16. GREENHOUSE GAS ASSESSMENT

16.1 Introduction and Background

This chapter of the ES presents the Greenhouse Gas (GHG) assessment for the Proposed Development. It provides quantification of likely GHG emissions associated with operation of the Energy Recovery Facility.

16.1 Scope of Assessment

The UK is legally bound to provide for 15% of its energy needs, including 30% of its electricity, 12% of its heat, and 10% of its transport fuel, from renewable sources by 2020. By 2017, the UK was not yet halfway towards the requirement for 12% of heat being from renewable sources. On its current course, there is growing concern that the UK will fail to achieve its 2020 renewable energy targets (Ref 16.1).

The Clean Growth Strategy, published in 2017, focuses its attention on the benefits to the economy of clean growth. It comments "We want a diverse electricity system that supplies our homes and businesses with secure, affordable and clean power. That means developing low carbon sources of electricity that are both cheap and clean, taking into account wider system impacts for all sources of generation (Ref 16.2). In 2018, the Government published its 25 year Environment Plan. In this, it commits to taking "all possible action to mitigate climate change (Ref 16.3). Nevertheless, as observed by the Committee on Climate Change, little in the way of energy policy has been published by the current Government. The annual energy statements, last published in 2014, have also not been continued. Therefore, policy looks to the 2010-2015 period for its direction.

Energy Recovery Facilities have been recognised and defined as renewable energy for some considerable time. For example, in 2000, the DTI stated that "All sources of renewable energy are at different stages of development in Great Britain. Large scale hydro, (i.e. exceeding 10MW installed capacity) and energy from waste (energy recovery from municipal solid waste [MSW] and from mixed streams of industrial and commercial waste [ICW]) are already commercially viable, well established in the market, and can compete with electricity from fossil fuels. For this reason, the Government considers that these two renewable energy sources, large scale hydro and energy from waste, should be excluded from the Obligation. This will allow resources to be targeted more effectively on those renewables needing continued support (Ref 16.4).

The requirement to consider *"climate (for example greenhouse gas emissions, impacts relevant to adaptation)"* was introduced by Schedule 4 (paragraph 4) of the Town and Country planning (Environmental Impact Assessment) Regulations 2017 (Ref 16.5) (i.e. after the 2016 ES was submitted to NCC). Schedule 4 of these regulations states: "A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: …. climate (for example greenhouse gas emissions, impacts relevant to adaptation)" and "A description of the likely significant effects of the development on the environment resulting from, inter alia: ….(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;"

Climate is therefore a new topic considered as part of the EIA for the Proposed Development that was not included in the 2016 ES.

At the scoping stage, the vulnerability of the Proposed Development to climate change was identified as low, given that the Site is located in an area that is relatively stable climatically and where climate change effects are not expected to be extreme over the lifetime of the Proposed Development. The impact of the Proposed Development on surface water, flood risk and the potential impact of flooding on the development are considered as part of Chapter 12 (Water Quality and Hydrology) of the ES. As a result, the Climate Change Risk Assessment was scoped out of the EIA.

Due to its nature and scale, it was identified that the Proposed Development has potential to produce significant GHG emissions and that the EIA should include a GHG assessment.

16.2 Assessment Methodology

IEMA guidance, Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref 16.6) states that *"in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their occurrence by taking mitigating action"*. As a result we do not intend to assign a significance threshold to the Proposed Development.

We have calculated the carbon footprint of the Proposed Development, according to the GHG Protocol as set out in **Section 16.2.2**.

Operational scope 1 and scope 2 emissions have been considered and quantified. Wider indirect (scope 3) emissions are excluded from the scope of this project (i.e. traffic emissions). Also scope 3 emissions are not included within the international 'significance' threshold calculation. Emissions associated with the commissioning and decommissioning phases of the Proposed Development are outside the scope of this assessment.

The components (i.e. the facilities, activities and services) of the Proposed Development scoped into the impact assessment for GHGs are identified in **Table 16.1**. The area of potential impact for the GHG emissions will be worldwide.

Table 16.1 Project Components to be assessment

Project Phase	Project Component	Activities
Operation	Corby Energy Recovery Facility: ■ Combustion emissions from electricity generated on and off-site ■ Emissions from the auxiliary burners ■ Emissions from back up generation ■ Combustion emissions from the fire water pumps	Operation of Corby Energy Recovery Facility

16.2.1 Baseline GHG Emissions

The Proposed Development comprises the construction of a new Energy Recovery Facility. As a result there are no baseline data to review. The quantification of GHG emissions associated with the operational phase of the Proposed Development will be undertaken in line with the carbon footprint methodology outlined in **Section 16.2.2**.

