Rosebank

Response to Requirement #1 (An assessment of the effects of downstream scope 3 emissions from the above project on climate) of the Regulation 12(1) Notice dated 21 July 2025

CONTENTS

ACRONYMS

APS	Announced Pledges Scenario
AR6	Sixth Assessment Report
CB	Carbon Budget
CBDP	Carbon Budget Delivery Plan
CCC	Climate Change Committee
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilization, and Storage
CH_4	Methane
CO_2	Carbon dioxide
CO_2eq	Carbon Dioxide Equivalent
DESNZ	Department for Energy Security and Net Zero
EIA	Environmental Impact Assessment
EPO	Environmental Protection Objective
EU	European Union
ES	Environmental Statement
FPSO	Floating Production Storage and Offloading vessel
GHG	Greenhouse Gas
GOGET	The Global Oil and Gas Extraction Tracker
Gt	Giga Tonne (10^9 tonnes)
HFC	Hydrofluorcarbons
IAS	International Aviation and Shipping
IEA	International Energy Agency
IEMA	Institute of Environmental Management and Assessment
IMP	Illustrative Mitigation Pathways
IP	Illustrative Pathways
LoF	Life of Field
NDC	Nationally Determined Contribution
NOAA	National Oceanic and Atmospheric Administration
N_2O	Nitrous oxide
NSTD	North Sea Transition Deal
NSTA	North Sea Transition Authority
NZE	Net Zero Emissions

PFC	Perfluorocarbons
SF6	Sulphur hexafluoride
SNMP	Scottish National Marine Plan
STEPS	Stated Policies Scenario
TES	Territorial Emissions Sectors
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UNFCCC	United Nations Framework Convention on Climate Change
WGI	Working Group I
WGIII	Working Group III
WTT	Well to Tank

DEFINITIONS / GLOSSARY

Announced Pledges Scenario (APS): An International Energy Agency (IEA) scenario that models future energy demand and supply based on governments' announced climate pledges, even if not yet backed by detailed policies.

Anthropogenic: Originating from human activity, especially in the context of emissions or environmental change.

Assessment: (The) 'Assessment' may from time to time refer to the assessment of the Rosebank Development's Downstream Scope 3 Emissions on the climate as required by the Supplementary Guidance and requested from Equinor UK by OPRED's Regulation 12(1) Notice.

Atmospheric Carbon Dioxide (CO_2): The concentration of CO_2 in the Earth's atmosphere, typically measured in parts per million (ppm).

Baseline Scenario: A description of the current state of the environment and a projection of its likely evolution without the implementation of the proposed project.

BECCS (Bioenergy with Carbon Capture and Storage): A technology that produces energy from biomass and captures and stores the resulting CO_2 emissions.

Carbon Budget (CB): The maximum amount of cumulative net global anthropogenic CO_2 emissions that would result in limiting global warming to a given level, such as 1.5°C or 2°C above pre-industrial levels.

Carbon Budget Delivery Plan (CBDP): The UK government's official strategy for meeting legally binding carbon budgets, outlining policies and proposals across sectors.

Carbon Cycle: The circulation of carbon between the atmosphere, oceans, soil, plants, and animals.

Carbon Dioxide Equivalent (CO_2eq): Unit of measurement used to compare emissions of different GHGs on the basis of their GWP (see GWP definition below). Other GHGs are converted to the equivalent amount of CO_2 expressed as CO_2e.

Carbon Intensity: The amount of CO_2 emitted per unit of energy or product output.

Carbon Sinks: Natural or artificial reservoirs that absorb and store carbon dioxide from the atmosphere, such as forests, soils, and oceans.

CCUS (Carbon Capture, Utilisation and Storage): Technologies that capture CO_2 emissions from sources like power plants and either reuse or store it so it will not enter the atmosphere.

Central Obligation: Refers to the requirement in the OGA Strategy for all relevant persons to take the steps necessary to: (a) secure that the maximum value of economically recoverable petroleum is recovered from the strata beneath relevant UK waters; and in doing so, (b) take appropriate steps to assist the Secretary of State in meeting the Net Zero target, including by reducing as far as reasonable in the circumstances greenhouse gas emissions from sources such as flaring and venting and power generation, and supporting carbon capture and storage projects.

Climate Change Act 2008: UK legislation that sets a legal framework for reducing GHG emissions and adapting to climate change, including a target for Net Zero emissions by 2050.

Climate Indicators: Key variables used to monitor and evaluate the state and trends of the climate system, such as atmospheric CO_2, global mean surface temperature, ocean heat content, and sea level.

Combustion: The process of burning a substance (such as oil or gas), resulting in the release of energy and emissions, primarily CO_2.

Conference of the Parties (CoP): The supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC), which meets annually to review progress and negotiate future actions.

Cumulative Emissions: The total net amount of CO_2 or GHGs emitted into the atmosphere over a specified period, often since the Industrial Revolution.

Decarbonisation: The process of reducing carbon emissions associated with electricity, industry, transport, and other sectors.

DESNZ: Department for Energy Security & Net Zero, a UK government department responsible for energy and climate policy.

Downstream Scope 3 Emissions: Downstream Scope 3 emissions arising from the transportation, processing, use and disposal of a product (see Scope 3 Emissions definition below).

EIA (Environmental Impact Assessment): A process that evaluates the likely environmental impacts of a proposed project, including direct and indirect effects.

EIA Directive: Directive 2011/92/EU of the European Parliament and of the Council, as amended by Directive 2014/52/EU.

Emissions Database for Global Atmospheric Research (EDGAR): A comprehensive database providing global estimates of GHG emissions.

Emission Reduction Pathways: Planned trajectories for decreasing GHG emissions over time which represent a set of possible strategies and actions to achieve specific emission reduction targets aligned with global climate goals like the Paris Agreement.

End User Combustion: The burning of hydrocarbons by the final consumer, resulting in GHG emissions.

Energy Institute: An organisation that publishes the Statistical Review of World Energy, providing data on global energy production and consumption.

Environmental Protection Objectives (EPOs): Generally refers to concentration limits set to protect the environment. In terms of global climate change, the EPOs are the international agreements and national legislation and policies, including sector specific strategies to mitigate climate change (see *Table 5* – Summary of Policy and Legislative Instruments).

Equinor UK: Equinor UK Limited, operator of the Rosebank Field. **Equinor**: An international energy company headquartered in Stavanger, Norway. It operates in over 30 countries, focusing on oil, gas, and renewable energy production.

EU27: The EU Member States after the UK left the EU.

Finch Judgment, 2024: UK's Supreme Court ruling in 2024 that a decision to grant planning permission for an onshore oil development project at a site in Surrey was unlawful, because downstream GHG emissions from the combustion of the oil produced were not assessed in the EIA as part of the planning decision.

GHG Protocol: The Greenhouse Gas Protocol, a widely used international accounting tool for government and business leaders to understand, quantify, and manage GHG emissions.

Global Carbon Budget: An annual assessment of CO_2 sources and sinks, tracking changes in emissions and removals.

Global Greenhouse Gas Reference Network: An international network of sites that provides long-term measurements of key GHGs (as defined below).

Global Mean Surface Temperature: The average temperature of the Earth's surface, used as a key indicator of climate change.

Global Warming Potential (GWP): Describes the relative potency of a GHG, taking into account how long it remains active in the atmosphere. GWPs currently used are calculated over 100 years and CO_2 is taken as the gas of reference with a 100-year GWP of 1.

Greenhouse Gases (GHGs): A group of gases contributing to global warming and climate change. Non fluorinated gases arising from the combustion of hydrocarbons include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

Hydrocarbons: Organic compounds consisting entirely of hydrogen and carbon, such as oil and natural gas.

IEMA, 2022: IEMA's guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance provides useful six step assessment principles that a developer may wish to follow when assessing the GHG emissions associated with their project.

Illustrative Mitigation Pathways (IMPs): Scenarios developed by the IPCC to explore how different mitigation strategies can achieve specific climate targets.

International Energy Agency (IEA): An intergovernmental organisation providing statistics, analysis, and policy advice on global energy.

Intergovernmental Panel on Climate Change (IPCC): International body created by the World Meteorological Organisation and the United Nations Environment Programme which synthesises published and peer-reviewed literature to develop an objective, comprehensive and transparent assessment of current knowledge. The 6th assessment report cycle concluded in 2023. The 7th assessment report cycle has commenced and will run until at least 2029.

IPCC AR6: The Sixth Assessment Report of the IPCC, providing the latest scientific knowledge on climate change.

IPCC Scenarios (SSP-RCP): Combined scenarios using Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs) to model future climate outcomes.

Jackdaw / Rosebank Judgment, 2025: Scotland's Court of Session ruling in 2025 in relation to assessment of Downstream Scope 3 Emissions under the Offshore EIA Regulations.

Just Transition: A framework for ensuring that the shift to a low-carbon economy is fair and inclusive, protecting workers and communities.

Kyoto Protocol: An international treaty adopted in 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). Its primary goal was to reduce greenhouse gas emissions and combat global warming.

Life of Field (LoF): The operational lifespan of an oil or gas field, from production start to cessation. For the Rosebank Development this is estimated up to 2051.

Mitigation: Actions taken to reduce or prevent the emission of GHGs.

Net Zero: A state where the amount of GHGs emitted is balanced by the amount removed from the atmosphere.

Net Zero Emissions (NZE) Scenario: An IEA scenario that models a pathway to Net Zero emissions from the energy sector by 2050.

Net Zero GHG Emissions: The amount of GHG released into the atmosphere being balanced by the amount removed, resulting in no net increase in atmospheric GHG.

Non-Energy Uses: Uses of hydrocarbons that do not result in combustion emissions, such as petrochemicals, lubricants, and asphalt.

North Sea Transition Deal (NSTD): A strategic partnership between the UK government and the offshore oil and gas industry to support the sector's shift toward Net Zero.

Offshore EIA Regulations: The Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020, governing environmental assessments for offshore projects in the UK.

OGA Strategy: The strategic plan published by the Oil and Gas Authority (now known as the North Sea Transition Authority, or NSTA) in March 2021.

OPRED: Offshore Petroleum Regulator for Environment and Decommissioning, a UK government body overseeing environmental regulation of offshore oil and gas.

OPRED's Regulation 12(1) Notice: OPRED's Regulation 12 Further Information Request Notice issued to Equinor UK Limited dated 21 July 2025.

Paris Agreement: Legally binding international treaty on climate change adopted in 2015 and joined by 195 Parties (194 States plus the European Union). Overarching goal to "*hold the increase in the global average temperature to well below 2°C above pre-industrial levels*" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels.*"

Parts per Billion (ppb): A unit of measurement for the concentration of a substance in air or water, used for gases like methane (CH_4) and nitrous oxide (N_2O).

Parts per Million (ppm): A unit of measurement for the concentration of a substance in air or water, commonly used for CO_2.

P10: A high-case scenario, representing a 10% probability that actual result will meet or exceed this level (as further described in section 5.1.14).

P50: A median-case scenario, representing a 50% probability that actual result will meet or exceed this level (as further described in section 5.1.14).

P90: A low-case scenario, representing a 90% probability that actual result will meet or exceed this level (as further described in section 5.1.14).

Primary Energy Demand: The total energy required by a country or the world, including all forms of energy before conversion or transformation.

Representative Concentration Pathways (RCPs): Scenarios that include time series of emissions and concentrations of the full suite of GHGs, aerosols, and chemically active gases, as well as land use/land cover.

Rosebank Development: The development of the Rosebank Field as further described at section 1.2.2.

Rosebank ES: means the environmental statement (ES) prepared for the Rosebank Development and submitted to OPRED on 3 August 2022 (Rosebank ES/2022/001).

Rosebank Field: an offshore oil and gas discovery located in the Faroe-Shetland Channel on the north-west edge of the UK Continental Shelf (UKCS). The location is approximately 130 km north-west of Shetland, in water which is around 1100 m deep. The field is located in UKCS blocks 213/26b and 213/27a (licence P1026), block 205/1a (licence P1191) and block 205/2a (licence P1272).

Rosebank Licences: UKCS blocks 213/26b and 213/27a (licence P1026), block 205/1a (licence P1191) and block 205/2a (licence P1272).

Scope 1 Emissions: Direct GHG emissions from sources owned or controlled by the reporting entity.

Scope 2 Emissions: Indirect GHG emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting entity.

Scope 3 Emissions: All indirect GHG emissions (not included in Scope 2, e.g. purchased electricity) which are a consequence of activities owned or controlled by a developer but which occur from sources in the value chain that are not within the ownership or control of the developer.

Scope 3 Category 9 Emissions: Emissions from transport and distribution of sold products after sale, by third parties.

Scope 3 Category 10 Emissions: Emissions from third-party processing of intermediate products sold.

Scope 3 Category 11 Emissions: Emissions from use of goods/services sold, which in the context of an oil and gas development project relates to the use and combustion of hydrocarbons.

Scope 3 Category 12 Emissions: Emissions from waste disposal and treatment of products sold at end of life.

Shared Socioeconomic Pathways (SSPs): Scenarios developed by the IPCC describing different ways the world might develop, with varying challenges to mitigation and adaptation.

Statistical Review of World Energy: An annual publication by the Energy Institute providing comprehensive data on global energy production and consumption.

Stated Policies Scenario (STEPS): An IEA scenario that models future energy demand and supply based on current government policies and measures.

Supplementary Guidance: "Environmental Impact Assessment (EIA) – Assessing effects of Downstream Scope 3 Emissions on climate", published by DESNZ on 19 June 2025, as supplementary guidance to the existing guidance in relation to the Offshore EIA Regulations.

Territorial Emissions: GHG emissions that occur within a country's borders.

Total Energy Supply (TES): The total amount of energy required to meet final end-use demand, including losses in conversion, transmission, and distribution.

UK Continental Shelf (UKCS): The area of the seabed and subsoil beyond the UK's territorial sea, over which the UK exercises rights for the exploration and exploitation of natural resources.

UK Net Carbon Account: The net amount of GHGs emitted by the UK, after accounting for removals by sinks.

UK Nationally Determined Contribution (also Nationally Determined Contribution) (NDC): The UK's official commitment under the Paris Agreement to reduce GHG emissions by a specified amount by a certain date.

Unabated Combustion: The burning of fossil fuels without the use of technologies to capture and store the resulting CO_2 emissions.

Well to Tank (WTT): Scope 3 Emissions associated with extraction, refining and transportation of raw fuel sources to an organisation's site (or asset), prior to combustion.

1 NON-TECHNICAL SUMMARY

1.1 Introduction

1.1.1 This document is an assessment of the effects of the Rosebank Development's Downstream Scope 3 Emissions on climate (the "Assessment"), as required by OPRED's Regulation 12(1) Notice dated 21 July 2025 ("OPRED's Regulation 12(1) Notice").

1.1.2 The UK's Supreme Court concluded in the Finch judgment that a decision to grant planning permission for an onshore oil development project at a site in Surrey was unlawful, because downstream GHG emissions from combustion of the oil produced were not assessed in the Environmental Impact Assessment as part of the planning decision (Finch Judgment, 2024[1]).

1.1.3 The Finch Judgment, 2024 was based on the Supreme Court's interpretation of the requirement in Article 3 of the Directive 2011/92/EU of the European Parliament and of the Council ("the EIA Directive") to identify, describe and assess the direct and indirect significant effects of a project. Offshore oil and gas production projects are subject to the Offshore EIA Regulations.

1.1.4 The Supreme Court's interpretation of the legal requirements in relation to EIAs is equally applicable to the Offshore EIA Regulations (Jackdaw / Rosebank Judgment, 2025[2]).

1.1.5 The Assessment seeks to provide an overview of the matters required by the Department for Energy Security & Net Zero – Environmental Impact Assessment (EIA) – Assessing effects of Downstream Scope 3 Emissions on climate - Supplementary guidance for assessing the effects of emissions on climate from offshore oil and gas projects issued in June 2025 (the "Supplementary Guidance").

1.1.6 The Rosebank ES details the evaluation of atmospheric emissions (*inter alia*) from the Rosebank Development and this Assessment details the relevant indirect Downstream Scope 3 Emissions that result when the oil and gas produced are eventually combusted.

1.1.7 The Assessment is submitted to OPRED to inform the decision on whether to agree to the grant of consent for the Rosebank Development[3].

1.2 Rosebank Description

1.2.1 The Rosebank Field is located in the Faroe-Shetland Channel on the north-west edge of the United Kingdom Continental Shelf (UKCS) approximately 130 km north-west of Shetland.

1.2.2 The Rosebank Field will produce via subsea production well templates and flexible risers to an FPSO. Oil will be exported from the FPSO using tankers and gas will be exported via a new offshore gas export pipeline to tie into the West of Shetland Pipeline System at the Clair Tee junction, and then through existing infrastructure to the St Fergus Terminal. The project is planned to be delivered in two phases, phase 1 comprises drilling 4 production and 3 water injection wells and, subject to learnings from initial wells, phase 2 will involve drilling up to a further 3 production and 2 water injection wells (the "Rosebank Development").

1.2.3 Details of the activities occurring during the Rosebank Development are provided in the Non-Technical Summary in the Rosebank ES.

[1] *R (on the application of Finch on behalf of the Weald Action Group) (Appellant) v Surrey County Council and others (Respondents)*.
[2] *2025csoh10-petitions-by-greenpeace-limited-and-uplift-for-judicial-review.pdf*.
[3] This Assessment has been prepared by the Competent Experts set out in Table 20 in Appendix C.

