Guernsey Electricity Limited

HOUSEHOLD APPLIANCE GREENHOUSE GAS STUDY 2024

UK0041759.5432_APPLIANCES STUDY 2024
JULY 2025

PUBLIC

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TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. UK0041759.5432

OUR REF. NO. UK0041759.5432_APPLIANCES STUDY 2024

DATE: JULY 2025

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EXECUTIVE SUMMARY

Guernsey Electricity Limited (GEL) is an integrated utility that generates, transmits and distributes electricity across the island of Guernsey. It also manages an interconnector with France through which a large proportion of electricity is imported.

The study aimed to compare the greenhouse gas (GHG) emissions released when consumers use electricity provided by different sources of electricity accounting for the whole lifecycle emissions produced during energy generation and distribution. The whole life cycle GHG emissions produced during electricity generation includes emissions from the below activities:

- The production and maintenance of infrastructure
- The generation, transportation and use of fuel
- Electricity lost during distribution

WSP calculated the GHG emissions released when running household appliances powered using electricity supplied by GEL or the UK grid.

This study only considered GHG emissions released from generation of the electricity and not from the production, maintenance and disposal of the appliances.

The results demonstrate that appliances powered by the GEL General Mix and GEL Importation Mix produce significantly lower emissions than appliances powered by the UK Grid. The emissions from GEL General Mix are 70% lower than the UK Grid emissions. The emissions from GEL Importation Mix are 98% lower than the UK Grid emissions.

METHODOLOGY

The study aimed to compare the greenhouse gas (GHG) emissions released when consumers use electricity provided by different sources of electricity accounting for the whole lifecycle emissions produced during energy generation and distribution. The whole life cycle GHG emissions produced during electricity generation includes emissions from the below activities:

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CALCULATION OF GREENHOUSE GAS (GHG) EMISSIONS

The release of GHG emissions upon the use of electrical appliances was derived through the following equation:

GHG emissions *($kgCO_2e/year$)* = ***Quantity of electricity used*** *(kilowatt-hours (kWh))* X ***GHG emissions produced to generate the electricity*** *(grams of carbon equivalence per kWh) ÷ 1000*

ESTIMATING THE QUANTITY OF ENERGY USED FROM HOUSEHOLD APPLIANCES

The study estimated the average annual energy consumption (kWh/year) from the below appliances.

- Washing machine
- Dishwasher
- Tumble dryer
- Slow cooker
- Electric oven
- Electric Hob
- Kettle
- Microwave
- Direct hot water cylinder

The average consumption value for washing machines, dishwashers, tumble dryers, kettles, microwaves, electric ovens and electric hobs were extracted from the *Electrical Products Data Tables (Table_A3) for Energy Consumption in the UK (ECUK)* (2024)[1]. For the slow cooker and dehumidifier, average annual consumption were calculated using figures from an appliance energy consumption blog[2]. This was sense checked against manufacturer data on power usage for various

[1] Department for Energy Security and Net Zero, Energy consumption in the UK 2024 - ECUK 2024: Electrical products data tables (Excel), Accessed May 2025
[2] Nimble Fins, How Much Electricity Does My Appliance Use? From Fans to Slow Cookers, Accessed May 2025

makes and models of slow cookers[3] and dehumidifiers[4] and was deemed representative. Where high and low values for power (watts) were provided, the median value was used. For direct hot water cylinders, the average annual consumption was calculated using Neptune's Direct Unvented Cylinder and usage figures from the Energy Use Calculator.[5,6]

GHG EMISSIONS PRODUCED TO GENERATE THE ENERGY

Emission factors represent the GHG emissions generated by activities. This study focuses on emission factors for producing a specific amount of electricity, which vary based on the generation process. Table 1 shows the emission factors for GEL's electricity tariffs and UK Grid Electricity.

Table 1 - Emission factors 2024

Emission factors 2024	Emissions factor (gCO_2e/kWh)
GEL General Mix (Lifecycle Emissions Intensity of all GEL's Distributed Electricity)[7]	81.8
GEL Importation Mix (Lifecycle Emissions Intensity of GEL's Imported Distributed Electricity)[7]	6.2
UK Grid Electricity (Lifecycle Emissions Intensity of the UK Grids Distributed Electricity)[8]	275.2

ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this study:

- This study only considered GHG emissions released from generation of the electricity and not from the production, maintenance and disposal of the appliances.
- In the absence of Guernsey-specific data on the average annual energy consumption for household appliances, industry averages have been sourced and used in this study.
- At the request of GEL, direct hot water cylinders have used for this study. Direct hot water cylinders are designed to accommodate properties where external heat sources are not available. They operate using electricity which powers inbuilt immersion heaters. For this study a direct hot water cylinder that operates using electricity to power two inbuilt 3kW immersion heaters for 3 hours a day for 365 days a year has been chosen.