A typical impact assessment is conducted by determining how the proposed activities will potentially affect the state of the environment described in the baseline. In the case of GHG emissions, this process is complicated by the fact that the potential impact of these emissions on the environment cannot be quantified within a defined space and time. The receptor for GHG emissions is therefore the worldwide climate, and the natural and societal systems and infrastructure which the climate will influence. Therefore, the methodology for this topic differs from other impact assessment chapters as sensitivity is not used.

16.2.2 Carbon Footprint Methodology

A carbon footprint is a measure of the estimated GHG emissions produced directly and indirectly by an individual, organisation, facility or product. The calculation of a carbon footprint generally involves the following equation:

Carbon Footprint Emissions = Activity Data x Emissions Factor x Global Warming Potential

- Activity data relate to the emission-causing activity, e.g. the combustion of a quantity of diesel or the use of a quantity of refrigerant gases.
- Emission Factors (EF) convert the activity data collected and consolidated into tonnes of the relevant GHG.
- Global Warming Potentials (GWP) are applied to non-CO2 GHGs to convert the result to carbon dioxide equivalent (tCO_2e).

The Proposed Development's carbon footprint will be estimated in accordance with the GHG Protocol: Corporate Accounting & Reporting Standard developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI), hereinafter referred to as the GHG Protocol (Ref 16.7). The GHG Protocol provides comprehensive guidance on accounting and reporting corporate GHG emissions for a range of sectors/emission sources. It provides the most widely used set of standards and tools for mandatory and voluntary GHG programmes and makes use of the Intergovernmental Panel on Climate Change (IPCC) GHG Inventory guidelines. In addition to the GHG Protocol, ERM has also aligned with the guidance and methodology set out within the Protocol for the quantification of greenhouse gas emissions from waste management activities (Ref 16.8). This Protocol was built on the Greenhouse Gas Protocol and is also compatible with the ISO standards related to GHG emissions inventory. The Protocol for the quantification of greenhouse gas emissions from waste management activities provides a credible approach to quantify, report and verify greenhouse gases (GHG) direct and indirect emissions of waste management actors. The purpose of this Waste Sector Protocol is to establish best practice across the waste sector for the implementation of a coherent and homogeneous annual GHG emissions reporting.

ERM has referred to these documents as well as site specific design data.

The approach taken for this assessment of the Proposed Development is therefore aligned with the protocol for the quantification of greenhouse gas emissions from waste management activities and the GHG Protocol.

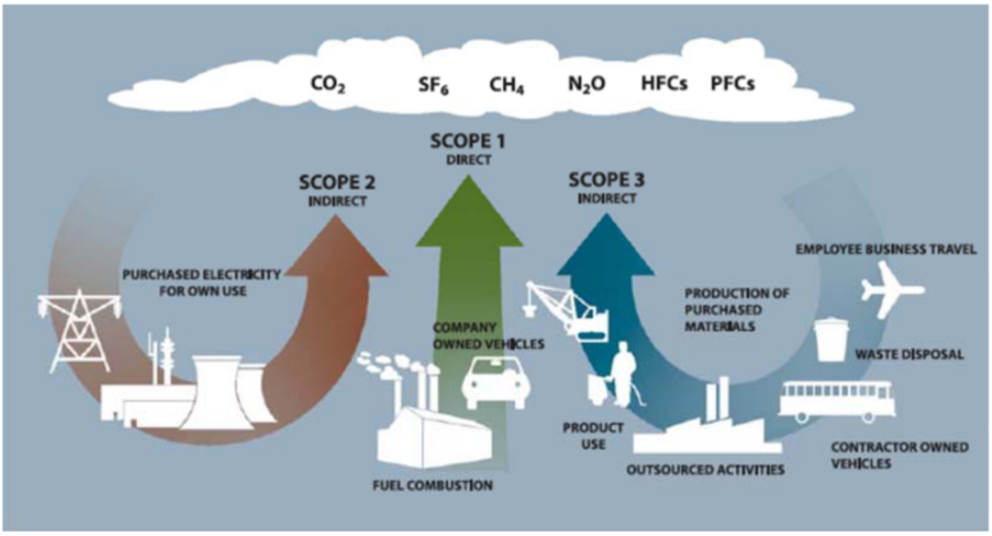
16.2.2.1 Scope of Carbon Footprint

The scope of the carbon footprint depends on the definition of boundaries relating to the operational aspects of the Proposed Development. Operating boundaries determine which emission-causing activities will be included in the carbon footprint. The GHG Protocol divides emissions into three categories as described below and illustrated in **Figure 16.1**.

