Cambois Connection Onshore Scheme

ES Appendix 5.1 Climate Assessment (Greenhouse Gas Emissions)

sse Renewables

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October 2023

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Contents

Tables

Acronyms and abbreviations

Acronym	Description
BBWF	Berwick Bank Wind Farm
BBWFL	Berwick Bank Wind Farm Limited
BEIS	Department for Business, Energy and Industrial Strategy
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GHG	Greenhouse Gas
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
LPA	Local Planning Authority
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
N/A	Not Applicable
NCC	Northumberland County Council
NPF	National Planning Framework
OCSP	Offshore Converter Station Platform
PDE	Project Design Envelope
SSER	SSE Renewables
UK	United Kingdom

Units

Unit	Description
%	Percentage
£	Pound Sterling
CO_{2e}	Carbon dioxide equivalent
GW	Gigawatt (power)
km	Kilometres (distance)
km^2	Square kilometres
m	Metre (distance)
m^2	Square metres
MW	Megawatt
nm	Nautical mile (distance)
T	Tonnes
Mt	Million tonnes

1. INTRODUCTION

This document presents the assessment of the likely significant effects of the Cambois Connection onshore infrastructure (hereafter referred to as "the Onshore Scheme") on climate through greenhouse gas (GHG) emissions (Climate Assessment). The Onshore Scheme comprises the components of the Cambois Connection that are located landward of mean low water springs (MLWS).

The development of the Cambois Connection is proposed by Berwick Bank Wind Farm Limited (BBWFL), a wholly owned subsidiary of SSE Renewables (SSER) (hereafter referred to as 'the Applicant').

1.1. DESCRIPTION OF THE ONSHORE SCHEME

The Cambois Connection comprises two proposals, or 'Schemes':

- the Marine Scheme, which comprises the construction and installation, operation and maintenance, and decommissioning of up to four High Voltage Direct Current (HVDC) Offshore Export Cables from up to two Offshore Converter Station Platforms (OCSPs) within the Berwick Bank Wind Farm (BBWF) array area to MHWS of the Landfall location near Cambois, Northumberland; and
- the Onshore Scheme, which comprises the construction and installation, operation and maintenance and decommissioning of a cable Landfall (landward of mean low water springs (MLWS)), including up to four onshore HVDC cables (Onshore Export Cables), an onshore Converter Station, High Voltage Alternating Current (HVAC) grid cables from the Onshore Converter Station to the existing Blyth National Grid substation near Cambois, and works to integrate into the existing Blyth substation.

The purpose of this infrastructure is to facilitate the export of green energy from the generation assets associated with the BBWF, located in the outer Firth of Forth. A separate application for developing a grid connection to Branxton, East Lothian, has been included as part of the Applicant's application for consent for the BBWF, currently being determined separately. The Cambois Connection will enable the BBWF to reach full generating capacity by the early 2030s.

The Onshore Scheme is located within the English onshore jurisdiction and will require planning permission from Northumberland County Council (NCC). In addition to the assessment of GHG emissions arising from the components of the Onshore Scheme, this report presents a cumulative assessment of the GHG emissions arising from the Onshore Scheme, the Marine Scheme, and the BBWF.)

1.2. BACKGROUND TO CLIMATE CHANGE AND REQUIREMENTS FOR ASSESSMENT

Human activities contribute to GHG emissions, such as carbon dioxide (CO_2) to the atmosphere, primarily by the combustion of fossil fuels. GHGs trap heat in the atmosphere, with higher concentrations leading to increasing global temperatures. Atmospheric CO_2 concentrations now exceed 400 parts per million for the first time in around 3 million years (The Royal Society, 2020), and increased GHG emissions have led to global average surface temperatures of 1°C higher than pre-industrial levels (World Meteorological Organisation (WMO), 2021). There is a global consensus on the need to tackle climate change and for accelerating GHG emissions reductions (Climate Change Committee (CCC), 2021). The impact of climate change is already being felt around the world with changing rainfall patterns and rising sea levels, increasing the risk of heatwaves, floods, droughts and fires, and has already caused damage to ecosystems, people, settlements and infrastructure (Intergovernmental Panel on Climate Change (IPCC), 2022).

Climate change requirements are outlined in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, which state that the environmental statement should include a description of the factors likely to be significantly affected by the project, including climate (for example):

- greenhouse gas emissions; and
- impacts relevant to adaptation.

Assessing the vulnerability of the Onshore Scheme to climate change, in particular the impacts of extreme weather caused by climate change during construction, operation and maintenance, and decommissioning, and adaptation to mitigate the potential effects of such impacts, has been scoped out of this assessment as it is not considered likely that the Onshore Scheme will be significantly affected by the expected climate change trends,

with the exception of increased rainfall and sea level rise, which will be managed through the site drainage design as detailed in the Scoping Report (SSER, 2022a).

As agreed with NCC, the effects of GHG emissions from the Onshore Scheme on climate has been considered, but not the adaptation and climate vulnerability/resilience effects on the Onshore Scheme arising from climate change, as noted in section 1.3 below.

1.3. CONSULTATION

Responses to the Scoping Report for the Onshore Scheme (SSER, 2022a) relevant to GHG emissions are provided in Table 1-1.

Table 1-1 – Scoping Comments

Organisation	Comment	SSER Response	NCC Response (September 2023)
Northumberland County Council (NCC)	The ES should also identify how the development impacts the natural environment's ability to store and sequester greenhouse gases, in relation to climate change mitigation and the natural environment's contribution to achieving net zero by 2050. Natural England's Carbon Storage and Sequestration by Habitat report (2021) and the British Ecological Society's nature-based solutions report (2021) provide further information.	In relation to climate change and associated scope of assessments, I would like to confirm that our following understanding from the Scoping Opinion issued by Northumberland County Council (NCC) on 4 January 2023 is correct: • a greenhouse gas (GHG) assessment (i.e. effects of a project on the climate through the release of GHG emissions) is to be undertaken, in accordance with our proposal to scope into the ES assessment of GHG emissions arising from the Onshore Scheme, made in our Scoping Report issued on 4 November 2023. Such a GHG assessment would cover the full life cycle of the Onshore Scheme, i.e. the construction, operation and maintenance, and decommissioning phases. • a climate vulnerability/resilience assessment (i.e. effects of future climate change on the project and how the project can be adopted to withstand predicted climate change) is not to be undertaken, in accordance with our proposal in the Scoping Report to scope out effects of anticipated future climate change on the Onshore Scheme. Notwithstanding this, designed in mitigation measures suggested in our Scoping Report, such as development and implementation of a sustainable drainage strategy will be accounted for in the ES.	I can confirm an agreement with your understanding set out below.

