

Electricity generation and use in Finland – fuels and CO_{2e} emissions Years 2013–2025

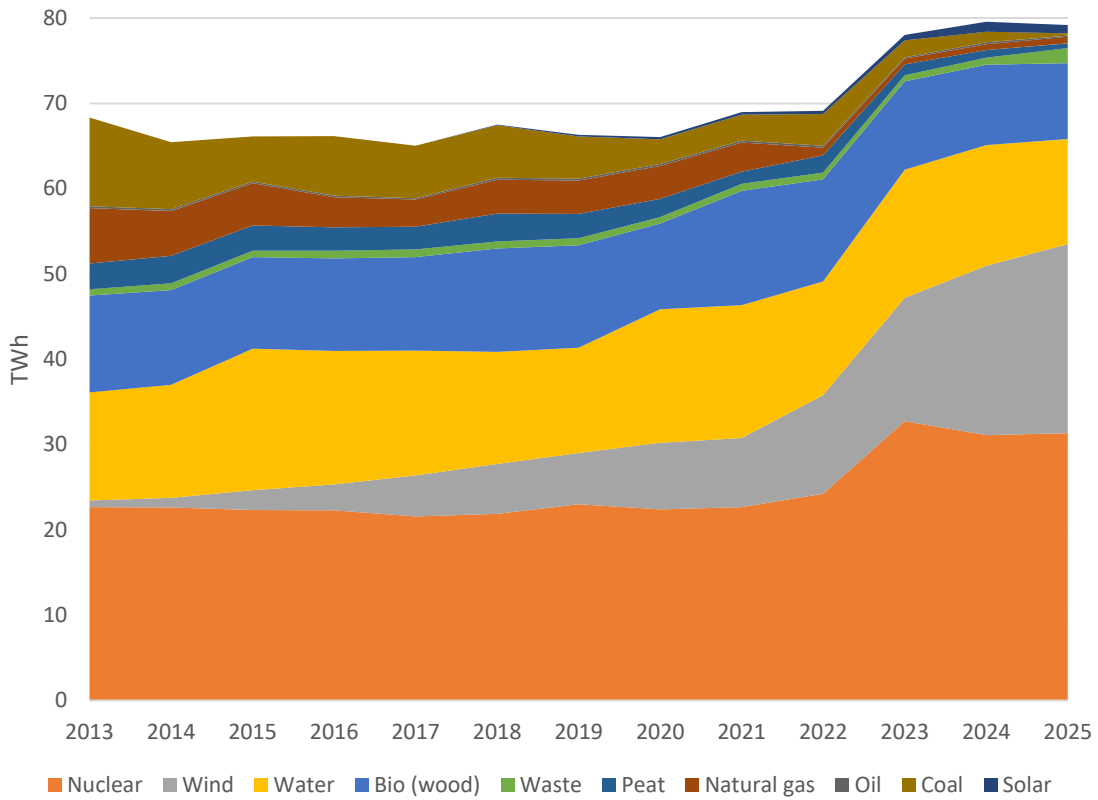
Kimmo Klemola, Cleanfi Oy 2026

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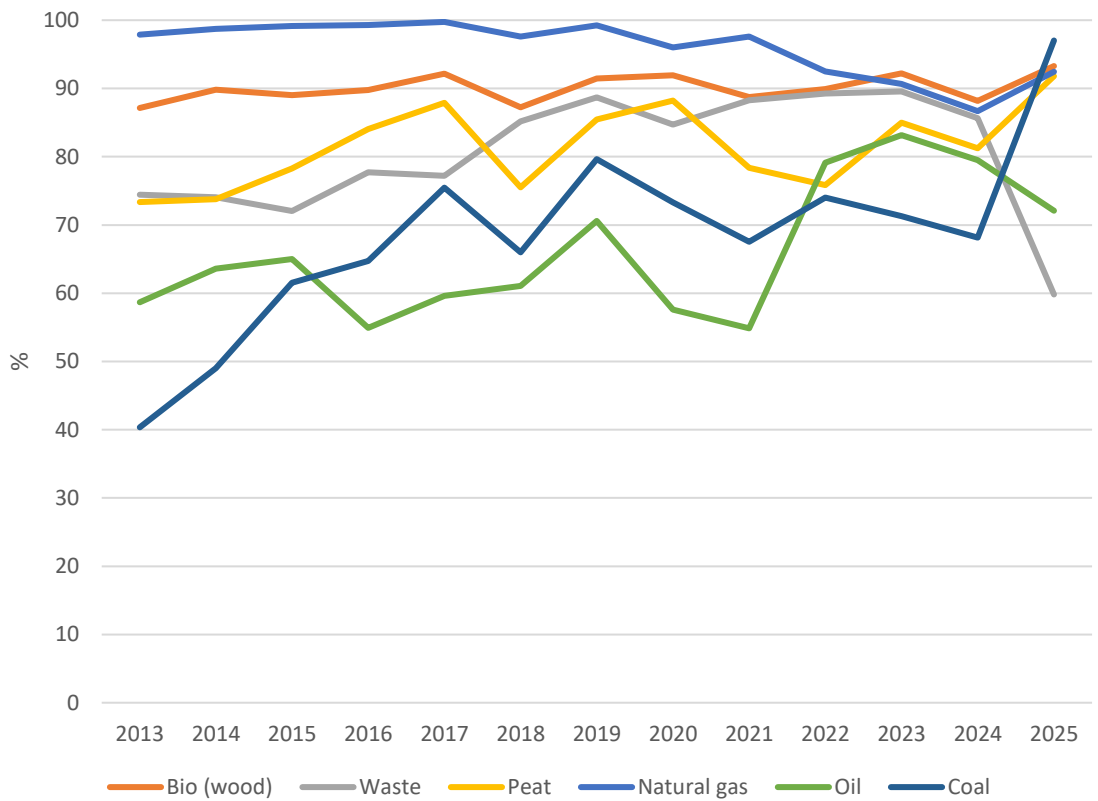
Table 1. Finland's electricity generation mix in 2025. Exports and imports are not taken into account. (Finnish Energy 2026)