1.3 What the Assessment Covers

1.3.1 The Assessment seeks to provide an overview of the matters required by the Supplementary Guidance and as required by OPRED's Regulation 12(1) Notice, including:

1.3.1.1 **Determination of the baseline** - The current state of the global and UK climate, including a reasonable future estimate of global GHGs affecting climate over the lifetime of the Rosebank Development;

1.3.1.2 **Environmental Protection Objectives -** The wider context of UK and international climate policies, including the Paris Agreement, the UK Climate Change Act, and the government's plans for a just and orderly transition to Net Zero (a state where the amount of GHGs emitted is balanced by the amount removed from the atmosphere). These policies include the role of oil and gas in meeting current and future energy needs, both in the UK and globally in the transition to Net Zero and beyond;

1.3.1.3 **Estimating Scope 3 Emissions -** The estimated Downstream Scope 3 Emissions includes as a minimum an assessment of the emissions that will arise from the use of hydrocarbons extracted as a result of the project (i.e. Scope 3 Category 11 emissions), based on the (worst case) presumption that all hydrocarbons will be combusted and on a P10 production profile (high oil case);

1.3.1.4 **Evaluating significance of the likely effects –** both how "likely" it is that the Rosebank Development's Downstream Scope 3 Emissions will impact the climate, and an assessment of the "significance" of the impact of the Rosebank Development's Downstream Scope 3 Emissions on climate;

1.3.1.5 **Scoping of alternatives –** Description of reasonable alternatives; and

1.3.1.6 **Consideration of mitigation measures –** Measures envisaged to avoid, prevent, reduce or offset any likely significant adverse effects of the Rosebank Development on the environment.

1.4 Determination of the Baseline

1.4.1 Climate change is a significant challenge facing society today. It is driven mainly by the build-up of GHG, especially carbon dioxide (CO_2), from human activities such as burning fossil fuels (oil, gas, and coal). These gases trap heat in the atmosphere, causing global temperatures to rise and leading to changes in weather patterns, rising sea levels, and impacts on natural ecosystems and human communities.

1.4.2 The baseline against which the assessment of the Rosebank Development's Downstream Scope 3 Emissions is carried out is defined at the global level, reflecting the worldwide nature of GHG impacts on climate. This Baseline Scenario is established by describing the current state of global GHG emissions, their historical trends, and the likely evolution of these emissions over the lifetime of the Rosebank Development should it not proceed (the "do-nothing" scenario).

1.4.3 The Assessment draws on authoritative sources such as the IPCC and EDGAR, which show that global GHG emissions have increased significantly over recent decades.

1.4.4 As required by the Supplementary Guidance, the Baseline Scenario is not limited to the local or national context but is explicitly set at the global scale, in recognition of the fact that GHGs have a global effect regardless of their point of emission.

1.4.5 The Assessment presents the current environmental baseline in terms of current global GHG emissions and evaluates future climate scenarios using the IPCC's Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs).

1.4.6 These scenarios are not forecasts but plausible futures shaped by global actions. Under very low and low emissions scenarios (SSP1-1.9 and SSP1-2.6), global CO_2 emissions decline rapidly, limiting temperature rise to 1.5°C–2°C. In the intermediate scenario (SSP2-4.5), emissions plateau before declining, resulting in a moderate temperature increase (2.1°C–3.5°C). In high and very high emissions scenarios (SSP3-7.0 and SSP5-8.5), emissions double, leading to severe warming (up to 5.7°C), where all sources contribute to significant climate impacts.

1.4.7 This comprehensive Baseline Scenario provides the reference point for assessing the likely and significant effects of the Rosebank Development's Downstream Scope 3 Emissions on the climate.

1.5 Environmental Protection Objectives

1.5.1 This section outlines the key international and national climate policies and objectives that frame the Assessment of the Rosebank Development's Scope 3 Emissions. At the international level, the Paris Agreement commits nearly 200 countries, including the UK, to limit global warming to well below 2°C and to pursue efforts to limit the increase to 1.5°C above pre-industrial levels (modelled by the SSP's referred to in section 1.4.6).

1.5.2 The UK has enshrined these ambitions in domestic law through the Climate Change Act 2008 (as amended), which sets a legally binding target for Net Zero GHG emissions by 2050 and establishes a system of five-year carbon budgets to guide progress.

1.5.3 The Assessment considers the Rosebank Development in the context of this policy landscape, considering not only the overarching goals but also sector-specific strategies such as the North Sea Transition Deal, which aims to reduce emissions from UK oil and gas production while supporting a managed transition.

1.5.4 The analysis recognises that, even in the most ambitious decarbonisation scenarios, there will be ongoing demand for oil and gas for some time, both in the UK and globally. The Rosebank Development is therefore evaluated in terms of its compatibility with these policies.

1.6 Estimating scope 3 Emissions

1.6.1 *Table 1a* below indicates which GHG Protocol categories are included in the Assessment and provides an explanation for those categories not included:

Downstream Category	Scope 3 Category Description	Included in scope of GHG emissions assessment
9	Downstream transportation and distribution	Yes
10	Processing of sold products	Yes
11	**Use of sold products**	**Yes**
12	End-of-life treatment of sold products	No – There is no end-of-life treatment accounted for given that 100% combustion is assumed
13	Downstream leased assets	No – not applicable as the Rosebank Development does not have specific business models involving leasing, franchising, or investing in third-party operations
14	Franchises	
15	Investments	

Table 1a - Downstream GHG Protocol Categories in scope of estimation method

1.6.2 For the Rosebank Development, the total gross Downstream Scope 3 Emissions (including categories 9, 10 & 11) based on a P10 production profile (high oil case) over its lifetime are estimated to be 249 million tonnes of carbon dioxide equivalent (CO2eq). [4]

1.6.3 For context, the P50 (mid case) scenario, which represents the most likely production outcome, is about 30% lower than the P10 estimate and the P90 (low case) scenario, representing a conservative, lower production outcome is more than 50% lower than the P10 estimate.

1.6.4 For the Rosebank Development, the total gross GHG emissions over its lifetime are estimated to be 254 million tonnes of carbon dioxide equivalent (CO2eq).

1.7 Evaluating Significance of the Likely Effects

1.7.1 The Assessment considers both the likelihood and magnitude of the impact on the global climate. It is acknowledged that any additional GHG emissions will contribute to climate change, and the sensitivity of the global climate as a receptor is considered high. Consideration therefore needs to be given to whether the Rosebank Development's Scope 3 Emissions are significant in the context of global emission reduction pathways.

1.7.2 The Assessment concludes that, whilst GHG emissions from the Rosebank Development are likely to occur, their magnitude is not significant when viewed in the context of international climate commitments, sector-specific Net Zero strategies, and UK government policies. The Rosebank Development's Scope 3 Emissions are compatible with global and national pathways that allow for continued, albeit declining, use of oil and gas during the transition to Net Zero.

1.7.3 The Rosebank Development's P10 (high oil case) production profile is within the range of what is considered compatible with frameworks like the Paris Agreement which aim to limit warming to below 2°C. In future climate scenarios where these targets are not met, emissions from all sources, including the Rosebank Development, could significantly impact the climate due to its high sensitivity and cumulative effects.

1.7.4 However, it must be recognised that Parties to the Paris Agreement have committed to achieving these goals and in assessing the significance of Rosebank's Downstream Scope 3 Emissions, the development aligns with Paris Agreement aligned production pathways. Therefore in that context the effect of the Rosebank Development's Downstream Scope 3 Emissions on climate is not significant.

[4] For the Assessment a 'do-nothing' scenario (e.g. a scenario where the Rosebank Development does not proceed) would result in zero emissions.

The same conclusion remains valid where the total GHG Emissions (section 1.6.4) are considered as the incremental increase in estimated emissions does not alter the analysis.

1.8 Scoping and Consideration of Alternatives and Mitigation Measures

Alternatives

1.8.1 Alternative field development options were discussed in "Consideration of Alternatives" in Chapter 2 of the Rosebank ES[5]. The concept select decision proposed a concept for the Rosebank Development which maximised economically recoverable volumes in compliance with the Central Obligation and the terms of the Rosebank Licences. Production volumes are largely independent of the alternative field development options described in the Rosebank ES, therefore it is considered that the estimate of the Downstream Scope 3 Emissions for the Rosebank Development is not materially affected by the concept select decision taken.

Mitigations

1.8.2 Mitigation measures require to be considered where the assessment concludes a project's Downstream Scope 3 Emissions have a likely significant adverse effect on the environment[6].

1.8.3 Where this is the case, the Supplementary Guidance states that "*mitigation measures available to the developer to avoid, prevent or reduce any significant adverse effects on the environment from Downstream Scope 3 Emissions are expected to be limited*."

1.8.4 Since the use (including whether or not this is by combustion) of the production is not within the control of the Rosebank Development, no mitigation measures that could be taken by the Rosebank Development have been identified.

1.8.5 Mitigation measures for Scope 1 Emissions (Atmospheric Emissions) from the Rosebank Development are discussed in the "Commitments Register – Chapter 9 Atmospherics and climate" in Appendix C of the Rosebank ES.

---

[5] See "Alternatives" in Appendix A (Uncertainties, Assumptions and Limitations).

[6] See "Mitigations" in Appendix A (Uncertainties, Assumptions and Limitations).

2 INTRODUCTION

2.1.1 Climate change is a significant challenge facing society today. It is driven mainly by the build-up of GHG, especially carbon dioxide (CO_2), from human activities such as burning fossil fuels (oil, gas, and coal). These gases trap heat in the atmosphere, causing global temperatures to rise and leading to changes in weather patterns, rising sea levels, and impacts on natural ecosystems and human communities. The UK has committed to reducing its emissions to "Net Zero" by 2050, meaning any remaining emissions must be balanced by removing an equivalent amount from the atmosphere.

2.1.2 The Assessment seeks to provide an overview of the matters required by the Supplementary Guidance and as required by OPRED's Regulation 12(1) Notice issued to Equinor UK[7]; namely the effects of the Rosebank Development's Downstream Scope 3 Emissions on climate[8].

2.1.3 The Rosebank ES details the evaluation of atmospheric emissions (*inter alia*) from the Rosebank Development, whereas this Assessment details the indirect Downstream Scope 3 Emissions.

2.1.4 The following principles set out in IEMA (2022) have informed this Assessment of the Rosebank Development's Downstream Scope 3 Emissions:

2.1.4.1 Setting the scope and extent of the assessment – see Section 5 "Estimating Scope 3 Emissions".

2.1.4.2 Determination of the baseline – see Section 3 "Environmental Baseline".

2.1.4.3 Decide on the emissions calculation methodologies – see Section 5 "Estimating Scope 3 Emissions".

2.1.4.4 Data collection – see Section 5 "Estimating Scope 3 Emissions".

2.1.4.5 Calculate / determine the GHG emissions inventory – see Section 5 "Estimating Scope 3 Emissions".

2.1.4.6 Consider mitigation opportunities and repeat 2.1.4.4 and 2.1.4.5 – see Appendix A "Uncertainties, Assumptions and Limitations".

2.1.5 The principles set out in IEMA (2022) have also informed the contextualisation and evaluation of significance of the Rosebank Development's Downstream Scope 3 Emissions – see Section 6 "Evaluating Significance of the Likely Effects".

[7] At the time of submission of this response to the Regulation 12(1) Notice, assets which (subject to necessary approvals) will transfer to Adura are in the process of an inter-affiliate transfer from Equinor UK Limited to Equinor SPV Limited (company number 16172712, which will be renamed Adura Operations Limited in due course). As part of this inter-affiliate transfer, Equinor UK Limited's (80%) beneficial interests in and field operatorship of Rosebank will be transferred from Equinor UK Limited to Equinor SPV Limited (company number 16172712

[8] See comments on "Equinor as an international operator", in Appendix B (Different Global Approaches, Requirements and Policies).

3 ENVIRONMENTAL BASELINE

3.1 Introduction

3.1.1 The IPCC AR6 Working Group I states that it is "*unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.*" The current climate baseline is therefore a warming one, where there are ongoing changes to climate receptors, such as global surface temperature, globally averaged precipitation and global mean sea level. As recognised by the global climate scientific community, the mechanism by which the Rosebank Development (or any oil and gas project) can affect the global climate is through GHG emissions (e.g. IPCC, 2025; Lan, 2025; Lindsey, 2025; Jacobson, 2023; Met Office, 2025). Therefore, to enable an assessment of the Rosebank Development's Downstream Scope 3 Emissions on the climate, the baseline must be described in terms of GHG emissions.

3.1.2 The IEMA (2022) guidance defines the baseline for GHG assessments as a "*reference point against which the impact of a new project can be compared against.*"[9] In the context of the Assessment, it is necessary to consider the existing and future state of global GHG emissions (in CO2eq where available), to enable an assessment of the Rosebank Development's Downstream Scope 3 Emissions against these baseline levels[10]. Therefore, this chapter includes:

3.1.2.1 a description of the current state of global GHG emissions;

3.1.2.2 an outline of its likely evolution of global GHG emissions without implementation of the Rosebank Development;

3.1.2.3 a reasonable future estimate of global GHG emissions affecting climate over the lifetime of the project.

3.1.3 When assessing the environmental effects of a project, the description of the current state of the environment usually covers the geographical area in which the project will be located (as presented in Chapter 4 of the Rosebank ES). However, for an assessment of the effects of Downstream Scope 3 Emissions, the Supplementary Guidance states that "*GHGs have a global effect on climate*" and therefore "*the location of the emissions is not relevant and a global baseline scenario of GHGs must be considered in the ES*" and consequently this Assessment considers the global position.

3.2 Current Environmental Baseline

Annual Global GHG Emissions

3.2.1 Over the last century, the combustion of fossil fuels like coal, oil and gas to provide the power and energy that modern civilisation depends upon has increased the concentration of atmospheric CO_2eq. GHG emissions have been steadily increasing since 1970, with the majority of contributions being comprised of CO_2 from fossil fuels, as well as increasing contributions of CH_4 and N_2O (Forster *et al.*, 2025). Anthropogenic emissions (e.g. those originating from human activity) of CO_2 occur on top of an active natural Carbon Cycle that circulates carbon between the reservoirs of the atmosphere, ocean, and terrestrial biosphere on timescales from sub-daily to millennial, while exchanges with geological reservoirs occur on longer timescales (Archer et al., 2009). Global climate systems have responded to the increase in CO_2 emissions through an increased uptake of CO_2 within the oceanic and terrestrial environments e.g. carbon sinks.

[9] 2022_iema_greenhouse_gas_guidance_eia.pdf.

[10] See "Global GHG Emission Projections" and "Climate Change Impacts" in Appendix A (Uncertainties, Assumptions and Limitations).

3.2.2 A range of data sources have been reviewed to describe the current state of global GHG emissions and to describe historic trends, including:

3.2.2.1 The IPCC (2021b) Sixth Assessment Report[11];

3.2.2.2 Forster et al. (2025) Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence;

3.2.2.3 The Emissions Database for Global Atmospheric Research (EDGAR) (EDGAR, 2024).

3.2.3 The IPCC (2021b) Sixth Assessment Report estimates:

3.2.3.1 That global net[12] Anthropogenic GHG[13] emissions were 59 Gt[14]CO_2eq[15] (+/- 6.6 Gt CO_2eq) in 2019, with the largest share and growth in gross GHG emissions occurring in CO_2 from fossil fuels combustion and industrial processes, followed by CH_4;

3.2.3.2 In 2019, approximately 79% of global GHG emissions came from the energy, industry, transport and buildings sectors; and approximately 22% from agriculture, forestry and other land use (IPCC, 2023);

3.2.3.3 From the total CO_2 emissions resulting from human activity between 2010 and 2019, combustion of fossil fuels was responsible for 81-91%, with the remainder resulting from land-use change and land management;

3.2.3.4 Between 2010-2019, average annual GHG emissions were higher than any previous decade, although the rate of growth has been slowing in comparison to 2000-2009.

3.2.4 More recently updated GHG emission estimates indicate that total global GHG emissions were 55.4 GtCO_2eq (+/- 5.1 GtCO_2) in 2023 of which CO_2 emissions from fossil fuel combustion and industry contributed 37.8 GtCO_2eq (+/- 3.0 GtCO_2) (Forster et al., 2025) (*Figure 1*).

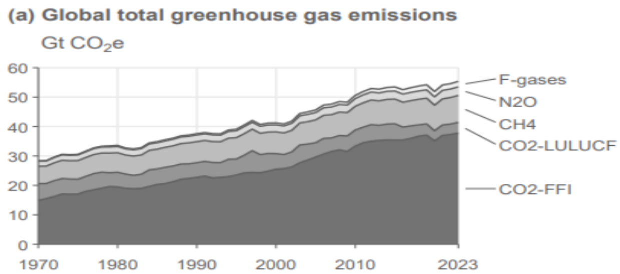

Figure 1 - Annual global anthropogenic GHG emissions 1970 – 2023 in CO_2-equivalent (Forster et al., 2025) NB: (LULUCF = Land Use, Land-Use Change and Forestry, FFI = Fossil Fuels and Industry) (Image credit: Forster et al., 2025)

[11] Sixth Assessment Report — IPCC.

[12] "Net" = sources minus sinks.

[13] The IPCC data covers the "basket" of GHGs: CO_2, CH_4, N_2O, HFCs, PFCs, SF6 and NF3.

[14] Gt = Giga tonne. 1 Gt = 10^9 tonnes.

[15] CO_2eq GHG emission metrics are used to express emissions of different GHGs in a common unit. Aggregated GHG emissions in the IPCC 2023 report are stated in CO_2- equivalents (CO_2-eq) using the Global Warming Potential with a time horizon of 100 years (GWP100) with values based on the contribution of Working Group I to the AR6. The choice of metric depends on the purpose of the analysis and all GHG emission metrics have limitations and uncertainties, given that they simplify the complexity of the physical climate system and its response to past and future GHG emissions.

3.2.5 The Emissions Database for Global Atmospheric Research (EDGAR) provides estimates of GHG emissions (excluding land use, land use change, and forestry) for the world, the EU27[16], and the UK from 1990 to 2023. During this period, global GHG emissions have risen by 62%. In contrast, emissions in the UK and EU have decreased by 50% and 34% respectively (*Table 1b*)[17]. As a share of global emissions, the UK's contribution has dropped from over 2% in 1990 to less than 1% in 2023, while the EU27's share has fallen from nearly 15% to 6% over the same period.

Year	GHG emissions in Mt CO_2eq / year (rounded to nearest million tonne)				%age change compared to 1990
	1990	2005	2015	2023	
World	32,726	41,297	48,809	52,963	+ 62%
EU27	4,877	4,554	3,880	3,222	- 34%
UK	761	673	501	379	- 50%
Shipping	395	609	702	747	+ 89%
Aviation	264	435	543	498	+ 89%

Table 1b - GHG emissions in Mt CO_2eq / year (excluding LULUCF net emissions) (shipping and aviation shown separately due to their international nature).