1.4. PURPOSE OF THE ASSESSMENT

The Climate Assessment has been undertaken in accordance with the following IEMA guidance:

Assessing Greenhouse Gas Emissions and Evaluating their Significance, February 2022 (IEMA,2022).

This assessment:

- Sets the scope and boundaries of the Climate Assessment;
- Presents the existing environmental baseline and the future baseline for the assessment;
- Identifies assumptions and limitations in compiling the environmental/climate information;
- Presents the likely significant effects on the climate arising from the Onshore Scheme through GHG emissions; and
- Highlights any mitigation measures which are recommended to prevent, minimise or reduce the GHG emissions impacts that give rise to any adverse likely significant effects of the Onshore Scheme.

2. POLICY & LEGISLATIVE CONTEXT

Policy and legislation specifically in relation to climate are provided in Table 2-1. UK carbon reduction targets and carbon budgets are provided in

Table 2-2..

Table 2-1 – Summary of Legislation and Policy Relevant to Climate

Policy/ Legislation	Summary
International	
Paris Agreement (2015)	Strengthened negotiations at COP21 led to the 2015 Paris Agreement, the aim of which is to maintain the increase in global average temperature at 'well below' 2°C and 'pursue efforts' to limit the temperature increase even further to 1.5°C. In 2018, the IPCC published a special report (IPCC, 2018) in response to the Paris Agreement, to present the impacts of the targeted 1.5°C temperature rise. The report highlighted that to achieve this, global emissions must decrease by 45% by 2030 (against a 1990 baseline), and that net zero global emissions (where emissions and removals from the atmosphere are balanced) must be achieved by 2050. This is noted to require rapid and far-reaching transitions of every sector on an unprecedented scale. The Glasgow Climate Pact, resulting from COP26 held in 2021, strengthened focus on limiting the temperature rise to 1.5°C, recognising the severity of climate impacts above this limit.
National (UK)	
Climate Change Act (2008) as amended in 2019	To support international efforts, the UK Climate Change Act (2008) set a legal reduction target of 80% for the UK against 1990 levels by 2050. It also introduced a series of carbon 'budgets' for five-year periods, to act as stepping-stones to the overall reduction. There are budgets currently set up to 2037. In response to the ambitions of the Paris Agreement, in 2019 the Climate Change Act was amended to set the overall reduction target by 2050 to at least 100% in net emissions against 1990 levels. The UK has so far outperformed its budgets, but progress is slowing, and the country is not on track to meet its future budgets or the overall reduction target, according to the most recent Progress Report to Parliament by the CCC (CCC, 2023).
Town and Country Planning (Environmental Impact Assessment) Regulations 2017	Schedule 4 of the Regulations requires a description of the factors likely to be significantly affected by the development which includes climate (for example greenhouse gas emissions and impacts relevant to adaptation).
Construction 2025 (UK Government, 2013)	Construction 2025 is a UK Government strategy paper that sets out how efficiency improvements will be created in construction covering sustainability and carbon and including a target to reduce whole life emissions by 50% by 2025 in the built environment. The included emissions reduction target of 50% is not project specific, and the efficiency improvements are broad. In terms of the Onshore Scheme and emissions reduction, the reduction target should be taken into account when developing specific mitigation measures, where relevant.
British Energy Security Strategy (Department for Business, Energy & Industrial Strategy (BEIS), 2022)	This policy paper outlines the UK Government's plans to make Britain energy independent, reduce reliance on foreign sources of energy and to work towards their net zero 2050 target. It includes plans to deliver 50 GW of energy generation via offshore wind by 2030 and enable smarter planning to increase the pace of deployment by 25%.

Policy/ Legislation	Summary
Powering Up Britain (HM Government, 2023a)	This policy paper outlines the UK Government's plans for setting out how the government will enhance the country's energy security and deliver on net zero commitments, by diversifying, decarbonising and domesticating energy production by investing in renewables.
Carbon Budget Delivery Plan (HM Government, 2023b)	The plan sets out a package of proposals and policies and associated timescales and delivery risks that enable carbon budgets 4-6 to be met from the different sectors. There are a number of policies within this document under the power sector, including policy 38 which notes that a review of the offshore transmission network will be carried out to ensure that there is the network suitable to support the delivery of offshore wind generation assets.
National (England)	
Draft Overarching Energy National Policy Statement (NPS) for Energy (EN-1)[1]	The NPS sets out the national policy for the delivery of major energy infrastructure in England and Wales. Although the Onshore Scheme is not classed as a nationally significant infrastructure project, the NPS does indicate Government's policy intent.
England National Planning Policy Framework (NPPF)	The NPPF sets out the government's planning policies for England and how these are expected to be applied, including of relevance, meeting the challenge of climate change (paragraph 154).
Regional/ Local	
Northumberland County Council Climate Change Action Plan 2021-23	Sets out the actions that the Council will take to meet their target of net zero by 2030, and the priorities for 2021 to 2023, including prioritising renewable energy generation. Under this priority action area, the plan notes that the county is well placed to support the offshore wind industry, and continue to support renewable technology where installations are technically possible, economically feasible, environmentally advantageous and socially acceptable.
Northumberland Local Plan 2016-2036 (Northumberland County Council)	Policy REN 1 within the Local Plan states that proposals for renewable energy and low carbon energy development will be supported including where, decentralised, renewable or low carbon energy supply systems are to be used to supply energy to a development. Policy STP4 states that development proposals should mitigate climate change and contribute to meeting nationally binding targets to reduce greenhouse gas emissions.

[1] A suite of draft revised Energy NPSs were published and consulted on by the UK Government in March 2023, and consultation closed on 23 June 2023. The consultation responses will be subject to consideration and the draft revised NPSs may now be revised before the NPSs are formally adopted. There is currently no date for the next stage of the review process and therefore this ES presents the current adopted NPSs which have been considered during the preparation of this ES. It is however noted by the Applicant that the new draft NPSs state that they may be material considerations in other applications which are not considered under the Planning Act (2008), this includes the Onshore Scheme. The draft EN-1 states that "To support the achievement of the transition to net zero, government is accelerating the co-ordination of the development of the grid network to facilitate the UK's net zero energy generation development and transmission." Further detail on the consideration of the draft NPSs in this ES is provided in Volume 2, Chapter 2: Policy and Legislation.