Electricity source	Electricity share	CHP share
	(%)	(%)
Crude	0.00	0.00
Natural gas	0.98	92.47
Coal	0.33	97.03
Anthracite	0.00	0.00
Lignite	0.00	0.00
Manure biogas	0.00	0.00
Sub-bituminous coal	0.00	0.00
Coking coal	0.00	0.00
Petroleum coke	0.00	0.00
Oil shale	0.00	0.00
Residual fuel oil	0.16	72.09
Residual fuel oil (no gas cleaning)	0.00	0.00
Diesel oil	0.00	0.00
Peat	0.68	91.80
Wood chips (Finnish softwood)	11.24	93.28
Wood chips (Finnish softwood) small	0.00	0.00
Wood pellets (Finnish softwood)	0.00	0.00
Wood pellets (Finnish softwood) small	0.00	0.00
Wood sawdust to pellets	0.00	0.00
Wood sawdust to pellets, small	0.00	0.00
Waste and other	2.24	59.82
Hydroelectric	15.55	
Wind	28.01	
Nuclear	39.57	
Solar	1.23	
Geothermal	0.00	

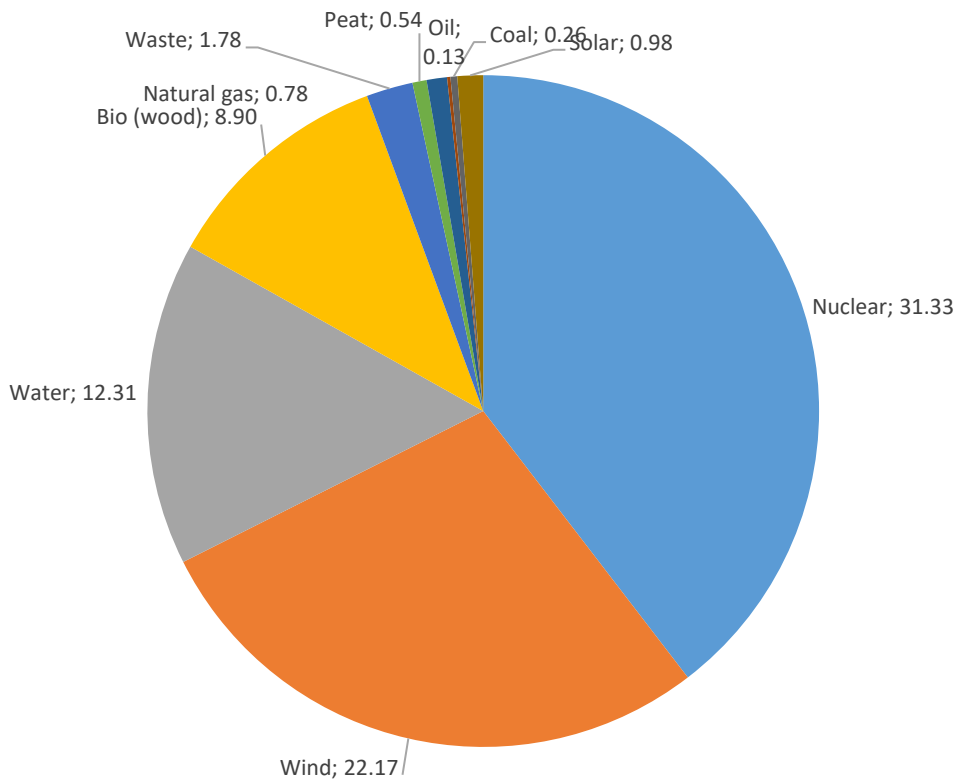
Electricity generation in Finland 2013–2025, TWh



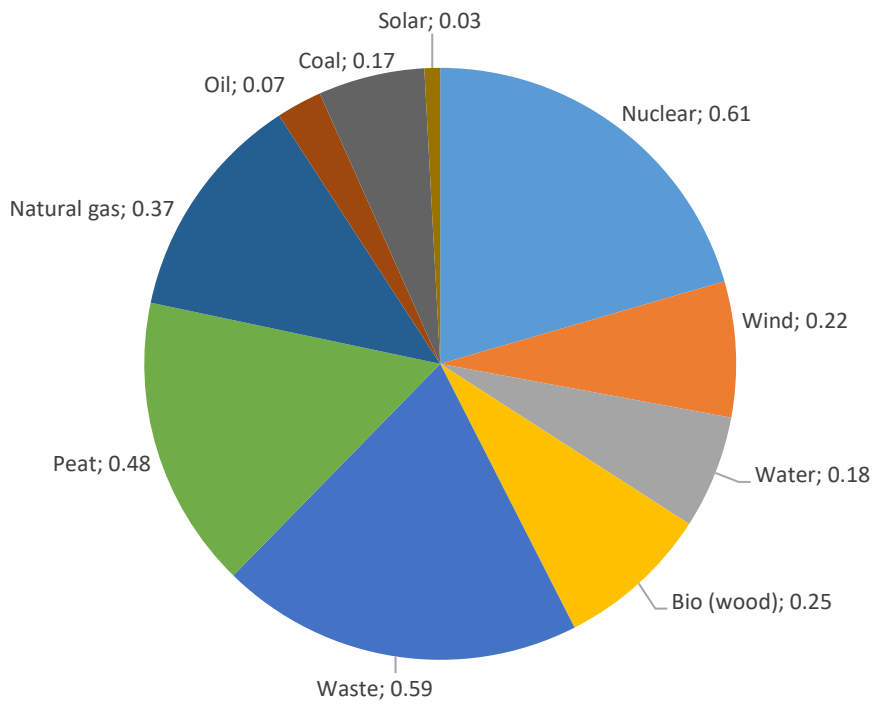
CHP share in electricity generation 2013–2025, %