Data source: EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database, EDGAR - The Emissions Database for Global Atmospheric Research a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO_2, EDGAR CH_4, EDGAR N_2O, EDGAR F-GASES version EDGAR_2024_GHG (2024) European Commission, JRC (Datasets). Crippa et al., 2024.

3.2.6 EDGAR provides estimates of fossil CO2 emissions[18] for the world, the EU27, and the UK from 1990 to 2023. During this period, fossil CO2 emissions have risen by 72%. In contrast, emissions in the UK and EU have decreased by 48% and 34% respectively (*Table 2*).

Year	Fossil CO_2 emissions in Mt CO_2 / year (rounded to nearest million tonne)				%age change compared to 1990
	1990	2005	2015	2023	
World	22,680	30,045	36,300	39,024	+ 72%
EU27	3,810	3,689	3,086	2,512	- 34%
UK	582	559	416	302	- 48%

Table 2 - Fossil CO_2 emissions in Mt CO_2 / year

Data source: IEA-EDGAR CO_2, a component of the EDGAR (Emissions Database for Global Atmospheric Research) Community GHG database version EDGAR_2024_GHG (2024) including or based on data from IEA (2023) Greenhouse Gas Emissions from Energy, www.iea.org/data-and-statistics, as modified by the Joint Research Centre.

3.2.7 Extrapolating the data in *Table 1* and *Table 2*, the UK's share of emissions in 2023 was approximately 0.77% of global fossil CO_2 emissions and 0.71% of global GHG emissions (in CO_2eq).

[16] The EU Member States after the UK left the EU.

[17] Shipping and Aviation are shown separately due the international nature of their emissions

[18] Carbon dioxide emissions when fossil fuels (coal, oil, gas) are burned for energy

Cumulative CO_2 Emissions and the Remaining Carbon Budget

3.2.8 "Cumulative CO_2 emissions" are defined by IPCC (2021b) as "*the total net amount of CO_2 emitted into the atmosphere as a result of human activities*." These emissions are a critical component of the environmental baseline due to their long-term impact on climate systems.

3.2.9 "*Cumulative net CO_2 emissions from 1850 to 2019 were 2,400 ± 240 $GtCO_2$ (IPCC, 2022). Of these, more than half (58%) occurred between 1850 and 1989 [1400 ± 195 $GtCO_2$], and about 42% between 1990 and 2019 [1000 ± 90 $GtCO_2$]. About 17% of cumulative net CO_2 emissions since 1850 occurred between 2010 and 2019 [410 ± 30 $GtCO_2$]*" (IPCC, 2022).

3.2.10 Data from the Global Carbon Budget[19] indicates that cumulative Anthropogenic CO_2 emissions (fossil and land use) for 1850–2023 totalled 2605 ± 260 $GtCO_2$, of which 70 % has occurred since 1960 and approximately 34 % (880 $GtCO_2$) since 2000.

3.2.11 Total cumulative CO_2 emissions from combustion of fossil fuels (excluding land use, land use change, and forestry) since the start of the Industrial Revolution is estimated to be over 1,500 $GtCO_2$ (1.5 trillion tonnes) (*Figure 2*).

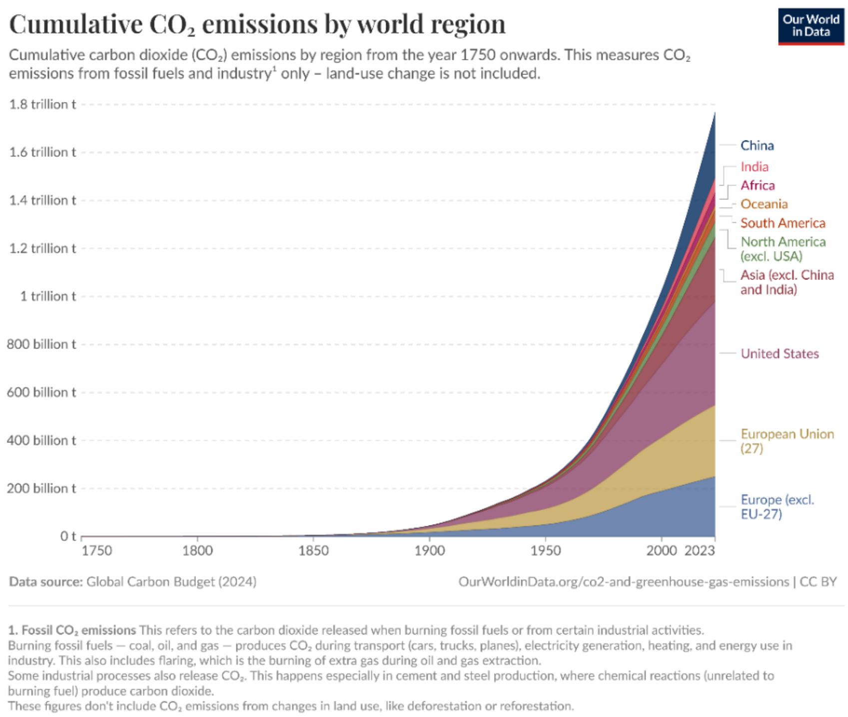

Figure 2 - Total cumulative emissions of carbon dioxide (CO_2) released when burning fossil fuels or from certain industrial activities, since the first year of available data, measured in tonnes

Data source: Global Carbon Budget (2024) – with major processing by Our World in Data. "Cumulative CO_2 emissions" [dataset]. Global Carbon Project, "Global Carbon Budget" [original data].[20]

---

[19] Global Carbon Budget | Home The Global Carbon Budget is an international research project that aims to develop a complete picture of the global carbon cycle. The Global Carbon Budget is updated annually and presents all anthropogenic emissions of carbon dioxide (CO_2) to the atmosphere, and all the carbon removed from the atmosphere by land and ocean, to account for the rise in atmospheric CO_2. It brings together many independent sources of data, including systematic observations and state-of-the-art model ensembles, to provide a robust, independent scientific assessment of CO_2 sources and sinks each year and their associated uncertainties. It tracks changes over time in CO_2 emissions from burning and other uses of fossil fuels and from land use change. It also assesses how the Earth's carbon sinks on the land and oceans are changing in response to human activities and climate change.

[20] CO_2 emissions - Our World in Data.

3.2.12 The "remaining carbon budget" refers to the total net amount of CO_2 that can be released over a certain timeframe to maintain global warming levels below a specific level (for example below the 1.5°C Paris Agreement goal) (IPCC, 2021b). Forster et al. (2025) estimate that from the beginning of 2025, the remaining carbon budget to maintain warming levels to below 1.5°C with >50% probability is 130 GtCO2eq.

3.3 Future Global GHG Emissions

Trends in Emissions

3.3.1 As set out in section 3.2 above, over the last century, the combustion of fossil fuels like coal, oil and gas to provide the power and energy that modern civilisation depends upon has increased the concentration of atmospheric CO_2.

3.3.2 The Global Greenhouse Gas Reference Network[21] (part of the NOAA[22] Global Monitoring Laboratory[23]) measures the atmospheric distribution and trends of the three main long-term drivers of climate change: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Data over several decades has been collected from a globally distributed network of air sampling sites and trends are presented below (*Figure 3*). The atmospheric concentration is expressed as parts per million (ppm) for CO_2 and as parts per billion (ppb) for CH_4 and N_2O. The red line represents the monthly mean values, centred on the middle of each month. The black line represents a long term trend where the average seasonal cycle has been removed.

These trends indicate that atmospheric concentrations of CO_2, CH_4 and N_2O are increasing.

[21] Carbon Cycle Greenhouse Gases - NOAA Global Monitoring Laboratory.

[22] National Oceanic and Atmospheric Administration (NOAA).

[23] NOAA Global Monitoring Laboratory.

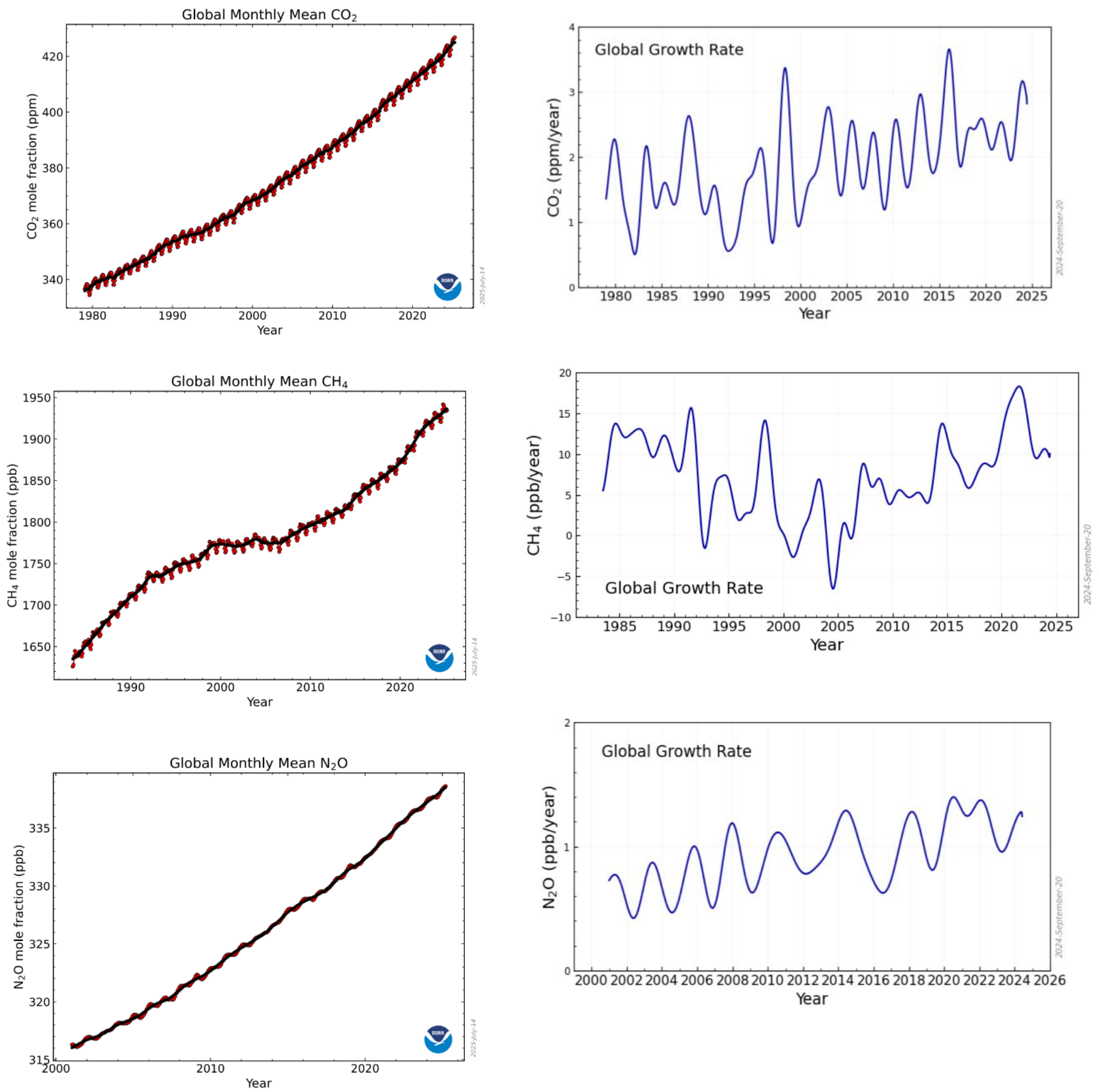

Figure 3 – Global monthly means and Global growth rates – CO_2 (ppm), CH_4 (ppb) and N_2O (ppb)

Sources: Dr. Xin Lan, NOAA/GML (gml.noaa.gov/ccgg/trends/) and Dr. Ralph Keeling, Scripps Institution of Oceanography (scrippsco2.ucsd.edu/).

Lan, X., Tans, P. and K.W. Thoning: Trends in globally-averaged CO_2 determined from NOAA Global Monitoring Laboratory measurements. https://doi.org/10.15138/9N0H-ZH07;

Lan, X., K.W. Thoning, and E.J. Dlugokencky: Trends in globally-averaged CH_4, N_2O, and SF6 determined from NOAA Global Monitoring Laboratory measurements. Version 2025-07, https://doi.org/10.15138/P8XG-AA10

Possible Future Climate Scenario: IPCC AR6 Working Group I: The Physical Science Basis

3.3.3 Climate change is not happening in isolation as a consequence of a single driver; it is happening in the context of a myriad of environmental, social, technological, economic, political and cultural changes and the GHGs that the world emits in the future is not known with any certainty. Therefore, climate scientists have developed different scenarios which are plausible narratives about how the future climate may unfold (IPCC, 2021a). These scenarios cover a range of possible emissions and climate futures and indicate what the situation could be like (i.e. the scenarios are projections based on assumptions and are not predictions). This section covers a range of potential climate futures and represents their likely evolution without implementation of the Rosebank Development (e.g. the "do-nothing" scenario).

3.3.4 The IPCC Sixth Assessment Report (AR6)[24] Working Group I: The Physical Science Basis explores the projected climate response to five illustrative scenarios that cover a wide range of plausible societal and climatic futures called Shared Socio-economic Pathways (SSPs). The scenarios are used to simulate changes in physical indicators of global climate change such as Global Surface Air Temperature, Global Mean Sea Level, Arctic sea ice area, precipitation patterns, ocean pH and carbon uptake, and large scale circulation patterns[25] over the near term (2021 – 2040), mid-term (2041 – 2060), and the long term (2081 – 2100). Uncertainty arises from scenario uncertainty, model limitations and biases, uncertainty in simulated effective radiative forcing and the model response, and uncertainty arising from internal variability, (IPCC, Working Group I, 2021).

3.3.5 The SSPs are narrative scenarios describing various ways the world might develop and identifies different socio-economic assumptions (e.g. population and urbanisation), geopolitical circumstances (how the world's governments collaborate and co-operate), and economic and technological trends (e.g. economic growth, income inequality, technology developments) (summarised in *Table 3*).

SSP	**Mitigation Challenges**	**Adaptation challenges**	**Summary of SSP characteristics that define mitigation challenges and the capacity to adapt to a changing climate**
SSP1	Low	Low	"Sustainability": The Green Road. population ~7 billion in 2100, strong international co-operation, rapid technological progress, reduced inequalities, inclusive development, sustainable land-use, less resource intensive consumption, including food produced in low-GHG emission systems and lower food waste, free trade and high environmental awareness reflected in sustainable lifestyles.
SSP2	Medium	Medium	"Middle of the Road": continuation of current trends, uneven progress on sustainability, medium population growth (~9 billion in 2100), medium income, technological progress, production and consumption patterns are a continuation of past trends, and only a gradual reduction in inequality occurs.
SSP3	High	High	"Regional rivalry" : The Rocky Road: high population growth (~13 billion in 2100), a fragmented world with weak international co-operation, low income and continued inequalities, material-intensive consumption and production, barriers to trade, and slow rates of technological change.
SSP4	Low	High	"Inequality" : The Road Divided: medium population growth (~9 billion in 2100), medium income, but significant inequality within and across regions. Technology advances benefit the wealthy and poorer nations are disproportionately affected by climate impacts.
SSP5	High	Low	"Fossil fuel intensive" : The Highway: population ~7 billion in 2100, high income, reduced inequalities, and free trade. Economic growth driven by fossil fuels. High levels of technological innovation. Resource-intensive production, consumption and lifestyles.

Table 3 - Summary of SSP narratives (adapted from Riahi et al., 2017)

[24] Sixth Assessment Report — IPCC.

[25] The Atlantic Meridional Overturning Circulation (AMOC), El Niño–Southern Oscillation (ENSO), the Northern and Southern Annular Modes (NAM and SAM).

3.3.6 These SSP narratives are combined with the Representative Concentration Pathways (RCPs) from the IPCC 5th assessment reporting period (AR5) [26]. These emissions scenarios are associated with various levels of global warming (*Table 4*).

Scenario SSP-RCP	Change in global surface temperature relative to 1850 - 1900 (ºC)		
	Near term to 2040	**Mid-term 2041 - 2060**	**Long term 2081 - 2100**
SSP1-1.9 (Very Low Emissions)	1.2 – 1.7	1.2 – 2.0	1.0 – 1.8
SSP1-2.6 (Low Emissions)	1.2 – 1.8	1.3 – 2.2	1.3 – 2.4
SSP2-4.5 (Intermediate Emissions)	1.2 – 1.8	1.6 – 2.5	2.1 – 3.5
SSP3-7.0 (High Emissions)	1.2 – 1.8	1.7 – 2.6	2.8 – 4.6
SSP5-8.5 (Very High Emissions)	1.3 – 1.9	1.9 – 3.0	3.3 – 5.7

Table 4 - Changes (5 - 95% likely) in global surface temperature for the five illustrative scenarios (IPCC, WGI, AR6, 2021b)

3.3.7 Each SSP-RCP[27] climate scenario corresponds to a CO_2 emissions profile (ref: IPCC AR6 WGI SPM Fig SPM.4):

3.3.7.1 "*The very low and low CO_2 emissions scenarios (SSP1-1.9 and SSP1-2.6) have CO_2 emissions declining from current levels to Net Zero around 2050 and 2070, respectively, followed by varying levels of net negative CO_2 emissions*";

3.3.7.2 "*The intermediate emissions scenario (SSP2-4.5) has CO2 emissions remaining around current levels until the middle of the century*";

3.3.7.3 "*High and very high emissions scenarios (SSP3-7.0 and SSP5-8.5) have CO2 emissions that roughly double from current levels by 2100 and 2050, respectively*".

3.3.8 The IPCC does not forecast a single most likely climate scenario, recognising that future GHG emissions will be shaped by a complex interplay of government policies, international cooperation, technological innovation, economic conditions, and societal behaviour. Climate scenarios are not forecasts, projections, or predictions. They are narrative tools that offer a nuanced understanding of potential futures without implying certainty and do not provide probabilities or assign likelihoods to future outcomes. The scenarios in Table 4 are illustrated in *Figure 4* below and show the range of potential climate futures in terms of modelled CO_2 emissions in the SSP scenarios.

[26] Fifth Assessment Report — IPCC. The Fifth Assessment Report explores five different Representative Concentration Pathways (RCPs). Each RCP corresponds with a level of radiative forcing (and degree of global warming) by 2100.

