Report

2025 Annual Carbon and Sustainability Report

For Seras Energy Ltd

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Executive Summary

Seras Energy Ltd provide sustainable biomass fuel products, primarily for use in power stations generating energy. The primary biomass streams that feed the Seras Energy Ltd business are waste wood and forestry by-products such as sawmill offcuts, branch and bark materials, wood from tree surgery, and wood from forest management. The greenhouse gas (GHG) lifecycle of Seras Energy Ltd biomass products for the 2025 calendar year is illustrated in Figure 1-1 below.

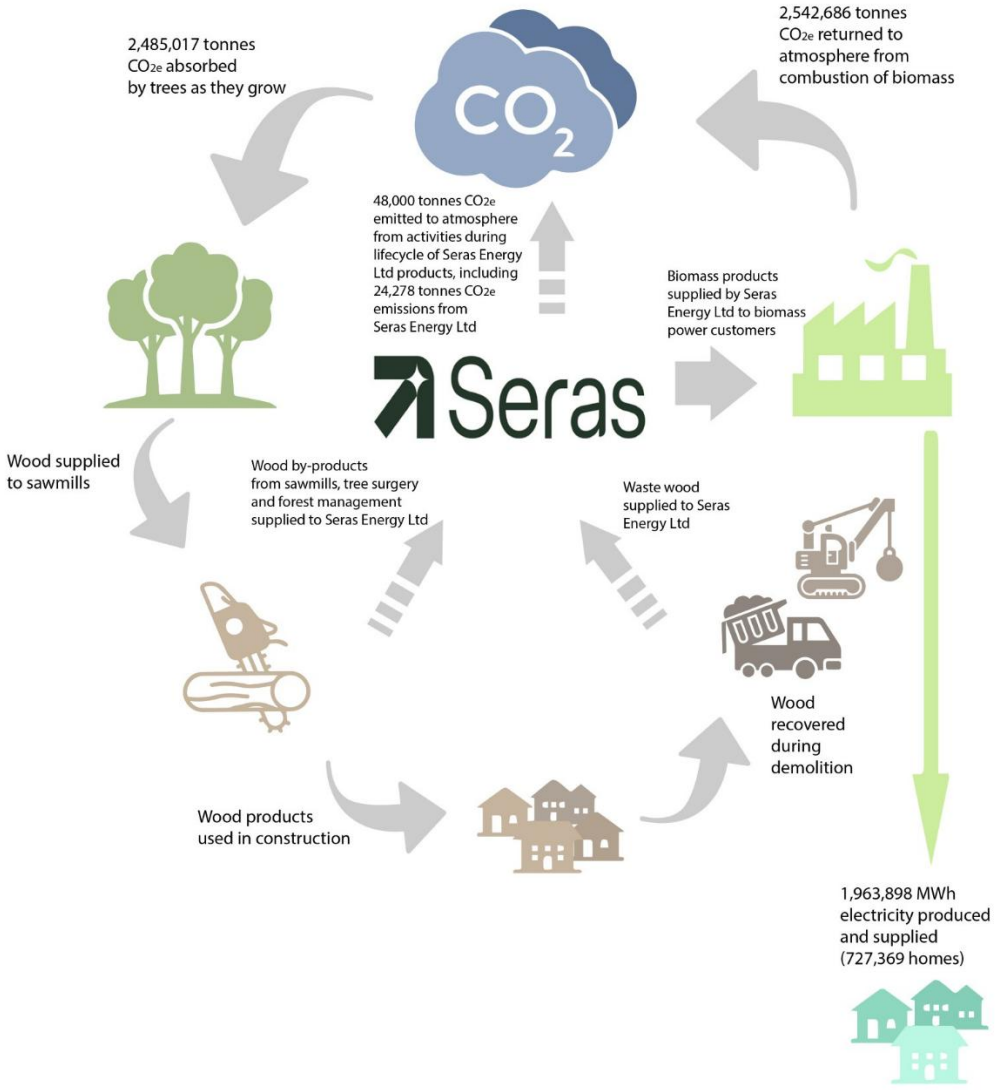

Figure 1-1: Greenhouse Gas Lifecycle of Seras Energy Ltd Biomass Products

Avoiding GHG Emissions

By treating over 1 million tonnes of waste wood that would otherwise be sent to landfill, Seras Energy Ltd and its supply chain partners and customers, enable the avoidance of over 582,000 tonnes of GHG emissions per year from landfilling waste wood.

By supplying a combined total of greater than 1.5 million tonnes of waste wood and forestry by-products for energy generation, Seras Energy Ltd enables its supply chain partners and customers to save over 750,000 tonnes of GHG emissions per year by avoiding gas-fired electricity generation.

In total the GHG savings from avoiding landfilling of waste wood and gas-fired electricity generation total around 1.3 $MTCO_2e$ in 2025.

Seras Energy Ltd Direct Emissions

Seras Energy Ltd operations result in GHG emissions, primarily related to the Company's fleet of haulage vehicles, as well as diesel-fired machinery at Seras Energy Ltd nationwide processing sites.

Seras Energy Ltd company GHG emissions total around 24,278 tonnes per annum, around 85% of which are related to diesel fuel consumption in Seras Energy Ltd haulage vehicles and machinery and third-party haulage vehicles.

Seras Energy Ltd plan to tackle these emissions in the future through the use of biofuels in site machinery, future electrification of site plant and the introduction of zero emission haulage vehicles in the next decade.

Decarbonising Seras Energy Ltd Customers Energy Generation

By supplying renewable biomass products to supply chain customers and partners, Seras Energy Ltd enables the production of low carbon energy for use by homes and businesses.

GHG emissions from the use of biomass products by Seras Energy Ltd customers equates to around 2.5 $MTCO_2e$ per year, the vast majority of which (2.49 $MTCO_2e$) is balanced by CO_2 absorbed by the biomass during its growth cycle, ensuring the energy generated has low carbon intensity over its lifecycle.

The residual carbon intensity of electricity exported by Seras Energy Ltd customers is around 54 gCO_2e/kWh, which is roughly seven times lower than natural gas power generation.

In 2025, Seras Energy Ltd supplied over 1 million tonnes of waste wood to biomass power customers, that would have otherwise been sent to landfill and saved over 582,781 tonnes of additional GHG emissions to atmosphere from landfill methane gas.

Seras Energy Ltd customers in 2025 used the total of 1,540,300 tonnes of biomass supplied by Seras Energy Ltd to generate an estimated 1,963,898 MWh of electricity, which is sufficient to power more than 727,369 homes. If this electricity were to be generated using natural gas power stations, the resulting fossil GHG emissions would be approximately 750,209 tonnes.

The power plants also export heat to consumers which replaces heat and offsets emissions generated by fossil fuel heat sources such as natural gas. Seras Energy Ltd themselves use some waste heat from a biomass customer for material drying at the Widnes site, saving approximately 14,707 tonnes of CO_2 per year, equivalent to 61% of Seras Energy Ltd's own GHG footprint.

Supporting Small Businesses

In addition to providing substantial volumes of wood products to customers operating large-scale biomass power plants, Seras Energy Ltd also provide products to a wide range of small businesses including small-scale biomass Combined Heat and Power (CHP) operators, fruit and vegetable growers, poultry farms and plant nurseries where they generate low carbon energy to reduce their own carbon footprints.

Net Zero Plan

Seras Energy Ltd has developed a plan to reduce the Company's Scope 1 and 2 emissions (circa. 12,024 tonnes in the calendar year 2025) to net zero by 2040. Measures are being introduced to tackle emissions primarily from diesel fuel use, including electric vehicle and plant upgrades and use of biofuels, and electricity including energy efficiency improvements at Seras Energy Ltd sites and transition to renewable energy.

Future Outlook

In the future, it is anticipated that Seras Energy Ltd customers will be able to upgrade their power plants to include carbon capture and storage (CCS), potentially creating carbon negative power stations and significantly contributing to the UK's efforts of achieving net zero carbon by 2050.

GHG Footprint 2025

Seras Energy Ltd's GHG footprint showing the annual Scope 1, 2 and 3 emissions (TCO_2e) for year 2025 is summarised in Table 1-1 below.

Table 1-1: Seras Energy Ltd GHG Footprint (2025)

GHG Emissions Scope	Activity	Annual GHG Emissions (TCO_2e)
Scope 1	Diesel fuel used in Seras Energy Ltd haulage fleet	8,636
	Diesel fuel used in Seras Energy Ltd site plant and machinery	2,962
	Domestic heating oil used at Seras Energy Ltd sites	14
	Seras Energy Ltd company cars	54
Scope 2	Electricity consumption	357
Scope 3	Employee commuting	50
	Seras Energy Ltd business travel (land, sea, air and hotel stays)	12
	Upstream fuel- and energy-related activities (Well-to-Tank (WTT) Emissions and Transmission and Distribution (T&D))	2,815
	Water supply and treatment	24
	Goods consumed by Seras Energy Ltd (e.g. tyres, batteries)	353
	Treatment and disposal of waste generated by Seras Energy Ltd	21
	Third party haulage of Seras Energy Ltd biomass fuels	8979
TOTAL ANNUAL GHG EMISSIONS (TCO_2e)		**24,278** [a]

[a] Based on unrounded values.

The wider Scope 3 emissions associated to Seras Energy Ltd's activity for 2025 are shown in Table 1-2.

Table 1-2: Seras Energy Ltd Wider Scope 3 GHG Emissions (2025)

Scope 3 GHG Emissions Activity	Annual GHG Emissions (TCO_2e)
Combustion of wood chip in biomass power plants	2,542,686
Sequestration of atmospheric CO_2 by trees	-2,485,017
Emissions from tree felling/forest management, transport and processing of wood by-products	19,213
Emissions from waste wood transport, sorting and separation, and processing	4,954
Seras Energy Ltd Emissions (from Table 1-1)	**24,278**
Total GHG Emissions (TCO_2e)	**106,113**
Total Biomass Throughput (T/annum)	**1,540,300**
Total Emissions per Tonne of Biomass ($kgCO_2e/T$)	**69**

Seras Energy Ltd's GHG footprint showing the annual Scope 1, 2 and 3 emissions (TCO_2e) from 2023 – 2025 is summarised in Table 1-3: Seras Energy Historic Scope 1-3 GHG Emissions (2023-2025)below.

