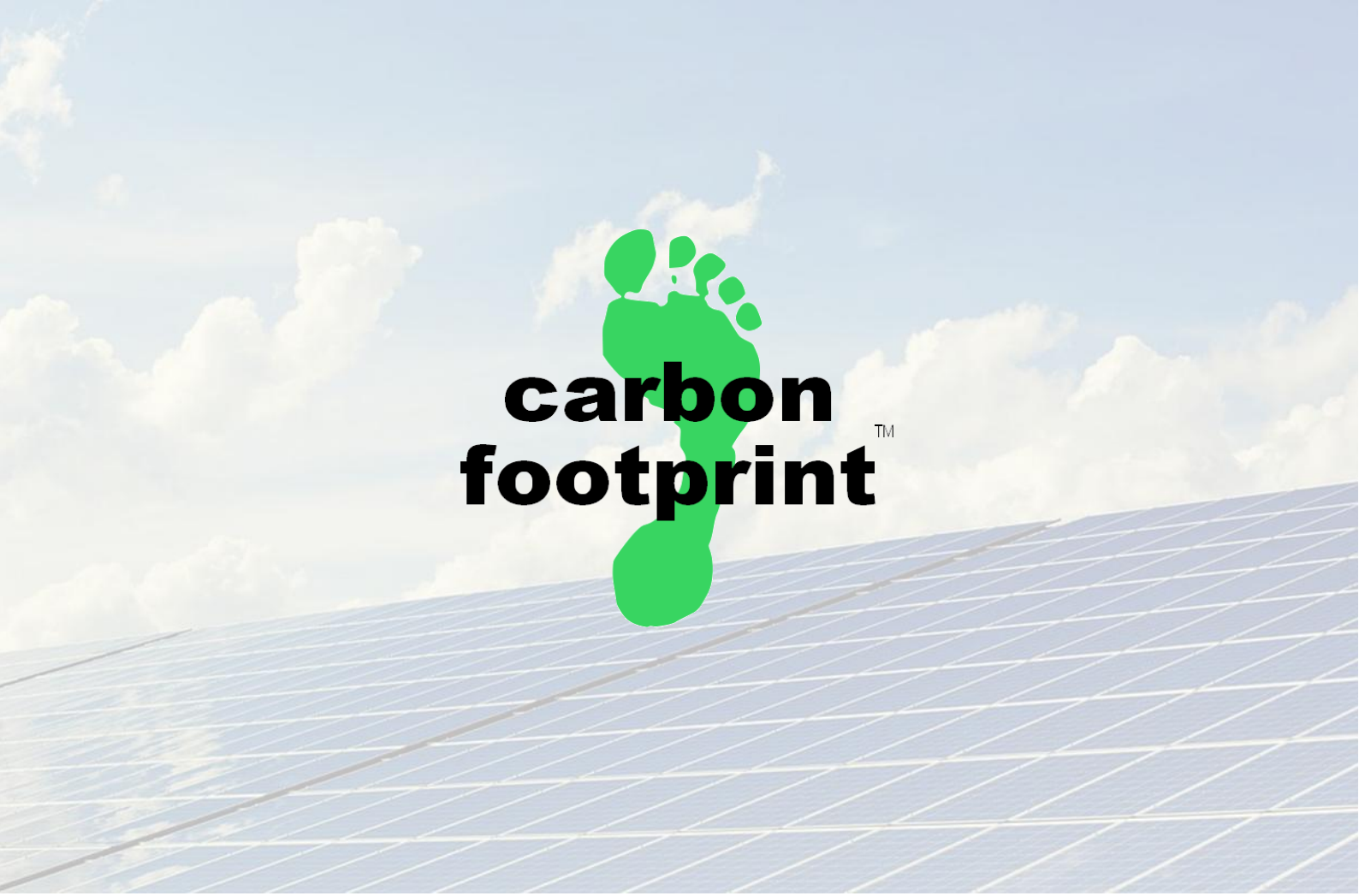


Product Footprint Verification Report of Volex PLC's JLR Mode 2 NACS Charger Cable