[27] The SSP-RCP scenarios impose global warming targets on the baseline SSP scenarios using the radiative forcing levels of the RCP scenarios at 2100. These AR6 scenarios are referred to as the 'SSP-RCP' scenarios (or the 'SSPx-y' scenarios): SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0 and SSP5-8.5.

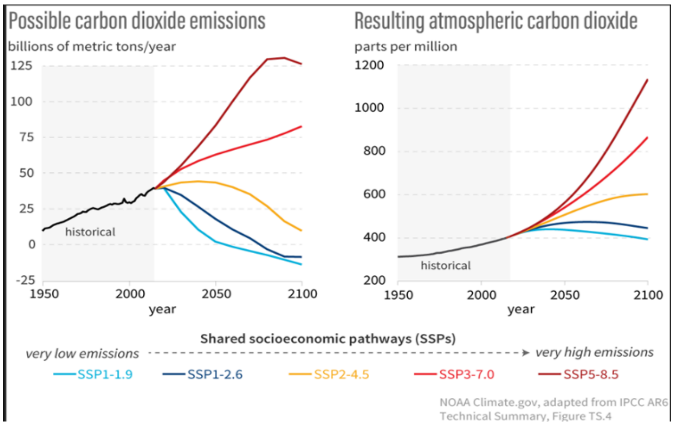

Figure 4 - Possible future pathways for yearly global carbon dioxide emissions (left) and the resulting atmospheric carbon dioxide concentrations (right) through the end of the century. These possible futures are based on different shared socioeconomic pathways ("SSPs"). Each pathway is an internally consistent set of assumptions about future population growth, global and regional economic activity, and technological advances. Climate models use the pathways to project a range of possible future atmospheric carbon dioxide amounts; for simplicity, the image shows the only the mean value predicted by the models for each pathway, not the full range of uncertainty. NOAA Climate.gov graphic adapted from figure TS.4 in the IPCC Sixth Assessment Report Technical Summary

3.3.9 Different social and economic developments can lead to significantly different future emissions of CO_2 and other GHGs. Reducing emissions rapidly will limit further changes to the climate (SSP1-1.9 and SSP1-2.6), and continued emissions will trigger larger, faster changes to the global climate (SSP3-7.0 and SSP5-8.5). Future warming depends on future GHG emissions, with cumulative net CO_2 dominating and affecting all the climate variables and the effect of each scenario on the physical Climate Indicators are detailed in the IPCC Working Group I report (IPCC, 2021, AR6, WGI, Chapter 4[28]).

3.3.10 The IPCC Working Group III further highlights that ambitious climate mitigation and climate-resilient development depend on coordinated global efforts through frameworks such as the UNFCCC, the Kyoto Protocol, and the Paris Agreement. Achieving these goals will require near-term political commitment, integrated cross-sectoral policies, financial mobilisation, and broad social cooperation to support rising national ambition and the development of effective climate strategies (IPCC, AR6, SYR, Full Report, 2023).

[28] Chapter 4 | Climate Change 2021: The Physical Science Basis.

4 ENVIRONMENTAL PROTECTION OBJECTIVES/CLIMATE POLICIES

4.1 Introduction

4.1.1 This chapter sets out:

4.1.1.1 the key environmental protection objectives (EPOs) and climate policies that provide the framework relevant to offshore oil and gas projects[29];

4.1.1.2 how those policies inform the approach to managing and mitigating climate impacts in line with the UK's Net Zero targets; and

4.1.1.3 the relevance of those policies and objectives in respect of assessing Downstream Scope 3 Emissions from the Rosebank Development.

4.1.2 By providing this overview, the context is set for assessing the impact of the Rosebank Development's Downstream Scope 3 Emissions on climate and the significance of the likely effects of the Rosebank Development's Downstream Scope 3 Emissions (Section 6).

4.2 Background

4.2.1 The Supplementary Guidance states that the assessment of likely significant effects of a project on the environment must (in accordance with Schedule 6(5)(d) of the Offshore EIA Regulations) "*take into account environmental protection objectives established in retained EU law or at national level*".

4.2.2 EPOs are overarching goals aimed at preserving and enhancing the natural environment. These objectives guide policy-making, planning, and project development to ensure that human activities do not cause unacceptable harm to ecosystems, natural resources, or public health.

4.2.3 EPOs related to climate change are unlike usual environmental protection parameters applicable to environmental receptors generally considered in EIA reports. For example, generally, local air quality or water quality objectives are defined by numeric emission limits, and absolute quantities which are considered protective of the receptor and against which emissions from the project can be measured can be assessed.

4.2.4 In the case of global climate change, however, the climate protection goals are met through an extensive and varied range of international and national policy interventions intended to drive the systemic and transformative changes required to decarbonise the global economy, adapt to climate change impacts, and ensure sustainable resource management with a target of reaching "Net Zero" global GHG emissions[30].

4.3 Objectives and Policies

4.3.1 The EPOs relevant to the consideration of the Rosebank Development's Downstream Scope 3 Emissions are framed in terms of international and UK policies, conventions, strategies and legislation

[29] The United Nations Framework Convention on Climate Change, the Paris Agreement, the UK's Nationally Determined Contributions, and the Climate Change Act 2008.

[30] Net-zero global greenhouse gas emissions refers to a state where the amount of GHGs released into the atmosphere is balanced by the amount removed, resulting in no net increase in atmospheric GHGs.

which are in place to reduce GHG emissions to the atmosphere and address the impacts and challenges of climate change.

4.3.2 The list below is not exhaustive; the aim is to identify and set out the main policy and legislative instruments which are particularly relevant to fossil fuel developments and emissions of CO_2 (the main GHG emitted from the combustion of fossil fuels). These policy and legislative instruments are summarised below – see *Table 5*.

Framework/legislation	Description	Relevance to fossil fuel developments
International frameworks		
United Nations Framework Convention on Climate Change (UNFCCC)	• Every UN recognised state and entity is a party to the UNFCCC. • Main goal is to address and combat global climate change by stabilizing GHG concentrations in the atmosphere at a level that would prevent dangerous human interference with the climate system. • Sets the foundation for future climate agreements including Paris Agreement (2015) and annual Conferences of the Parties (COP). The COP conferences are annual UN climate summits under the UNFCCC, where countries negotiate and agree on global climate action.	Directly influences policies and agreements co-ordinating international responses to climate change.
***Paris Agreement* (2015)**	• Legally binding international treaty on climate change adopted at the COP21 in 2015 and joined by 195 Parties (194 States plus the European Union). • Overarching goal to "*hold the increase in the global average temperature to well below 2°C above pre-industrial levels*" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels*."	International treaty to address climate change; legally binding on all UNFCCC member governments.
Recent Conference of the Parties (COP)	• COP27 created a Loss and Damage Fund; COP28 agreed to shift from fossil fuels and boost renewables; COP29 focused on tripling climate finance and finalising carbon market rules; COP30 aims to strengthen implementation, national plans, and adaptation accountability.	COPs set the global direction for climate policy.
***Glasgow Climate Pact*[31]**	• Agreement reached at the COP26 climate summit in 2021, where nearly 200 countries committed to accelerating action to tackle climate change. • Emphasises the need to limit global warming to 1.5°C, calls for the phasedown of unabated coal power and inefficient fossil fuel subsidies, and urges countries to strengthen their 2030 emissions targets.	Requires signatory countries to increase climate action toward reducing reliance on fossil fuels.

[31] Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its second session, held in Glasgow from 31 October to 12 November 2021. Addendum.

UK Legal and Policy Frameworks		
Climate Change Act 2008 (as amended) [32]	• Sets a legal framework for the UK to reduce and mitigate GHG emissions and build capacity to adapt and strengthen resilience to climate risks. • Committed the UK to reducing its GHG emissions by 80% by 2050 compared to 1990 levels and this was subsequently amended by the Target Amendment Order 2019[33] to Net Zero[34] emissions by 2050 on a whole economy basis. • Introduced a system of five-year Carbon Budgets to guide progress and established the Climate Change Committee (CCC) to provide independent advice and monitor compliance.	Sets legally binding carbon reduction targets and five-year Carbon Budgets, which require the UK to progressively cut GHG emissions.
UK Carbon Budget	• Legally binding limit on the UK Government on the total amount of GHGs which can be emitted over a five-year period, established under the Climate Change Act 2008. • The budgets are designed to guide the UK's path to achieving Net Zero emissions by 2050 and are set 12 years in advance to allow for long-term planning. Each budget progressively reduces the allowable emissions, with the sixth Carbon Budget (2033–2037) targeting a 77% reduction from 1990 levels, and the proposed seventh budget (2038–2042) aiming for 535 $MtCO_2eq$, including emissions from international aviation and shipping (IAS). • The budgets are informed by advice from the Climate Change Committee (CCC) and require government action across sectors like transport, energy, buildings, and agriculture to meet the targets. • GHG emissions from upstream oil and gas production are included in these statistics under the Fuel Supply Sector.	Carbon Budgets are not directly comparable to estimates of Downstream Scope 3 Emissions derived from UKCS hydrocarbon field development production profiles. The UK Carbon Budgets and the data collected to track progress refer to UK Territorial Emissions Statistics (TES) i.e. the data is collected at the point of end use. GHG emissions from fossil fuels are counted towards the UK emissions statistics when the fuel is used in one of the TES sectors and not before. Hydrocarbons produced from the UKCS will not necessarily be combusted within UK borders and Downstream Scope 3 Emissions estimates from UKCS production profiles are not directly used in the preparation of UK GHG emissions official statistics and emissions projections. The Carbon Budget relates to UK Net Carbon Account (emissions less removals) and this is not directly or usefully comparable with a gross emissions estimate based on production volumes.

[32] Climate Change Act 2008.

[33] The Climate Change Act 2008 (2050 Target Amendment) Order 2019.

[34] i.e. there is a balance between GHG emissions and removals by way of natural and/or engineered carbon sinks.

UK Carbon Budget Delivery Plan **(DESNZ, 2023)[35]**	• The government's official strategy for meeting the legally binding Carbon Budgets. • Outlines a comprehensive package of quantified and unquantified policies and proposals across sectors like energy, transport, buildings, and industry. Aims to reduce emissions while promoting energy security and economic growth.	UK oil and gas sector's expertise and supply chains are key to supporting the technologies that will help the UK meet its Carbon Budgets, and ensure UK energy security during the transition to Net Zero by 2050 whilst CBDP policies to reduce reliance on fossil fuels are developed and implemented.
Clean Power 2030 Action Plan (UK Government, 2024)[36]	• The UK Government's energy decarbonisation plans include the Clean Power 2030 Action Plan (UK Government, 2024) setting out a pathway to a clean power system by 2030. The plan indicates that large increases in installed renewables capacity will be needed to meet the presumed increase in electricity demand due to early electrification of the transport (electric vehicles), heat (replacement of domestic gas boilers with heat pumps), and industry sectors. • For decarbonisation targets to be met, the electricity supplied to meet this increased demand (in TWh) must be from 'Clean Power'. To facilitate these changes, the plan includes major reforms to grid connections, planning, and consenting processes. It also introduces "Great British Energy," a publicly owned company to drive delivery, and emphasises collaboration with devolved governments, industry, and communities to ensure energy security, affordability, and climate resilience.	The rate of decarbonisation in the transport and domestic heating sectors, and in the UK economy as a whole, is not known with any certainty and, hence it is acknowledged the UK is likely to still require significant amounts of gas and oil, with continued reliance on imported energy supplies (NESO, 2024).
Climate Change Committee (CCC) 2025 report to Parliament[37]	• Assesses the credibility of the government's policies and plans to deliver the GHG emissions reductions set out in the Carbon Budget Delivery Plan and publishes annual reports on progress towards the CB targets. • Highlights that UK emissions have fallen by over 50% since 1990, largely due to the decarbonisation of electricity, but warns that future reductions must come from sectors like transport, buildings, and industry.	With North Sea resources largely depleted, the UK risks becoming increasingly reliant on imports if it does not accelerate its transition.
"Balanced Pathway" scenario [38]	• Developed by the CCC, a strategic roadmap to achieve Net Zero GHG Emissions by 2050, guiding the UK's Seventh Carbon Budget (2038–2042) • Outlines a mix of technological, behavioural, and policy measures across sectors like transport, energy, buildings, agriculture, and aviation.	Demand for oil and gas declines in the CCC Balanced Pathway scenario where all sectors of the UK economy are decarbonised in line with achieving Net Zero by 2050.

[35] Carbon Budget Delivery Plan - GOV.UK.
[36] Clean Power 2030 Action Plan - GOV.UK.
[37] Progress in reducing emissions - 2025 report to Parliament - Climate Change Committee.
[38] https://www.theccc.org.uk/publication/the-seventh-carbon-budget/.

	• Key features include rapid deployment of electric vehicles, heat pumps, and renewable energy, alongside carbon removals and demand reduction strategies. • The scenario targets an 87% emissions reduction by 2040 compared to 1990 levels, with a legally binding cap of 535 $MtCO_2eq$ for the budget period.	However, there is still demand for oil and gas in the UK in the Net Zero aligned Balanced Scenario pathway to 2050 and beyond. To meet this demand, the CCC predicts that the UK will need to import oil and gas in the future even in a best case, full decarbonisation scenario where all the UK Carbon Budgets are met.
UK Climate Strategies		
UK Nationally Determined Contribution (2025)[39]	• The Prime Minister, Sir Keir Starmer, announced the UK's NDC target to reduce all greenhouse gas emissions[40] by at least 81% by 2035, compared to 1990 levels (excluding international aviation and shipping emissions) at COP29 (held in Azerbaijan in 2024). The UK NDC was subsequently presented to Parliament in January 2025 (UK Government, 2025). • The UK NDC is a 1.5°C aligned, economy-wide absolute emissions reduction target, covering all GHGs, sectors and categories, and is informed by the latest science. Achievement of the UK's NDC will be assessed by comparing total net GHG emissions and removals (the reference indicator) in 2035 with the target year level. Final base year and target year level estimates will be based on the UK National Inventory Document (NID) submitted to the UNFCCC in 2037. • Decarbonisation policies particularly relevant to GHG emissions from the combustion of fossil fuels as presented to Parliament are mainly related to the Energy sector as reflected in the UK Carbon Budget Delivery Plan, (DESNZ, 2023).	Sectors within scope of the NDC are typically end user sectors e.g. Energy (including transport); Industrial Processes and Product Use (IPPU); Agriculture; Land-use, Land-Use Change and Forestry (LULUCF); and Waste.
Independent Review of Net Zero (Mission Zero, 2023)[41]	• The Independent Review of Net Zero (Mission Zero, 2023) was commissioned in September 2022, to make recommendations how the UK could better meet its Net Zero commitments and deliver UK Net Zero targets in a manner that was both affordable, efficient, and in a pro-business and pro-enterprise way. • Recognises the balance between the need to reduce UK reliance on hydrocarbons as quickly as possible and the need to meet present demand for hydrocarbons and protect UK energy security.	Although, in the long run, the report indicates that hydrocarbons will be replaced with renewable alternatives, the review references Future Energy Scenario modelling carried out by the National Grid Electricity System Operator (NESO) which highlights that policy interventions to "aggressively" tackle demand for hydrocarbons through electrification of

[39] Nationally Determined Contribution - NDC | Climate Policy Database.

[40] GHGs covered by the NDC are CO2, CH4, N2O, HFCs, PFCs, SF6 and NF3

[41] MISSION ZERO - Independent Review of Net Zero.

	• In the short term the UK will continue to be dependent on gas, including for heating buildings and marginal production within the power sector[42] and while demand for petroleum products is likely to fall in some parts of the economy such as road transport, all major forecasters expect resilient or even growing demand for other uses of hydrocarbons such as petrochemicals[43]. • The review highlighted the importance of the domestic oil and gas industry for the UK economy, both historically and for the future, describing how the industry supports thousands of jobs and invests £billions into the UK economy. The supply chain, skills base and infrastructure stock that has been built up by the oil and gas industry is considered crucial for decarbonising the UKCS and creating an offshore energy system in the transition towards offshore wind, CCUS and hydrogen. Given its importance to the economy, the transition to decarbonise the UKCS must be equitable and protect British jobs, industry, and consumers. It is important that the technical skills, capabilities and expertise developed over many years in the UKCS oil and gas sector are retained in the UK for the future energy technologies.	transport and heating, coupled with greater energy efficiency will be required to reduce UK dependency on fossil fuels for its energy needs. The NSTA production projections indicate that the CCC's balanced pathway demand scenario never falls below projections for domestic oil and gas production[44] and the UK continues to consume more oil and gas than it produces for the foreseeable future. The review concludes that, instead of looking to suppress production, the Net Zero pathway for the oil and gas industry is to accelerate efforts to reduce Carbon Intensity of production (scope 1 and 2 emissions) in accordance with the North Sea Transition Deal.
Net Zero Strategy: Build Back Greener [45]	• Sets out policies and proposals for decarbonising all sectors of the UK economy to meet a Net Zero target by 2050. It sets out how the UK would deliver Carbon Budgets 4, 5 and 6, and the 2030 NDC, as well as Net Zero GHG Emissions by 2050. • The North Sea Transition Deal (NSTD, 2021) is the Net Zero Strategy sector plan for UKCS Oil and Gas.	Aims to balance the need for energy security with the need to reduce emissions, guiding the sector toward a lower-carbon future.

Powering Up Britain, The Net Zero Growth Plan (2023)[46]	• Builds on the Net Zero Strategy, and responds to the expert recommendations made in the Independent Review of Net Zero.
	• Strengthens delivery of actions required to stay on track to meet Carbon Budgets.
	• Meets statutory obligations under the Climate Change Act (2008) for the government to:
	  ○ respond to the Climate Change Committee's (CCC's) Progress Report to Parliament; and
	  ○ provide a Carbon Budget delivery update that sets out a package of proposals and policies.
		Acknowledges that fossil fuels will retain a crucial role in the energy system until there are credible clean energy alternatives that can replicate their role and that the upstream oil and gas sector continues to make good progress in decarbonising oil and gas production in line with the North Sea Transition Deal (NSTD).