Table 1-3: Seras Energy Historic Scope 1-3 GHG Emissions (2023-2025)

GHG Emissions Scope	Activity	Annual GHG Emissions (TCO_2e)		
		2023	2024	2025
Scope 1	Diesel fuel used in Seras Energy Ltd haulage fleet	10,149	8,709	8,636
	Diesel fuel used in Seras Energy Ltd site plant and machinery	3,027	2,799	2,962
	Domestic heating oil used at Seras Energy Ltd sites	9	14	14
	Seras Energy Ltd company cars	42	48	54
Scope 2	Electricity consumption	1,138	660	357
Scope 3	Employee commuting	21	10	50
	Seras Energy Ltd business travel (land, sea, air and hotel stays)		13	12
	Upstream fuel- and energy-related activities (Well-to-Tank (WTT) Emissions and Transmission and Distribution (T&D))	3,305	2,860	2,815
	Water supply and treatment	7	12	24
	Goods consumed by Seras Energy Ltd (e.g. tyres, batteries)	120	104	353

GHG Emissions Scope	Activity	Annual GHG Emissions (TCO_2e)		
		2023	2024	2025
	Treatment and disposal of waste generated by Seras Energy Ltd	122	58	21
	Third party haulage of Seras Energy Ltd biomass fuels	11,853	10,045	8979
TOTAL ANNUAL GHG EMISSIONS (TCO_2e)		**29,793**	**25,330**	**24,278**

Table 1-4: Seras Energy Ltd Historic Wider Scope 3 GHG Emissions (2024-2025)

Scope 3 GHG Emissions Activity	Annual GHG Emissions (TCO_2e)	
	2024	2025
Combustion of wood chip in biomass power plants	2,832,892	2,542,686
Sequestration of atmospheric CO_2 by trees	- 2,768,641	-2,485,017
Emissions from tree felling/forest management, transport and processing of wood by-products	22,979	19,213
Emissions from waste wood transport, sorting and separation, and processing	7,297	4,954
Seras Energy Ltd Emissions (from Table 1-1)	**22,571**	**24,278**
Total GHG Emissions (TCO_2e)	**117,098**	**106,113**
Total Biomass Throughput (T/annum)	**1,716,100**	**1,540,300**
Total Emissions per Tonne of Biomass ($kgCO_2e/T$)	**68**	**69**

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Figures

1 Introduction

Setting of Report

1.1 Seras Energy Ltd, formerly known as Esken Renewables, is the UK's leading supplier of commercial biomass, used for generating energy in a number of UK biomass plants. A combination of waste wood and forestry by-products biomass are supplied, both of which benefit from being considered renewable energy resources.

1.2 Seras Energy Ltd has commissioned Logika annually since 2022 to undertake an analysis to understand the carbon emissions and wider environmental credentials of Seras Energy Ltd's operations, and identify how the process of biomass fuel production and use compares in carbon and general environmental terms to other forms of energy generation. The 2022 report examined the business for the financial year 2021/2022 (FY22), whereas the 2023 report examined the business for the 2023 calendar year[1]. Since 2023, Seras Energy Ltd has reported emission using annual calendar year.

1.3 This report examines the business for the 2025 calendar year.

Carbon and Climate Change

1.4 Climate change (sometimes also referred to as Global Warming) describes the change in the global climate caused by the release of greenhouse gasses (GHGs[2]) which act to trap heat within the earth's atmosphere. Climate change includes changes (both globally and regionally) of temperature, rainfall, frequency of storms, and sea level.

1.5 GHGs include emissions that occur naturally, for example due to release of methane from peat bogs as well as from human activity, for example due to the combustion of fossil fuels. The primary GHG is Carbon Dioxide (CO_2) which accounts for over 90% of all GHG emissions.

1.6 Key sources of human induced GHG emissions include:

- the combustion of hydrocarbon-based fuels (e.g. petrol, diesel, kerosene) in motorised transport;
- the combustion of coal, gas, and oil for the generation of electricity;
- the combustion of gas and oil for heating; and
- from industrial processes (for example the production of cement, steel and glass).

1.7 To simplify the measurement of GHG, it has become normal practice to present them in a common unit called Carbon Dioxide Equivalent (CO_2e). This takes into account that some GHGs result in greater warming than others.

1.8 For example, 1 kg of methane (which is a GHG) has the same effect on climate as 28-34 kg of CO_2. To convert methane to CO_2e it is therefore multiplied by a factor between 28 and 34. CO_2 on the other hand is multiplied by 1.

[1] Seras Energy Ltd changed their reporting period from financial year to calendar year for 2023 onwards.
[2] GHGs are atmospheric emissions defined as having an effect on global climate and include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

1.9 Climate change is a global issue and is therefore the subject of an international response. To meet this challenge, members of the United Nations signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, whose objective is to stabilise global climate change.

1.10 Members of the UNFCCC meet regularly to agree and ratify international treaties to meet this objective, the most recent and significant of which has been the Paris Agreement signed in 2016. This seeks to limit global climate change to less than a 2 degrees Celsius increase by the end of this century, with an ambition for this to be no more than 1.5 degrees Celsius.

1.11 To keep global temperature rise below 2 degrees Celsius, scientists have calculated that net global emissions[3] of GHG need to fall to zero by the 2080s, and to meet a 1.5-degree Celsius objective they need to be net zero by 2050. It is the responsibility of individual country states to set national policy that contribute to these global goals, reflecting each country's historic responsibilities and level of economic development. In other words, developed countries like the UK are expected to cut their GHG emissions faster and deeper than developing countries. Through the Climate Change Act, the UK has therefore set a legally binding target to reduce its GHG emissions to net zero by 2050.

1.12 The UK Government recognises a key role for biomass in the transition to net zero by 2050 and sets out the need to switch from fossil fuel energy production to low carbon energy production (including biomass) in its Industrial Decarbonisation Strategy[4] and Biomass Strategy[5].

1.13 Through the application of CCS, it is also possible that in the future, biomass power plants can become net carbon negative (i.e. permanently remove CO_2 from the atmosphere) which would cement the role of biomass in long-term energy generation.

[3] Net emissions reflect that there are both sources of emissions, for example combustion of fuels that add emissions to the atmosphere and carbon sinks, for example trees, that reduce GHG emissions in the atmosphere. The balance between the two are net emissions.
[4] DESNZ and BEIS (2021) Industrial Decarbonisation Strategy. Available: https://assets.publishing.service.gov.uk/media/6051cd04e90e07527f645f1e/Industrial_Decarbonisation_Strategy_March_2021.pdf
[5] DESNZ (2023) Biomass Strategy. Available: https://assets.publishing.service.gov.uk/media/64dc8d3960d123000d32c602/biomass-strategy-2023.pdf

2 GHG Footprint

Background

2.1 As a biomass fuel supplier, Seras Energy Ltd facilitates the production of green energy (electricity and heat) in its customers' power plants using sustainable biomass fuels.

2.2 Seras Energy Ltd has two main UK supply chains for biomass fuels:

- **Waste wood**: wood products that have reached the end of their useful lifetime and have become a waste material, such as wood recovered from building deconstruction, wood from landscaping and gardening projects, and wood from domestic recycling centres; and
- **Wood by-products**: these are by-products from the wood products industry, such as bark and branch material and offcuts from sawmills producing commercial wood products, wood from tree surgery, wood from highway and railway clearance and maintenance, and forestry management.

2.3 Each of these wood sources can be considered to be part of a sustainable carbon lifecycle, which is explained in the sections below.

Waste Wood

2.4 Seras Energy Ltd receives waste wood from suppliers in the UK for conversion into wood chips for use in customers' biomass power plants.

2.5 When wood products used in construction come to the end of their useful life, they become a waste product. In most cases, due to the quality of these waste products, it is not possible to prolong the life of all waste wood by reuse or recycling (e.g. recycled panel boards or landscape surfaces) and it is necessary to treat or dispose of this wood. Biomass energy is the best solution for this wood to recover energy, as the most likely alternative would be disposal in landfill which has no substantive secondary benefits.

2.6 Disposal of waste wood in landfill would also lead to emissions of methane during decomposition of the wood, which is a very potent GHG responsible for considerable global warming. Further discussion on methane emissions is provided in Section 3.

2.7 The carbon cycle associated with the waste wood supply chain is related to the fact that CO_2 emissions from the combustion of the waste wood are broadly equal to the CO_2 that was absorbed from the atmosphere by the trees during their growth cycle. Wood products serve a primary lifetime as building materials, furniture etc. before they become a waste product and are subsequently utilised for energy production. The production of energy from waste wood therefore provides a secondary benefit at the end of the primary lifetime of the wood.

Wood By-Products

2.8 Seras Energy Ltd also work with a wide range of suppliers to source sustainable wood by-products for conversion into wood chips for use in customers' biomass power plants. Seras Energy Ltd also work proactively in forestry management, providing advice on effective tree thinning to maximise the growth potential of a woodland plantation.

2.9 As part of the life of a sustainable forest, wood is routinely cropped and used for the manufacture of wood products such as sawn wood, flooring, doors, fencing, furniture, panel boards and MDF, or felled in order to make space for effective tree growth and to create a healthy woodland. The process of

cropping the trees and making the aforementioned wood products results in a supply of wood by-products, which if left unused would simply biodegrade and release much of its stored carbon to the atmosphere (predominantly in the form of methane).

2.10 By using these wood by-products for the production of biomass wood fuels for energy generation, the carbon is still returned to the atmosphere, but a useful commodity is produced (electricity and heat) which reduces the need for energy from fossil fuel combustion and ultimately results in lower overall GHG emissions to the atmosphere.

2.11 There are some emissions associated with fuels consumed by machinery used to crop the trees, transport and process the wood by-products into wood chips, but these emissions are relatively small. Furthermore, Seras Energy Ltd is proactively exploring initiatives to reduce and eventually eliminate these emissions in the future through the use of biofuels, and the conversion of diesel-powered processing equipment to electric-powered versions (discussed further in Section 4).

Scope of Seras Energy Ltd GHG Footprint

Seras Energy Ltd Corporate GHG Footprint

2.12 In reporting GHG emissions associated with a company's activities, the best practice approach is to follow the GHG Protocol[6], which is the agreed international standard for GHG emissions reporting.

2.13 The GHG protocol divides all GHG emissions into three categories, referred to as Scopes, which are defined as follows:

- **Scope 1 GHG Emissions**: these are emissions directly related to a company's activity such as fuels used by Company owned vehicles and assets;
- **Scope 2 GHG Emissions**: these are emissions released by third parties in the generation of energy (i.e. electricity or heat) purchased by the reporting company; and
- **Scope 3 GHG Emissions**: these are indirect emissions related to a company's customers and supply chain.

2.14 In relation to Seras Energy Ltd, the Scope 1, 2 and 3 emissions associated with the business, which form the Company's carbon reporting envelope, are summarised in Table 2-1 and Figure 2-1.

Table 2-1: Seras Energy Ltd Scope 1, 2 and 3 GHG Emissions

GHG Emissions Scope	Associated Activities
Scope 1	• Diesel fuel consumed in Seras Energy Ltd's vehicle fleet for collection of wood by-products and waste wood from suppliers, and delivery of processed wood chips to customers. • Diesel fuel consumed by plant and machinery in Seras Energy Ltd-owned processing facilities such as Tilbury and other facilities. • Fuel oil used for heating and hot water in offices and welfare facilities owned or leased by Seras Energy Ltd. • Emissions from Seras Energy Ltd company cars.
Scope 2	• Electricity purchased by Seras Energy Ltd and used on all Seras Energy Ltd owned or leased offices and facilities.

[6] https://ghgprotocol.org/

GHG Emissions Scope	Associated Activities
Scope 3	• Emissions from the mining, processing and manufacture of goods and raw materials consumed by Seras Energy Ltd (e.g. tyres and batteries for fleet vehicles, oils and lubricants for plant and fleet). • Emissions from water supply and wastewater treatment for water used in all Seras Energy Ltd owned and leased offices and facilities. • Emissions from business travel by land, air and sea, as well as hotel stays. • Emissions associated with the treatment and disposal of waste generated by Seras Energy Ltd. • Emissions associated with haulage of wood to Seras Energy Ltd facilities or from Seras Energy Ltd to customers by third party hauliers. • Well-to-tank (WTT) emissions associated with diesel fuel consumed by Seras Energy Ltd. • Transmission and distribution (T&D) emissions associated electricity consumed by Seras Energy Ltd.