Table 2-2 – UK Carbon Budgets as set in Carbon Budget Orders 2009, 2011, 2016 and 2021

UK carbon budget period	UK carbon budget level
1st carbon budget (2008 to 2012)	3,018 $MtCO_2e$
2nd carbon budget (2013 to 2017)	2,782 $MtCO_2e$
3rd carbon budget (2018 to 2022)	2,544 $MtCO_2e$
4th carbon budget (2023 to 2027)	1,950 $MtCO_2e$
5th carbon budget (2028 to 2032)	1,725 $MtCO_2e$
6th carbon budget (2033 to 2037)	965 $MtCO_2e$

Table source: Advice on reducing the UK's emissions - Climate Change Committee (theccc.org.uk)

3. STUDY AREA AND BASELINE

3.1. STUDY AREA

The study area includes all carbon emitting activities within the Onshore Scheme boundary, relevant carbon emitting activities beyond the Onshore Scheme boundary that contribute to the total carbon footprint of the construction, operation and maintenance and decommissioning of the Onshore Scheme, and energy generation from alternative sources.

The GHG assessment is a wide-ranging topic in terms of potential sources, both originating within the Onshore Scheme boundary and from much further afield and is not limited to the geographic extent of the Onshore Scheme boundary.

3.2. BASELINE

3.2.1. METHODOLOGY TO INFORM BASELINE

The baseline conditions for the assessment are informed by the total background emissions of GHGs from all sources, i.e. all UK GHG emissions, as provided by national statistics. In addition, baseline environmental characteristics for the Onshore Scheme with specific reference to GHG emissions are provided for the existing situation and in the future, assuming the Onshore Scheme is not implemented.

3.2.2. UK GHG EMISSIONS

3.2.2.1. Emissions

The total UK territorial emissions for 2021 (last reported year) were 426.5 million tonnes (Mt) carbon dioxide equivalent[2] (CO_2e), (BEIS and Department for Energy Security & Net Zero (DESNZ), 2023a). Provisional figures have been released for 2022, with the total UK territorial emissions for 2022 being 417.1 Mt CO_2e (BEIS and DESNZ, 2023b).

The UK has in place carbon budgets for five-year periods up to 2037, as shown in

[2] Includes carbon dioxide and other greenhouse gases included the Kyoto Protocol, adopted 1997 and ratified in 2005. Details about each of the Kyoto Protocol GHGs can be found here: Global Warming Potentials (IPCC Second Assessment Report) | UNFCCC

Table 2-2. Whilst budgets have not yet been set beyond 2037, there is a legal requirement for the UK to reach net zero emissions by 2050, as set in the Climate Change Act 2008.

3.2.2.2. Electricity Generation

The UK emitted 0.193 $kgCO_2e$ for each kWh of energy generated in 2022 (last reported year, long-run marginal figure) (BEIS and DESNZ, 2023c). This emissions factor has been projected by BEIS up until 2100. The emissions factor is projected to decrease significantly over the next 10 years, due to lower carbon forms of energy generation coming online and older, higher carbon forms of energy generation (i.e. fossil fuels) being phased out. The emissions factor is projected to be 0.091 $kgCO_2e$/kWh in 2030 (first operating year of the Cambois Connection). The emissions factor continues to decrease until 2050 when the emissions factor is 0.002 $kgCO_2e$/kWh. It is then projected to remain at this low level of residual emissions until 2100.

3.2.3. NORTHUMBERLAND COUNTY COUNCIL GHG EMISSIONS

The total GHG emissions for Northumberland County Council for 2021 (the last reported year) were 2,069.7 $ktCO_2e$ (National Statistics, 2023).

3.2.4. ONSHORE SCHEME SPECIFIC BASELINE GHG EMISSIONS

The Onshore Scheme will be located in an area of approximately 188 ha, which currently comprises a range of new and legacy industrial uses, 'brown field' site and arable farmland and residential settlements, flanked by the Cambois coastline to the east, as shown in Volume 4, Figure 1.2.

tFor the purposes of this assessment, a conservative GHG emissions baseline of zero is applied, which represents a robust worst-case approach.

3.2.5. FUTURE BASELINE SCENARIO

If the Onshore Scheme is not constructed, it is likely that the current activities on site will continue as they are with limited changes anticipated in the near-future.

As mentioned in section 3.2.2 the emissions factor for UK energy generation is projected to continuously decrease until 2050 when it reaches 0.002 $kgCO_2e$/kWh. This rate of decrease is based on a variety of factors and is altered every year based on changes in policy, current energy generation capacity, economics and planned projects. The projection would remain similar in future years, and would only be materially impacted by large scale changes in government policy, geopolitical events or economic issues.

4. ASSESSMENT METHODOLOGY

The potential impacts of GHG emissions are very specific in terms of receptors and impacts because:

- There is only one receptor, the atmosphere, which is non-site-specific;
- There is only one direct impact, global warming, which is also non-site-specific; and
- All units of CO_2e can be considered to have the same impact no matter where they are emitted.

Therefore, assessment of the effects of the Onshore Scheme on climate is limited to quantification of the magnitude of GHG emissions, from individual sources and in total, and comparisons of these to the baseline. Different GHGs have different global warming potentials, and to account for this they will be reported throughout this assessment as their CO_2e value.

4.1. GUIDANCE

The assessment has been undertaken in accordance with the following guidance:

- IEMA (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance; and
- PAS 2080:2023 - Carbon Management in Infrastructure.

4.2. IMPACTS TO BE ASSESSED

Table 4-1 presents the elements included in the assessment, including their data sources.