[42] Climate Change Committee (2020), 'The Sixth Carbon Budget: The UK's path to Net Zero', Sixth Carbon Budget - Climate Change Committee
[43] IEA (2018), 'The Future of Petrochemicals', https://www.iea.org/reports/the-future-of-petrochemicals.
[44] NSTA production and expenditure projections Data and insights - Production and expenditure projections.
[45] Net Zero Strategy: Build Back Greener - GOV.UK.
[46] Powering Up Britain - The Net Zero Growth Plan.

British Energy Security Strategy (2022)[47]	• UK government's plan to strengthen energy independence, reduce reliance on imported fossil fuels, and accelerate the transition to clean energy. Triggered by global energy price shocks and the war in Ukraine. • Sets out ambitious targets, including generating 95% of electricity from low-carbon sources by 2030 and fully decarbonising the power sector by 2035. • Focuses on expanding nuclear power, offshore wind, solar, hydrogen, and carbon capture, while also supporting domestic oil and gas as a transitional measure.	Outlines the UK's commitment to maintaining domestic oil and gas production as part of a secure energy transition, recognising fossil fuels as critical short-term transition fuels while accelerating investment in clean energy to reduce long-term dependence on imports and meet Net Zero goals.
Sector-Specific and Regional Plans		
North Sea Transition Deal (NSTD, 2021)[48]	• Strategic partnership between the UK government and the offshore oil and gas industry to support the sector's shift toward a Net Zero future. • Aims to reduce emissions from UK Continental Shelf (UKCS) production by 50% by 2030 (compared to 2018 levels), with interim targets of 10% by 2025 and 25% by 2027. • Sets a voluntary target of 50% UK content in new energy projects.	Represents a strategic partnership between the UK government and the offshore oil and gas industry to decarbonise production, invest in clean energy technologies like CCUS and hydrogen, and support a managed transition away from fossil fuels while maintaining energy security and economic growth.
Scottish National Marine Plan (2015)[49]	• Comprehensive framework for the sustainable development and management of Scotland's marine resources across both inshore (0–12 nautical miles) and offshore (12–200 nautical miles) waters. • Aims to balance environmental protection with economic growth by guiding decisions on marine activities such as fishing, energy, transport and conservation management. • Specifically (as described in the SNMP) Policy: OIL & GAS 1, OG-1: The Scottish Government will work with DECC, the new Oil and Gas Authority and the industry to maximise and prolong oil and gas exploration and production whilst ensuring that the level of environmental risks associated with these activities are regulated.	OG-1 context: Oil and gas are set to remain a vital source of energy while we move towards a future based upon renewable energy and it is sensible to secure reserves domestically as far as possible for as long as they may be needed. The Scottish Government's twin objectives to develop a low carbon economy and maximise resource recovery in the North Sea are complementary over the long term. A successful oil and gas sector is a prerequisite for the diversification of the energy supply and the growth of the market for low carbon goods and services.

Table 5 – Summary of Policy and Legislative Instruments.

[47] https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy.
[48] https://www.gov.uk/government/publications/north-sea-transition-deal.
[49] https://www.gov.scot/publications/scotlands-national-marine-plan/.

5 ESTIMATING SCOPE 3 EMISSIONS

5.1 Introduction

5.1.1 Estimates of (i) Downstream Scope 3 Emissions (Category 11 - end user combustion) emissions and (ii) midstream emissions (Scope 3 Category 9 & Scope 3 Category 10 – transport, distribution and processing) associated with the Rosebank Development are set out below.

5.1.2 The methodology applies UK Government GHG reporting: conversion factors 2025 (DESNZ, 2025b) as set out in Tables 8 & 10 below to the Rosebank Development production profiles.

5.1.3 While it is recognised that the actual end-use and fate of the hydrocarbons may vary, and that "*a significant share is used as feedstock for petrochemicals and other non-energy industry sources*" (IPCC AR6 WGIII), the calculation is intentionally conservative, using the highest anticipated hydrocarbon production (the 'P10') data expected to be produced during the lifetime of the Rosebank Development and the presumption that all produced hydrocarbons will be combusted, in accordance with the Supplementary Guidance.

5.1.4 In order to give a complete picture of the potential range of outcomes, estimates of end-use combustion emissions are included in respect of the P10, P50 and P90 production profiles over the Life of Field:

5.1.4.1 P10 (high case): This represents an optimistic scenario. There is a 10% probability that actual production will exceed this estimate. It reflects a high-end outcome, often used to show the potential upside of a project;

5.1.4.2 P50 (mid case): This is the most likely or median scenario. There is a 50% probability that actual production will be higher or lower than this estimate. It's typically used for planning and decision-making as it balances risk and realism;

5.1.4.3 P90 (low case): This represents a conservative scenario. There is a 90% probability that actual production will exceed this estimate. It reflects a low-end outcome, often used to assess downside risk.

5.2 Background

5.2.1 The Supplementary Guidance states that:

5.2.1.1 "At a minimum, an ES should include an assessment of the downstream emissions that will arise from the use of hydrocarbons extracted as a result of the project (i.e. Scope 3 Category 11 emissions)."

5.2.1.2 "For the purpose of quantifying the environmental effects of scope 3 emissions, the assessment must consider the highest quantity of hydrocarbons expected to be produced (i.e. extracted from the field) over the lifetime of a project. Therefore, the estimate of scope 3 emissions must reflect the highest anticipated hydrocarbon production (the 'P10' data) specified in the application for development and production consent submitted to the NSTA."

5.2.1.3 "The starting point for assessment of scope 3 category 11 emissions should be the (rebuttable) presumption that all produced hydrocarbons will be combusted. Those scope 3 category 11 *emissions should be calculated using the highest anticipated hydrocarbon production (the 'P10' data) expected to be produced during the lifetime of the project multiplied by a suitable conversion factor."*

5.2.1.4 *"Suitable conversion factors for the combustion of the produced hydrocarbons could be taken from the most recently published Government conversion factors for company reporting of greenhouse gas emissions (DESNZ, 2025b), or other suitable sources."*

5.2.1.5 *"Developers may choose to estimate scope 3 emissions on the basis that not all hydrocarbons produced will be combusted. There is a wide range of published methodologies (IPIECA, 2016; GHG Protocol, 2013) and emissions conversion factors (DESNZ, 2025b; GHG Protocol, 2013; IEA, 2013) available to estimate scope 3 emissions related to the non-combustion fate of the hydrocarbons."*

5.3 Scope of Assessment

5.3.1 The GHG emissions from extraction and production processes (Scope 1 under the GHG Protocol[50]) at the Rosebank Development have been quantified and assessed in Section 9 of the Rosebank ES (see *Table 6*). The total estimated Scope 1 Emissions in Table 6 below total 4,543,176 tCO_2e.

Year	LoF usage (t)	CO_2	CO	NOx	N_2O	SOx	CH_4	VOC	tCO_2e
Diesel fuel	96,539	308,923	89	1,303	21	386	3	28	315,117
Fuel gas	1,398,525	3,999,782	4,196	8,531	308	18	1,287	50	4,129,114
Flaring	29,270	81,956	196	35	2	0	527	59	98,945

Table 5 - Estimated emissions from fuel gas, diesel and flare at the FPSO for life of field (Rosebank ES table 9-5)

5.3.2 The GHG Protocol includes 15 separate categories of Scope 3 Emission types of which seven categories (nos. 9 – 15) correspond to downstream emissions (*Table 7*).

5.3.3 The scope of this Assessment is the emissions resulting from the eventual combustion by the end user of the oil and gas produced from the field (Scope 3 Category 11: "Use of sold products") and the emissions resulting from downstream transportation and processing (Scope 3 Category 9: "Downstream transportation and distribution" and Scope 3 Category 10: "Processing of sold products").

5.3.4 Aligning with the Supplementary Guidance, it is assumed that all produced hydrocarbons from the field are eventually combusted: no deduction is made for oil or gas that may be destined for non-energy uses[51] and Scope 3 Category 12: "End-of-life treatment of sold products" is therefore not relevant to the scope of the Assessment.

5.3.5 The Supplementary Guidance indicates that a "*rationale should be provided for the scope 3 emissions [GHG Protocol] categories selected for assessment*". *Table 7* indicates which categories are included in the Assessment and provides an explanation for those categories not included.

[50] https://ghgprotocol.org/.

[51] Non-energy uses examples: petrochemicals (plastics, foams, rubbers), asphalt, bitumen, lubricants, waxes, solvents, petroleum coke used in manufacturing processes (metals, brick, glass, paint, fertiliser).

Downstream Category	Scope 3 Category Description	Included in scope of GHG emissions assessment
9	Downstream transportation and distribution	Yes
10	Processing of sold products	Yes
11	Use of sold products	Yes
12	End-of-life treatment of sold products	No – There is no end-of-life treatment accounted for given that 100% combustion is assumed
13	Downstream leased assets	No – not applicable as the Rosebank Development does not have specific business models involving leasing, franchising, or investing in third-party operations
14	Franchises	
15	Investments	

Table 6 - Downstream GHG Protocol Categories in scope of estimation method

5.4 Estimation of Relevant Downstream GHG Emissions: Methodology

Equation for Scope 3 Categories 9, 10 & 11

$$\text{Emissions}_{CO2eq,oil/gas} = \text{Production}_{oil/gas} * \text{Conversion Factor}_{CO2eq,oil/gas}$$

where: $\text{Emissions}_{CO2eq,oil/gas}$ = emissions of CO_2eq from Oil / Gas (tonnes CO_2eq)
$\text{Production}_{oil/gas}$ = amount of Oil / Gas[52] produced (tonnes)
$\text{Conversion Factor}_{CO2eq,oil/gas}$ = CO_2eq conversion factor Oil / Gas (tonnes CO2eq / tonne)

Production Profiles for Scope 3 Categories 9, 10 & 11

5.4.1 The oil and gas activity data for the calculation are the field production profiles in metric units (tonnes of oil and million standard cubic metres of gas). Volumetric gas units are converted to mass in tonnes using a reference density of natural gas (100% mineral blend) from the 2025 Fuel properties (DESNZ 2025b)[53]. The P10 production profile (high oil case) presented in the Rosebank ES is used as the base case for the emissions estimate.

Conversion Factors for end user combustion emissions (Scope 3 Category 11)

5.4.2 There is no conversion factor presented for crude oil in the UK Government GHG reporting: conversion factors 2025 (DESNZ, 2025b), therefore a conversion factor for Fuel Oil is used as a proxy for the range of products that may be refined from crude oil and Natural Gas (100% mineral blend) is used as a proxy for the produced gas (*Table 8*).

Fuel	Factors (kg CO_2eq/tonne)
Fuel Oil[54]	3,228.89
Natural Gas (100% mineral blend)[55]	2,603.30

Table 7 - Conversion Factors used for Scope 3 Category 11

[52] The fuel gas and flare gas tonnes (*Table 5*) are subtracted from the total produced gas to give an export gas estimate. The values in *Table 5* are associated with the P10 production profiles and are pro-rata for P50 and P90 profiles.
[53] Density of natural gas (100% mineral blend) 0.80200 kg/m3 (DESNZ, 2025b).
[54] Density of fuel oil 983.284kg/m3 (UK GHG reporting conversion factors 2025).
[55]

Conversion Factors for other downstream emissions ("WTT")(Scope 3 Categories 9 & 10)

5.4.3 Categories 9 and 10 are defined as "midstream" processes. The methodology for estimating midstream GHG emissions broadly follows UK Environmental Reporting Guidelines(BEIS, 2019) and the associated emission conversion factors (DESNZ, 2025). Scope 3 Well to Tank (WTT) conversion factors are detailed for different fuel types to allow organisations to include midstream processing and transportation emission in their GHG reporting.

5.4.4 WTT conversion factors (DESNZ, 2025) cover the full value chain of emissions associated with extracting the hydrocarbons up until the point of use and therefore include upstream GHG emissions included in the Rosebank ES. The estimated emissions from the Rosebank Development presented in the Rosebank ES are approximately 5.6 million tCO_2eq (*Table 9*). This is subtracted from the WTT estimate to provide a figure related to midstream – defined as transportation, processing and refining and distribution.

Rosebank ES Table	Description	CO2eq for life of field (tonnes)
9-3	Estimated emissions from drilling and well completion	151,651
9-4	Estimated emissions and associated GWP from installation works	61,935
9-5	Estimated emissions from fuel gas, diesel and flare at the FPSO for life of field (excluding electrification)	4,543,176
9-6	Estimated emissions from logistics operations during the production phase	847,621
Total		5,604,383

Table 9 - Estimated emissions from the Rosebank Development presented in the Rosebank ES

5.4.5 The WTT conversion factor for fuel oil in the UK Government GHG reporting: conversion factors 2025 (DESNZ, 2025b) is an estimate based on similar fuels (*Table 10*). The WTT emissions for these oil derived fuels are based on modelling of upstream emissions associated with imported crude oils used in EU refining, estimates of the emissions associated with the transport of these crude oils to EU refineries by sea and pipeline, emissions from refining modelled on a country and country basis, and an estimate of emissions associated with imported finished products (Exergia et al., 2015). The methodology[56] for calculating the WTT conversion factors for natural gas is different to the other fuels as it considers the increasing share of UK gas supplied via imports of LNG (which have a higher WTT conversion factor than conventionally sourced natural gas) in recent years. These factors are likely to represent an overestimate for crude oil and gas which is produced, refined and used in Europe.

WTT	Factors (kg CO_2eq/tonne)
Fuel Oil	714.87
Natural Gas (100% mineral blend)	423.16

Table 10 - Conversion Factors used for Scope 3 Categories 9 & 10

5.5 Estimation of Downstream Scope 3 GHG Emissions: Summary

Scope 3 Emissions estimates

[56] 2025 Government greenhouse gas conversion factors for company reporting: Methodology paper.

5.5.1 The Well to Tank emissions estimates for the P10 production profiles – the high production case - are estimated to be approximately 40 million tonnes CO_2eq split into approximately 37 million tonnes CO_2eq attributed to crude oil (90%) production and 3 million tonnes CO_2eq to gas (10%) production volumes. (*Table 11*)

5.5.2 The end user combustion emissions associated with the P10 production profiles – the high production case - are estimated to be approximately 208 million tonnes of CO_2eq split into approximately 190 million tonnes CO_2eq attributed to crude oil (90%) production and 18 million tonnes CO_2eq to gas (10%) production volumes. (*Table 11*)

Downstream Scope 3 Categories	***Oil (tonnes CO_2eq)***	***Gas (tonnes CO_2eq)***	***Total (tonnes CO_2eq)***
Well to Tank (Categories 9 & 10)	36,936,000	3,159,000	40,095,000
End user (Category 11)	190,151,000	18,436,000	208,587,000
Total Downstream	227,087,000	21,595,000	248,682,000

Table 11 - Downstream Scope 3 Categories 9, 10, and 11 GHG emissions estimates in tonnes CO_2eq for P10 production profile (high oil case)

5.5.3 The total gross GHG emissions for the Rosebank Development are, therefore, estimated to be approximately 254 million tonnes CO_2eq (*Table 11* plus *Table 9*) over LoF.

5.5.3.1 The environmental impact of Rosebank Development Scope 1 Emissions and certain upstream Scope 3 Emissions (for support vessels and helicopter flights) are assessed in the Atmospheric Emissions (Chapter 9) in the Rosebank ES – 5.6 million tonnes CO_2eq (*Table 9*).

5.5.3.2 The environmental impact of Rosebank Development Downstream Scope 3 Emissions (P10 high case) is evaluated in this Assessment – 248.7 million tonnes CO_2eq (*Table 11*).

5.5.4 The assumptions and associated uncertainties inherent in the calculation methodology of the Rosebank Development Downstream Scope 3 Emissions are contained in Appendix A.

5.6 Sensitivity Analysis

Production Profiles

5.6.1 The downstream emissions estimates depend entirely on production profiles as the methodology applies conversion factors to production volumes. The estimates presented above are based on the P10 production profile (high oil) case presented in the Rosebank ES.

5.6.2 The emissions estimates for the end user GHG emissions calculated from all production profiles rounded to nearest thousand tonnes CO_2eq are presented in *Table 12*.

5.6.3 The P50 Downstream Scope 3 Emissions estimate is approximately 30% lower than the P10 Downstream Scope 3 Emissions estimate and the P90 estimate is more than 50% lower than the P10 estimate[57].

Production Profiles	***P10 (tonnes CO_2eq)***	***P50 (tonnes CO_2eq)***	***P90 (tonnes CO_2eq)***
End User (Category 11) Emissions	208,587,000	145,753,000	102,455,000

Table 12 – End User (Category 11) emissions estimates in tonnes CO_2eq (P10, P50 & P90) case

[57] The sensitivity of Downstream Scope 3 Emissions estimate of the Well to Tank (Categories 9 & 10) P50 and P90 compared to the P10 are approximately the same as the sensitivity of the Downstream Scope 3 Emissions estimate of the End User (Category 11) P50 and P90 compared to the P10.

6 EVALUATING SIGNIFICANCE OF THE LIKELY EFFECTS

6.1 Introduction

6.1.1 The Supplementary Guidance requires an assessment of the significance of the likely effects of Scope 3 Emissions and consideration of the cumulative effects of the proposed project with other existing and planned future projects[58], in a global context[59].

6.2 Likely Impact

6.2.1 The "*causal chain from emissions to resulting warming of the climate system"* is illustrated in Figure 2.1 of the IPCC AR6 Synthesis Report[60] and discussed in the Environmental Baseline (section 3). The impact of the Rosebank Development's Downstream Scope 3 Emissions on the climate is considered "likely" as GHG emissions from any project will contribute to climate change.

6.3 Context and criteria used to assess significance

6.3.1 The Supplementary Guidance also requires (i) *"an indication of the criteria used to determine whether an impact is 'likely' [see section 6.2.1 above] and whether it is 'significant'"* and (ii) *"appropriate context to support that determination of significance"*.

Approach

6.3.2 The principles set out in IEMA (2022) have informed the contextualisation and evaluation of the significance of the Rosebank Development's Downstream Scope 3 Emissions. The significance of the Rosebank Development's Downstream Scope 3 Emissions is evaluated using a matrix approach, whereby the sensitivity of receptor and magnitude of impact are combined to derive the overall significance level.