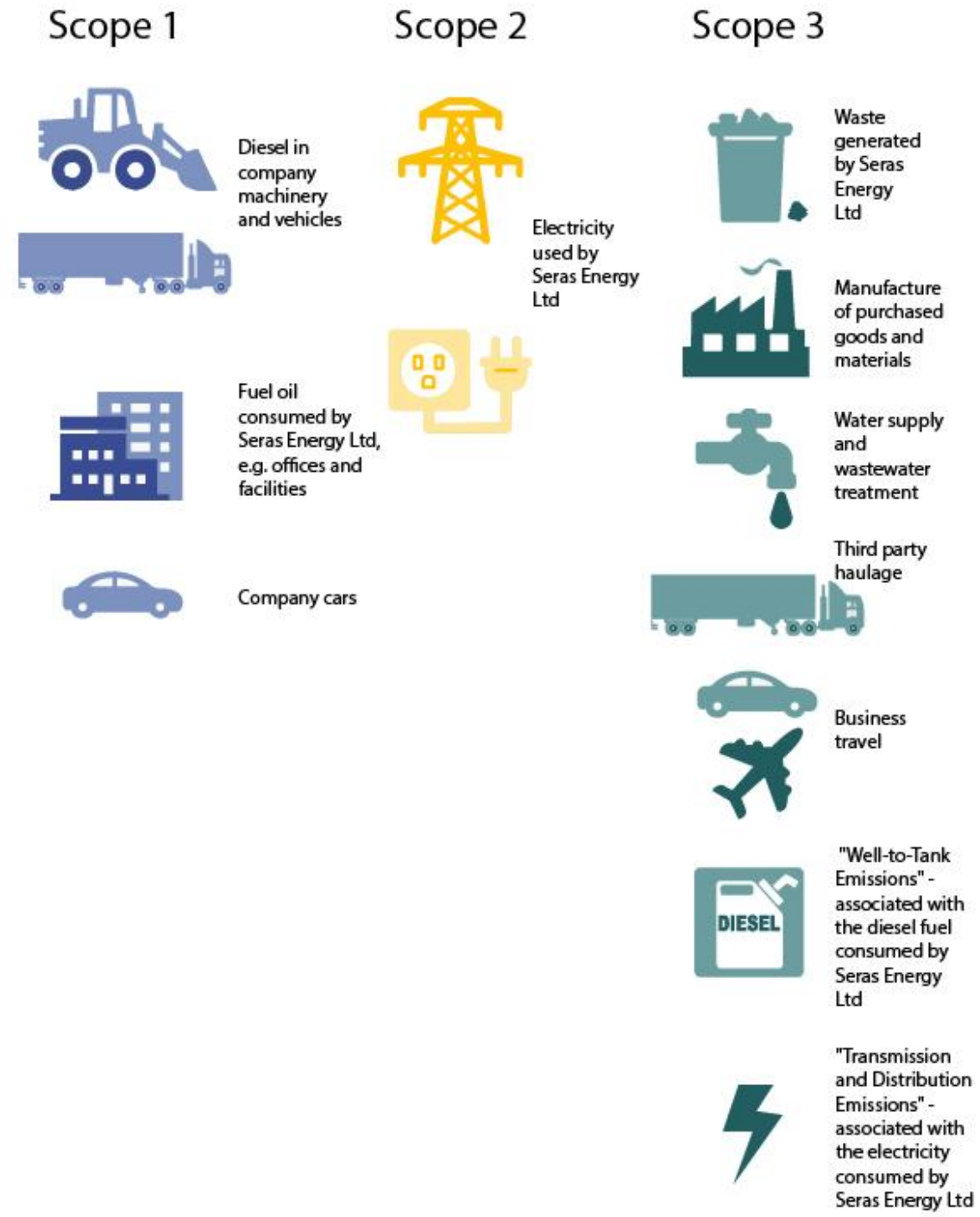

Figure 2-1: Seras Energy Ltd Scope 1, 2 and 3 GHG Emissions

2.15 It should also be noted that for some Scope 3 emissions such as recycling of ferrous metals, although there may be GHG emissions associated with the recycling process, these emissions would be much lower than those associated with the production of new ferrous metal products, and this is therefore a potential benefit in terms of overall GHG emissions. This is further discussed in Section 3.

Wider Scope 3 Emissions

2.16 It is also important to acknowledge that there are other wider Scope 3 GHG impacts associated with Seras Energy Ltd's activities, which affect the overall carbon intensity (i.e. lifecycle carbon emissions) associated with Seras Energy Ltd customers' biomass power plants, which are set out in Table 2-2. These additional Scope 3 emissions, which are all important to the overall carbon lifecycle are further described in Paragraphs 2.23 to 2.25 later in this section.

Table 2-2: Seras Energy Ltd Wider Scope 3 GHG Emissions

Scope 3 GHG Emissions Activity	Description
Combustion of wood chip in biomass power plants	Downstream of Seras Energy Ltd, the combustion of biomass wood products in biomass power plants results in the release of GHG emissions to atmosphere.
Sequestration of atmospheric CO_2 by trees	Upstream of Seras Energy Ltd, the CO_2 removed from the atmosphere by trees which form the biomass supplied by Seras Energy Ltd (both wood by-products and waste wood) during their growth cycle. This constitutes a negative GHG emission (i.e. a GHG removal) which balances with the GHG emissions from combustion of the wood chip in biomass power plants.
Emissions from tree felling/forest management, transport, and processing of wood by-products	Upstream emissions released, predominantly due to diesel and electricity consumption in vehicles and machinery associated with felling, forest management, and the transport and processing of wood products before distribution of the by-products to Seras Energy Ltd. This applies to the wood by-products stream only.
Emissions from waste sorting, processing and transport associated with waste wood	Upstream emissions associated with the transport, sorting and separation, and processing of waste wood by Seras Energy Ltd waste wood suppliers. This applies to the waste wood stream only.

2.17 The major Scope 3 source is emissions (predominantly CO_2) from combustion of the biomass wood chip products in Seras Energy Ltd customers' biomass power plants. Although these emissions contribute to global warming, the carbon emitted was removed from the atmosphere by the trees which provide the source of the wood, and therefore a carbon cycle is created.

2.18 Where wood is sourced from sustainable forestry and tree plantations are replaced as they are cropped, then this creates a close-to net zero carbon lifecycle, with carbon emitted by combustion of wood near to equalling the carbon removed from the atmosphere by the trees as they grow. The only additional emissions are therefore associated with felling or forest management, transport, and processing of wood chips (for the wood by-products part of the business) as well as waste processing and transport emissions (for the waste wood part of the business). This carbon lifecycle in relation to Seras Energy Ltd's business is explained further in Paragraphs 2.33 to 2.35 later in this section.

Quantification of Seras Energy Ltd GHG Footprint

Seras Energy Ltd Corporate GHG Footprint

2.19 The key components of Seras Energy Ltd's GHG footprint are described in Section 2.1 and Table 2-1, and principally relate to the use of fuels in the Company's fleet of vehicles and machinery.

2.20 A summary of the annual 2025 GHG footprint for Seras Energy Ltd is provided in Table 2-3.

2.21 This footprint matches the footprint provided for company reporting in accordance with the Task Force on Climate-Related Financial Disclosures (TCFD), with the addition of emissions from third party hauliers alongside WTT and T&D emissions. It should be noted that the inclusion of WTT and T&D emissions has only been in place since the 2024 annual GHG footprint, however inclusion of these elements is best practice for company carbon accounting and is in alignment with the GHG Protocol. To allow for comparison, and for completeness, WTT and T&D emissions from previous years (both financial and calendar) have been back-calculated utilising information presented in previous reports for Seras Energy Ltd and DESNZ emissions factors. GHG footprints for previous years are provided in Appendix A2. Technical details of the inputs to the 2025 calculations are provided in Appendix A1.

2.22 The predominant source of emissions is diesel fuel use in Seras Energy Ltd's fleet of haulage vehicles and site plant, together with third party haulage vehicles, which make up around 85% of the total annual GHG footprint. Seras Energy Ltd are committed to working to reduce these emissions over the coming years and further details of measures to reduce these emissions is discussed in Section 4.

Table 2-3: Seras Energy Ltd GHG Footprint (January 2025 – December 2025)

GHG Emissions Scope	Activity	Annual GHG Emissions (TCO_2e)	Scope Total	% of Total
Scope 1	Diesel fuel used in Seras Energy Ltd haulage fleet	8,636	11,667	48%
	Diesel fuel used in Seras Energy Ltd site plant and machinery	2,962		
	Domestic heating oil used at Seras Energy Ltd sites	14		
	Seras Energy Ltd company cars	54		
Scope 2	Electricity consumption	357	357	1%
Scope 3	Employee commuting	50	12,254	50%
	Seras Energy Ltd business travel (land, sea, air and hotel stays)	12		
	Upstream fuel- and energy-related activities (WTT and T&D emissions)	2,815		
	Water supply and treatment	24		
	Goods consumed by Seras Energy Ltd (e.g. tyres, batteries)	353		
	Treatment and disposal of waste generated by Seras Energy Ltd	21		

GHG Emissions Scope	Activity	Annual GHG Emissions (TCO_2e)	Scope Total	% of Total
	Third party haulage of Seras Energy Ltd biomass and fuels	8979		
TOTAL 2025 ANNUAL GHG EMISSIONS (TCO_2e)		**24,278**		

[a] Based on unrounded values.

Wider Scope 3 Emissions

2.23 It is also important to acknowledge that there are other wider Scope 3 GHG impacts associated with Seras Energy Ltd's activities, which affect the overall carbon intensity (i.e. lifecycle carbon emissions) associated with Seras Energy Ltd customers' biomass power plants. These additional Scope 3 emissions are described in Table 2-4.

2.24 This is based on year 2025 data. Technical details of the inputs to these GHG calculations are provided in Appendix A1.

Table 2-4: Seras Energy Ltd Wider Scope 3 GHG Emissions

Scope 3 GHG Emissions Activity	Annual GHG Emissions (TCO_2e)	Emissions per Tonne of Biomass ($kgCO_2e/T$)
Combustion of wood chip in biomass power plants	2,542,686	1,651
Sequestration of atmospheric CO_2 by trees	-2,485,017	-1,613
Emissions from tree felling/forest management, transport, and processing of wood by-products	19,213	12
Emissions from waste wood transport, sorting and separation, and processing	4,954	3
Seras Energy Ltd Emissions (Table 2-3)	24,278	14
TOTAL EMISSIONS	**106,113**	**68.89**

2.25 The data in Table 2-4 demonstrates that the largest contributor to GHG emissions is emissions from the combustion of biomass by Seras Energy Ltd customers. However, the majority of these emissions are balanced out by CO_2 absorbed from the atmosphere by the trees which form the source of the biomass. The residual GHG emissions are 106,113 tonnes per annum.

Electricity Generation

2.26 Biomass power plants, such as those operated by Seras Energy Ltd customers, provide a constant, reliable electricity supply to power homes and businesses, without which electricity would need to be generated by other means, including natural gas power stations.

2.27 The lifecycle GHG emissions from biomass power stations are very low (see Table 2-5) due to the removal of carbon from the atmosphere by the trees that constitute the wood used during their growth cycle.

2.28 Seras Energy Ltd provided 1,540,300 tonnes of biomass fuel to customers' power plants in 2025. This was used to generate an estimated 1,963,898 MWh of electricity.

2.29 If this amount of electricity were to be generated by natural gas power stations, it would result in the emissions of approximately 750,209 tonnes of fossil CO_2e to the atmosphere.

2.30 Ofgem estimate that average UK household electricity consumption is 2,700 kWh/year[7]. On this basis, the electricity generated by Seras Energy Ltd customers is enough to power more than 727,370 homes.