Table 4-1 – Elements Included in the Assessment for the Onshore Scheme

Phase	GHG Emission Sources	Data Sources
Site Preparation and Construction	Embodied CO_2e emissions of construction materials, including emissions from raw material extraction through manufacture	Estimates of construction materials and quantities were provided by the Cambois Connection design team
	Emissions associated with the transportation of construction materials to the Onshore Scheme	Source locations of materials are not yet known so reasonable worst case scenario estimates have been made
	Emissions associated with construction activities and plant used on site	Construction activities and plant are not yet known so reasonable worst case scenario estimates have been made based on similar construction projects
Operation and Maintenance	Emissions associated with the replacement of materials and components in the Onshore Scheme	Replacement of materials and components is not yet known so reasonable worst case scenarios have been made
	Emissions associated with the consumption of energy at the Onshore Scheme site	Data provided by the Applicant based on Cambois Connection design as presented in Volume 2, Chapter 5: Project Description was used with benchmarks from the Scottish Futures Trust
Decommissioning	Emissions associated with the waste and recycling processes of the Onshore Scheme's materials	Quantity and type of decommissioned material assumed to be the same as the materials used in construction

Phase	GHG Emission Sources	Data Sources
	Emissions associated with decommissioning activities from plant and vehicles	Activities and plant are assumed to be similar to those used during construction

Table 4-2 presents the elements not included in the assessment for the Onshore Scheme, and the justification for their exclusion. The elements excluded are not anticipated to materially affect the outcomes resulting from this assessment. It is considered that the elements not included in the assessment would not contribute to more than 5% of total GHG emissions. This is in line with a proportionate approach which considers that where expected GHG emissions are less than 1% of total GHG emissions they can be excluded from assessment, provided that the combined exclusions are not more than a maximum of 5% of total GHG emissions, in accordance with IEMA guidance.

Table 4-2 – Elements Not Included in Assessment for the Onshore Scheme

Phase	GHG Emission Sources	Justification
Site Preparation and Construction	Emissions from the collection, treatment and disposal of solid waste	It is anticipated that the quantity of solid waste produced from the construction phase is minor and would account for <1% of total emissions.
	Emissions associated with employee travel to site	Data for the travel of employees to the site is not available at this stage. It is considered that emissions would be <1% of total emissions based on professional judgement from assessment of other similar projects.
Operation and Maintenance	Emissions from the collection, treatment, and disposal of solid waste	It is anticipated that the quantity of solid waste produced during operation is negligible and therefore has been scoped out.
	Emissions from the treatment of liquid effluent from staff on site	It is anticipated that the quantity of liquid waste produced during operation is negligible and therefore has been scoped out.
	Emissions associated with employees commuting to and from site	Once operational, the Onshore Scheme will have a small workforce on site, and the Site will be subject to infrequent inspections and maintenance visits whilst in operation. Exact workforce numbers are not yet known but estimated to be <10 people. It is considered that emissions would be <1% of total emissions based on professional judgement from assessment of other projects.
Decommissioning	Emissions associated with employee travel (terrestrial)	Data for the travel of employees to the site is not available at this stage. It is considered that emissions would be <1% of total emissions based on professional judgement from assessment of other projects.

Phase	GHG Emission Sources	Justification
Land Use Change	Emissions associated with changes in land use and vegetation from the Scheme	The site mainly consists of low value brownfield land and arable land, with limited carbon sequestration. It is considered that emissions would be <1% of total emissions based on professional judgement from assessment of other projects.

4.3. CALCULATING CONSTRUCTION GHG EMISSIONS

The design data for the assessment has been provided by the Applicant and reflects the Applicant's design of the Onshore Scheme at this stage, in accordance with the Project Design Envelope (PDE) approach followed by the Applicant for the Onshore Scheme ES (see Volume 2, Chapter 5: Project Description).

A quantification of construction phase GHG emissions has been calculated using the Atkins' Carbon Knowledgebase tool, which contains a detailed library of calculation formulae and over 1,000 emissions factors from authoritative sources such as the Inventory of Carbon and Energy (ICE, versions 1.6(a), 2.0 and 3.0) (Circular Ecology, 2022), the Department for Environment, Food and Rural Affairs (Defra) Greenhouse Gas Reporting Conversion Factors (Defra, 2022), and the EMEP/CORINAIR Emission Inventory Guidebook (EMEP/EEA, 2019). The tool calculates the construction phase emissions in accordance with PAS 2080: Carbon Management in Infrastructure, the international standard for assessing carbon emissions throughout a project's lifecycle.

It is not yet known at this stage where materials will be sourced from. Therefore, the following assumptions have been made using the RICS (2017) guidance:

- Export Cable components (Globally sourced) – 10,000km by sea, 200km by road; and
- Other components (Locally sourced) – 100km by road.

Several components of the Onshore Scheme do not have a detailed design at this stage. Where it has not been possible to identify the material composition of Onshore Scheme components, conservative assumptions have been made. Assumptions regarding the construction phase GHG emissions are listed in Section 4.7.

4.4. CALCULATING OPERATION AND MAINTENANCE GHG EMISSIONS

The operation and maintenance phase of the Onshore Scheme has two key areas:

- Operational electricity consumption; and
- Maintenance and repair.

The Onshore Scheme as part of the Cambois Connection will transfer electricity from BBWF to the National Grid Blyth substation. To calculate the operational energy requirements, the Scottish Futures Trust Construction Carbon Assessment Tool, produced by Circular Ecology (Scottish Futures Trust, 2019), was used.

This tool calculates annual operational carbon using industry-wide benchmarks[3], and the estimated operational floor area of the Onshore Scheme. A decarbonisation rate was applied to this annual figure to account for the decarbonisation of the grid as the UK moves towards Net Zero.

It is assumed, as a worst case, that the following repair events will take place during the lifetime of the Onshore Scheme:

- All access tracks will require 1 full replacement;
- Full length replacement of one individual cable per group of HVDC cables4 within the cable corridor;

[3] Benchmarks produced following a review of over 1,200 UK case studies

4 A group of cables is all cables of a particular type - HVDC, HVAC and fibre optic

- Full length replacement of one individual cable per group of HVAC cables; and
- Full length replacement of one fibre optic cable per group of cables.

This is noted below in section 4.7. A quantification of maintenance GHG emissions has been calculated using the Atkins' Carbon Knowledgebase tool, as described above in section 4.3.

4.5. CALCULATING DECOMMISSIONING GHG EMISSIONS

The decommissioning phase of the Onshore Scheme has three key areas:

- Breakdown and removal of material from the site;
- Transportation of material to waste facilities;
- Treatment of waste material.

At the moment there is limited information available about the exact processes required to decommission the Onshore Scheme. It is likely that by the time the Onshore Scheme is decommissioned the processes will be different from those currently practiced as decommissioning is not expected to take place until 2065 at the earliest. Therefore, broad assumptions have been made to model the emissions that could arise during the decommissioning phase.

It is assumed that the vehicles and plant used to decommission the Onshore Scheme are the same as those in the construction phase. However, given that decommissioning will take place from 2065, i.e. 15 years after net zero targets should have been achieved in accordance with UK net zero targets (refer to section 2), all vehicles and plant are assumed to have net zero emissions. This is a fair assumption given that the same quantity of material needs to be taken from the site as was added in the first place and that net zero emission vehicles will likely have been operating for at least 15 years, in accordance with assuming decarbonisation of the transportation sector during the course of the operation and maintenance phase.