[3] AO, Slow Cookers AO Search, Accessed May 2025
[4] Currys, Dehumidifiers Search, Accessed May 2025
[5] Neptune, Neptune Direct Unvented Cylinders | Electric Heating Company, Accessed May 2025
[6] Energy Use Calculator, Electricity usage of a Water Heater, Accessed May 2025
[7] Guernsey Electricity Ltd, GEL Corporate GHG Emissions 2024_v1.0 15042025.xlsx, Accessed April 2025
[8] Department for Energy Security and Net Zero (DESNZ), Greenhouse gas reporting: conversion factors 2024, Accessed May 2025. This figure calculated by WSP and is the sum of the following emission factors:
- UK electricity, Electricity generated, 207.05 gCO_2e/kWh
- Transmission and distribution, T&D- UK electricity, 18.3 gCO_2e/kWh
- WTT- UK electricity, WTT- UK electricity (generation), 45.9 gCO_2e/kWh
- WTT- UK electricity, WTT- UK electricity (T&D), 3.97 gCO_2e/kWh

RESULTS AND CONCLUSIONS

Figure 1 and Figure 2 present a comparison of GHG emissions released when consumers use electrical appliances powered by different sources of electricity accounting for the whole lifecycle emissions produced during energy generation and distribution.

Figure 1 - Comparison of average annual operational emissions from household appliances powered by GEL General Mix, GEL Importation Mix and UK Grid Electricity

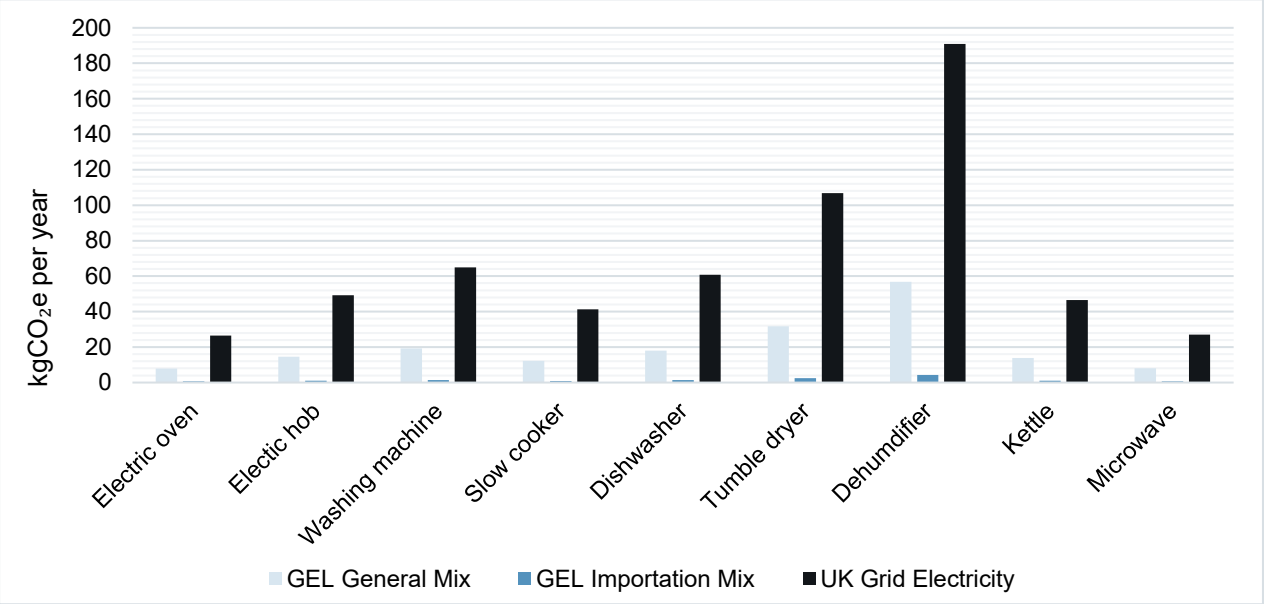
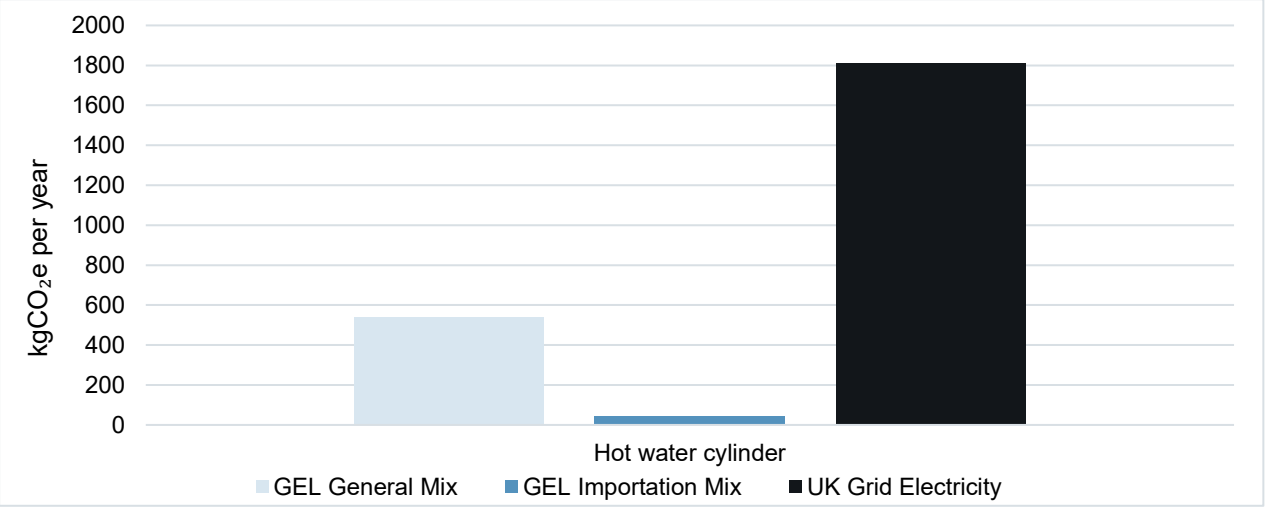


