explore cabling material options	Investigate the carbon impact of different cabling material options (e.g. copper vs aluminium), and select the lowest carbon option.	Low	Difficult	D	Short term (during design)
O-44	Renewable power for site buildings	Use renewable energy sources to power site buildings where feasible.	Low	Difficult	D	Long term (during operation)
O-45	Optimised concrete bunding	Implement tapered concrete bunding, subject to alignment with the design team.	Low	Difficult	D	Short term (during design)
O-46	Use local construction workforce	Engage local workforce and contractors where possible to reduce transportation emissions, taking into account specific skillsets and location constraints. This should be achievable for common roles, but could be more difficult for specialist roles.	Low	Difficult	D	Medium term (during construction)
O-47	Soil stabilisation for pavements	Use soil stabilisation techniques for car park and pavement base construction to reduce material requirements and future maintenance and repairs.	Low	Difficult	D	Medium term (during construction)
O-48	Cold-recycled road base materials	Consider cold recycled bound material (CRBM) for road construction to reduce virgin material requirements, noting potential cost implications.	Low	Difficult	D	Medium term (during construction)
O-49	Full electric vehicle site fleet	Use a 100% electric vehicle fleet for all onsite operations.	Low	Difficult	D	Long term (during operation)
O-50	Low-carbon pavement materials	Use warm mix asphalt for car park and access road construction.	Low	Difficult	D	Medium term (during construction)
O-51	CCSU-enabled cement procurement	Consider sourcing cement from Carbon Capture and Storage Unit (CCSU) plants where emissions are captured at source. It is recognised, however, that there's limited availability of such facilities in Europe.	Low	Difficult	D	Medium term (during construction)