Heat for Waste Drying

2.31 Seras Energy Ltd require heat for drying of wood chips (principally those sourced from wood by-products) before distribution to customers. Currently, a drying facility at Widnes operates using low carbon heat from the nearby biomass power plant and therefore avoids the combustion of fossil fuels to heat the drying processes. For example, at the Widnes site, Seras Energy Ltd used 72,556 MWh of heat from the biomass plant for wood drying in 2025. This alone saves approximately 14,707 tonnes of GHG emissions per year from the use of natural gas heat for wood drying, which is equivalent to 61% of Seras Energy Ltd's GHG footprint (as set out in Table 2-3) and a considerable saving.

2.32 A portion of the wood dried at Widnes is supplied to a range of small business end users, which are discussed further in Section 5.1.

Seras Energy Ltd Carbon Lifecycle Analysis

Lifecycle GHG Emissions

2.33 In carbon accounting, it is accepted that energy generated from the combustion of biomass is a low carbon energy source.

2.34 The rational for this in GHG accounting has been explained in Paragraphs 2.4 to 2.11 earlier in this Section, in that the release of these emissions is simply returning carbon to atmosphere that was absorbed by the biomass feedstock during its growth cycle.

2.35 The carbon lifecycle of Seras Energy Ltd's biomass products, taking account of the analysis and discussion provided in earlier in this Section, is illustrated visually in Figure 2-2.

[7] https://www.ofgem.gov.uk/information-consumers/energy-advice-households/average-gas-and-electricity-use-explained

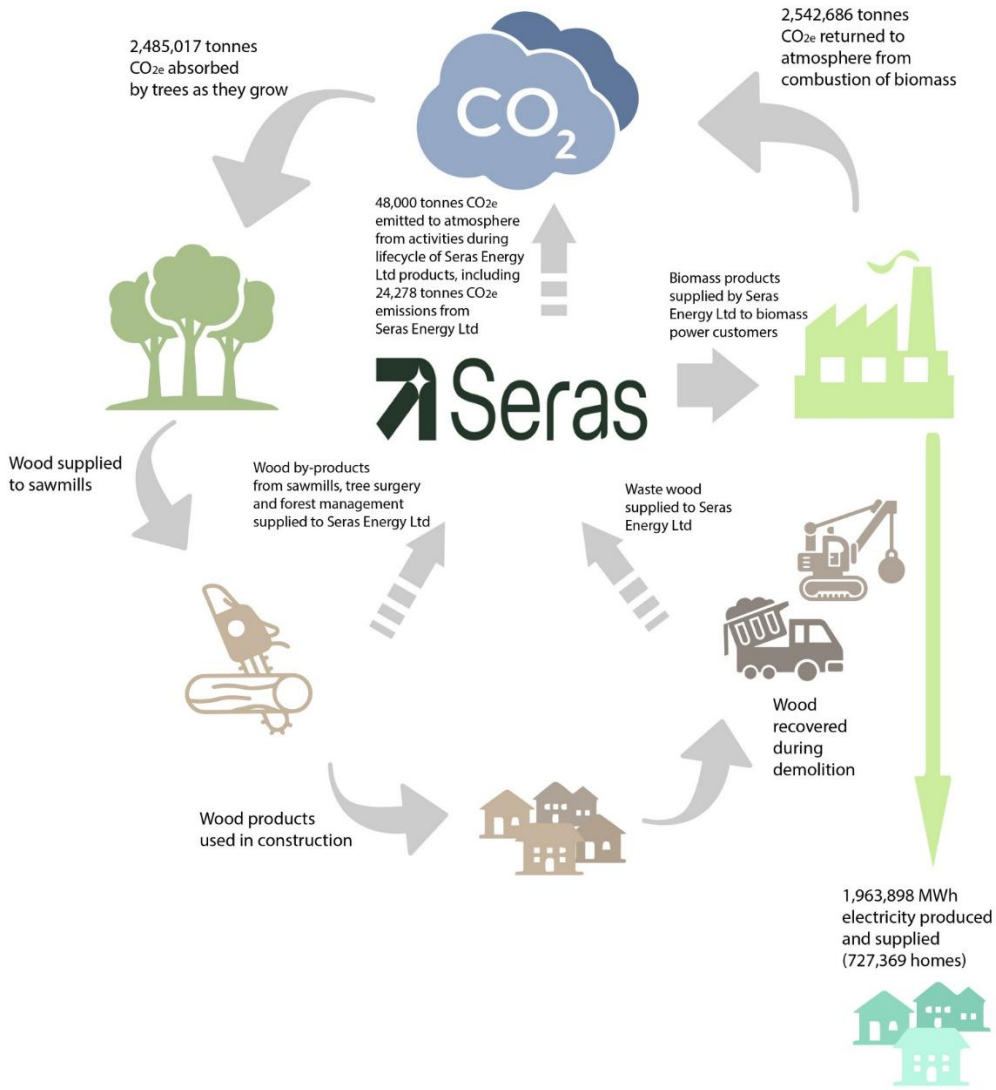

Figure 2-2: Seras Energy Ltd Biomass Products Carbon Lifecycle

Biomass Power Carbon Intensity

2.36 An analysis of the direct GHG intensity of electricity generated by a range of electricity generation types is provided in Table 2-5. The direct emissions for biomass take account of major emissions within the supply chain, and for biomass and energy from waste include carbon sequestered by the biomass (or biomass portion) of the fuel consumed.

Table 2-5: Comparison of GHG Emissions for Electricity Generation

Energy Source	Direct GHG Intensity (gCO_2e/kWh)	Reference
Natural Gas (CCGT)	382	
Wind	0	

Energy Source	Direct GHG Intensity (gCO_2e/kWh)	Reference
Solar	0	Department for Energy Security and Net Zero (DESNZ) Fuel Mix Disclosure Data 2023/2025[8]
Energy from Waste (EfW)	757	Tolvik Consulting UK EfW Statistics 2025[9]
Seras Energy Ltd Biomass	54	(Total residual GHG emissions / electricity generation)

2.37 The data in Table 2-5 shows that compared to other sources of electricity generation, on a direct emissions basis, it is clear that biomass electricity has low carbon intensity (i.e. is a low carbon energy source).

2.38 It is also important to note that the analysis in Table 2-5 is for electricity production only. Biomass power stations also produce heat which can be used by commercial customers or as part of district heat networks. Although this is also the case for EfW, it is not applicable to wind and solar where heat is either not produced or routinely able to be usefully harnessed.

2.39 The use of waste heat ultimately further reduces the overall GHG intensity of energy generated, which is discussed further in Section 3.

2.40 In the future, installation of CCS onto biomass power plants has the potential to lead to biomass power plants having substantially lower GHG emissions, and potentially net negative lifecycle emissions, as is discussed further in Section 4. This will also be the case for EfW, although it is unlikely that EfW will be able to achieve net negative emissions.

[8] DESNZ (2025) Fuel mix disclosure data table. Available: https://www.gov.uk/government/publications/fuel-mix-disclosure-data-table/fuel-mix-disclosure-data-table

[9] Tolvik Consulting (2025) UK Energy from Waste Statistics – 2024. Available: https://www.tolvik.com/published-reports/view/uk-energy-from-waste-statistics-2024/

3 GHG Benefits

3.1 The generation of energy from biomass, and treatment of waste wood by energy recovery has a number of indirect GHG benefits. These indirect benefits are savings in GHG emissions that would otherwise be emitted elsewhere.

Heat Production

3.2 As discussed in Section 2, biomass power plants, such as those operated by Seras Energy Ltd customers, provide a constant, reliable electricity supply to power homes and businesses, without which electricity would need to be generated by other means, including natural gas power stations.

3.3 In addition, as discussed in Section 2, heat produced by these power plants can be used by local consumers to offset the use of natural gas or heating oil.

3.4 The precise amount of heat export and usage from Seras Energy Ltd customers power plants is not known, but as is discussed in Section 2.3.4, at the Widnes site Seras Energy Ltd used 72,556 MWh of heat from the biomass plant for wood drying in 2025, saving approximately 14,707 tonnes of GHG emissions per year from use of natural gas heat. This represents only a tiny portion of the total potential heat supply of Seras Energy Ltd customers, which have the potential to save many more thousands of tonnes of fossil GHG emissions from gas and oil combustion.

3.5 It is likely that heat from Seras Energy Ltd customers is well utilised, or can be utilised in the future as connection options become available, and this will further lower the carbon intensity of energy produced by these power plants.

Avoiding Landfill

3.6 Seras Energy Ltd processes waste wood that either by its constituency (e.g. MDF) or contamination with treatments and coatings (e.g. Grade C waste wood) cannot be reused or recycled; therefore, use for biomass energy represents the best fate of this material as an alternative to landfill.

3.7 When wood (and other biodegradable material) is landfilled, it breaks down anaerobically (without oxygen) and releases a mixture of CO_2 and methane gas. Some of this gas is captured and used for energy, but much of it is released to the atmosphere.

3.8 As previously discussed, methane is a very potent GHG, which has a much greater global warming potential (GWP) than CO_2 (released when biomass is combusted). The GWP of methane is between 28-34 times higher than CO_2. This means for every tonne of methane released, the atmospheric warming effect is equivalent to 28-34 tonnes of CO_2.

3.9 Seras Energy Ltd received, processed, and supplied over 1,000,000 tonnes of waste biomass in 2025 that would otherwise be landfilled, saving over 582,000 tonnes of GHG emissions from landfill methane emissions.

Recovered Materials

3.10 In processing waste wood for provision to customers, Seras Energy Ltd recovers a large volume of ferrous and non-ferrous metals and other materials which can be recycled and reprocessed into useful products, saving GHG emissions associated with the manufacture and transport of new products.

3.11 The recovery of metals provides significant benefits in this regard as the production of steel and metal alloys are very energy intensive and result in substantial GHG emissions (for example from coking coal used in blast furnaces for steel manufacture). Recovery and recycling of metals by Seras Energy Ltd therefore provides a positive benefit for offsetting GHG emissions from the mining and production of new metal products.

3.12 In addition, the biomass power plants operated by Seras Energy Ltd's customers produce two key by-products, bottom ash and air pollution control residue, both of which can be processed into products for use in the construction industry. These by-products replace products produced from newly quarried minerals which saves GHG emissions associated with the quarrying and processing of such products, and positively contributes to a circular economy.

4 Net Zero Plan and Future Outlook

4.1 Seras Energy Ltd has committed to reducing Scope 1 and 2 emissions to net zero by 2040. In addition, the Company will seek to reduce the Scope 3 emissions, and biomass power has the potential to play a key role in the UK's transition to a net zero economy. This section outlines the measures being investigated, trialled or considered by Seras Energy Ltd to meet its 2040 net zero (Scope 1 and 2) target, reduce its Scope 3 emissions and in conjunction with its biomass customers contribute to the transition to net zero.

Net Zero Scope 1 Emissions

Heavy Vehicle Fleet

4.2 A large portion of the Company's Scope 1 and 2 emissions are related to diesel consumption in heavy duty and specialist vehicles and plant for which zero-emission alternatives are not yet readily available and therefore it is likely that the majority of the Scope 1 emissions will be substantially reduced in the 5 to 15-year timeframe in line with fleet rollover and technological advancements.

4.3 Seras Energy Ltd plan to implement or investigate the feasibility of implementing the following measures to avoid and reduce Scope 1 emissions from its heavy and specialist vehicle fleet:

- Rollout a green driver programme to improve fuel efficiency (primarily for haulage);
- Seras Energy Ltd's fleet partner aims to deliver an 8% carbon reduction through an established 3-year replacement programme to a more fuel-efficient fleet; and
- Future fleet rollover to electric- or zero-emission vehicles in line with fleet procurement plans and available technologies.