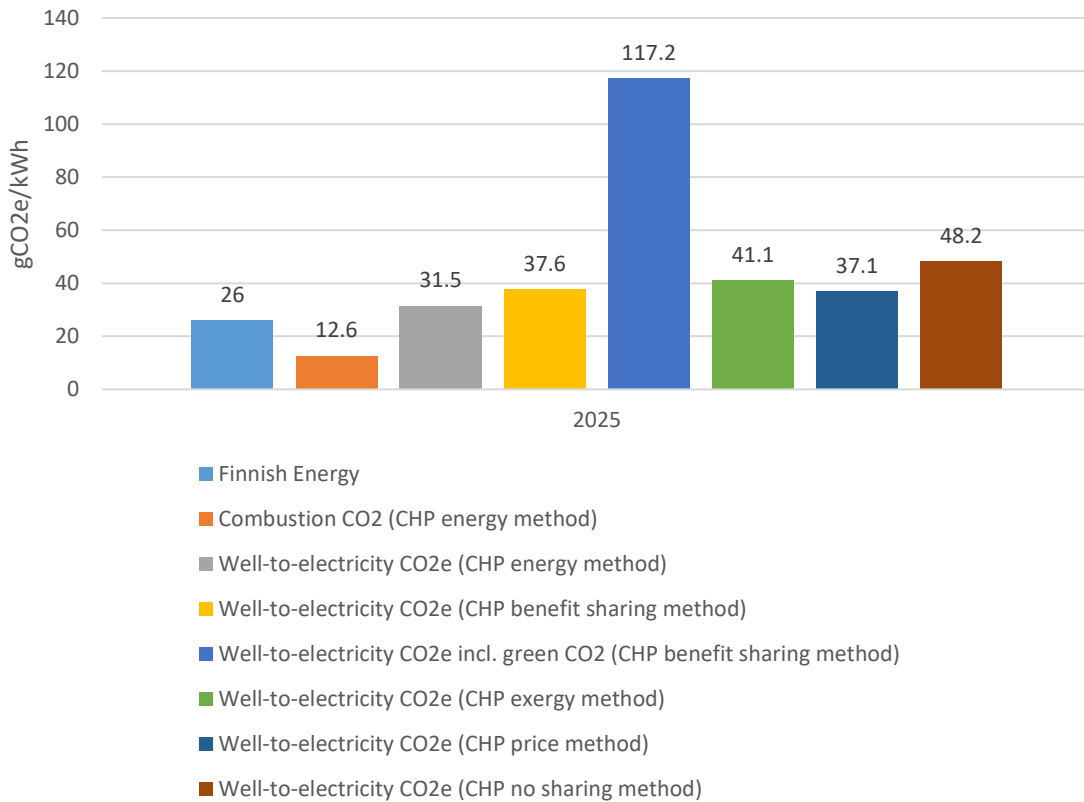
Electricity generation in Finland in 2025, (79.16 TWh), TWh



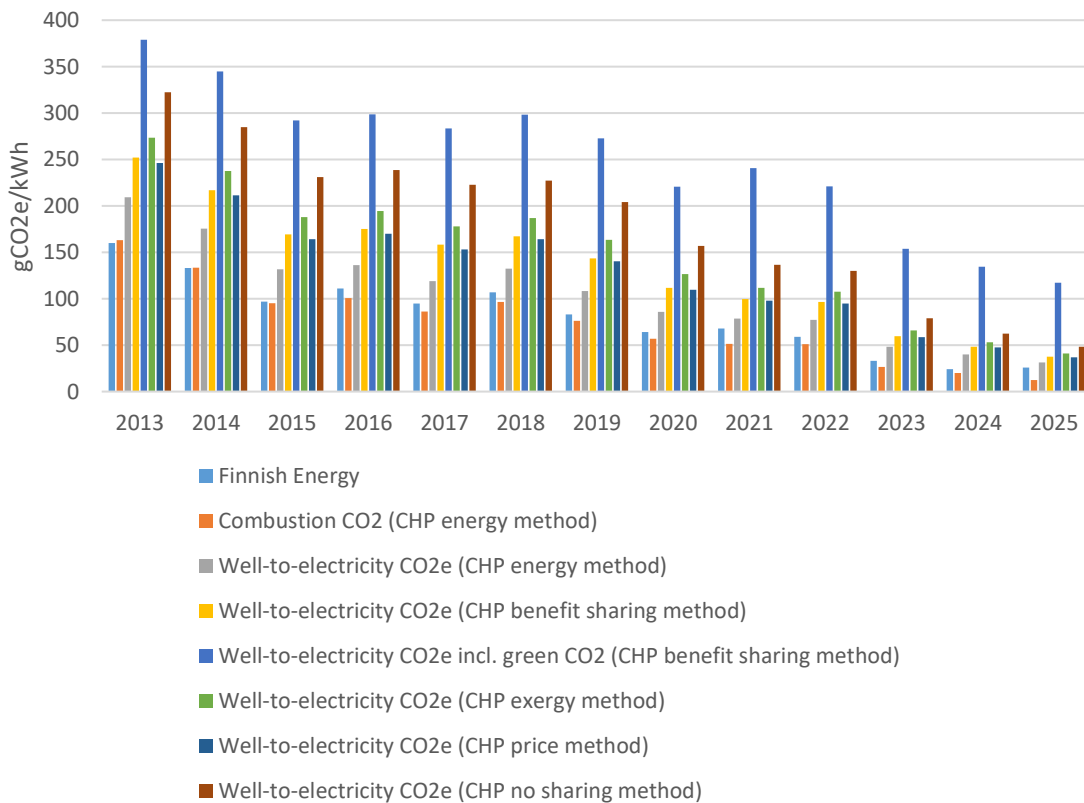
Electricity generation in Finland in 2025, (2.98 MtCO₂e, 37.6 gCO₂e/kWh), MtCO₂e (benefit sharing method)