The same assumption is used for the on-land transportation of materials which will be transported to nationally based waste facilities (300km distance using RICS, 2017 guidance).

As details on waste management are not available at this stage (refer to Volume 2, Chapter 5: Project Description), all decommissioned materials are assumed to be disposed of in landfill and not recycled. This would represent a reasonable worst-case scenario for the materials.

4.6. SIGNIFICANCE ASSESSMENT

The method of assessment of whether the calculated GHG emissions from the Onshore Scheme will have a significant effect on climate has been determined in accordance with IEMA's 2022 guidance. There is no legal limit for GHG emissions for any one development. The guidance suggests that the level of significance should be related to how a project contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050, as stated in section 6.2 of the guidance: "*The crux of significance…is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050 (or other date as defined in targets for devolved administrations)*."

The IEMA 2022 guidance document notes that practitioners need to consider whether project GHG emissions are aligned to achieving net zero by 2050, using the science based 1.5°C trajectory. Where this is not the case, then the effects are judged to be moderate adverse or major adverse, and thus can be classed as a significant effect. Projects that are compatible with the trajectory can have their effects classed as minor adverse, or where the project achieves GHG emission mitigation that goes beyond the trajectory, negligible. In both cases, the effects are not considered to be significant. Projects that result in GHG emissions being avoided or removed from the atmosphere can be considered to have a significant beneficial effect. The IEMA 2022 guidance notes that the UK 2050 target for net zero and interim carbon budgets are considered by the UK Climate Change Committee to be compatible with the required trajectory.

The percentage contribution of the Onshore Scheme to the national carbon budgets has been determined in accordance with IEMA 2022 guidance on significance. Although the IEMA guidance suggests that, for context, it would be good practice to consider a project's GHG emissions in relation to sector-based targets, there are currently no sector budgets for electricity transmission or generation or any other sector provided by the UK Government. Sector-based targets have therefore not been considered in accordance with current UK legislation.

4.7. LIMITATIONS AND ASSUMPTIONS

The key limitation of the assessment is the information available within the Project Design Envelope (PDE) for the Onshore Scheme to enable estimations of GHG emissions at the time of the assessment. This has required assumptions to be made, and some industry standard data to be used as a proxy. The following assumptions have been made during the carbon assessment:

- Carbon factors are drawn from the Inventory of Carbon and Energy (ICE versions 2.0 and 3.0);
- The Onshore Cable System will comprise of up to four HVDC 525kV cables, each 2.1km long, and will include fibre optic cables;
- Due to lack of cable construction details in the PDE, an online supplier information was used to advise cable-layer calculations;
- Transportation of materials has been modelled using RICS (2017) guidance. See Section 4.3.
- For obtaining concrete quantity of Joint Bays and Transition Joint Bays, a depth equivalent to cable trench depth and a width of 150mm was considered. The material for these items has been assumed to be C35/45 with no reinforcement due to lack of detailed designs at this stage.
- The construction details for all types of Construction Compounds on site are unavailable at this stage. To account for representative emissions, a 500mm deep C35/45 concrete foundation is assumed along with a 150mm thick Gen3 blinding concrete, for the respective areas of compounds (as provided within the PDE).
- The Converter Station Building details are unavailable at this stage. To account for representative emissions, a 1m deep C35/45 concrete foundation laid on 150mm thick Gen3 blinding concrete is assumed for the whole of converter station building area as provided within the PDE.
- For Onshore Grid Cables (HVAC), material details are assumed to be the same as Onshore HVDC cables owing to unavailability of details on actual cables at the time of the assessment.
- Onshore energy requirements remain consistent throughout the operational lifecycle of the project.
- The Onshore Scheme is expected to start construction phase works in Q4 2025 ending in Q4 2029. Further details are available in Volume 2, Chapter 5: Project Description.
- Commissioning of the Cambois Connection and hence of the Onshore Scheme is planned to commence in 2030;
- The Cambois Connection and hence the Onshore Scheme will be operational for 35 years;
- GHG emissions from shipping will decrease at a steady rate year-on-year until reaching net zero in 2050 due to the anticipated decarbonisation of shipping vessels in line with the UK government's net zero legislation (UK Chamber of Shipping, undated);
- It is assumed that the following repair events will take place during the lifetime of the Onshore Scheme:
    - All access tracks will require 1 full replacement ;
    - Full length replacement of one individual cable per group of cables;
    - Full length replacement of one fibre optic cable per group of cables.
- All decommissioning plant will have net zero emissions in accordance with assuming decarbonisation of the shipping sector during the operation and maintenance phase (refer to Section 4.5); and
- All decommissioned materials will be sent to landfill, as a worst-case assumption (refer to section 4.5).

5. ASSESSMENT

5.1. CONSTRUCTION

An assessment of the construction phase GHG emissions has been carried out based on the elements scoped into the assessment (refer to section 4.2) and the assumptions made (refer to section 4.7). The results in **Error! Reference source not found.** provide the predicted GHG emissions arising from construction phase of the Onshore Scheme.

The Onshore Scheme is estimated to generate 110,939 tCO_2e during the construction phase. The greatest quantity of GHG emissions is derived from the embodied carbon resulting from the production of the materials.

Table 5-1 – Onshore Scheme Construction Phase GHG Emissions

Component Category (PAS 2080 Lifecycle Stage)	Works Area (as per PDE)	Sub-Component Category (Asset)	GHG Emissions (tCO_2e)
Materials (A1-3)	Cable and Landfall	Cabling	1,668
		Joint Bays	123
		Transition Joint Bays	612
		Construction Compounds	14,402
		Access Tracks	848
		Earthworks (Imported Fill)	1,437
	Converter Station	Converter Station Foundation Slab	32,184
		Construction Compounds	6,228
		Access Tracks	202
		Earthworks (Imported Fill)	6,661
	Onshore Grid	Cabling	3,573
		Joint Bays	247
		Construction Compounds	13,355
		Access Tracks	908
		Earthworks (Imported Fill)	1,475
	Subtotal		**83,372**
Transportation (A4)	Cable and Landfall	Cabling - Ship	18
		Cabling - Road	5
		Joint Bays	9
		Transition Joint Bays	4
		Construction Compounds	1,122

Component Category (PAS 2080 Lifecycle Stage)	Works Area (as per PDE)	Sub-Component Category (Asset)	GHG Emissions (tCO_2e)
		Access Tracks	1,226
		Earthworks (Imported Fill)	91
	Converter Station	Converter Station Foundation Slab	2,333
		Construction Compounds	485
		Access Tracks	292
		Earthworks (Imported Fill)	2,997
	Onshore Grid	Cabling – Ship	39
		Cabling – Road	11
		Joint Bays	18
		Construction Compounds	1,040
		Access Tracks	1,313
		Earthworks (Imported Fill)	818
	Subtotal		**12,661**
Construction Activities		**Fuel consumption**	**14,906**
Total			**110,939**

5.2. OPERATION AND MAINTENANCE

An assessment of the operational and maintenance phase GHG emissions has been carried out based on the elements scoped into the assessment (refer to section 4.2) and the assumptions made (refer to section 4.7). These GHG emissions are shown in Table 5-2.