Sensitivity of receptor

6.3.3 The global climate has been identified as the receptor for the assessment and as stated in the Supplementary Guidance the expectation is that the sensitivity will be 'high' due to the contribution of GHG emissions to climate change (IEMA, 2022; DESNZ, 2025a).

Magnitude of impact

6.3.4 The key consideration in evaluating significance is not simply whether a project results in GHG emissions, nor the absolute volume of those emissions, but whether that project aligns with global emission reduction pathways. Therefore, the Assessment considers the compatibility of the Rosebank Development's Downstream Scope 3 Emissions with the global emission reduction pathways.

---

[58] Flexibility in the Rosebank Development design could allow Equinor UK Limited to develop long-term plans to maintain production and potentially extend asset life through the development of nearby oil and gas opportunities. The emissions from such potential opportunities are not included in this Assessment as they are not "planned future projects" for the purposes of the Offshore EIA Regulations, and also because it would be too speculative to carry out such an assessment because of the unknown details of such opportunities.

[59] See "Demand predictions" and "Future global GHG emissions" in Appendix A (Uncertainties, Assumptions and Limitations).

[60] IPCC_AR6_SYR_LongerReport.pdf.

Global Emission Reduction Pathways

6.3.5 The Supplementary Guidance states that "*an assessment of scope 3 emissions in relation to the current state of climate and global emission-reduction pathways (IPCC, 2023) is more likely to support a reasoned conclusion on significance*." The Supplementary Guidance also states that if "*global-reduction pathways are used to contextualise magnitude of emissions as above, this approach should be inherently cumulative as these pathways take into account a wide range of existing and planned projects and other activities*".

6.3.6 The Assessment therefore considers the Rosebank Development in terms of the future climate scenarios and the mitigation pathways, which account for existing and planned projects, in the IPCC AR6 reports. These provide the environmental baseline against which the significance assessment is being carried out and ensure that the Assessment is cumulative.

6.3.7 These future climate scenarios can be mapped on to the Illustrative Mitigation Pathways (IMPs) discussed in the IPCC Working Group III Mitigation of Climate Change (IPCC, 2022). The IMPs have common features such as deep and rapid emissions reductions in all sectors[61] but also different combinations of sectoral mitigation strategies designed to achieve systemic transformational change. They differ in terms of their focus:

6.3.7.1 IMP-Ren – emphasis on renewables;

6.3.7.2 IMP-Neg - carbon dioxide removal that results in net negative global GHG emissions;

6.3.7.3 IMP-LD - efficient resource use as well as shifts in consumption patterns globally, leading to low demand for resources, while ensuring a high level of services and satisfying basic needs;

6.3.7.4 IMP-GS - less rapid introduction of mitigation measures followed by a subsequent gradual strengthening;

6.3.7.5 IMP-SP - global shift towards a sustainable development pathway that includes emissions reductions.

6.3.8 In addition, there are two reference illustrative pathways (IPs), Current Policies (IP-CurPol) and Moderate Action (IP-ModAct), which are illustrative of higher emissions and assume continuation of current policies or some moderate mitigation actions and show the consequence of current policies and pledges. The IMPs and IPs and the associated SSP are shown in *Table 13*.

6.3.9 Emissions vary between scenarios depending on socio-economic assumptions and levels of climate change mitigation and are related to the Paris Agreement as follows:

[61] Sectors include, electricity generation, industry, buildings and urban areas, transport, agriculture, forestry, land-use (AFOLU).

Warming category		Description	WGI SSP	WGIII IP/IMP
C1	Limit warming to 1.5°C (>50%) with no or limited overshoot	Reach or exceed 1.5°C during the 21st century with a likelihood of ≤67%, and limit warming to 1.5°C in 2100 with a likelihood >50%.	SSP1-1.9	IMP-SP, IMP-LD, IMP-Ren
C2	Return warming to 1.5°C (>50%) after a high overshoot	Exceed warming of 1.5°C during the 21st century with a likelihood of >67%, and limit warming to 1.5°C in 2100 with a likelihood of >50%.		IMP-Neg
C3	Limit warming to 2°C (>67%	Limit peak warming to 2°C throughout the 21st century with a likelihood of >67%	SSP1-2.6	IMP-GS
C4	Limit warming to 2°C (>50%)	Limit peak warming to 2°C throughout the 21st century with a likelihood of >50%.		
C5	Limit warming to 2.5°C (>50%)	Limit peak warming to 2.5°C throughout the 21st century with a likelihood of >50%.		
C6	Limit warming to 3°C (>50%)	Limit peak warming to 3°C throughout the 21st century with a likelihood of >50%.	SSP2-4.5	ModAct
C7	Limit warming to 4°C (>50%	Limit peak warming to 4°C throughout the 21st century with a likelihood of >50%.	SSP3-7.0	CurPol
C8	Exceed warming of 4°C (≥50%)	Exceed warming of 4°C during the 21st century with a likelihood of ≥50%.	SSP5-8.5	

Limited overshoot refers to exceeding 1.5°C by up to about 0.1°C and for up to several decades
High overshoot refers to temporarily exceeding 1.5°C global warming by 0.1°C–0.3°C for up to several decades

Table 13 - Illustrative Mitigation Pathways (IMPs) and Illustrative Pathways (IPs) of higher emissions in relation to warming categories, and SSP scenarios

Ref: Pathak, M. et al., Box TS.5, Table.1 Technical Summary in: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

6.3.10 Future cumulative CO_2 emissions differ across scenarios and determine how much warming will be experienced under each scenario. Scenarios with very low or low GHG emissions (SSP1-1.9 and SSP1-2.6) would have rapid and sustained effects to limit human-caused climate change, compared with scenarios with high or very high GHG emissions (SSP3-7.0).

6.3.11 The IPCC does not include an assessment of the likelihood of each IMP because climate mitigation actions depend on co-operation between international governments and political and societal choices. Similarly, global fossil fuel consumption patterns and future mitigation actions that determine current and future levels of global GHG emissions and the impact on climate cannot be influenced at the project level.

Context - Future Demand

6.3.12 The Supplementary Guidance states that the assessment should *"provide appropriate context to support a determination of significance."*

6.3.13 The International Energy Agency (IEA) also use a scenario based approach specifically designed to examine future energy trends and demand projections for oil and gas. The Global Energy and Climate (GEC) model is built on a set of different underlying assumptions about how the global energy system might evolve over time which the IEA refer to in their World Energy Outlook and Energy Technology Perspectives reports.

6.3.14 The IEA scenarios highlight the importance of government policies in determining the future of the global energy system: decisions made by governments are the main differentiating factor explaining the variations in outcomes across the scenarios. However, the IEA also account for other elements and influences, notably the economic and demographic context, technology costs and learning, energy prices and affordability, corporate sustainability commitments, and social and behavioural factors. While the evolving costs of known technologies are modelled in detail, technology breakthroughs (such as nuclear fusion) are not anticipated.

6.3.15 This is further described and explained in “Sector-specific Net Zero strategies and reduction trajectories” sections 6.4.13 – 6.4.19 below.

Selection of Criteria

6.3.16 For some assessments of impact, such as underwater noise or seabed impact, significance criteria are standard or numerically based. For other impact topics, such as Downstream Scope 3 Emissions, for which no applicable limits, standards or guideline values exist, a qualitative approach is required. Therefore, this Assessment reviews current and emerging policy and regulatory positions together with a review of expert scientific advice from bodies such as the IPCC.

6.3.17 The criteria presented here have been informed by reference to the IEMA (2022) guidance and the IPCC global emission reduction pathways which are then used to contextualise the Downstream Scope 3 Emissions being assessed as an indirect effect of the project:

6.3.17.1 International climate commitments – global emission mitigation pathways in the context of ongoing demand for oil and gas (ICC-GEMP);

6.3.17.2 Sector-specific Net Zero strategies and reduction trajectories - published by industry bodies for sectors (e.g. IEA) crucial to reducing GHG emissions (SSS-NZ);

6.3.17.3 UK government climate policies and strategies - existing UK government policy, defining actions for GHG emissions reduction, that is compatible with national climate commitments (UK Gov-CPS).

Methodology

6.3.18 The assessment of impact significance is an inherently uncertain process as it involves the projection of potential climate futures. A methodology has been designed in order to carry out this Assessment by applying consistent criteria and reasonable assumptions. The terms and criteria associated with the impact assessment process are described and defined. Details of how these are combined to assess consequence and impact significance are then provided.

6.3.19 As described in 6.3.3, the sensitivity of the climate (receptor) is high.

6.3.20 Magnitude of the impact (significance) of the Rosebank Development’s Downstream Scope 3 Emissions is assessed in the context of the project’s compatibility with the following assessment criteria as per *Table 14* (matrix):

Emissions Profiles	Criteria to assess magnitude of the impact	Consequence	Significance of effect on climate
High	• **ICC-GEMP** - The project's Downstream Scope 3 Emissions are not compatible with international climate commitments and global emissions-reductions pathways compatible with holding the global average temperature to well below 2.0°C. • **SSS-NZ** - The project's Downstream Scope 3 Emissions are not compatible with any sector-specific Net Zero strategies and reduction trajectories. • **UK Gov-CPS** - The project is not compatible with UK government climate policies and strategies.	Major	Significant
Intermediate	• **ICC-GEMP** - The project's Downstream Scope 3 Emissions are not compatible with international climate commitments and global emissions-reductions pathways compatible with holding the global average temperature to well below 2.0°C. • **SSS-NZ** - The project's Downstream Scope 3 Emissions are partially aligned with sector-specific Net Zero strategies and reduction trajectories. • **UK Gov-CPS** - The project is partially aligned with UK government climate policies and strategies.	Moderate	Significant
Low	• **ICC-GEMP** - The project's Downstream Scope 3 Emissions are consistent with international climate commitments and global emissions-reductions pathways compatible with holding the global average temperature to well below 2.0°C. • **SSS-NZ** - The project's Downstream Scope 3 Emissions are aligned with sector-specific Net Zero strategies and reduction trajectories. • **UK Gov-CPS** - The project is aligned with UK government climate policies and strategies.	Low	Not Significant
Very Low	• **ICC-GEMP** - The project's Downstream Scope 3 Emissions consistent with international climate commitments and global emissions-reductions pathways compatible with efforts to limit global warming to 1.5°C. • **SSS-NZ** - The project's Downstream Scope 3 Emissions go beyond the requirements of current and emerging sector-specific Net Zero strategies and reduction trajectories. • **UK Gov-CPS** - The project goes beyond the requirements of UK government climate policies and strategies.	Negligible	Not Significant

Table 14 - Assessment of significance matrix

6.4 Assessment of Significance

International climate commitments and global emission mitigation pathways (ICC-GEMP)

6.4.1 The Assessment contextualises Rosebank production projections with current global production and future global demand projections under emission reduction pathways compatible with the Paris Agreement.

6.4.2 The Global Oil and Gas Extraction Tracker (GOGET)[62] is a global dataset of oil and gas resources and their development. The most recent published data sets (February 2025) indicate that total global oil and gas production combined was approximately 55,816 million boe/year, with approximately 47,988 million boe/year (85%) produced by the top 20 producing countries. The UK ranks 27th in the list with an estimated figure of 380 million boe year (0.6% of global production). Country data for oil, NGL and gas production volumes are presented in *Figure 5* and *Figure 6*.

6.4.3 The IPCC indicate that there will be global demand for oil and gas in all future climate scenarios, including the emission reduction scenarios which are classified into the C1, 1.5°C warming category (IPCC, WGIII, 2022). In these global modelled pathways, by 2050, almost all electricity is supplied from zero- or low-carbon sources, such as renewables or fossil fuels with CCS (IPCC, 2022, WGIII) resulting in much lower levels of demand aligned with the warming category. The global use of oil and gas in energy systems in 2050 is projected to decline by about 60% and 45% respectively (70% for gas without CCS) (median estimate), compared to 2019 (Table 3.6, IPCC, WGIII, Full report).

6.4.4 In 2019, oil consumption was 98,898 thousand barrels per day and gas consumption totalled 3,905.4 billion cubic metres (bcm) (Energy Institute, 2025). This demand declines to approximately 39,600 thousand barrels/day and 172 billion cubic metres per year assuming the decline rates stated above. Rosebank would contribute up to 0.1% of this ongoing demand in this best mitigation 1.5°C aligned demand case.

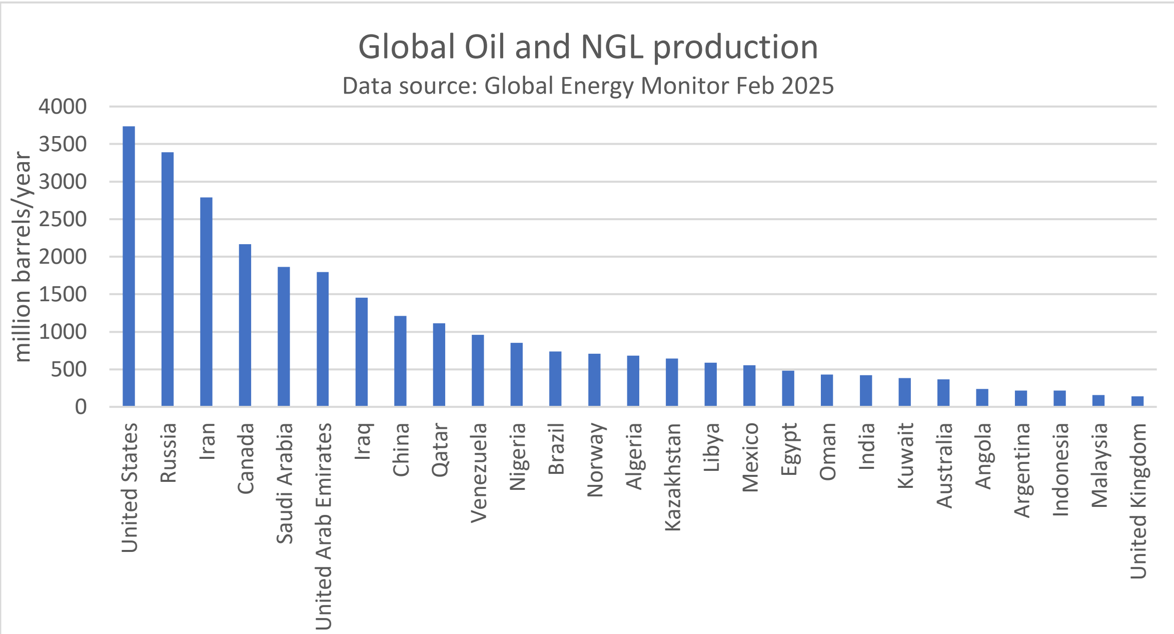

Figure 5 - Global Oil and NGL Production

[62] Global Oil and Gas Extraction Tracker - Global Energy Monitor.

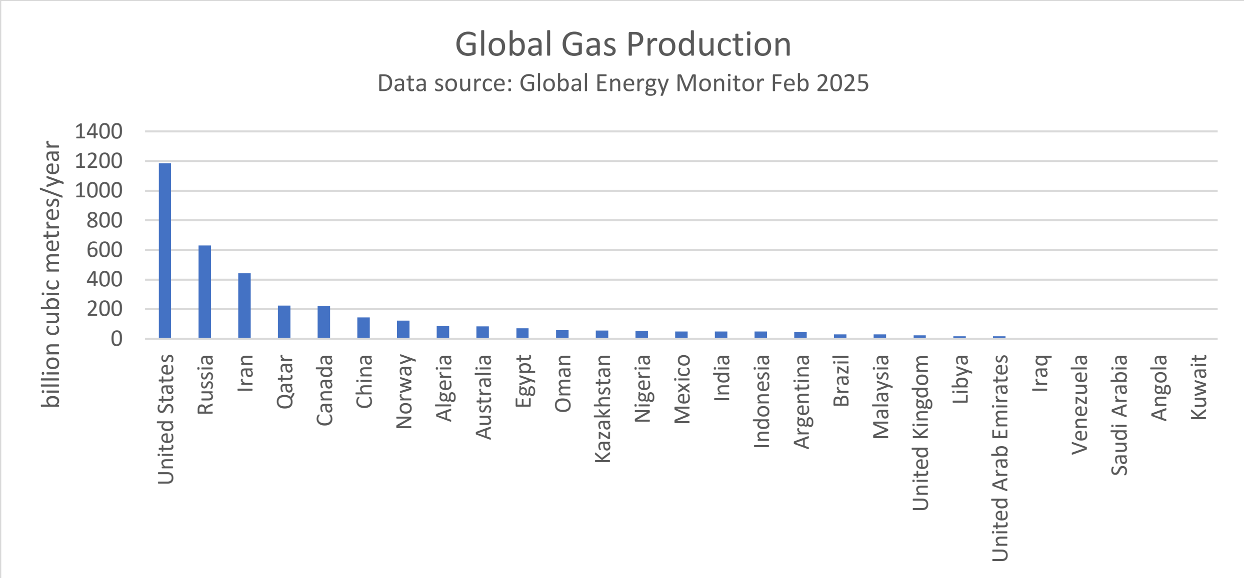

Figure 6 - Global Gas Production

6.4.5 The IPCC (AR6, WGIII, Full Report, Table 3.2) summarise the modelled global emissions pathways categorised by projected global warming levels. The illustrative scenarios considered by the AR6 WGI and the Illustrative (Mitigation) Pathways assessed in WGIII are aligned with the relevant temperature categories. The projected median GHG emissions in 2030, 2040, and 2050 across a selection of emissions pathways relative to 2019 are presented in *Table 15*. The range of future projections (5^{th} to 95^{th} percentile) are referenced in brackets under the median future indicating the uncertainty around these future projections.

6.4.6 Rosebank Downstream Scope 3 Emissions (including estimate for WTT emissions) are estimated to be approximately 14 $MtCO_2eq$, 10$MtCO_2eq$, and 4$MtCO_2eq$ in 2030, 2040, and 2050 respectively, equivalent to less than 0.05% of these median projections in the C1 warming category scenarios. In comparison, in the C7 scenario Rosebank Downstream Scope 3 Emissions correspond to an even lower proportion.