January 2025

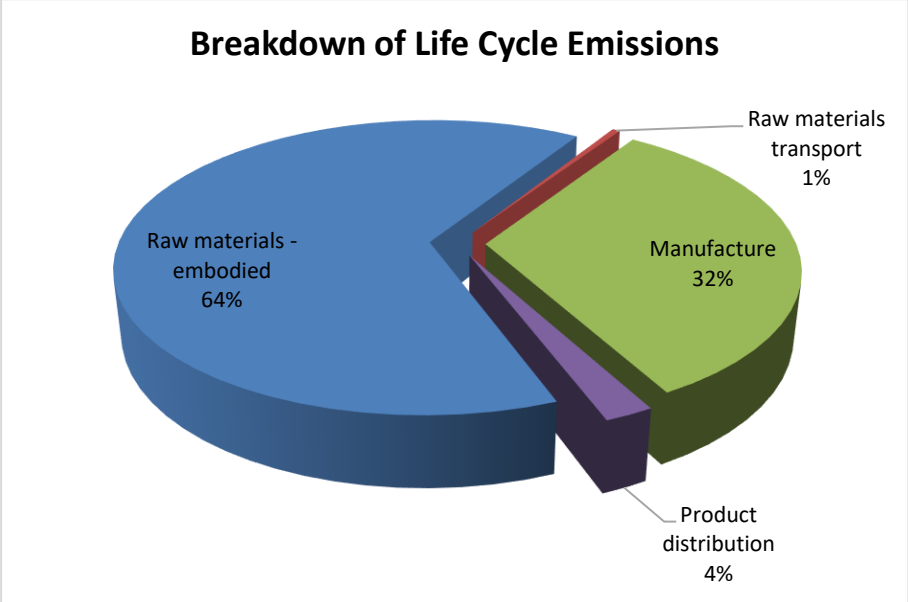
Executive Summary

This report provides a verification of the greenhouse gas (GHG) emissions associated with one of Volex PLC's (Volex) JLR Mode 2 NACS Charger Cables.

This assessment focuses on the verification of the GHG emissions calculated in house by Volex, associated with the following carbon life cycle analysis stages: embodied GHG emissions from the product's raw materials, the transport of the raw materials to the manufacturing facility, the manufacturing process, and the distribution of the product to its suppliers.

Total verified ***Cradle-to-Gate*** product life cycle emissions for one of Volex's JLR Mode 2 NACS Charger Cable's is **24.04 kgCO_2e**. The breakdown of life cycle carbon emissions is detailed in the following Table.

Process	Life cycle emissions per JLR Mode 2 NACS Charger Cable	
	Emissions per life cycle stage (kgCO_2e)	Percentage contribution to total emissions
Raw materials - embodied	15.29	63.6%
Raw materials transport	0.20	0.8%
Manufacture	7.67	31.9%
Product distribution	0.88	3.7%
Total kgCO_2e	**24.04**	**100%**



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Verification summary

Verifier:	Olivia Hollos, Environmental Consultant, Carbon Footprint Ltd
Report reviewed by:	Myles Howard, Senior Environmental Consultant, Carbon Footprint Ltd
Authorised by:	Dr. Wendy Buckley, Managing Director / Co-Founder Carbon Footprint Ltd

1. Introduction

1.1 Scope of this Assessment

The aim of this assessment is to verify the ***Cradle-to-Gate*** carbon life cycle emissions assessment completed by Volex for a single JLR Mode 2 NACS Charger Cable.

Verified carbon emissions for the product assessed in this report include those derived from the extraction and processing of raw materials, the transport of the raw materials to the manufacturing facility, the manufacturing process, and the distribution of the product to its suppliers.

1.2 What is a Life Cycle Assessment (LCA)?

LCA is the assessment of the environmental impacts of a product or service during its life cycle. It incorporates the analysis of raw materials, manufacture, transport, usage, and disposal. LCAs can evaluate several environmental impacts (air pollution, ozone layer depletion, climate change, etc.) or focus on a single impact (e.g. climate change). When only climate change is considered, it is called product carbon footprint or carbon LCA.