Operational energy will emit 72,600 tCO_2e over the lifetime of the Onshore Scheme. It is assumed that the energy generation sector will decarbonise at a steady rate in line with the UK Government's net zero target and will be net zero by 2050.

Additionally, emissions will be generated by the replacement of components of the Onshore Scheme over its 35-year operational lifespan. 1,643 tCO_2e will be emitted from the replacement of these components.

Table 5-2 – Operation and Maintenance Phase GHG Emissions

Component Category	Sub-component Category	Operating Lifetime GHG Emissions (tCO_2e)
Key component replacement	Replacement of Offshore Export Cables	**1,643**
Operational energy consumption	Electricity usage	**72,600**
Total		**74,243**

5.3. DECOMMISSIONING

An assessment of the decommissioning phase GHG emissions has been carried out based on the elements scoped into the assessment (refer to section 4.2) and the assumptions made (refer to section 4.7). These emissions are shown in Table 5-3. The Onshore Scheme is estimated to generate up to 908 tCO_2e during the decommissioning phase. All the emissions are generated during the disposal and processing of the materials to landfill. All decommissioning vehicles and plant are assumed to have net zero emissions in accordance with assuming decarbonisation of the respective sectors during the operation and maintenance phase (refer to Sections 4.5 and 4.7).

Table 5-3 – Decommissioning Phase GHG Emissions

Component Category	Sub-component Category	GHG Emissions (tCO_2e)
Decommissioning	Waste disposal and processing	908
Total		**908**

5.4. TOTAL EMISSIONS OF THE ONSHORE SCHEME

Overall, the total GHG emissions resulting from the construction, operation and maintenance, and decommissioning of the Onshore Scheme will be up to 186,090 tCO_2e and are shown in Table 5-4.

Table 5-4 – Onshore Scheme Lifecycle GHG Emissions

Lifecycle Stage	GHG Emissions (tCO_2e)
Construction	110,939
Operation and Maintenance	74,243
Decommissioning	908
Total	**186,090**

5.4.1. COMPARISON TO UK CARBON BUDGETS

The Applicant is committed to reducing GHG emissions wherever practicable and to supporting the UK Government in meeting their carbon reduction targets.

It is assumed that the construction phase takes place in stages from 2025 to 2029 and that the GHG emissions resulting from this phase are spread evenly over these stages. This period falls over the 4th (2023-2027) and 5th (2028-2032) carbon budgets of the UK Government.

The Onshore Scheme will operate during the 5th (2028-2032) and 6th (2033-2037) carbon budget periods. The operation and maintenance phase will extend until after the UK Government's 2050 net zero target date. The decommissioning phase will occur after the net zero target dates and emissions from this phase are therefore not included in the table below.

Table 5-5 shows the proportion of the relevant carbon budgets that the Onshore Scheme would contribute to the UK Government's 5-year budget periods.

Table 5-5 – Comparison of Onshore Scheme to UK Government Carbon Budgets (tCO_2e)

Project Stage	Relevant Carbon Budget (GHG Emissions in tCO_2e)			
	4th (2023-27)	5th (2028-32)	6th (2033-37)	2038-2050
UK Government Carbon Budget	**1,950,000,000**	**1,725,000,000**	**965,000,000**	**n/a**
Onshore Scheme construction GHG emissions	48,016	48,017	-	-

Project Stage	Relevant Carbon Budget (GHG Emissions in tCO_2e)			
	4th (2023-27)	5th (2028-32)	6th (2033-37)	2038-2050
Onshore Scheme Operation and Maintenance GHG emissions	-	24,514	23,571	24,514
Total GHG emissions	**48,016**	**72,531**	**23,571**	**24,514**
Percentage of UK Government carbon budget	0.002%	0.004%	0.002%	N/A

Note: This table does not include the GHG emissions resulting from the replacement of cable components as it is not known at this stage when any replacements might take place and hence into which of these carbon budgets (5th and 6th budget) they might fall, if in any.

Table source: Advice on reducing the UK's emissions - Climate Change Committee (theccc.org.uk)

5.5. ASSESSMENT OF SIGNIFICANCE

The GHG emissions from the construction phase of the Onshore Scheme do not contribute more than 0.003% to any of the UK carbon budgets that fall within this phase.

The GHG emissions from the operation and maintenance phase of the Onshore Scheme do not contribute more than 0.002% to any UK carbon budgets that fall within this phase.

The GHG emissions from the decommissioning phase of the Onshore Scheme do not contribute to any UK carbon budget as these emissions fall after the UK Government's net zero targets to be met by 2050.

Overall, the assessment has found that the Onshore Scheme will emit a total of 186,090 tCO_2e during its lifetime. These emissions do not contribute more than 0.004% to any of the individual UK carbon budgets that are currently set, which amounts to a very small proportion of the carbon budgets. Therefore, using professional judgement, it is considered that the total GHG emissions from the Onshore Scheme will at no point impact the UK Government's ability to meet its carbon budgets. The UK carbon budgets align with the GHG emissions reduction trajectory required to limit warming to 1.5°C, in line with IEMA guidance (2022) for determining significance, as noted in section 4.5. Therefore, the Project can be considered to have a **minor adverse, non-significant impact on the climate.** Furthermore, given the low quantity of emissions the Onshore Scheme is estimated to generate as a worst case during decommissioning after the net zero targets have been met, the Onshore Scheme is considered to have a **non-significant adverse impact** during the decommissioning phase.