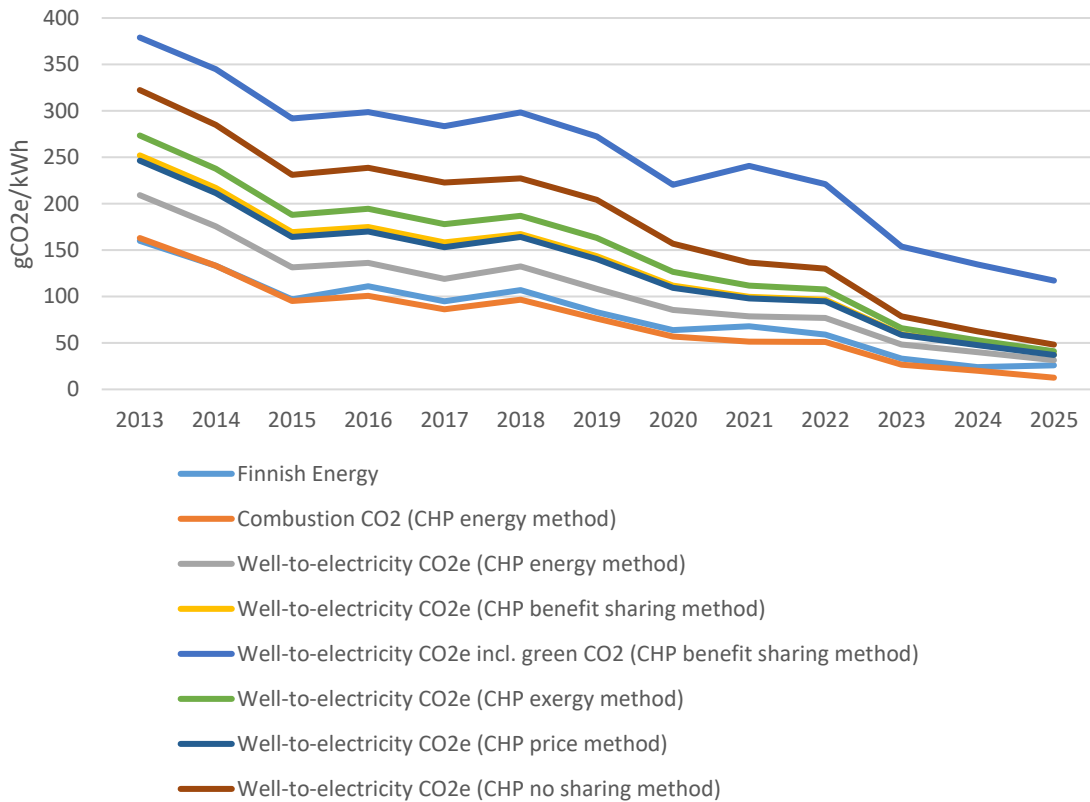
Electricity generation in Finland 2025, gCO₂e/kWh



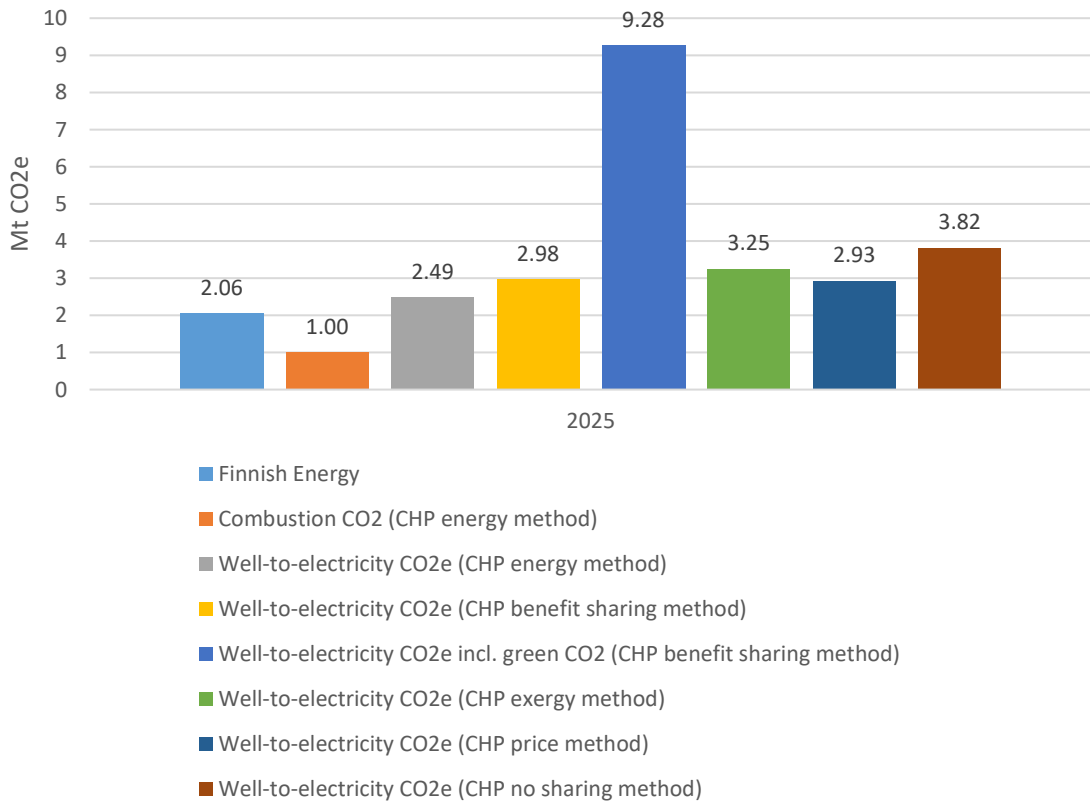
Electricity generation in Finland 2013–2025, gCO₂e/kWh