- Scope 1 – direct emissions from sources owned or under the operational control of the company;
- Scope 2 – indirect emissions from the consumption of purchased electricity; and
- Scope 3 – indirect emissions: an optional reporting category allowing for other indirect emissions associated with but not controlled by the company, such as contractor activities and employee business travel.

This GHG assessment focusses on scope 1 and scope 2 emissions. Scope 3 emissions are beyond the scope of this assessment.

Figure 16.1 The Categorisation of GHG Emissions under the GHG Protocol



Source: Ref 16.7

During the operational phase, the carbon footprint includes scope 1 and 2 emissions. Scope 2 emissions will be from on-site generation, exported to the grid, with an assumed proportion parasitic load.

16.2.2.2 *Sources of Activity Data, EFs and GWPs*

The activity data used for the GHG emissions assessment have been based on data received from Cobalt Energy, working on behalf of the Applicant. **Table 16.2** summarises the main identified sources of Emissions Factors for each potential emission source.

Table 16.2 Emission Factor Sources

Emission Source	Emissions Factor
Grid emission factor	UK Generated Electricity (average fuel mix) EF = 0.28 Kg CO2e/kWh UK Government GHG conversion factors for company reporting 2018 (version 1.01) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018
Waste composition	44.323033kg CO2 per 100kg municipal waste (excluding biogenic carbon) http://randd.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=18237 Updated compositional estimates for local authority collected waste and recycling in England 2010/2011 (EV0801)
LPG emission factor	2937.32 Kg CO2e/tonne UK Government GHG conversion factors for company reporting 2018 (version 1.01) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018
Diesel (100% mineral diesel) emission factor	2.68779kg CO2e/litre UK Government GHG conversion factors for company reporting 2018 (version 1.01) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

16.3 Planning Policy and Guidance

16.3.1 National Planning Policy

The principles of the NPPF (2018) (Ref 16.9) relevant to climate change are provided in Section 14 'Meeting the challenge of climate change, flooding and coastal change' and states '*the planning system should support the transitions to a low carbon future in a changing climate… It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure'.*

The National Policy Statement for Energy (NPS EN-1) (Ref 16.10) recognises that there is an urgent need for new large scale renewable energy projects to come forward to ensure that the 2020 target is met, together with wider decarbonisation ambitions.

Biomass electricity has the advantage that it is both predictable and controllable and so can be used for baseload or peak load generation, a point recognised in NPS EN-1 and a contribution that is increasingly important in ensuring the security of UK supplies. Energy recovery facilities has the added advantages that it extracts value from biomass at the end of its useful life and reduces the amount of waste otherwise sent to landfill and thus reduces methane emissions. Unlike any other fuel, wastes have already provided various societal benefits before becoming a source of energy.

NPS EN-1 is clear on the role of energy recovery facilities in future large-scale renewable energy generation, whilst the Government's Review of Waste Policy in England 2011 indicated an expected trebling of the contribution from energy recovery facility waste derived renewable electricity from thermal combustion, stating that "Our horizon scanning work up to 2020, and beyond to 2030 and 2050 indicates that even with the expected improvements in prevention, re-use and recycling, sufficient residual waste feedstock will be available through diversion from landfill to support significant growth in this area, without conflicting with the drive to move waste further up the hierarchy (Ref 16.11).

The National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (Ref 16.12) demonstrates the role of energy recovery facility in meeting the urgent need for energy infrastructure. "The recovery of energy from the combustion of waste, where in accordance with the waste hierarchy, will play an increasingly important role in meeting the UK's energy needs. Where the waste burned is deemed renewable, this can also contribute to meeting the UK's renewable energy targets. Further, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales."

16.3.2 Local Planning Policy

16.3.2.1 *North Northamptonshire Minerals & Waste Local Plan (2017)*

Policy 26 of the Minerals and Waste Local Plan (Ref 16.13) requires that new development seeks to support the move to a low carbon economy by way of reduced greenhouse gas production, through design and layout that incorporates energy and water efficiency, and where appropriate flood mitigation or attenuation.

16.3.2.2 *Part 1 Local Plan: North Northamptonshire Joint Core Strategy (2016)*

The Local Plan Part 1's (Ref 16.14) vision sets out how the development plan aims to deliver sustainable growth in a way that benefits existing and new communities and tackle environmental concerns, particularly around climate change. A number of the Local Plan policies are directed at creating sustainable places that are naturally resilient to future climate change and minimising carbon footprints.