5.6. CUMULATIVE EFFECTS

The effects of GHG emissions are essentially inherently cumulative; it is their concentration in the atmosphere, not the actual level of GHG emissions, that determines the warming effect (i.e., it is the 'stock' rather than the 'flow' which is important). In addition, it is the global excess of GHG emissions from human activities all over the world that contributes to the overall effect on climate, not only local GHG emissions. And it is the global atmosphere that is the receptor for these GHG emissions. For these reasons, the impact of the Project should be considered in the context of overall GHG emissions from the UK. As noted in the IEMA guidance (2022), the effects of GHG emissions from specific cumulative projects should not be individually assessed as there is no basis for selecting any particular project over any other.

The Onshore Scheme is one part of the Cambois Connection which also includes a Marine Scheme that allows for the connection from the BBWF to landfall (Volume 2, Chapter 5: Project Description). Both the Onshore Scheme and the Marine Scheme need to be constructed for the Cambois Connection to operate as intended.

The BBWF will produce the electricity that the Cambois Connection (Marine Scheme and Onshore Scheme) will export to the National Grid. The BBWF will be constructed between 2025 and 2032 which overlaps with the construction phase of the Cambois Connection. The Onshore Scheme would only be constructed and subsequently operated if BBWF is also constructed and operated. Since the Onshore Scheme is therefore connected to BBWF, a cumulative assessment of the GHG emissions associated with the BBWF together with

the Marine Scheme and the Onshore Scheme of the Cambois Connection is presented here in order to provide a precautionary, reasonable worst-case assessment of potential GHG emissions.

BBWF was estimated to emit a total of 7,678,553 tCO_2e during the lifetime of BBWF project (Cambois Connection Marine Scheme Volume 3, ES Appendix 5.1 Climate Assessment (GHG Emissions). This data is adapted from the BBWF ES (SSER, 2022b) and includes a reasonable worst-case scenario for the decommissioning of the BBWF, assuming all materials would be sent to landfill instead of being recycled.

The BBWF project lifecycle GHG emissions are shown in Table 5-6.

Table 5-6 – BBWF Lifecycle GHG Emissions

Lifecycle Stage	GHG Emissions (tCO_2e)
Construction	6,260,562
Operation & Maintenance	1,412,137
Decommissioning	5,854
Total	**7,678,553**

Table 5-7 compares the cumulative GHG emissions of the Marine Scheme, the Onshore Scheme and BBWF with the UK carbon budgets. As BBWF is due to be constructed between 2025 and 2033 (SSER, 2022d), the cumulative GHG emissions will occur during the 4th, 5th and 6th UK carbon budgets. The combined emissions of the Marine Scheme, the Onshore Scheme and BBWF will release 2,582,686 tCO_2e during the 4th carbon budget, 4,407,660 tCO_2e during the 5th carbon budget and 515,542 tCO_2e during the 6th carbon budget.

Table 5-7 – Comparison of Cumulative GHG Emissions to UK Government Carbon Budgets (tCO_2e)

Project	Relevant Carbon Budget			
	4th (2023-27)	5th (2028-32)	6th (2033-37)	2038-2050
UK Government Carbon Budget	**1,950,000,000**	**1,725,000,000**	**965,000,000**	**n/a**
Berwick Bank GHG emissions	2,441,752	4,185,669	490,929	554,349
Onshore Scheme GHG emissions	48,016	72,531	23,571	24,514
Marine Scheme GHG emissions	92,918	149,460	1,042	1,084
Total cumulative GHG emissions	**2,582,686**	**4,407660**	**515,542**	**579,947**
Percentage of UK carbon budget	0.13%	0.26%	0.05%	n/a

The cumulative GHG emissions from the Marine Scheme, the Onshore Scheme and BBWF do not contribute to more than 0.26% of any of the individual UK carbon budgets that fall within the construction and operation and maintenance phases, which amounts to a very small proportion of the UK carbon budgets. Therefore, it is considered that these cumulative GHG emissions will not impact the UK Government's ability to meet its carbon budgets. The UK carbon budgets align with the GHG emissions reduction trajectory required to limit warming to 1.5°C, in line with IEMA guidance (2022) for determining significance.

Therefore, using professional judgement and the small proportion of the carbon budget that the three projects contribute to, the GHG emissions resulting cumulatively from the Marine Scheme, Onshore Scheme and BBWF

are considered to have a **non-significant, minor adverse cumulative effect** on the climate during the construction phases of all three projects.

There are currently no carbon budgets set beyond 2038 when BBWF, the Marine Scheme and the Onshore Scheme will still be operating and when the decommissioning phase occurs. However, using professional judgement and given the low quantity of emissions these three projects are estimated to generate during their decommissioning phases after 2050, BBWF, the Marine Scheme and Onshore Scheme are considered to have **a non-significant, minor adverse cumulative effect on the climate during the decommissioning phase.**

The inclusion of BBWF's low-carbon energy generation capabilities changes the significance of the cumulative effect on climate during the operation and maintenance phase. The generation of low-carbon energy from BBWF will result in less energy being produced from high-carbon energy sources (i.e. fossil fuel sources). Therefore BBWF will save 10,815,010 tCO_2e[5] from being emitted into the atmosphere that otherwise would have been emitted from these conventional, higher-carbon forms of energy generation (CCC, 2013). Taking into account this saving results in an overall cumulative saving of **4,165,792 tCO_2e** from being emitted into the atmosphere during the lifecycle of the Marine Scheme, Onshore Scheme and BBWF. The saving would begin during the UK's 5th carbon budget and would continue for 35 years.

In line with the IEMA guidance (2022), the saving provided by BBWF will result in an **overall significant beneficial effect** on the climate from these cumulative effects, which would not be achievable without the Cambois Connection.

5.7. MITIGATION MEASURES

Mitigation against effects on climate is the reduction in GHG emissions released in association with the Onshore Scheme during the construction, operation and maintenance and decommissioning phases. Mitigation should follow the carbon reduction hierarchy in PAS 2080:2023: Avoid, Switch, Improve. Mitigation should be applied to the Onshore Scheme where practicable, however, these measures do not need to be implemented for the likely significant assessment outcomes in Section 5.6 to be met. Their implementation would result in further GHG emissions savings.

Mitigation measures set out in Table 5-8 require consideration to reduce GHG emissions resulting from construction activities.