Warming Category	WGI SSP	WGIII IMP	GHG emissions Gt CO_2eq/year			Emission milestones	Cumulative CO_2 emissions Gt CO_2 2020 - 2100
			2030	2040	2050	Peak GHG emissions	
C1	SSP1-1.9	IMP-SP IMP-LD IMP-Ren	33 (22-37)	18 (6-24)	8 (0-15)	2020-2025	550
C3	SSP1-2.6	IMP-GS	40 (30-49)	29 (21-36)	20 (14-27)	2020-2025	860
C6	SSP2-4.5	ModAct	54 (50-62)	53 (48-61)	52 (45-57)	2020-2025	2790
C7	SSP3-7.0	CurPol	62 (53-69)	67 (56-76)	70 (58-83)	2090-2095	4220

Table 15 - modelled global emissions pathways categorised by projected global warming levels

6.4.7 The "production gap" is the difference between global governments' planned fossil fuel production and global production levels consistent with limiting global warming to 1.5ºC or 2ºC. The UNEP Production Gap report (SEI, 2023) analyses future fossil fuel production plans of twenty countries and compares these volumes to the projected levels of future fossil fuel production estimates in climate models consistent with keeping the Paris Agreement's temperature goal within reach.

6.4.8 The projected amounts of fossil fuel production consistent with the Paris Agreement's goal to "*hold the increase in the global average temperature to well below 2°C above pre-industrial levels*" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels*" (a Paris Agreement aligned production pathway) compared with Rosebank Development P10 production profile (high oil case) in the relevant year are presented below (SEI, 2023).

6.4.9 The data in *Table 16* indicates that Rosebank Development production comprises between 0.06% and 0.08% of global oil production in the 1.5°C compatible case and between 0.07% and 0.03% of global oil production in the 2°C compatible case. Therefore, the Rosebank Development P10 production profile is within a Paris Agreement aligned production pathway.

	2030	2035	2040	2045	2050
Pathways consistent with 2°C (median) – Oil Mb/d	99.65	94.00	83.03	69.78	57.83
Rosebank Development P10 production profile (high oil case) as a %	0.07%	0.06%	0.05%	0.05%	0.03%
Pathways consistent with 1.5°C (median) – Oil Mb/d	88.55	78.92	63.32	45.85	32.20
Rosebank Development P10 production profile (high oil case) as a %	0.08%	0.07%	0.07%	0.07%	0.06%

Table 16 - Rosebank Development P10 annual production compared with production volumes in 2°C-consistent 1.5°C-consistent pathways

6.4.10 Out of the twenty fossil fuel producing countries analysed in the UNEP Production Gap report (SEI, 2023), the UK is one of two countries (the other being Norway), where the report indicates decreases in both oil and gas production by 2030 (compared to a 2021 baseline). In addition, the UK's contribution to global supplies of oil and gas is currently less than 1%.

6.4.11 Future reductions in GHG emissions will depend on how quickly the international community and individual nation states are able to decarbonise the sectors which are heavily reliant on fossil fuels – electricity generation, transport, domestic and industrial heating. Successful and large-scale decarbonisation in these sectors will naturally reduce demand for fossil fuels, and net-zero energy systems[63] will use far less fossil fuels than today. The precise quantity of fossil fuels available in the future under various mitigation scenarios is challenging to estimate with certainty (Bauer et al., 2016). The IEA and IPCC indicate that even in Net Zero energy systems, there will still be ongoing demand for fossil fuels in Net Zero energy systems for non-energy uses[64], for energy use with abatement (e.g. CCS), and in "hard to abate" sectors such as heavy land transport and aviation.

6.4.12 Modelled mitigation pathways that envisage significant reductions in demand for fossil fuels across all sectors of the global economy and a rapid transition to a Net Zero global energy system, indicate that there will still be demand for oil and gas in the future. The Rosebank Development can contribute to meeting ongoing global demand in the context of international emissions reduction pathways whilst UKCS production, as a whole, is in decline.

Sector-specific Net Zero strategies and reduction trajectories (SSS-NZ)

6.4.13 The Assessment has considered analysis carried out by the IEA regarding the role of oil and gas in the energy transition to Net Zero and beyond. Structural changes in the energy sector in the transition to Net Zero will cause demand for fossil fuels to fall, with the rate of decline depending on how quickly governments deliver in full on their national energy and climate pledges (IEA, 2023b). The IEA stress that a "*large and sustained surge in clean energy investment is what removes the need for new fossil fuel projects*" (IEA, 2023b) in their NZE Scenario and that "*reducing fossil fuel supply investment in advance of, or instead of, policy action and investment to reduce demand would not lead to the required Net Zero outcomes*". Future demand for oil and gas is described in the future climate models developed by the IEA and summarised below.

6.4.14 The IEA have estimated what future oil and gas demand could look like in a range of three different future scenarios, each of which is built on a different set of underlying assumptions about how the energy system might evolve over time. These scenarios are not predictions, and do not contain a single view about what the long-term future might hold. They represent different possible versions of the future, the levers and actions that influence demand for energy and the energy mix, to gain insights into the future of global energy.

6.4.15 The IEA Stated Policies scenario (STEPS) reflects current policy settings and provides a benchmark to assess the potential achievements (and limitations) of recent developments in energy and climate policy. The IEA Announced Pledges scenario (APS) assumes that all climate commitments made by governments and industries[65], are met in full and on time and shows how close, or otherwise, current pledges get the world to the target of limiting global warming to 1.5°C. The IEA Net Zero Emissions

---

[63] Energy systems that produce very little or no CO_2 emissions.

[64] E.g. petrochemical feedstocks, machinery oils, lubricants and grease, paraffin wax, asphalt and bitumen, synthetic fibres and plastics, industrial solvents, paint additives, adhesives. As these non-energy uses do not result in emissions of CO_2, these levels of demand are not accounted for in the IPCC GHG emission reduction scenarios.

[65] Commitments made as of at the end of August 2024 including Nationally Determined Contributions (NDCs) and longer-term Net Zero targets, as well as targets for access to electricity and clean cooking.

by 2050 Scenario (NZE) is designed to achieve specific outcomes[66] and shows a pathway to reach them. The NZE scenario is a projected future scenario where the world is on track to implement all measures required to reduce demand for fossil fuels, fully decarbonise the energy system, and the global energy sector achieves Net Zero CO_2 emissions by 2050.

6.4.16 The IEA present future demand estimations for oil and gas in each of the scenarios[67]. The oil demand projections under each IEA scenario compared with Rosebank Development production volumes in the relevant year are presented in *Table 17* below. Rosebank Development production can contribute to ongoing future global demand for oil and gas in each of the modelled scenarios. Production from the Rosebank Development declines between 2030 and 2050 at approximately the same rate as the decline in demand projected in the NZE scenario.

Oil **Million bpd**	IEA STEPS	IEA APS	IEA NZE	**Rosebank P10 production profile**	%age Rosebank / STEPS	%age Rosebank / APS	%age Rosebank / NZE
2030	101.7	92.8	78.3	**0.0708**	0.07	0.08	0.09
2035	99.1	82.0	57.8	**0.0584**	0.06	0.07	0.1
2050	93.1	53.7	23.0	**0.0195**	0.02	0.036	0.08
Gas **Bcm/yr**	IEA STEPS	IEA APS	IEA NZE	**Rosebank P10 production profile**	%age Rosebank / STEPS	%age Rosebank / APS	%age Rosebank / NZE
2030	4430	4003	3617	**0.625**	0.014	0.015	0.017
2035	4422	3493	2257	**0.504**	0.011	0.014	0.022
2050	4377	2466	882	**0.146**	0.003	0.006	0.016

Table 17 - Rosebank Development P10 production profile in 2030, 2035 and 2050 as a proportion of global demand under the IEA STEPS, APS, and NZE scenarios

6.4.17 *Table 17* shows that there is ongoing demand for oil and gas in all scenarios. Three-quarters of oil demand in a NZE scenario is used in sectors where the oil is not combusted, including as a petrochemical feedstock, and in products such as paraffin waxes, asphalt and bitumen. The remainder is combusted mainly in the remaining diesel trucks on the road, aviation, and shipping. These residual emissions are offset from within the energy sector through the use of direct air capture with CCUS and

[66] The IEA NZE scenario models a pathway which achieves Net Zero emissions from the energy sector by 2050 without offsets from other sectors, an emissions trajectory consistent with keeping the temperature rise in 2100 below 1.5 °C (with at least a 50% probability) with limited overshoot, universal access to modern energy services by 2030 and major improvements in air quality.
[67] It is noted that the IEA (NZE) demand projections are different to the (Paris Agreement aligned) SEI (2023) production projections due to the different modelling assumptions. However, the trajectory is the same.

bioenergy with CCUS i.e. at or near Net Zero CO_2 emissions from consumption of oil in a NZE aligned pathway.

6.4.18 The IEA report "The Oil and Gas Industry in Net Zero Transitions" (IEA, 2023b) illustrates that there is much the oil and gas industry can do to accelerate Net Zero transitions; the first step is to reduce emissions that occur during oil and gas operations. The IEA identified five "key levers" to drive reduction in emissions intensity including tackling methane emissions, eliminating routine flaring, and electrifying upstream facilities. The IEA (2023b) presents a global average of approximately 60 kg CO_2eq/boe[68] for upstream oil extraction and processing[69]. The Rosebank Development can contribute to ongoing global demand whilst emitting less than a quarter of emissions from comparable production based on the global average.

6.4.19 As per the assessment of significance matrix in *Table 14* the consequence is assessed as low because:-

6.4.19.1 As demand declines under the NZE scenario the Downstream Scope 3 Emissions decline on a corresponding trajectory to 2050. Rosebank production profiles, and hence the Downstream Scope 3 Emissions, also decline on a similar pathway;

6.4.19.2 The Rosebank ES details how the Rosebank Development is designed and operated in accordance with the North Sea Transition Deal which is the UK strategy corresponding to the IEA "levers". These matters are evaluated in the Rosebank ES including an estimate of Carbon Intensity of production of around 12 kg CO_2eq/boe for Phase 1.

UK government climate policies and strategies (UK Gov-CPS)

6.4.20 Future UK demand for oil and gas and projected UKCS production are considered in the context of the UK Government stated policies, strategies and legislation in *Table 5.*

6.4.21 The Rosebank Development's Downstream Scope 3 Emissions have been assessed in the context of the EPOs as described in Table 5, Section 4, and in particular the:

6.4.21.1 North Sea Transition Deal;

6.4.21.2 Net Zero Strategy: Build Back Greener;

6.4.21.3 Mission Zero: Independent Review of Net Zero;

6.4.21.4 Climate Change Act 2008 (as amended);

6.4.21.5 Climate Change Committee's Balanced Pathway to Net Zero;

6.4.21.6 Powering Up Britain: The Net Zero Growth Plan.

6.4.22 The Climate Change Committee's Balanced Pathway presented in the 7th Carbon Budget (CB7) report includes a future projection for UK oil and gas demand and a future projection for UK oil and gas production based on NSTA production projections of existing and future developments (which includes sanctioned but not yet producing fields, like the Rosebank Development). The CB7 demand projection indicates that UK demand for oil and gas will continue to exceed UKCS oil and gas production in this decarbonisation pathway (*Figure 7*).

---

[68] CO_2 intensity is applicable for 2022. Other oil and gas producers are also reducing their CO_2 intensities.

[69] The Oil and Gas Industry in Net Zero Transitions (Table 3.1).

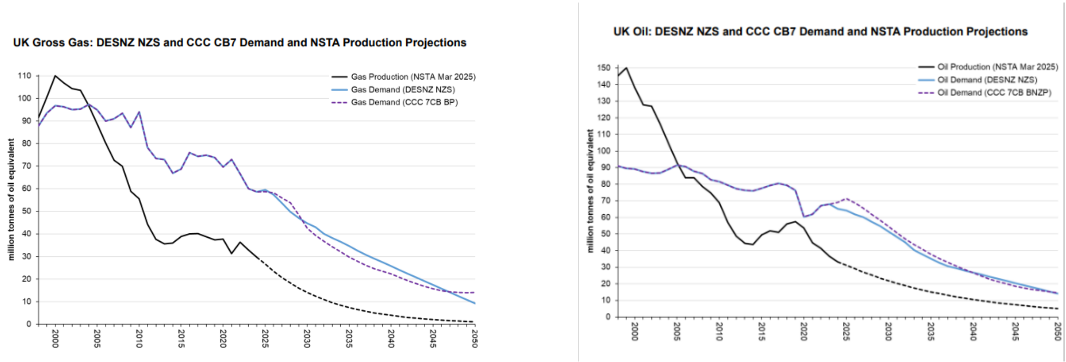

Figure 7 - UKCS gross gas and oil production trajectories compared with future demand under CB7

6.4.23 The graphs indicate that UKCS oil and gas production is less than the CB7 projected future UK demand under a decarbonisation pathway consistent with meeting the UK Net Zero targets and it is concluded that ongoing UKCS production is compatible with the UK's transition to Net Zero targets set under the Climate Change Act 2008 (as amended).

6.5 Conclusion

Climate Scenarios

6.5.1 As set out in Section 3 – Environmental Baseline:

6.5.1.1 (Section 3.3.8) the IPCC does not forecast a single most likely climate scenario, recognising that future GHG emissions will be shaped by a complex interplay of government policies, international cooperation, technological innovation, economic conditions, and societal behaviour. These emissions scenarios are associated with various levels of global warming;

6.5.1.2 (Section 3.3.10) different social and economic developments can lead to significantly different future emissions of CO_2 and other GHGs;

6.5.1.3 (Section 3.3.11) ambitious climate mitigation and climate-resilient development depend on coordinated global efforts through frameworks such as the UNFCCC, the Kyoto Protocol, and the Paris Agreement.

6.5.2 Due to the variables set out in section 6.5.1, it cannot be expressly stated with any certainty what the most realistic future climate scenario will be. The effect on climate depends on the success of co-ordinated global efforts to achieve global climate targets.

6.5.3 In a scenario where Parties to the Paris Agreement have failed to "*hold the increase in the global average temperature to well below 2°C above pre-industrial levels*" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels*", the emissions from any project, including the Rosebank Development, could have a significant effect on climate. This is because, all emissions in that scenario will have a significant effect due to the sensitivity of the climate as a receptor and the cumulative effect of continuing unabated emissions.

6.5.4 However, it must be recognised that Parties to the Paris Agreement have committed to achieving the overarching goal to "*hold the increase in the global average temperature to well below 2°C above pre-*

industrial levels" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels*".

Conclusion on Assessment of Significance

6.5.5 As set out in section 6.2, the Downstream Scope 3 Emissions associated with the Rosebank Development are assessed as having a likely impact on climate. The sensitivity of the climate receptor is considered to be "high" (section 6.3.3).

6.5.6 In order to assess the significance of the Rosebank Development Downstream Scope 3 Emissions the context of the emissions profiles and criteria set out in section 6.4 and *Table 14* have been used as follows:

6.5.6.1 ICC-GEMP - As set out in section 6.4.9, the Rosebank Development P10 production profile is within a Paris Agreement aligned production pathway. The consequence is therefore assessed to be low;

6.5.6.2 SSS-NZ - As set out in *Table 17*, the Rosebank Development is aligned with future demand estimations for oil and gas in each of the IEA scenarios. The consequence is therefore assessed to be low;

6.5.6.3 UK Gov-CPS - The Rosebank Development is included within the UKCS gross gas and oil production trajectories compared with future demand under CB7 as set out in *Figure 7*. The consequence is therefore assessed to be low.

6.5.7 The conclusion is, therefore, that in a Paris Agreement aligned production pathway, the effect of the Rosebank Development's Downstream Scope 3 Emissions on climate is not significant.[70]

[70] The same conclusion remains valid where the total GHG Emissions are considered as the incremental increase in estimated emissions does not alter the analysis.

APPENDIX A – UNCERTAINTIES, ASSUMPTIONS AND LIMITATIONS

Key uncertainties associated with the Assessment are outlined in *Table 18* below:

Element	Uncertainties, Assumptions and Limitations
Downstream Scope 3 GHG Emissions estimates	• Product end-use – as a worst-case it has been assumed that all hydrocarbons will be combusted over the LoF. However, it is recognised that "*a significant share is used as feedstock for petrochemicals and other non-energy industry sources*" (IPCC AR6 WGIII). • Hydrocarbon production – P10 is used as "high-case" in terms of production from the Rosebank Development (and therefore presents a "worst-case" in terms of emissions). However, production in reality may be lower than this. • Other Scope 3 Emissions in the value chain – the Scope 3 Emissions assessment considers the combustion of hydrocarbons only. Other Scope 3 Emissions (upstream) may also occur in the value chain. However, estimation of Scope 3 Emissions across these fragmented elements of the value chain is complex and there may be a risk of double counting Scope 3 Emissions with parties involved in the value chain. In line with Supplementary Guidance, Scope 3 Categories 9-11 emissions are considered within this assessment. Scope 3 Category 12 is not relevant because of the assumption of 100% combustion. Upstream emissions are considered in Section 9 of the Rosebank ES. • Conversion factors – Conversion factors are applied, as per the Supplementary Guidance, where detailed data cannot be obtained. Being generic, the conversion factors do not reflect the specific product or combustion conditions under which the hydrocarbon is utilised by the end user.
Global GHG Emission projections	• Climate projections - uncertainty is inherent in climate projections due to variability in socio-economic pathways, climate system responses, and model limitations. Future emissions trajectories depend on assumptions about global cooperation, technological advancement, and policy implementation, which are subject to change. Climate models also differ in sensitivity and resolution, contributing to a range of possible outcomes (IPCC, 2023). • Likelihood/uncertainty of future emissions – there is an inherent uncertainty in the likelihood of each emission reduction pathway, which relies on projections of future economic growth, technology deployment, fossil fuel prices, electricity generation costs and population change (IPCC, 2023). • Uncertainty in historic emissions - uncertainty arises due to more limited data acquisition and less well established conversion factors for older technologies.
Climate Change impacts	• Degree of human influence on climate change – although there is clear evidence of human influence on climate system, attributing warming to specific anthropogenic forcings remains uncertain (IPCC, 2023). • Climate tipping point – there is uncertainty over when possible 'tipping points' in the climate system may be met, whereby irreversible impacts may occur and would result in significant climate impacts above those from climate projections associated with global warming (CSIRO, 2024). • Physical and biological responses to climate change - uncertainty remains around the biochemical and physical environmental change in climate systems from global warming and the subsequent biological and socio-economic responses to changes in climate variables. There may also be difficulties in attributing changes in the physical, biological and socio-economic environment to climate change. • Climate policy, adaptation and mitigation – Governments responses to climate change remain uncertain. This will have an influence on climate change impacts.
Demand predictions	• It is challenging to predict future demand levels for oil and gas with certainty as this depends on a mix of complex factors: economic (global growth and industrial demand), technological (rate of shift to renewables, efficiency improvements, carbon capture and storage development), geopolitical (conflicts and sanctions can disrupt supply and influence demand, production quotas and strategic decisions by OPEC

	producers influence global price and demand), policy and regulation (carbon pricing, national regulations) environmental and behavioural (lifestyle and environmental awareness), price swings (such as those seen during the Covid pandemic and the Russian invasion of Ukraine).
Future global GHG emissions	• Future global GHG emissions in particular CO2 emissions from fossil fuel consumption, will depend on the success of international collaborative efforts to decarbonise the global energy system. The IPCC notes that there is no "one size fits all" approach to decarbonising national energy systems and approaches in different countries will depend on specific national circumstances, with some countries achieving Net Zero energy systems before others.
Alternatives	• Alternative field development options were discussed in "Consideration of Alternatives" in Chapter 2 of the Rosebank ES. The concept select decision proposed a concept for the Rosebank Development which maximised economically recoverable volumes in compliance with the Central Obligation and the terms of the Rosebank Licences. Production volumes are largely independent of the alternative field development options described in the Rosebank ES, therefore it is considered that the estimate of the Downstream Scope 3 Emissions for the Rosebank Development is not materially affected by the concept select decision taken.
Mitigations	• Mitigation measures are required where the assessment concludes a project's Downstream Scope 3 Emissions have a likely significant adverse effect on the environment. • Where this is the case, the Supplementary Guidance states that "*mitigation measures available to the developer to avoid, prevent or reduce any significant adverse effects on the environment from downstream scope 3 emissions are expected to be limited*." • Since the use (including whether or not this is by combustion) of the production is not within the control of the Rosebank Development, no mitigation measures that could be taken by the Rosebank Development have been identified. • Mitigation measures for scope 1 and 2 CO2eq emissions from the Rosebank Development are discussed in the "Commitments Register" in Appendix C of the Rosebank ES.