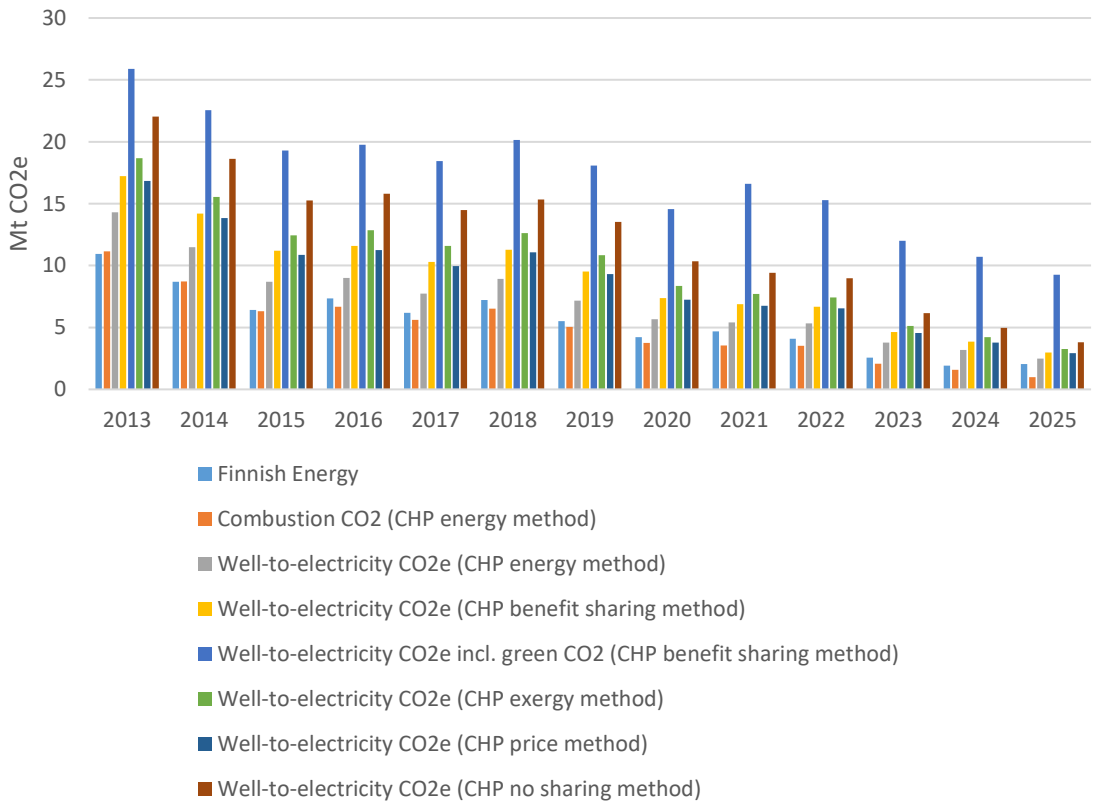
Electricity generation in Finland 2013–2025, gCO₂e/kWh



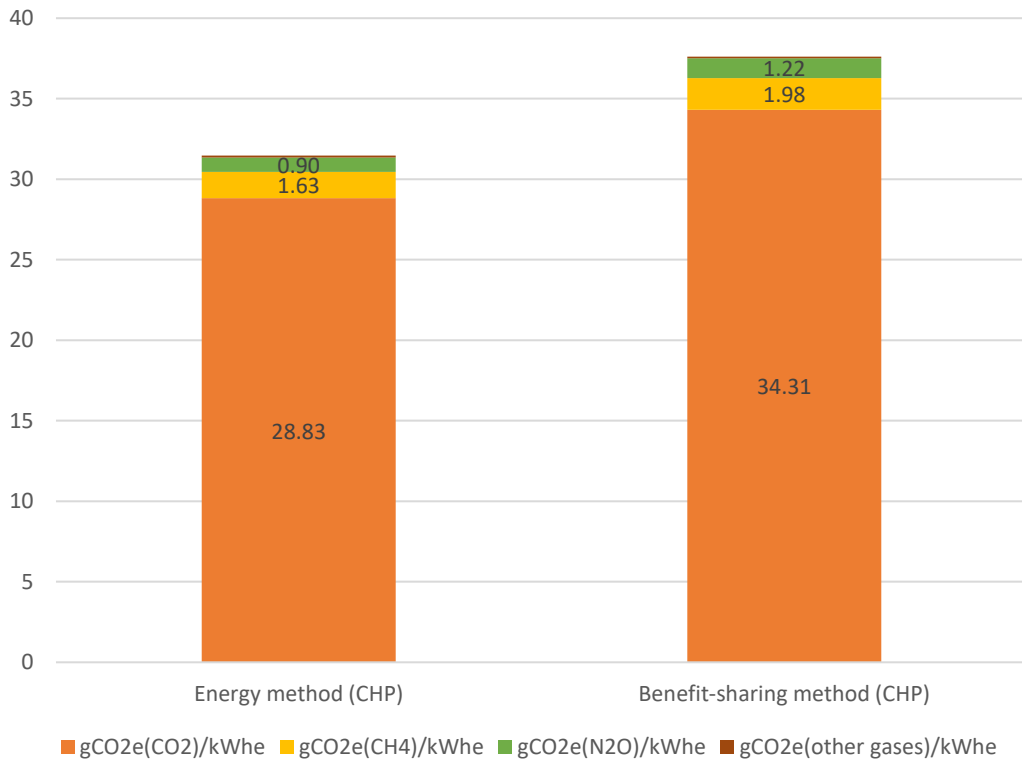
Electricity generation in Finland 2025, MtCO₂e



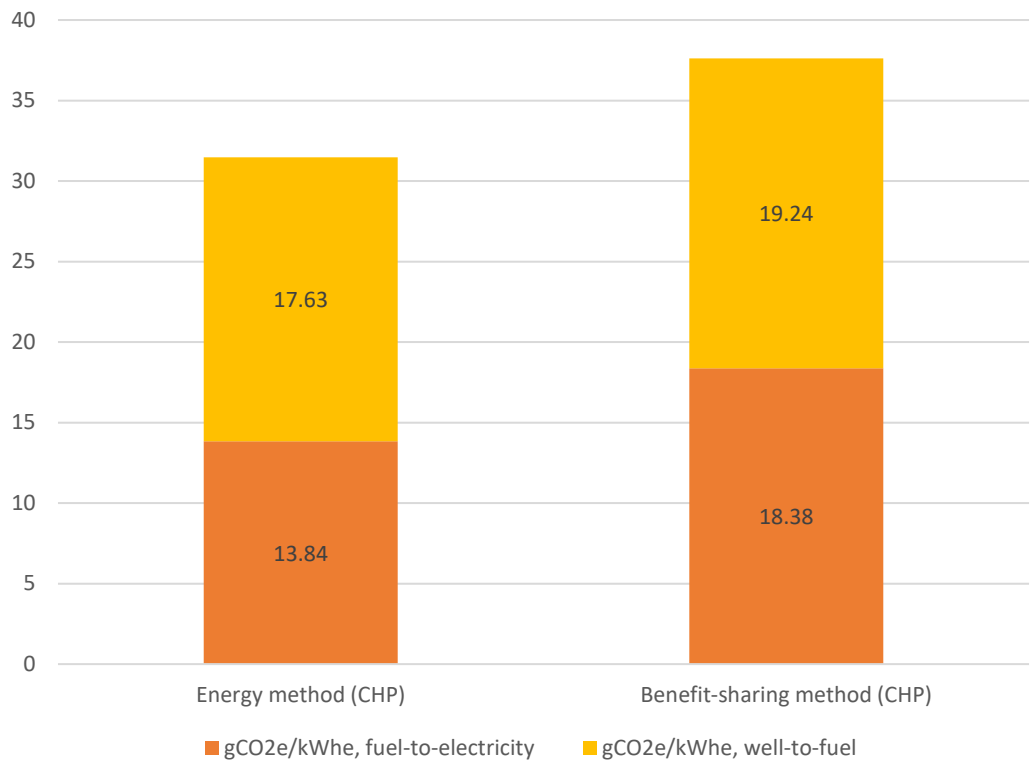
Electricity generation in Finland 2013–2025, MtCO₂e