Table 5-8 – Mitigation Measures during Construction

Life Cycle Module	Sub-component	Mitigation Measures
Materials	Onshore	Reduction of materials consumption should be carried out, where practicable, in line with any design changes. In addition, consideration should be given to alternative low carbon materials e.g., recycled aggregates, cement substitution etc. Low carbon alternatives should be investigated for the key bulk materials that make up the cable components, particularly aluminium, steel, and plastics. The design team should work with the supply chain to identify possible alternative materials that could replace these key components.
Transport	Materials	Transportation of materials should be reduced by reducing the quantity of materials required, where practicable. Additionally, where practicable, detailed design and procurement measures should be specified to reduce the necessity to source materials from long distances.
Construction Processes	Construction plant use	Construction plant GHG emissions should be avoided and reduced by designing for efficient construction processes as part of design development. During construction, plant GHG

[5] This number is higher than in the BBWF Climate Assessments Report (SSER, 2022c) due to the use of an updated, more appropriate load factor of 46.9% taken from the ESO (2022).

Life Cycle Module	Sub-component	Mitigation Measures
		emissions should be managed via a Construction Environmental Management Plan (CEMP), which should specify plant operator efficiency requirements.
	Construction water use	Construction water consumption should be reduced by designing for efficient construction processes as part of design development. During construction mains water consumption should be managed via a CEMP, which should specify reduction and reuse measures, where practicable.
	Construction waste transportation	Avoidance and reduction of waste generation and hence waste transport should be carried out in accordance with the mitigation measures outlined in a CEMP.
	Construction waste off-site processing	Avoidance and reduction of waste generation and hence off-site waste processing should be carried out in accordance with the mitigation measures outlined in a CEMP.
	Employee commuting	Local contractors should be used where practicable, reducing the distance driven by employees. Public transport or low carbon options should be encouraged.
	Construction vehicle movement	Reduce the volume of fuel consumed through efficient planning of vehicle movements, reducing the distance that construction vehicles travel during the construction phase.
	Construction vehicle fuel	Identify whether there are opportunities to use more fuel-efficient vehicles, alternative, lower-carbon fuels or electric-powered vehicles.

Mitigation measures set out in Table 5-9 should be considered during the operation and maintenance phase to reduce GHG emissions resulting from operation and maintenance activities of the Onshore Scheme. The proposed mitigation measures do not need to be implemented for the results and outcomes in Section 5.6 to be achieved but to improve the results further. Several of the mitigation measures are already being considered by the Applicant.

Table 5-9 – Mitigation Measures during Operation and Maintenance

Life Cycle Module	Mitigation Measures
Maintenance and repair	The mitigation measures detailed in Table 5-8 for the construction stage also apply to ongoing maintenance and repair. The design of the cable components should be carefully considered to minimise the need for replacement.
Operational vehicle movement	Reduce the volume of fuel consumed through efficient planning of vehicle movements, reducing the distance that operational vehicles travel during the operational phase.
Operational vehicle fuel	Identify whether there are opportunities to use more fuel-efficient vehicles, alternative, lower-carbon fuels or electric-powered vehicles.

Mitigation measure set out in Table 5-10 should be considered during the decommissioning phase, if decommissioning is required, to reduce GHG emissions resulting from decommissioning activities of the Onshore Scheme. The proposed mitigation measures do not need to be implemented for the results and outcomes in Section 5.6 to be achieved but to improve the results further. Several of the mitigation measures are already being considered by the Applicant.

Table 5-10 – Mitigation Measures during Decommissioning

Life Cycle Module	Mitigation Measures
Opportunities for recycling	Identify whether there are opportunities to increase the recyclability of the materials generated during decommissioning, where practicable.
Opportunities for waste reduction	Identify whether there are opportunities to decrease the amount of waste generated during decommissioning by increasing the re-use of the materials generated during decommissioning, where practicable.
Decommissioning vehicle movement	Reduce the volume of fuel consumed through efficient planning of vehicle movements, reducing the distance that decommissioning vehicles travel during the decommissioning phase.
Decommissioning vehicle fuel	Identify whether there are opportunities to use even more fuel-efficient vehicles, alternative, lower-carbon fuels or electric-powered vehicles.

6. SUMMARY

The construction of the Onshore Scheme will contribute 110,939 tCO_2e of GHG emissions during the construction phase. The operational phase of the Onshore Scheme will contribute 74,243 tCO2e of GHG emissions. The Onshore Scheme will generate 908 tCO_2e of GHG emissions during the decommissioning phase.

The GHG emissions from the lifetime emissions of the Onshore Scheme do not contribute more than 0.005% to any of the individual existing UK carbon budgets that fall within its lifetime. Therefore, the Onshore Scheme can be considered to have a **minor adverse, non-significant impact on the climate.**

A cumulative assessment was completed for the effects of the Onshore Scheme with the Marine Scheme (and hence for the Cambois Connection as a whole) and with the BBWF on which the implementation of the Cambois Connection and hence the Onshore Scheme are dependent. The cumulative assessment shows that the cumulative GHG emissions arising from the Onshore Scheme, the Marine Scheme and BBWF contribute to no more than 0.26% to any of the UK's current carbon budgets.

The decommissioning phases of the Onshore Scheme, the Marine Scheme and BBWF will occur after the UK net zero target is required to be met. As a reasonable worst case it has been assumed that there will be a small quantity of emissions generated during decommissioning, but that these are considered to have a non-significant minor adverse cumulative effect on the climate during the decommissioning phases.

It is considered that these cumulative GHG emissions at no point will impact the UK Government's ability to meet its carbon budgets. Therefore, the GHG emissions resulting from the cumulative assessment are considered to have a **non-significant, minor adverse cumulative effect** on the climate, which occurs during the overlapping construction phases of the Onshore Scheme, the Marine Scheme and BBWF**.**

The inclusion of BBWF's low-carbon energy generation capabilities in the operation and maintenance phase of the cumulative assessment changes the significance of the Onshore Scheme's effect on climate for operation. Cumulatively, there will be a **significant beneficial effect** on the climate during the operation and maintenance phase due to BBWF's energy production offsetting the need for more conventional, higher-carbon energy generation sources (i.e. fossil fuels). Cumulatively, there will be a saving of 4,165,792 tCO_2e from the generation of energy from BBWF. Cumulatively, there will be an **overall significant beneficial effect** on the climate during the Onshore Scheme's lifetime due to these cumulative effects, which would not be achievable without the Cambois Connection.

Without low-carbon energy generation, such as BBWF and the associated required electricity transmission to the National Grid, which the Onshore Scheme will support BBWF in delivering, the average grid GHG intensity will not decrease as is projected, which could adversely affect the UK's ability to meet its carbon reduction targets.

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