1.3 How is the product carbon footprint calculated?

The product carbon footprint was derived from a combination of activity data provided by Volex (primary data) and emission factors extracted from internationally recognised metrics. GHG activity data was then multiplied by GHG emission factors to produce carbon metrics. This was deemed an acceptable method.

Raw material emission factors are sourced from Defra/DESNZ (2024) and IEA (2023), whilst transportation emission factors are sourced from Defra/DESNZ (2024) alone. Electricity generation emissions factors are sourced from IEA (2023), whilst emission factors for district heating (an additional energy source in the manufacturing facility) are sourced from Defra/DESNZ (2024). All emission factors used were deemed appropriate.

1.4 Abbreviations

CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
Defra	Department of Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
EV	Electric Vehicle
GHG	Greenhouse Gas
HDPE	High density polyethylene
HGV	Heavy Goods Vehicle
IEA	International Energy Agency
kg	Kilograms
km	Kilometres
kWh	Kilowatt Hours
LCA	Life Cycle Assessment
PC	Polyvinyl chloride
USD	United States Dollar

2. Calculation uncertainty assessment & materiality

The table below provides a summary of the data used in the assessment.

Table 1: Assessment accuracy, materiality and simple error analysis

GHG Category	Data source	Verifier comments
Raw materials - embodied	The total weight in kg of High-density polyethylene (HDPE) used in the outer casing was used in the calculations. The weight in kg of the different metal components also in the outer casing was used in the calculations. The specific types of metal for each component were included, but due to the availability of emission factors all materials were categorised as copper as this was the material already with the largest weight in the mix. The weights in kg of the Polyvinyl chloride (PVC) and copper that constitute the cable itself were used in the calculations.	All raw materials used in the components of the charging cable were accounted for. All emission factors used were verified as correct.
Raw materials transport	Due to the availability of information, it was assumed by Volex that all raw materials were transported via road by average HGV truck. Volex identified the location of key raw material suppliers and calculated an average distance in km between these suppliers and the manufacturing facility in China.	The distance calculation method was deemed acceptable and all emission factors used were verified as correct. The assumptions regarding the specific modes of transport were deemed acceptable also. Recommendations have been provided to Volex to improve the accuracy of these calculations in the future.
Manufacture	The manufacturing facility provided total kWh consumption for electricity and district heating for the whole facility. This information was submitted on a monthly basis by the facility into Volex's 360 sustainability reporting system. Total consumption was apportioned to the production of Volex's JLR Mode 2 NACS Charger Cable based on the proportion of Volex's annual revenue (from the charging cable alone) out of the manufacturing facility's revenue, both in USD.	Volex explained it was unable to obtain actual kWh data per product due to the charging cable's multiple different production lines. The company was also of one of many manufacturing its products in this facility. This was deemed justifiable. Therefore, the revenue

GHG Category	Data source	Verifier comments
		allocation method was deemed acceptable. All emission factors used were verified as correct.
Product distribution	Volex calculated the road distance in km between the manufacturing facility in Suzhou, China and Shanghai departure port. The second leg distance in km between Shanghai and Tilbury arrival port was also calculated, and it was assumed by Volex that the product was transported via average container ship. The final leg distance in km between Tilbury port and the supplier's site in Gaydon, UK. It was assumed by Volex that the road portion of the route was done so via average HGV truck.	All km distances and emission factors used were verified as correct. The assumptions regarding the specific modes of transport were deemed acceptable also.

3. Calculation and Data Checks

The calculations were completed by Volex using Microsoft Excel. Spot checks were carried out on the calculation methodology and the emission factors used, and the errors identified have been documented in Table 2.