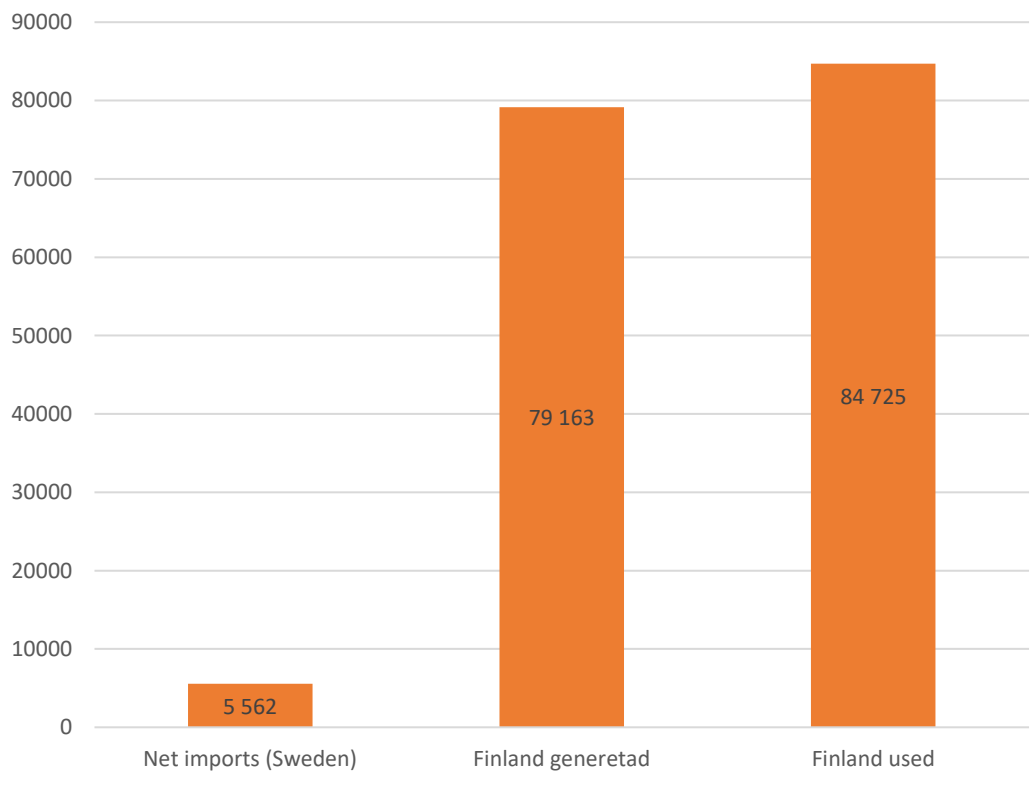
Electricity generation in Finland in 2025, gCO₂e/kWhe



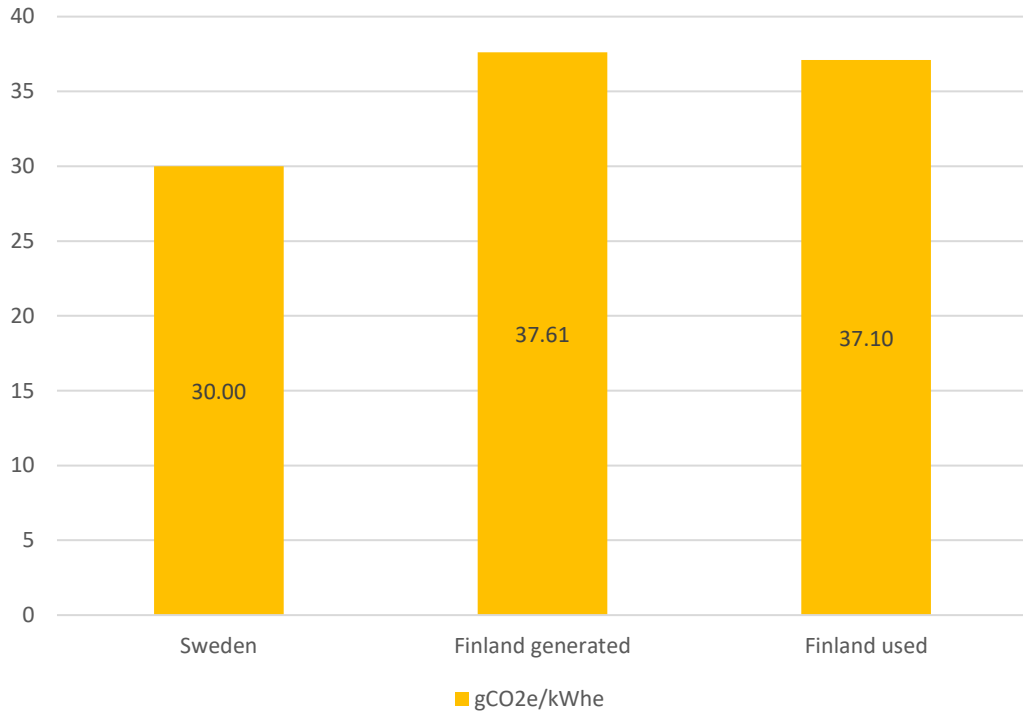
Electricity generation in Finland in 2025, gCO₂e/kWhe