16.4 Carbon Footprint Calculations

The GHG footprint, detailed below, has been based on information provided by the Applicant, in addition to which any assumptions made have been documented within the GHG assessment report and accompanying spreadsheets.

16.4.1 Scope 1 Emissions Assumptions

Given that actual waste composition data was not available at the time of the assessment, GHG emissions were calculated based on the latest average kerbside waste composition figures for England, as set out within the 'Updated compositional estimates for local authority collected waste and recycling in England, 2010/11' (EV0801) . The waste combustion emissions calculated reflect CO_2 only rather than a CO_2 equivalent (CO_2e) figure.

The national waste composition data includes both biogenic and non-biogenic (fossil) carbon wastes. It is recognised that biogenic carbon was taken up relatively recently as the biomass grew, and an equilibrium is reached between carbon taken up and carbon released to atmosphere. Non biogenic carbon feeds the long term carbon cycle and is therefore considered as a net carbon addition. The Intergovernmental Panel on Climate Change guidelines on greenhouse gas assessment and reporting stipulate that biogenic emissions of carbon should not be included in the assessment of emissions from waste. For the purposes of this assessment, the biogenic waste is considered to have a carbon emissions factor of zero (i.e. it has been excluded from the GHG calculations).

In calculating the CO_2 associated with annual waste combustion at the facility and in the absence of more detailed efficiency data, 100% combustion conversion efficiency and combustion rates have been assumed. Emissions associated with the LPG auxiliary burners, used for incinerator start up and for boosting temperatures as required, were included within the scope 1 boundary. Diesel consumed by the firewater pumps and back-up generator and will be minimal and have therefore been excluded from the scope 1 emissions calculation for the following reasons.

- The firewater pump would only be used in the event of a fire and in the first instance the electric pump would be used, making use of the diesel pump highly unlikely and diesel consumption unlikely.
- Start-up of the backup generator would be tested monthly, using minimal diesel over the course of a year. It is understood that the generators would only be used where the plant lost connection to the grid and that back up generation would cover only essential equipment, enabling the plant to be shut down safely.

16.4.2 Scope 2 Emissions Assumptions

It is understood that the Proposed Development will have an output capacity of 23MWe, equating to an annual electricity output of 184,000MWh, based on an annual operation of 8,000 hours (760 hours per year shut down).

The parasitic load for the plant will be around 10%, with the remaining energy exported to the national grid. On the basis of 10%, the annual parasitic load for the Proposed Development is 18,400MWh, which equates to 5,208 tonnes CO_2e. This parasitic load will meet the plants energy demand, including powering of the automated system designed to move waste from delivery through the plant to waste storage and collection (e.g. forklifts, grab cranes, overhead conveyor lines).

16.4.3 Electricity Export Assumptions

The Protocol for the quantification of greenhouse gas emissions from waste management requires that "*avoided emissions are not included in or deducted from direct and indirect emissions and should be reported separately*".

The Proposed Development is expected to export 165,600MWh of electricity to the National Grid each year, equating to 46,876 tonnes CO_2e. This exported electricity is classified as an "Avoided Emission", which would otherwise have occurred in the production of energy by the grid-connected power sources.

16.4.4 Avoided Emissions

In addition to exports of electricity to the grid as a beneficial product of waste management, an Energy Recovery Facility has other sources of avoided emissions. This assessment has not attempted to quantify these, however we have considered the wider GHG benefits of an Energy Recovery Facility.

The UK still landfills hundreds of thousands of tonnes of waste annually. Although the commercial contracts for the Proposed Development and therefore the exact source of waste are not confirmed, it is reasonable to assume that the Proposed Development will contribute to the national capacity of Energy Recovery Facilities and reduce the need for landfill.

By avoiding sending waste to landfill the releases of potent GHG, methane, are significantly reduced. Even where landfills have gas capture and power generation schemes there is still a significant quantity of methane emitted. By diverting waste away from landfill this emission is avoided.

The recovery of ferrous metals from bottom ash is another source of avoided emissions, the metals thus recovered will be sent for recycling and turned into primary metal for the market. This avoids the energy (and thus carbon) required to mine and process ore to generate virgin metal.

The recovery of bottom ash is another source of avoided emissions. The bottom ash can be reprocessed as aggregate, thus avoiding the energy (and carbon) required to extract and process virgin aggregate.