Table 2: Calculation and data checks

Life cycle stage	Issue	Recommendation/Action	Comment/action by Volex
Raw materials - embodied	Volex have confirmed that the remaining 30% of the cable's weight is made from PVC plastic, but the material's embodied emissions are not calculated.	Include these embodied emissions in your raw material calculations.	Updated to include the weight in kg of this element, which has then been multiplied by the correct emission factor.
	The calculation of the embodied emissions for the copper element of the cable is using the emission factor for HDPE.	Replace with emission factor for copper.	Updated.
Raw material transport / Product distribution	The emission factor used for average HGV truck travel is for the 'km' unit, however the factor is being multiplied by a tonne.km figure.	Replace with average HGV truck emission factor for the 'tonne km' unit	Updated.
Product distribution	Leg 1 distance from the manufacturing facility in China to Shanghai port is not included	Include this journey leg.	Updated using actual km distance.

4. Conformance with verification criteria

Carbon Footprint Ltd has examined Volex's GHG statement in relation to the ISO 14067:2018 reporting guidelines. The verification activities have shown that Volex has met the verification criteria satisfactorily.

Relevance – the data collected and reported reflects the significant environmental impacts of the product life cycle.

Completeness – emission sources that come within the reporting boundary have been quantified and reported where possible. Exclusions (if applicable) have been disclosed and justified.

Consistency – methodologies are documented and appear to be consistent.

Transparency – the carbon footprint report states the company's approach to data collection and the estimations that were made.

Accuracy – sufficient accuracy has been achieved. Actions to improve data accuracy and reduce uncertainty have been identified.

5. Carbon Footprint Standard

Carbon Footprint Ltd has reviewed the product carbon footprint assessment carried out by Volex, in order to assess its compliance with ISO 14067:2018. By achieving this Volex has qualified to use the Carbon Footprint Standard branding. This can be used on all marketing materials, including web site and customer tender documents, to demonstrate your carbon management achievements.

The Carbon Footprint Standard is recognition of your organisation's commitment to carbon management. The text to the right-hand side of the logo demonstrates what level you have achieved in line with international best practice.

6. Verification Team

Carbon Footprint Ltd has enabled the completion of the carbon footprints of over 20,000 businesses globally via our tools and consultancy. We are confident that we bring independent, ethical conduct, fair representation, due professional care and fresh insights to carbon management and verification activities.

We work with a vast range of companies, from SMEs to multinational blue-chip corporations with goals to comply with legislation, cut the cost of carbon in their business, maximise sales by developing true sustainable credentials and prepare for future legislation.
We are a world leading carbon footprinting company:

- We follow international standards, such as ISO14064-1, PAS2050, GHG Protocol, ISO14064-3 within our work
- We are ISO 14001:2015 and ISO 9001:2015 certified
- We are approved under the Quality Assurance Standard (QAS) – which includes an independent check of our online carbon calculators.
- We work with other businesses to complete/validate GHG emissions for their Mandatory GHG Reporting and CDP reporting requirements
- We run the Carbon Academy (for peer group learning)
- We provide input and advice to the government on low carbon legislation

Olivia Hollos
Environmental Consultant
Olivia has a master's degree in Sustainability and is an associate member of IEMA. She has completed numerous carbon footprint assessments to both the ISO14064-1 and GHG Protocol Standard. Olivia has a particular interest in emerging technologies and their crucial role in shaping the future of renewable energy projects.

Myles Howard
Senior Environmental Consultant
Myles is a Senior Environmental Consultant at Carbon Footprint Ltd, with a Bachelor's degree in Environmental Sciences (Hons). He is a member of the Institute of Environmental Sciences. Myles has vast experience across a diverse range of environmental and sustainability services including bespoke tool development, GHG verifications and validations.

Dr. Wendy Buckley
Managing Director / Co-Founder Carbon Footprint Ltd
Wendy has a B.Sc. & Ph.D. in Physics and is also a Member of the Chartered Institute of Marketing with MCIM status. She has held various appointments across the globe in both the public and private sector. She has developed extensive knowledge in manufacturing, thermodynamic processes and low energy solutions. Wendy has won a number of business awards and is Chair Person of the Sustainable Business Network in North Hampshire.