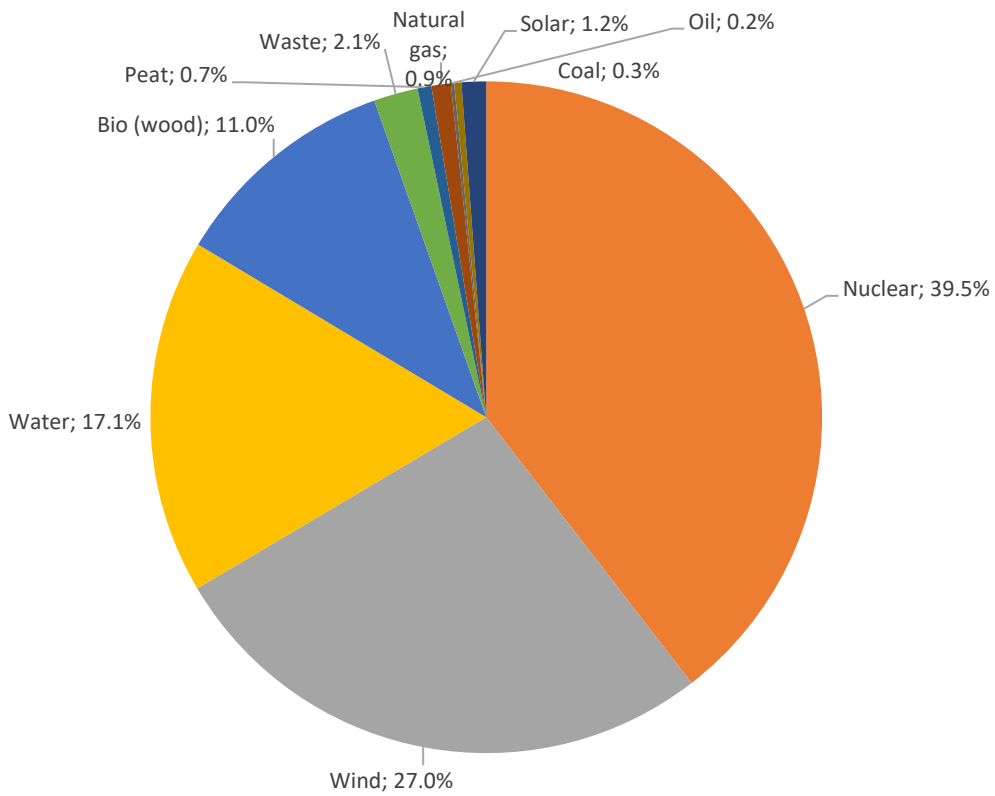
Electricity used in Finland in 2025, GWh

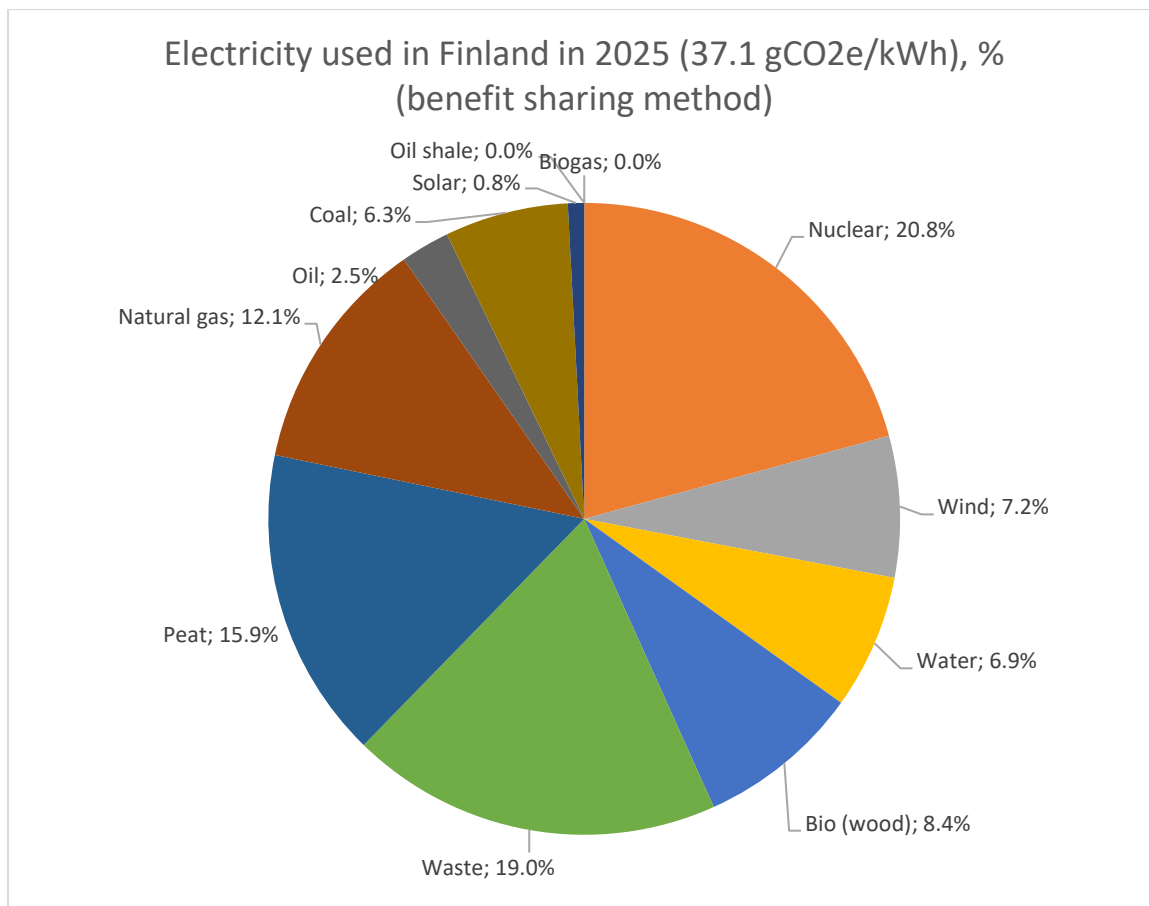


Carbon intensity of electricity used in Finland in 2025, gCO₂e/kWhe (benefit-sharing method)