Small Vehicle and Company Car Fleet

4.4 Seras Energy Ltd plan to implement or investigate the feasibility of implementing the following measures to avoid and reduce Scope 1 emissions from its small vehicle and company car fleet:

- Fleet rollover to electric vehicles for cars and small vans in line with fleet procurement plans;
- Seras Energy Ltd have undertaken a trial to assess the business feasibility of replacing their current diesel van fleet with an electric van fleet;
- Reduce the number of company cars with currently only 1 remaining, and
- Amend company car policy to reflect more sustainable car use and reduce company car mileage through a set car allowance.

Site Machinery and Plant

4.5 Seras Energy Ltd plan to implement or investigate the feasibility of implementing the following measures to avoid and reduce Scope 1 emissions from site machinery and plant:

- Seras Energy Ltd completed a biofuel trial at Widnes to replace diesel fuel used in plant and machinery at a number of the Company's processing sites;
- Monitoring feasibility of moving site plant and machinery to biofuel, closely linked to the cost of biodiesel;

- Upgrades to fixed plant running on diesel fuel, with power switching to mains electricity; and
- Future rollover to electric or zero emission mobile machinery and plant in line with procurement plans and available technologies.

Net Zero Scope 2 Emissions

Electricity Consumption

4.6 As the UK decarbonises its electricity generation through increasing wind, solar, nuclear, and of course biomass, together with battery storage, and decommissioning the use of gas and oil, as has been the case for coal power in recent years, the electricity consumed by Seras Energy Ltd would transition towards net zero.

4.7 Nonetheless, Seras Energy Ltd plan to implement or investigate the feasibility of implementing the following measures to avoid and reduce Scope 2 emissions from electricity consumption:

- Seras Energy Ltd have completed the conversion to LED lighting on all sites;
- Installation of sensor-controlled lights which automatically turn off when rooms and spaces are not in use was installed for the main offices and is planned to be installed in site cabins;
- When historic portacabins come to the end of their life, these will be switched to more energy efficient units;
- Energy audit to be completed across the business in April 2026, to examine demand for heating and biomass drying and identify opportunities for energy saving;
- Staff training to reduce energy use in offices and site cabins;
- Examine opportunities for renewable energy generation on Seras Energy Ltd sites (e.g. installation of solar panels); and
- Upgrade the Tilbury Green Power site (also known as 'Tilbury 1' or 'T1') to a 100% renewable energy tariff is in-progress and will provide a 100% renewable supply to Seras' wood processing lines and other electric uses on site. It should be noted that as of October 2024, all Seras Energy Ltd sites (with the exception of the T1 site) operating using a 100% renewable energy tariff.

4.8 In terms of residual Scope 1 and 2 emissions, offsetting will only be considered for any final residual emissions that cannot be 100% avoided or reduced by 2040.

Reducing Scope 3 Emissions

4.9 Seras Energy Ltd also plan to reduce the Company's Scope 3 emissions where possible, including working with suppliers and contractors. Measures being implemented or investigated to avoid and reduce Scope 3 emissions are summarised in the following sections.

Water

- Minimise water consumption where possible, and increase staff awareness of water saving; and
- Investigate opportunities for rainwater harvesting or greywater harvesting at processing sites where water is used for operational processes.

Business Travel

- Reduce the number of company cars provided to employees and work to eliminate company cars entirely;
- Encourage use of virtual meetings to reduce the need for business travel; and
- Review policies and procedures for business travel and promote lower carbon forms of travel such as train to private car use.

Waste and Procurement

4.10 Review contracts and consider Environmental Performance Declarations (EPDs) when purchasing products and services;

- Work with third party fleet operators to reduce fuel and emissions from third party fleet, including encouraging contractors to adopt their own net zero plans and targets;
- Work with major plant suppliers such as JCB on refurbishment (rather than replacement) of machinery;
- Review waste collection contract to improve waste recycling rate;
- Work towards ensuring zero waste to landfill;
- Work with suppliers to take back and recycle uniforms;
- Maximise recovery of metal fragments from waste wood during processing and continue to send these for metal recycling;
- Reduce oil and lubricant use through electrification of machinery or use of synthetic or low carbon oils and lubricants where possible;
- Review and minimise battery use across the business; and
- Ensure used tyres from fleet vehicles are reused or recycles.

4.11 More widely, efforts to decarbonise the UK economy are reflected worldwide, with most nations party to the Paris Agreement having committed to economic decarbonisation by around 2050 or a few years later.

4.12 This means that the carbon intensity of goods and materials purchased and used by Seras Energy Ltd would decarbonise in the future.

4.13 In addition, efforts to decarbonise the waste sector would also result in a reduction in emissions associated with the treatment or disposal of waste generated by Seras Energy Ltd, as waste minimisation measures reduce overall waste volumes, waste reuse and recycling rates increase, and energy from waste facilities install CCS.

Future Outlook

4.14 The UK Government has set out how the use of biomass energy is likely to be prolonged in the future by the application of CCS systems onto biomass power stations.

4.15 The systems work by passing the combustion gasses through a series of processes which remove CO_2 from the airstream. The residual gas is released to atmosphere and the captured CO_2 is stored, with

the potential for either permanent storage in CO_2 reservoirs, or for reuse in industries such as the drinks industry or for the production of green fuels known as 'Power to Liquid' fuels.

4.16 The application of Bioenergy with Carbon Capture and Storage (BECCS) would mean a large proportion of the circa 2.5 million tonnes of CO_2e emitted from Seras Energy Ltd customers (see Table 2-4) per year can potentially be captured and stored, permanently removing it from the atmosphere.

4.17 This would provide a significant climate change benefit and would reduce the energy intensity of biomass power to a negative value (i.e. for each MWh of energy produced, more carbon is removed from the atmosphere than is released).

5 Wider Sustainability Aspects

5.1 Beyond the GHG benefits described in Section 3, Seras Energy Ltd business also offers some wider sustainability benefits and opportunities.

Supporting Small Businesses

5.2 In addition to biomass products supplied to larger power-generating customers, Seras Energy Ltd also provide biomass products to a wide range of small business end users. Seras Energy Ltd's products are used by these businesses to lower their own carbon emissions, progress towards net zero operations, and improve the sustainability of their businesses.

5.3 These products are sourced from the wood by-products side of the business, including sawmill chip, sawmill dust, and forest management arisings, and are processed and dried at Widnes and supplied to small business customers for a range of users.

5.4 Some examples of small businesses provided with biomass products by Seras Energy Ltd are provided in Table 5-1 below and illustrated in Figure 5-1.

Table 5-1: Seras Energy Ltd Small Business End Users

End User Activity	Description
Small-Scale CHP Plants	A portion of biomass products produced by Seras Energy Ltd is supplied to owners of small-scale biomass CHP plants, to generate low carbon heat and electricity for local heat networks or commercial businesses.
Poultry Farming	Rearing of chickens requires poultry sheds to be maintained at a fixed temperature range to comply with welfare regulations. In winter months and when the birds are juvenile and very small, this requires poultry sheds to be continuously heated. Seras Energy Ltd supply a number of poultry farms with wood chips for biomass boilers to provide low carbon heat to poultry sheds that would otherwise employ gas or fuel oil for the generation of heat, thus lowering these farms' carbon footprint.
Fruit and Vegetable Growing	A number of Seras Energy Ltd's smaller customers grow fruit and vegetables to supply to UK food retailers. Biomass processed and dried at Widnes is supplied by Seras Energy Ltd for use in biomass boilers to provide low carbon heat to greenhouses for food growing. Without biomass heat, these customers would use natural gas or fuel oil for heat, greatly increasing their own carbon footprint.
Nursery Plant Growing	Seras Energy Ltd also supply to a small business growing nursery plants for garden centres. Biomass processed and dried at Widnes is supplied to provide low carbon heat to greenhouses at the nursery used to grow and propagate plants.
Animal Housing	Seras Energy Ltd supply dried sawmill dust and shavings to a third party (AW Jenkinson) who supply it to agricultural market as animal bedding. The products supplied, once used, will then have potential to be further utilised, for example to generate energy in an anaerobic digestion facility.

Figure 5-1: Seras Energy Ltd Small Business End Users

Other Sustainability Aspects

5.5 As part of discussions with Seras Energy Ltd, in addition to carbon reductions (covered in Section 4) the potential for wider sustainability benefits to be harnessed by Seras Energy Ltd has been considered, within both current and future operations. However, ultimately these are relatively limited, as the focus of operations is understandably on biofuel manufacturing and carbon reduction.

5.6 For example, as part of the forestry management operations, the potential exists to provide biodiversity enhancement through the felling and retention of some dead wood, to create additional habitats. It could be argued that through the decomposition of dead wood carbon is released to the atmosphere, which in terms of carbon accounting would be against the principle of reducing CO_2 emissions. However, ultimately this would be a very slow release and, in the intervening period, would support the growth of other plants which by their nature would have carbon benefits. In terms of

carbon quantification, the decomposition of these relatively small quantities of dead wood would be negligible.

5.7 Over and above carbon accounting, the felling and retention of some trees would nominally reduce wood supply for processing and therefore may not be a desired approach commercially. However, should there be marginal areas of the woodland plantations which are not forested, there may be the potential to plant wildflowers and contribute positively to the natural environment.

5.8 It is also understood that there are existing ponds located at the current processing sites, which capture and treat surface water prior to discharge. Depending on their current condition, there is the potential to enhance the biodiversity of these features and increase habitat diversity. If tanks and significant below ground pipework are present on some sites, consideration could be given to retrofitting above ground features such as ponds and swales, to increase the sustainability value of all sites.

5.9 The potential to provide future sustainability elements may in part be led by the potential electrification of machinery (as set out in Section 4). This would require the construction of buildings to house this machinery. In turn this could enable:

- Rainwater could be captured within tanks fitted to external facades, or below ground features, for use for internal washdown or external damping.
- Photovoltaic (PV) panels could be fitted to the building roofs. With machinery housed internally, external dust would be less of concern in terms of their impact on the PV panels.
- The sustainability of materials used in construction should be considered, reducing the carbon footprint where feasible.

6 Conclusion

6.1 Seras Energy Ltd provide sustainable biomass fuel products, primarily for use in power stations generating energy.

Avoiding GHG Emissions

6.2 By treating over 1 million tonnes of waste wood that would otherwise be sent to landfill, Seras Energy Ltd and its supply chain partners and customers enable the avoidance of over 582,000 tonnes of GHG emissions per year from landfilling waste wood.

6.3 By supplying a total greater than 1.5 million tonnes of waste wood and forestry by-products for energy generation, Seras Energy Ltd enables its supply chain partners and customers to save approximately 750,209 tonnes of GHG emissions per year from avoiding the need for gas-fired electricity generation.

6.4 In total the GHG savings from avoiding landfilling of waste wood and gas-fired electricity generation total around 1.3 $MTCO_2e$ in 2025.

Seras Energy Ltd Direct Emissions

6.5 Seras Energy Ltd's company GHG emissions total around 24,278 tonnes per annum, around 83% of which are related to diesel fuel consumption in Seras Energy Ltd haulage vehicles and machinery and third-party haulage vehicles.

Decarbonising Seras Energy Ltd Customers Energy Generation

6.6 GHG emissions from Seras Energy Ltd customers equates to around 2.5 $MTCO_2e$ per year, the vast majority of which is balanced by CO_2 absorbed by the biomass during its growth cycle, ensuring the energy generated has low carbon intensity over its lifecycle.