In general, studies have shown that there is a net carbon benefit to energy recovery facility where there is also diversion of waste away from landfill. By a net carbon benefit, it is meant that the total carbon emissions as a result of that waste being managed are reduced as a result of the waste going to energy recovery facility. The scale of the carbon benefit (reduction in emissions) depends on the calorific value of the waste, whether the landfill that was avoided had the capability of generating power from landfill gas and whether metals are captured from the bottom ash, amongst other considerations.

If the waste had been diverted from another European energy recovery facility plant, any scope 1 GHG benefits would be marginal (and dependent on plant efficiencies), however efficiencies in GHG emissions associated with transportation (scope 3) are likely to be made, where waste is diverted for recovery in the UK.

16.5 GHG Emission Results

The operational carbon footprint for the Proposed Development is estimated to amount to 123,012 t CO_2e per year. As set out above, this figure includes scope 1 emissions from waste combustion, auxiliary burners, and scope 2 electricity consumption. Electricity export data have been reported separately.

Table 16.3 breaks down the annual operational emissions for each source based on the current description of the Proposed Development (Chapter 4).

Table 16.3 Estimated Annual Operational GHG Emissions for Corby Energy Recovery Facility

Emissions Category	Scope	Annual Operational Phase GHG Emissions (tCO_2e)	% of total scope 1 & 2
Emissions from waste combustion (excluding biogenic waste)	1	116,126	94.4

Emissions Category	Scope	Annual Operational Phase GHG Emissions (tCO_2e)	% of total scope 1 & 2
Auxiliary burners	1	1,677	1.4
Electricity consumption	2	5,208	4.2
Total annual scope 1 and 2 emissions operational emissions		**123,012**	**100**
Electricity exported to the national grid (165,600MWh)	N/A	46,876	

This assessment has not considered the wider GHG benefits of diverting waste from landfill to the Energy Recovery Facility and therefore avoiding releases of potent GHG, methane. However we are able to make the following high-level assumptions.

- If the waste feedstock had gone to landfill rather than energy recovery facility it is likely that there would have been additional GHG emissions as a result. In this situation it is assumed that the GHG savings associated with energy recovery facility diverting waste from landfill would be considerable.
- If the waste had been diverted from another European energy recovery facility plant, any scope 1 GHG benefits would be marginal (and dependent on plant efficiencies), however efficiencies in GHG emissions associated with transportation (scope 3) are likely to be made, where waste is diverted for recovery in the UK.

In order to fully appreciate the GHG benefits associated with diverting waste from landfill or improving waste transportation efficiencies, a full assessment including scope 3 emissions could be undertaken.

In summary, the Proposed Development, in common with all forms of combustion related power generation, will generate carbon emissions. As the fuel is waste however, and as there is still a considerable supply of waste currently going to landfill or overseas for recovery, the expectation is that these carbon emissions will be more than counterbalanced by avoided emissions from landfill, avoided emissions from alternative sources of power, avoided emissions from metals production, avoided emissions from aggregate production and also potentially from international transport. The overall position therefore is one of provision of a renewable, stable and diverse supply of power, with net carbon emissions expected to be comparable if not better than the grid average, that has the additional benefit of preventing waste going to landfill."

16.6 References

Ref 16.1 Energy and Climate Change Committee. (2020) renewable heat and transport targets. Summary. Posted on www.parliament.uk. Appendix A

Ref 16.2 Clean Growth Strategy: Leading the way to a low carbon future (2017) HM Government

Ref 16.3 A Green Future: Our 25 Year Plan to Improve the Environment (2017) HM Government

Ref 16.4 Section 2.4 of the Renewables Obligation Preliminary Consultation. DTI, 2000.

Ref 16.5 Ministry of Housing, Communities & Local Government (2017) The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Ref 16.7 WRI/WBCSD GHG Protocol (2015) http://www.ghgprotocol.org/corporate-standard

Ref 16.8 UK Government GHG conversion factors for company reporting 2018 (version 1.01)

Ref 16.9 Ministry of Housing, Communities and Local Government (2018) National Planning Policy Framework

Ref 16.10 National Planning Policy Statement for Energy (NPS EN-1) (2011) DECC

Ref 16.11 Government Review of Waste Policy in England (2011) Defra

Ref 16.12 National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) DECC, (2011)

Ref 16.13 Northamptonshire County Council (2017) Northamptonshire Minerals and Waste Local Plan

Ref 16.14 North Northamptonshire Joint Planning Unit (2016) North Northamptonshire Joint Core Strategy 2011 – 2031