Figure 2 - Comparison of average annual operational emissions from direct hot water cylinders powered by GEL General Mix, GEL Importation Mix and UK Grid Electricity



The study aimed to compare whole life cycle GHG emissions released when consumers use electricity powered by different sources of electricity. The results demonstrate that appliances powered by the GEL General Mix and GEL Importation Mix produce significantly lower emissions than appliances powered by the UK Grid. The emissions from GEL General Mix are 70% lower than the UK Grid emissions. The emissions from GEL Importation Mix are 98% lower than the UK Grid emissions.

APPENDIX – FULL RESULTS

Table 2 - Average annual energy consumption of household appliances

Appliance type	Average annual consumption (kWh/year)	Source
Electric oven	96	ECUK 2024: Electrical products data tables
Electric hob	179	ECUK 2024: Electrical products data tables
Washing machine	236	ECUK 2024: Electrical products data tables
Slow cooker	150*	Nimble Fins, How Much Electricity Does My Appliance Use? From Fans to Slow Cookers
Dishwasher	221	ECUK 2024: Electrical products data tables
Tumble dryer	388	ECUK 2024: Electrical products data tables
Dehumidifier	694**	Nimble Fins, How Much Electricity Does My Appliance Use? From Fans to Slow Cookers
Kettle	169	ECUK 2024: Electrical products data tables
Microwave	98	ECUK 2024: Electrical products data tables
Direct hot water cylinder	6570***	Neptune, Neptune Direct Unvented Cylinders | Electric Heating Company (electric-heatingcompany.co.uk)

*estimated using the assumption of 160 Watts of power for the appliance, in use 6 hours per day for 3 days a week for a year[2]

**estimated using the assumption of 475 Watts of power for the appliance, in use 4 hours per day for 365 days a year[2]

***estimated using the assumption of two immersion heater with 6000 Watts of combined power, in use 3 hours per day for 365 days a year[5, 6]

Table 3 - Operational emissions for household appliances using the different GEL electricity tariffs and the UK grid electricity

Appliance type	Total operational emissions ($kgCO_2e$/year)		
	GEL General Mix[7]	GEL Importation Mix[7]	UK Grid Electricity[8]
Electric oven	7.85	0.60	26.42
Electric hob	14.64	1.12	49.26
Washing machine	19.30	1.47	64.95
Slow cooker	12.25	0.94	41.22
Dishwasher	18.08	1.38	60.82
Tumble dryer	31.74	2.42	106.79
Dehumidifier	56.73	4.33	190.87
Kettle	13.82	1.06	46.51
Microwave	8.02	0.61	26.97
Direct hot water cylinder	537.41	41.03	1808.20

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