Table 18 - Key Uncertainties, Assumptions and Limitations in the Assessment

APPENDIX B – DIFFERENT GLOBAL APPROACHES, REQUIREMENTS AND POLICIES

Different Global Approaches, Requirements and Policies associated with the Assessment are outlined in Table 19 below:

Element	Different Global Approaches, Requirements and Policies
Equinor as an international operator	• Equinor is an international operator, operating across a number of jurisdictions. It recognises that different requirements and policies have been adopted in different locations around the world in connection with climate targets and GHG emissions. This Assessment is specific to the Rosebank Development in the context of the relevant regulatory position in the UK, including the requirements of the Offshore EIA Regulations, the terms of the Supplementary Guidance and the case law which led to the Supplementary Guidance. It is not an endorsement of any one approach or outcome, nor does it comment on UK or international climate policies or targets. As the Supplementary Guidance confirms, alternative approaches may be possible. The appropriate or applicable approach for any other projects will be determined by the nature of those projects, including their local regulatory requirements and policies.

Table 19 - Different Global Approaches, Requirements and Policies

APPENDIX C – COMPETENT EXPERTS

Competent Expert information is detailed in *Table 20* below:

Name	Company	Title	Relevant Qualifications Experience
Withheld	Xodus	Withheld	Approximately 20 years of experience in environment/oil and gas, with extensive experience in managing west of Shetland environmental issues. PhD in marine energy, and chartered environmentalist.
Withheld	Xodus	Withheld	Approximately 17 years of experience in undertaking EIA Projects. Managed a number of large oil and gas projects, including west of Shetland projects.
Withheld	Equinor UK Limited	Withheld	Approximately 13 years of experience in offshore oil and gas regulatory compliance.
Withheld	Equinor UK Limited	Withheld	Approximately 25 years of experience in oil and gas, with extensive experience in commercial, joint venture and regulatory relations.

Table 20 – Competent Expert information

REFERENCES

Archer et al., 2009. Archer, D., Eby, M., Brovkin, V., Ridgwell, A., Cao, L., Mikolajewicz, U., Caldeira, K., Matsumoto, K., Munhoven, G., Montenegro, A. and Tokos, K.. Atmospheric Lifetime of Fossil Fuel Carbon Dioxide. The Annual Review of Earth and Planetary Sciences. Doi: 10.1146/annurev.earth.031208.100206.

Bauer et al., 2016. Nico Bauer, Jérôme Hilaire, Robert J. Brecha, Jae Edmonds, Kejun Jiang, Elmar Kriegler, Hans-Holger Rogner, Fabio Sferra, Assessing global fossil fuel availability in a scenario framework, Energy, Volume 111, 2016, Pages 580-592, ISSN 0360-5442,. (https://www.sciencedirect.com/science/article/pii/S0360544216307058)

BEIS, 2019. Environmental reporting guidelines: including Streamlined Energy and Carbon Reporting requirment. https://www.gov.uk/government/publications/environmental-reporting-guidelines-including-mandatory-greenhouse-gas-emissions-reporting-guidance

Climate Change Committee (2020), 'The Sixth Carbon Budget: The UK's path to Net Zero', Sixth Carbon Budget - Climate Change Committee

CCC, 2025a. Climate Change Committee. Progress in reducing emissions. Report to Parliament, 134pp. June 2025. Progress in reducing emissions – 2025 report to Parliament

CCC, 2025b. Climate Change Committee. The Seventh Carbon Budget. Advice for the UK Government, 394pp. February 2025. http://www.theccc.org.uk/publications

DESNZ and BEIS, 2022. North Sea Transition Deal. Updated: March 2022. https://www.gov.uk/government/publications/north-sea-transition-deal

DESNZ, 2022. British energy security strategy, Updated: April 2022. https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

DESNZ, 2023. Carbon Budget Delivery Plan, March 2023. Carbon Budget Delivery Plan

DESNZ, 2025a. UK Greenhouse Gas Inventory, 1990 to 2023 Annual Report for Submission under the Framework Convention on Climate Change. Compiled on behalf of the UK Department for Energy Security and Net Zero (DESNZ) for the Science and Innovation for Climate and Energy (SICE) Directorate, by Ricardo. 603pp. United Kingdom. 2025 National Inventory Document (NID) | UNFCCC

DESNZ, 2025b. Greenhouse gas reporting: conversion factors 2025. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025

DESNZ, 2025c. Building the North Sa's energy future. Consulation. March 2025. https://www.gov.uk/government/consultations/building-the-north-seas-energy-future

EDGAR, 2024. Emissions Database for Global Atmospheric Research. Crippa *et. al*., 2024. Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M., Schaaf, E., Monforti-Ferrario, F., Becker, W.E., Quadrelli, R., Risquez Martin, A., Taghavi-Moharamli, P., Koykka, J., Grassi, G., Rossi, S., Melo, J., Oom, D., Branco, A., San-Miguel, J., Manca, G., Pisoni, E., Vignati, E. and Pekar, F., GHG emissions of all world countries, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/4002897, JRC138862. EDGAR - The Emissions Database for Global Atmospheric Research

Exergia et al. (2015). Study on actual GHG data for diesel, petrol, kerosene and natural gas. A study by Exergia, E3 Modelling and COWI for the European Commission, DG ENER. Retrieved from https://ec.europa.eu/energy/sites/ener/files/documents/Study%20on%20Actual%20GHG%20Data%20Oil%20Gas_Project%20Interim%20Report.pdf

Equinor, 2022. Rosebank Environmental Statement. August, 2022. 401pp. Available on Equinor.com Rosebank oil and gas field - Equinor

Energy Institute, 2025. Energy Institute Statistical Review of World Energy 2025

Finch Judgment, 2024. The Supreme Court. R (on the application of Finch on behalf of the Weald Action Group) (Appellant) v Surrey County Council and others (Respondents). Judgment Given on 20 June 2024. Available online at: https://supremecourt.uk/uploads/uksc_2022_0064_judgment_c3d44bb244.pdf

Forster et al., 2025. Forster, P. M., Smith, C., Walsh, T., Lamb, W. F., Lamboll, R., Cassou, C., Hauser, M., Hausfather, Z., Lee, J.-Y., Palmer, M. D., von Schuckmann, K., Slangen, A. B. A., Szopa, S., Trewin, B., Yun, J., Gillett, N. P., Jenkins, S., Matthews, H. D., Raghavan, K., Ribes, A., Rogelj, J., Rosen, D., Zhang, X., Allen, M., Aleluia Reis, L., Andrew, R. M., Betts, R. A., Borger, A., Broersma, J. A., Burgess, S. N., Cheng, L., Friedlingstein, P., Domingues, C. M., Gambarini, M., Gasser, T., Gütschow, J., Ishii, M., Kadow, C., Kennedy, J., Killick, R. E., Krummel, P. B., Liné, A., Monselesan, D. P., Morice, C., Mühle, J., Naik, V., Peters, G. P., Pirani, A., Pongratz, J., Minx, J. C., Rigby, M., Rohde, R., Savita, A., Seneviratne, S. I., Thorne, P., Wells, C., Western, L. M., van der Werf, G. R., Wijffels, S. E., Masson-Delmotte, V., and Zhai, P.: Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence, Earth Syst. Sci. Data, 17, 2641–2680, https://doi.org/10.5194/essd-17-2641-2025 .

Global Carbon Budget (2024) – with major processing by Our World in Data. "Cumulative CO_2 emissions" [dataset]. Global Carbon Project, "Global Carbon Budget" [original data]

HM Government, 2021. Net Zero Strategy: Build Back Greener. October 2021. https://assets.publishing.service.gov.uk/media/6194dfa4d3bf7f0555071b1b/net-zero-strategy-beis.pdf

HM Government 2023. Powering Up Britain. The Net Zero Grown Plan. March 2023. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147457/powering-up-britain-net-zero-growth-plan.pdf

IEA (2018), 'The Future of Petrochemicals', https://www.iea.org/reports/the-future-of-petrochemicals

IEA 2023a Net Zero Roadmap. A Global Pathway to Keep the 1.5ºC Goal in Reach. 2023 Update. International Energy Agency Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach – Analysis - IEA

IEA 2023b. The Oil and Gas Industry in Net Zero Transitions, World Energy Outlook Special Report, November 2023.

IEA-EDGAR CO2, a component of the EDGAR (Emissions Database for Global Atmospheric Research) Community GHG database version EDGAR_2024_GHG (2024) including or based on data from IEA (2023) Greenhouse Gas Emissions from Energy, www.iea.org/data-and-statistics, as modified by the Joint Research Centre.

IEA, 2024a. The International Energy Agency (IEA), Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M., Schaaf, E., Monforti-Ferrario, F., Becker, W.E., Quadrelli, R., Risquez Martin, A., Taghavi-Moharamli, P., Köykkä, J., Grassi, G., Rossi, S., Melo, J., Oom, D., Branco, A., San-Miguel, J., Manca, G., Pisoni, E., Vignati, E. and Pekar, F., GHG emissions of all world countries, Publications Office of the European Union, https://data.europa.eu/doi/10.2760/4002897.

IEA, 2024b. World Energy Outlook IEA 2024; World Energy Outlook 2024 – Analysis - IEA, License: CC BY 4.0.

IEMA, 2022. Institute of Environmental Management & Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance. 2nd Edition. https://www.isepglobal.org/media/xmgpoopk/2022_iema_greenhouse_gas_guidance_eia.pdf

IPIECA, 2016. Estimating petroleum industry value chain (Scope 3) greenhouse gas emissions. Overview of methodologies. June 2016. https://www.ipieca.org/resources/estimating-petroleum-industry-value-chain-scope-3-greenhouse-gas-emissions-overview-of-methodologies

IPCC, 2021a: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3−32, doi:10.1017/9781009157896.001.

IPCC, 2021b. The Working Group I (WGI) contribution to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6). The Physical Science Basis of Climate Change, Technical Summary. Arias, P.A., N. Bellouin, E. Coppola, R.G. Jones, G. Krinner, J. Marotzke, V. Naik, M.D. Palmer, G.-K. Plattner, J. Rogelj, M. Rojas, J. Sillmann, T. Storelvmo, P.W. Thorne, B. Trewin, K. Achuta Rao, B. Adhikary, R.P. Allan, K. Armour, G. Bala, R. Barimalala, S. Berger, J.G. Canadell, C. Cassou, A. Cherchi, W. Collins, W.D. Collins, S.L. Connors, S. Corti, F. Cruz, F.J. Dentener, C. Dereczynski, A. Di Luca, A. Diongue Niang, F.J. Doblas-Reyes, A. Dosio, H. Douville, F. Engelbrecht, V. Eyring, E. Fischer, P. Forster, B. Fox-Kemper, J.S. Fuglestvedt, J.C. Fyfe, N.P. Gillett, L. Goldfarb, I. Gorodetskaya, J.M. Gutierrez, R. Hamdi, E. Hawkins, H.T. Hewitt, P. Hope, A.S. Islam, C. Jones, D.S. Kaufman, R.E. Kopp, Y. Kosaka, J. Kossin, S. Krakovska, J.-Y.

IPCC, 2022*: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926

IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.

GHG Protocol, 2013. The Greenhouse Gas Protocol; A Corporate Accounting and Reporting Standard. Revised Edition. Available online at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

Jackdaw/Rosebank Judgment, 2025. Outer House, Court of Session. Judicial review of the lawfulness of the grant of consent given by the Secretary of State for Business Energy and Industrial Strategy under Regulation 14 of the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020 and the grant of consent under Regulation 15 of the 2020 Regulations by the Oil and Gas Authority to BG International Limited for the development of and production from the Jackdaw Field. 29th January 2025. Available online at: https://www.scotcourts.gov.uk/media/v0zkbsxy/2025csoh10-petitions-by-greenpeace-limited-and-uplift-for-judicial-review.pdf

Lan, X., K.W. Thoning, and E.J. Dlugokencky (2022): Trends in globally-averaged CH4, N2O, and SF6 determined from NOAA Global Monitoring Laboratory measurements. Version 2025-09, https://doi.org/10.15138/P8XG-AA10

Lan et al., 2023. Lan, X., Tans, P. and K.W. Thoning: Trends in globally-averaged CO2 determined from NOAA Global Monitoring Laboratory measurements. Version 2023-04 https://doi.org/10.15138/9N0H-ZH07

Lan, X., NOAA/GML and Keeling, R (2025). Scripps Institution of Oceanography: Scripps CO_2 Program. https://www.scrippsco2.ucsd.edu/

Mission Zero, 2023. Independent Review of Net Zero, Final Report, 13 January 2023, 340 pp. Review of Net Zero - GOV.UK

Paris Agreement, 2015. The Paris Agreement. United Nations Framework Convention on Climate Change, 12 December 2015. UNTC

NESO, 2024. Clean Power 2030, Advice in achieving clean power for Great Britain by 2030. National Energy System Operator, December 2024. 84pp plus Annexes.

Net Zero Strategy, 2021. Net Zero Strategy: Build Back Greener, 368 pp. Department of Energy Security and Net Zero and Department of Energy and Industrial Strategy, 2021

NOAA, 2022. Carbon dioxide now more than 50% higher than pre-industrial levels. NOAA Climate.gov. June 2022. https://www.noaa.gov/news-release/carbon-dioxide-now-more-than-50-higher-than-pre-industrial-levels

NOAA, 2025. Climate change: atmospheric carbon dioxide. NOAA Climate.gov. May, 2025. https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide

NSTA, 2024. Emissions Monitoring Report, North Sea Transition Authority. September 2024. Emissions Monitoring Report 2024

NSTD, 2021. North Sea Transition Deal. Published by the Department of Business, Energy and Industrial Strategy under the Conservative government. North Sea Transition Deal - GOV.UK

OPRED, 2025. EIA – Assessing effects of downstream scope 3 emissions on climate - Supplementary guidance. June 2025.

Riahi et al., 2017. Riahi, K., van Vuuren, D. P., Kriegler, E., Edmonds, J., O'Neill, B. C., Fujimori, S., Bauer, N., Calvin, K., Dellink, R., Fricko, O., Lutz, W., Popp, A., Cuaresma, J. C., Kc, S., Leimbach, M., Jiang, L., Kram, T., Rao, S., Emmerling, J., Ebi, K., Hasegawa, T., Havlik, P., Humpenöder, F., Da Silva, L. A., Smith, S., Stehfest, E., Bosetti, V., Eom, J., Gernaat, D., Masui, T., Rogelj, J., Strefler, J., Drouet, L., Krey, V., Luderer, G., Harmsen, M., Takahashi, K., Baumstark, L., Doelman, J. C., Kainuma, M., Klimont, Z., Marangoni, G., Lotze-Campen, H., Obersteiner, M., Tabeau, A., and Tavoni, M.: The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview, Global Environ. Change, 42, 153– 168, https://doi.org/10.1016/j.gloenvcha.2016.05.009, 2017.

Royal Society, 2021. The Carbon Cycle, one in a series of Briefing Notes available at Climate change: science and solutions | Royal Society (www.royalsociety.org)

Scottish Government, 2015. Scotland's National Marine Plan. March 2015. https://www.gov.scot/publications/scotlands-national-marine-plan/

SEI, 2023. SEI, Climate Analytics, E3G, IISD, and UNEP. (2023). The Production Gap: Phasing down or phasing up? Top fossil fuel producers plan even more extraction despite climate promises. Stockholm Environment Institute, Climate Analytics, E3G, International Institute for Sustainable Development and United Nations Environment Programme. https://doi.org/10.51414/sei2023.050

UK Government, 2024. Clean Power 2030 Action Plan: A new era of clean electricity. 138pp.

UK Government, 2025. United Kingdom of Great Britain and Northern Ireland's 2035 Nationally Determined Contribution Presented to Parliament by the Secretary of State for Energy Security and Ne Zero by Command of His Majesty January 2025. 74 pp. UK's 2035 NDC ICTU.pdf

WMO, 2024. WMO Greenhouse Gas Bulletin, No.20, 2024. 28 October 2024 ISSN 2078-0796