Electricity used in Finland in 2025, (84.7 TWh), %





Principles and parameters

In combined heat and power (CHP) generation, the energy inputs and emissions are allocated between heat and power outputs. The principles of the allocation methods are explained by Soimakallio and Manninen¹:

- **Energy method: primary energy is allocated to heat and power on the basis of the energy (enthalpy) content of those products.** Burning 100 MJ fuel in a CHP plant generates 36 MJe usable electricity and 51 MJ heat. These values are used in this analysis. In power generation, the power station losses are taken into account.
- **Exergy method: primary energy is allocated to power and heat on the basis of the exergy content of those products.** The exergy of power is higher than the exergy of heat and thus e.g. the CO₂e emissions per kWh for power are higher than in energy method. The exergy factors used for power and heat are 1 and 0.24, respectively. These values were used by Soimakallio and Manninen.
- **Price method: primary energy is allocated to power and heat on the basis of the difference between the prices of those products.** The price of power is higher than the price of heat and thus e.g. the CO₂e emissions per kWh for power are higher than in energy method. The

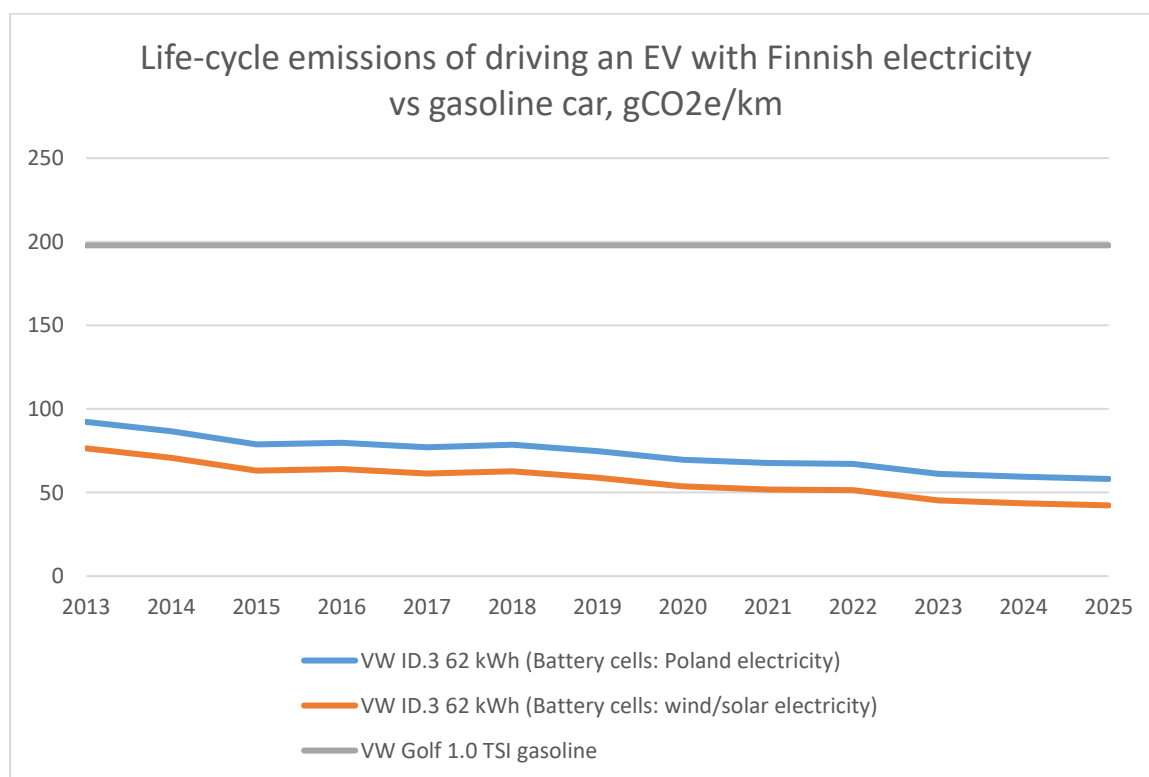
¹ Soimakallio Sampo, Manninen Jussi, Chapter 2: Energy efficiency and the Finnish energy system, in Energy Use – Visions and Technology Opportunities in Finland, VTT, Edita, 2007.

average household prices for electricity and district heat were calculated from 2015 to 2017 and were found to be 16.99 cent/kWh and 7.80 cent/kWh, respectively².

- **Benefit sharing method: primary energy is allocated to heat and power on the basis of the fuel consumption of the forms of heat and power production replaced by CHP.** The benefit for power is higher than the benefit for heat and thus e.g. the CO_{2e} emissions per kWh for power are higher than in energy method. The efficiencies of the replaced heat and power production plants used here equal to 89 % and 36 %, respectively. In power generation, the power station losses are taken into account.
- **Partial benefit sharing method: primary energy is allocated to heat on the basis of the fuel consumption of alternative heat production, and the remaining share is allocated to power.** Not calculated in this analysis.
- **No sharing method: primary energy is allocated without sharing, i.e. allocated to one product only.** If all primary energy is allocated to electricity, e.g. all CO_{2e} emissions are allocated to power.

Electric car vs gasoline car

The life-cycle emissions (gCO_{2e}/km) including car manufacturing, materials, operation (electricity, fuel), maintenance and end-of-life were calculated for Volkswagen ID.3 and Volkswagen Golf gasoline cars for a time period of 2013–2025, if the electricity is Finland’s generated electricity (benefit sharing method). Volkswagen ID.3 battery cells are manufactured in Poland, and thus Poland’s electricity mix was used in calculations. The calculations were carried out also for the case where renewable electricity is used in battery cell manufacturing (e.g. “Northvolt” batteries). Life-cycle distance driven is 298000 km.



² Statistics Finland's PX-Web databases, Price of district heating by type of consumer, Price of electricity by type of consumer.

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