6.7 The residual carbon intensity of electricity exported by Seras Energy Ltd customers is around 54 gCO_2e/kWh, which is seven times lower than natural gas.

6.8 In 2025, Seras Energy Ltd supplied over 1 million tonnes of waste wood to biomass power customers, that would have otherwise been sent to landfill and saved over 582,781 tonnes of additional GHG emissions to atmosphere from landfill methane gas.

6.9 Seras Energy Ltd customers in 2025 used the total 1,504,300 tonnes of biomass supplied by Seras Energy Ltd to generate an estimated 1,963,898 MWh of electricity, which is sufficient to power more than 727,370 homes. If this electricity were to be generated using natural gas power stations, the resulting fossil GHG emissions would be approximately 750,209 tonnes.

6.10 The power plants also export heat to consumers which replaces heat and offsets emissions generated by fossil fuel heat sources such as natural gas. Seras Energy Ltd themselves use some waste heat from a biomass customer for waste drying at the Widnes site, saving approximately 14,707 tonnes of CO_2 per year, equivalent to 61% of Seras Energy Ltd's own GHG footprint.

Supporting Small Businesses

6.11 In addition to providing substantial volumes of wood products to customers operating large-scale biomass power plants, Seras Energy Ltd also provide products to a wide range of small businesses

including small-scale biomass CHP operators, fruit and vegetable growers, poultry farms and plant nurseries where they generate low carbon energy to reduce their own carbon footprints.

Net Zero Plan

6.12 Seras Energy Ltd have developed a plan to achieve net zero Scope 1 and 2 carbon emissions by 2040. Measures to tackle these emissions will include the use of biofuels in site machinery, future electrification of site plant and introduction of zero emission haulage vehicles as technological advancements allow. It is important to note that the switch to biofuels in site machinery will depend on future financial viability.

6.13 The net zero plan also includes measures to reduce Scope 3 emissions, through minimising the need for materials and products, working with suppliers and contractors to reduce the carbon emission associated with third parties, and investigating measures to harvest rainwater and minimise water consumption.

Future Benefits

6.14 In the future, it is anticipated that Seras Energy Ltd customers will be able to upgrade their power plants to include CCS, potentially creating carbon negative power stations and significantly contributing to the UK's efforts to achieve net zero carbon by 2050.

7 Glossary

BECCS	Biomass Energy with Carbon Capture and Storage
BEIS	Department for Business, Energy and Industrial Strategy
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CHP	Combined Heat and Power
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DDOC	Decomposable Degradable Organic Carbon
DESNZ	Department for Energy Security and Net Zero
EfW	Energy from Waste
gCO_2e/kWh	Grams of Carbon Dioxide Equivalent per Kilowatt Hour of Electricity Generated
GHG	Greenhouse Gas
g/MJ	Grams per Mega Joule
g/mol	Grams per Mole
GWP	Global Warming Potential
IPCC	International Panel on Climate Change
kWh	Kilowatt Hour
MJ/kg	Mega Joules per kilogram
$MTCO_2e$	Mega Tonnes of Carbon Dioxide Equivalent
MWh	Mega Watt Hour
NCV	Net Calorific Value
N_2O	Nitrous Oxide
PV	Photovoltaic
TCO_2e	Tonnes of Carbon Dioxide Equivalent
T&D	Transmission and Distribution
u	Atomic Mass
UNFCCC	United Nations Framework Convention on Climate Change
WTT	Well-to-Tank

8 Appendices

A1 2025 Carbon Footprint Technical Appendix

Introduction

A1.1 This Appendix provides all the technical data and assumptions used in the calculation of the GHG emissions and energy outputs related to the Seras Energy Ltd business and supply chain.

Seras Energy Ltd Company GHG Footprint

A1.2 Seras Energy Ltd produce an annual GHG footprint for corporate reporting as part of TCFD. The TCFD footprint covers emissions from the main activities associated with the Seras Energy Ltd business and provides the basis of the core GHG footprint set out in Table 2-3.

A1.3 All input data have been provided by Seras Energy Ltd. Data on fuel usage, electricity, water consumption, and purchased goods are all obtained from invoices for the purchase of the relevant commodities. Where necessary, such as for materials purchased, assumptions have been made by Seras Energy Ltd to convert the materials from unit numbers to mass in tonnage, based on estimates of commodity weight etc.

A1.4 Other inputs such as company car mileage and business mileage have been obtained from company expense claims.

A1.5 All GHG emissions factors used in the footprint calculations have been obtained from DESNZ[10] where suitable factors are available. For a small number of products used by Seras Energy Ltd (e.g. anti-freeze and ad-blue) emissions factors have been derived from other published sources.

A1.6 A summary of the Seras Energy Ltd company GHG footprint (excluding third party haulage emissions; see Table A1-2) is provided in Table A1-1.

Table A1-1: Seras Energy Ltd Corporate GHG Footprint for 2025 (Excluding Third Party Haulage)

Emissions Source	Metric	2025 Consumption	GHG Factor ($kgCO_2e$ / metric unit)	GHG Emissions (TCO_2e)	Rounded GHG Emissions by Source as presented in Table 2-3 (TCO_2e)
Scope 1 Emissions					
Diesel fuel used in Seras Energy Ltd haulage fleet	litres	3,360,371	2.570	8636.15	8,636
Diesel fuel used in Seras Energy Ltd site plant and machinery	litres	1,180,148	2.513	2962.17	2,962
Domestic heating oil used at Seras Energy Ltd sites	litres	5,658	2.540	14.37	14
Seras Energy Ltd company cars	miles	194,810	0.276	53.84	54

[10] DESNZ (2024) Greenhouse gas reporting: conversion factors 2024. Available: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024

Emissions Source	Metric	2025 Consumption	GHG Factor ($kgCO_2e$ / metric unit)	GHG Emissions (TCO_2e)	Rounded GHG Emissions by Source as presented in Table 2-3 (TCO_2e)
Scope 2 Emissions					
Electricity consumption	kWh	2,017,339	0.177	357.07	357
Scope 3 Emissions					
Employee commuting - diesel car	miles	181,503	0.276	50.17	50
Business travel - air	km	11,651	0.128	1.49	12
Business travel - train	km	48,944	0.035	1.74	
Business travel - sea	km	2,327	0.129	0.30	
Business travel - hotel stay	night	832	10.4	8.65	
Upstream fuel-related activities (WTT emissions) - Seras Energy Ltd haulage vehicles	litres	3,360,371	0.611	2,053.2	2,815
Upstream fuel-related activities (WTT emissions) - Seras Energy Ltd site plant and machinery	litres	1,180,148	0.611	721.1	
Upstream fuel-related activities (WTT emissions) – domestic heating oil used at Seras Energy Ltd sites	litres	5,658	0.531	3	
Upstream energy-related activities (T&D) – electricity consumption	kWh	2,017,339	0.019	37.4	
Water supply	m^3	106,011	0.191	20.28	24
Wastewater treatment	m^3	20,352	0.171	3.48	
Purchased goods – lubricating oil	litres	2,681	1,401	3.23	353
Purchased goods – hydraulic oil	litres	14,896	1,401	17.95	
Purchased goods – engine oil	litres	2,506	1,401	2.98	

Emissions Source	Metric	2025 Consumption	GHG Factor ($kgCO_2e$ / metric unit)	GHG Emissions (TCO_2e)	Rounded GHG Emissions by Source as presented in Table 2-3 (TCO_2e)
Purchased goods – anti-freeze fluid	litres	4,570	1.266	5.79	
Purchased goods – ad-blue (diesel exhaust fluid)	litres	305,192	0.293	89.27	
Purchased goods – Batteries	kg	25	4,633.48	0.12	
Purchased goods – tyres	tonnes	68.86	3,335.57	229.69	
Purchased goods – printed paper	tonnes	2.88	1,345.077	3.87	
Waste – general	tonnes	1,055.55	4.686	4.95	21
Waste – Lubricating oil	litres	150	4.686	0.001	
Waste – Hydraulic Oil	litres	600	4.686	0.002	
Waste – engine oil	litres	1,410	4.686	0.01	
Waste - batteries	kg	25	4.686	0.0001	
Waste – tyres	kg	68,860	4.686	0.32	
Waste – metal (ferrous)	tonnes	3,116.65	4.686	14.6	
Waste – metal (non-ferrous)	tonnes	297.5	4.686	1.39	
Total GHG Emissions (TCO_2e)					**24,278**

[a] Based on unrounded values.

[b] DESNZ emissions factors from waste have reduced significantly from 21.281 (in the 2023 dataset) to 4.686. DESNZ state that "*changes are due to updated assumptions about GHG emissions from waste being sent to MRF facilities. MRF operation now has a factor of 1.64 kg per tonne of input whereas the previous figure used was 3.44 kg per tonne*".

Third Party Haulage

A1.7 In addition to the GHG emissions reported by Seras Energy Ltd as part of TCFD disclosure[11], there are additional emissions associated with third party haulage of Seras Energy Ltd biomass. All the emissions from haulage of biomass using Seras Energy Ltd's own fleet of vehicles is captured in the Scope 1 fuel consumption emissions in Table A1-1.

[11] Task Force on Climate-Related Financial Disclosures.

A1.8 The emissions from third party hauliers are considered to be Scope 3 emissions associated with Seras Energy Ltd's business. If, for example, Seras Energy Ltd outsourced all haulage to third parties, then all the emissions under Scope 1 for the haulage fleet would be captured as Scope 3 emissions.

A1.9 Seras Energy Ltd has provided data on the tonnages of biomass product hauled by third parties.

A1.10 The haul routes operated by third parties vary substantially, and so an estimate of average single trip haul distance has been made, which is 180 km. The distance estimated results in total GHG emissions from third party haulage being similar, albeit slightly higher, than the total GHG emissions from Seras Energy Ltd's haulage fleet.

A1.11 GHG emissions for third party haulage are then calculated using GHG emissions factors for road freight from DESNZ[10], based on the tonnage of material hauled and the average distance travelled. The DESNZ GHG factor used in the calculation is relevant to emissions from 50% laden articulated HGVs >33 tonnes in laden weight; this is considered appropriate given the density of biomass.

A1.12 The calculation of GHG emissions from third party haulage is presented in Table A1-2.

Table A1-2: GHG Emissions from Third Party Haulage

Tonnage Hauled by Third Parties (2025)	Average Distance Hauled (km)	GHG Factor ($kgCO_2e$/tonne/km)	GHG Emissions (TCO_2e)
538,721	180	0.093	8,979

Wider Scope 3 Emissions

A1.13 In addition to the company GHG footprint (including third party haulage) described above, there are some wider Scope 3 emissions which are relevant to the overall lifecycle carbon emissions associated with the use of Seras Energy Ltd's biomass products for energy generation. These wider Scope 3 emissions are described in Section 2.

Biomass Power Production and Carbon Sequestration

A1.14 GHG emissions associated with the combustion of biomass in the power plants operated by Seras Energy Ltd's customers have been calculated based on the tonnages of waste wood and wood by-products supplied by Seras Energy Ltd in 2025.

A1.15 In order to calculate the carbon within the biomass and the emissions resulting from combustion, as well as the amount of CO_2 sequestered by the trees which supply the biomass, a series of variables must be estimated, including the average carbon content by mass, net calorific value (NCV) of the biomass, and production and release of nitrous oxide (N_2O) and methane (CH_4) during biomass combustion.

A1.16 The release of small quantities of N_2O and CH_4 during combustion are important as these emissions have a very high GWP relative to CO_2, and therefore it is robust to acknowledge their contribution to the overall GHG emissions balance.

A1.17 All data on carbon content, NCV, and N_2O and CH_4 emissions have all been based on analysis by Defra[12] and the International Panel on Climate Change (IPCC)[13,14].

A1.18 The key inputs into the calculation of emissions from biomass combustion, as well as carbon sequestration, are provided below in Table A1-3.

Table A1-3: Key Inputs to Biomass Power Plant and Carbon Sequestration GHG Emissions

Parameter	Value	Metric	Comments
Carbon Content of Biomass Fuel	44	% by mass	Based on Defra[12] data.
NCV of Biomass Fuel	18	MJ/kg	Energy content of biomass in megajoules per kilogram of biomass
N_2O Emissions from Biomass Combustion	0.004	g/MJ	Grams of N_2O produced for each megajoule of biomass consumed
CH_4 Emissions from Biomass Combustion	0.03	g/MJ	Grams of CH_4 produced for each megajoule of biomass consumed
GWP of N_2O	310	CO_2e	In accordance with IPCC[14].
GWP of CH_4	28	CO_2e	
Atomic Mass of Carbon	12	Atomic Mass (u)	Rounded to the nearest whole number
Molecular Mass of CO_2	44	g/mol	Rounded to the nearest whole number

A1.19 The data in Table A1-3 can be used in conjunction with biomass tonnages provided by Seras Energy Ltd to estimate the stored carbon in the biomass (i.e. carbon sequestered from the atmosphere by trees during the growth cycle) and subsequent release of emissions to the atmosphere in biomass power plants.

A1.20 The calculation of GHG emissions from the biomass combustion is provided in Table A1-4 below.

Table A1-4: Calculation of Biomass Power Emissions

Parameter	Value			Metric	Comments
	Waste Biomass	By-Product Biomass	Total		
Biomass Throughput	1,057,200	483,100	1,540,300	Tonnes	Provided by Seras Energy Ltd for 2025
Total Carbon in Biomass Fuel	465,168	212,564	677,732	Tonnes C	Waste throughput x carbon content by mass

[12] Defra (2014) Energy recovery for residual waste. A carbon based modelling approach.
[13] IPCC (2006) IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Chapter 2 Stationary Combustion.
[14] 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.

Parameter	Value			Metric	Comments
	Waste Biomass	By-Product Biomass	Total		
Total CO_2 Sequestered by Biomass	1,705,616	779,401	2,485,017	Tonnes CO_2	Carbon content / atomic mass of C (12) x molecular mass of CO_2 (44) (see Table A1-3)
Total N_2O Emitted by Biomass Combustion	23,597	10,783	34,379	Tonnes CO_2e	NCV x N_2O emissions (in g/MJ) x N_2O GWP in Table A1-3 x biomass throughput
Total CH_4 Emitted by Biomass Combustion	15,985	7,304	23,289	Tonnes CO_2e	NCV x CH_4 emissions (in g/MJ) x CH_4 GWP in Table A1-3 x biomass throughput
Total CO_2 Emitted by Biomass Combustion	1,705,616	779,401	2,485,017	Tonnes CO_2	This is equal to the mass of CO_2 sequestered by the trees, minus a small component of sequestered carbon, which is converted to CH_4 during biomass combustion.
Total Energy Input of Biomass Fuel	19,029,600	8,695,800	27,725,400	GJ	Biomass throughput x NCV in Table A1-3.
Total GHG Emitted by Biomass Combustion	1,745,198	797.489	2,542,686	Tonnes CO_2e	Total of CO_2 + N_2O + CH_4 emissions

Upstream Wood By-Product Emissions and Waste Wood Processing Emissions

A1.21 The final elements of the wider Scope 3 GHG footprint are emissions associated with upstream activities associated with Seras Energy Ltd suppliers.

A1.22 These emissions arise on the wood by-product side in relation to tree felling and forest management, wood transport, sawmills, and other supply chain emissions. On the waste wood side, emissions are associated with sorting, separation, processing and transport of the waste before it is received by Seras Energy Ltd.

A1.23 It is not appropriate to include emissions associated with wood products manufacture or use for the waste wood business as any GHG emissions associated with this primary lifetime of the materials is not additional to Seras Energy Ltd.

A1.24 Emissions from tree felling, forest management, and upstream processing and transport of wood by-products has been estimated based on published analysis by the Department of Sustainable Resources Management at the State University of New York[15]. This research estimates a GHG emission of 39.77 $kgCO_2e$/tonne of biomass for wood by-products.

A1.25 Emissions from processing, sorting, separation and transport of waste wood biomass has been estimated using DESNZ GHG emissions factors[10] for closed loop waste wood recycling, of 6.41 $kgCO_2e$/tonne of waste wood.

A1.26 The calculation of these upstream Scope 3 emissions is presented in Table A1-5.

Table A1-5: Upstream Scope 3 Emissions Calculation

Product Stream	Annual Tonnage (T/annum)	GHG Emissions Factor ($kgCO_2e$/tonne)	Total Annual GHG Emissions (TCO_2e)
Wood By-Products	483,100	39.77	19,213
Waste Wood	1,057,200	4.6857	4,954
Total	**1,540,300**	**-**	**24,167**

Biomass Energy Outputs

A1.27 In order to calculate the potential GHG benefits of energy generated by Seras Energy Ltd's customers using biomass products supplied by Seras Energy Ltd, an estimate of the electricity generated by Seras Energy Ltd's customers has been carried out.

A1.28 A summary of the calculation of electricity generated using Seras Energy Ltd biomass products is provided in Table A1-6.

Table A1-6: Calculation of Electrical Energy Outputs

Parameter	Value			Metric	Comments
	Waste Biomass	By-Product Biomass	Total		
Energy Input	19,029,600	8,695,800	27,725,400	GJ	NCV (Table A1-3) x Throughput (Table A1-4).
	5,286,042	2,415,519	7,701,562	MWh	Energy input in GJ x 0.277778[16].
Electrical Efficiency of Biomass Plant	30	30	30	%	Assumption based on typical plant efficiencies.
Gross Electrical Output	1,585,813	724,656	2,310,468	MWh	Energy Input x fraction of electrical efficiency (0.3).

[15] Weyrens, J.P.; Therasme, O.; Germain, R.H. Quantifying the Life Cycle Greenhouse Gas Emissions of a Mechanized Shelterwood Harvest Producing Both Sawtimber and Woodchips. Forests 2022, 13, 70. https://doi.org/10.3390/f13010070

[16] One GJ is approximately equal to 0.277778 MWh.

Parameter	Value			Metric	Comments
	Waste Biomass	By-Product Biomass	Total		
Parasitic Load of Plant[17]	15	15	15	%	Percentage of total electricity generated. Assumption based on typical large scale biomass plants.
Parasitic Electricity Consumption	237,872	108,698	346,570	MWh	Gross electrical output x fraction of parasitic electrical load (0.15).
Total Exported Electricity	1,347,941	615,957	1,963,898	MWh	Gross electrical output minus parasitic electrical consumption.

A1.29 The electricity exported by Seras Energy Ltd's customers is provided to homes and businesses in the local area to each biomass plant. Ofgem analysis[7] estimates that the average UK household consumes 2,700 kWh (2.7 MWh) of electricity each year. On this basis, the 1,963,898 MWh of electricity generated by Seras Energy Ltd's customers is sufficient to power over 727,370 UK households.

Biomass Power Carbon Intensity

A1.30 In order to compare biomass power to other forms of power generation, as presented in Table 2-5 of this report, a carbon intensity calculation has been carried out for power produced by Seras Energy Ltd biomass products. The carbon intensity is the net amount of carbon emitted in order to generate each unit of electricity.

A1.31 The carbon intensity calculation combines the data in Table A1-3, Table A1-4, Table A1-5 and Table A1-6, as presented in Table A1-7.

Table A1-7: Calculation of Biomass Lifecycle Carbon Intensity

Parameter	Value	Metric	Comments
Total GHG Emitted by Biomass Combustion	2,542,686	TCO_2e	See Table A1-3.
Total CO_2 Sequestered by Biomass	-2,485,017	TCO_2e	See Table A1-3.
Upstream GHG Emissions for Wood By-Products	19,213	TCO_2e	See Table A1-5.
Upstream GHG Emissions for Waste Wood	4,954	TCO_2e	See Table A1-5.
Seras Energy Ltd Scope 1-3 GHG Emissions	24,278	TCO_2e	Total from Table A1-1 and Table A1-2.
Total GHG Emissions	106,113	TCO_2e	Sum of emissions in this table.
Total Electricity Generated	1,963,898	MWh	See Table A1-6.

[17] Parasitic load is the electricity used by the plant in order to operate. This energy has been discounted from the exported electricity values.

Parameter	Value	Metric	Comments
Carbon Intensity of Biomass Electricity	54	gCO_2e/kWh	Total emissions / total electricity x 1000.

A1.32 The lifecycle carbon intensity of the electricity generated by Seras Energy Ltd's customers is 54 gCO_2e/kWh, which is much lower than other forms of energy generation (EfW and natural gas) as set out in Table 2-5 of this report.

Landfill Emissions

A1.33 As discussed in Section 3, waste wood processed and supplied by Seras Energy Ltd would otherwise have to be treated or disposed by alternative means, such as landfill.

A1.34 A landfill gas calculation has been undertaken to estimate the amount of methane that might result if the waste wood supplied by Seras Energy Ltd was instead sent to landfill. The inputs to the calculation are provided in Table A1-8.

Table A1-8: Inputs to Landfill Emissions Calculation

Parameter	Value	Metric	Comments
Proportion of Waste Wood that is Decomposable Degradable Organic Carbon (DDOC)[18]	12.5	%	Assumptions consistent with Defra's modelling of GHG emissions from landfill[12].
Landfill Gas CO_2 Content	50	%	
Landfill Gas CH_4 Content	50	%	
Landfill Gas Recovery Efficiency	75	%	
Proportion of Released CH_4 Oxidised in Landfill Cap	10	%	
Proportion of Captured CH_4 Leaked through Gas Engines	1.5	%	
GWP of CH_4	28	TCO_2e/T	In accordance with IPCC[14].

A1.35 The input data provided in Table A1-8 have been used to calculate the resultant landfill methane releases as set out in Table A1-9.

Table A1-9: Calculation of Landfill Emissions

Parameter	Value	Metric	Comments
Waste Biomass Throughput	1,057,200	Tonnes/yr	See Table A1-4.
Proportion of Waste Wood that is DDOC	132,150	Tonnes C	12.5% of waste biomass throughput.

[18] Decomposable Degradable Organic Carbon (DDOC) content is the proportion of the wood by mass that will anaerobically break down in landfill to form landfill gas (a mixture of CO_2 and CH_4).

Parameter	Value	Metric	Comments
Total CH_4 in Landfill Gas	88,100	Tonnes	DDOC / molecular mass of C (12) x % CH_4 in landfill gas (50%) x molecular mass of CH_4 (16) / 1000.
Captured CH_4	66,075	Tonnes	75% of total CH_4 in landfill gas.
Uncaptured CH_4	22,025	Tonnes	25% of total CH_4 in landfill gas.
Uncaptured CH_4 Oxidised in Landfill Cap	2,203	Tonnes	10% of Uncaptured CH_4.
Captured CH_4 Leakage through Gas Engines	991	Tonnes	1.5% of Captured CH_4.
Total CH_4 Released	20,814	Tonnes	Uncaptured CH_4 + Captured CH_4 leaked through gas engines - uncaptured CH_4 oxidised in landfill cap.
Total GHG Emissions	582,782	Tonnes CO_2e	Total CH_4 released x GWP for CH_4 (see Table A1-8).

A1.36 It is estimated that if the waste wood supplied by Seras Energy Ltd in 2025 were to be sent to landfill, additional GHG emissions of 582,782 tonnes would occur. These emissions are essentially prevented by the use of waste wood biomass in power plants.

Lifecycle Emissions by Wood Product

Waste Wood Carbon Lifecycle

A1.37 Waste wood received, processed and supplied by Seras Energy Ltd totalled over 1 million tonnes in 2025. This biomass was consumed by Seras Energy Ltd's customers to produce an estimated 1,347,941 MWh of low carbon electricity, enough to power 499,237 homes[7].

A1.38 The wood by-products carbon lifecycle is illustrated visually in Figure A1-1

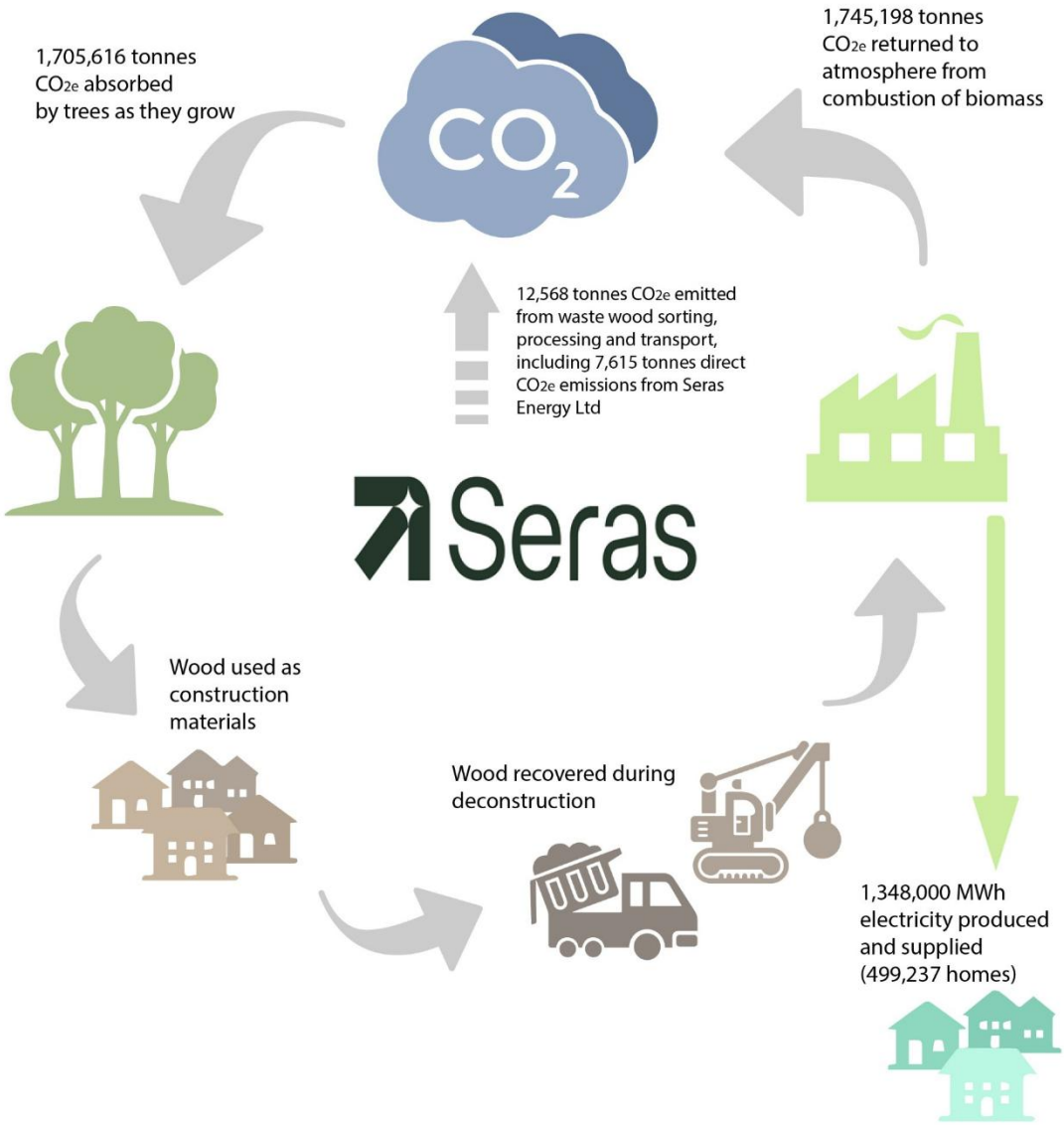

Figure A1-1: Waste Wood Carbon Lifecycle

Wood By-Products carbon Lifecycle

A1.39 Wood by-products derived, received, processed and supplied by Seras Energy Ltd totalled 483,100 tonnes in 2025. This biomass was consumed by Seras Energy Ltd's customers to produce an estimated 615,957 MWh of low carbon electricity, enough to power 228,132 homes[7].

A1.40 The wood by-products carbon lifecycle is illustrated visually in Figure A1-2.

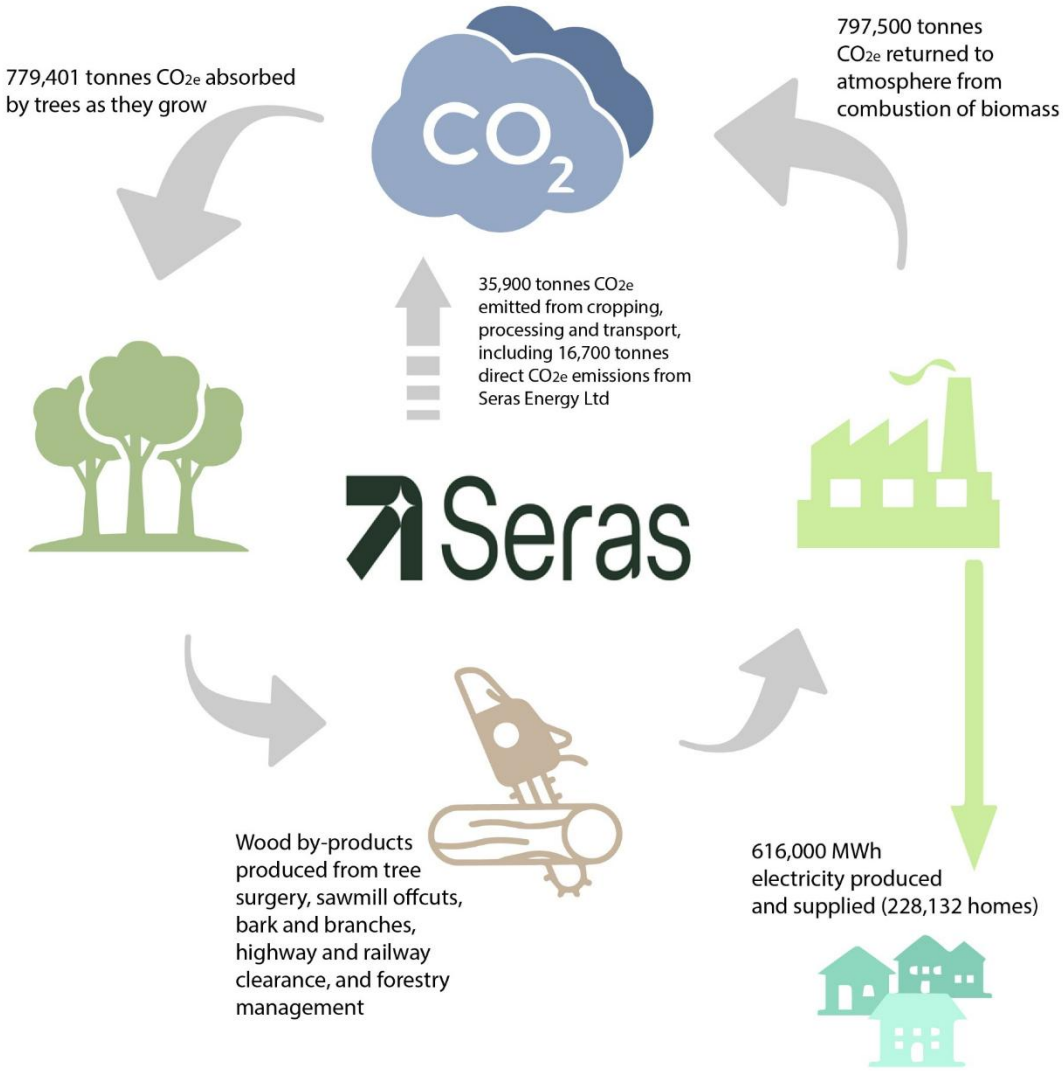

Figure A1-2: Wood By-Products Carbon Lifecycle

A2 GHG Footprints from Previous Years

A2.1 Table A2-1 provides the annual GHG footprint for Seras Energy Ltd for 2022 (financial year), 2023 (both financial year and calendar year) and 2024 (calendar year) to allow for comparison. Totals are provided both excluding and including Scope 3 Upstream WTT and T&D emissions, as these emission sources were new to the 2024 annual GHG footprint (in alignment with the GHG Protocol[6]).

A2.2 WTT and T&D emissions from previous years (both financial and calendar) have been back-calculated utilising information presented in previous reports for Seras Energy Ltd and DESNZ emissions factors.

Table A2-1: Annual GHG Emissions (tonnes CO_2e)

Year	2022	2023	2023	2024	2025
Reporting Period	*Financial Year (Mar 21-Feb 22)*	*Financial Year (Mar 22-Feb 23)*	*Calendar Year (Jan-Dec 23)*	*Calendar Year (Jan-Dec 24)*	*Calendar Year (Jan-Dec 25)*
Scope 1					
Diesel fuel used in company's haulage fleet	11,828	10,402	10,149	8,709	8,636
Diesel fuel used in company's site plant and machinery	3,726	3,969	3,027	2,799	2,962
Domestic heating oil at company sites	2	5	9	14	14
Company cars	48	35	42	48	54
Scope 2					
Electricity Consumption	1,106	1,124	1,138	660	357
Scope 3					
Business travel & employee commuting	41	34	21	23 [a]	62
Water supply and treatment	8	8	7	12	24
Goods consumed	72	198	120	104	353
Waste treatment and disposal	112	114	122	58 [b]	21
Third party haulage	11,741	16,854	11,853	10,045	8,979
Total (excluding upstream WTT and T&D emissions)	**28,684**	**32,743**	**26,488**	**22,471**	**21,463**
Scope 3 – Upstream WTT and T&D emissions [c]	3,874	3,461	3,305	2,860	2,815
Revised total (including upstream WTT and T&D emissions)	**32,558**	**36,204**	**29,793**	**25,330**	**24,278**

[a] Within the 2025 report, these GHG emissions have been reported individually for "Business Travel" and "Employee Commuting" in alignment with the GHG Protocol[6].

[b] As previously discussed, DESNZ emissions factors from waste have reduced significantly from 21.281 (in the 2023 dataset) to 4.686. DESNZ state that *"changes are due to updated assumptions about GHG emissions from waste*

being sent to MRF facilities. MRF operation now has a factor of 1.64 kg per tonne of input whereas the previous figure used was 3.44 kg per tonne".

[c] As previously discussed in this report, the inclusion of upstream WTT and T&D emissions is continued in 2025, following the inclusion in the 2024 annual footprint; however, inclusion of these elements is best practice for company carbon accounting and is in alignment with the GHG Protocol.

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