Raphaël Bahisson,
rbahisson@gmail.com

November 30th, 2025

# Impacts of Transport and Heating Electrification on Great Britain's Power Demand and Market Dynamics

In 2024, the UK's total electricity demand amounted to 319 TWh, which represents a 0.5% increase compared to 2023 (*1*). In 2025, two key structural transitions are expected to push the country's demand even higher: namely the electrification of vehicles as well as the transition of residential heating from gas to electricity-based systems.

The percentage of EVs in the UK's car parc has been linearly increasing since 2021, from 1% to an estimated 5% in 2025 (*2*). Regarding residential heating, the UK has announced its goal to reach full decarbonization of domestic heating by 2050 ("Heat Pump Ready" Program). According to a UK census conducted in 2025, 77% of households are still using gas-based or oil-based heating systems (*3*).

These shifts will not only increase overall demand in the upcoming years, but also directly affect the demand patterns and therefore impact the electricity markets, pricing, volatility, and trading dynamics.

## 1. Electrification of Transport in the UK

### *a. Impact on Electricity Demand*

Assuming the number of EVs in the UK car park continues its linear growth of 1% yearly, while the total UK car parc remains stable at 34 million cars, EVs will reach the 10%-mark in 2030 and the 30%-mark in 2050 (*2*). Moreover, we exclude all other factors that could impact UK's electricity demand such as demographic factors or technological innovations. Finally, a recent report states that on average, an EV will consume 2'000 kWh of electricity per year (*4*). Therefore, an increase of 5%, respectively 25%, in the proportion of EVs within the UK car park by 2030, respectively 2050, would translate into an increase in the electricity demand of:

$$(10\% - 5\%) \cdot 34 \cdot 10^6 \cdot 2'000 = 3.4 \text{ TWh by 2030}$$

$$(30\% - 5\%) \cdot 34 \cdot 10^6 \cdot 2'000 = 17 \text{ TWh by 2050}$$

By 2030, that means EVs will be responsible for an increase of almost 1% in UK's electricity demand; and by 2050, its demand will have increased by 5.33%.

Charging these new EVs will also translate into new spikes in electric demand. Since most EV owners will charge their vehicle after work (5 PM – 9 PM), we might observe a secondary evening peak. Thanks to technologies such as smart or off-peak charging already available on EVs, we might observe shifts in the demand towards overnight hours (12 AM – 5 AM). In this scenario, daily peaks of electricity demand in the UK would be smoothed out, while its baseload would be raised. This secondary evening peak could raise the national peak demand up by 5 to 8 GW once EVs exceed 10 million units, by 2050 (*5*).

### *b. Impact on Electricity Prices and Volatility*

As we previously calculated, the introduction of EVs in the UK car park will increase the national electricity demand, which creates upwards pressure on electricity prices. This effect will be especially visible during evening peaks, when charging coincides with reduced renewables. As previously mentioned, so-called smart charging EVs will contribute to flattening peaks in electricity demand, which should help soften average price effects.

Regarding the price volatility, the electrification of transport in the UK will impact it on a daily basis. Indeed, price spikes in the evening will increase even more due to evening charging, while cheap renewable energy will still dominate the midday hours.

Overall, the electricity market in the UK will evolve toward an even greater intraday price dispersion rather than steady inflation over time.

## 2. Transition to Electricity-based Residential Heating

### *a. Impact on Electricity Demand*

Assuming the UK aims to reach the goal of the "Heat Pump Ready" Program by 2050, it needs to convert 77% of its households to electrified heating. We also assume that the number of households in the UK remains stable up to 2050, at around 28.6 million (*6*). Finally, we assume that the transition towards electric heating systems for UK homes should be linear from 2025 up to 2050:

$$\frac{77\% \cdot 28.6 \cdot 10^6}{2050-202} = 880'880 \text{ households per year until 2050}$$

Therefore, we have 880'880 households that need to transition every year up until 2050. Moreover, a regular electricity-based heating system such as a heat pump uses on average 5'000 kWh of electricity per year and household in the UK (*7*). That means, per year, the UK's national electricity demand will increase by the following:

$$880'880 \cdot 5'000 = 4.4044 \text{ TWh per year}$$

The transition to heat pumps would therefore increase the total electricity demand by 4.4044 TWh in the UK every year up to 2050. By 2030, the electricity demand will have increased by 6.90% in the UK and by 2050, it will have gone up by 34.51%, excluding all other factors that may contribute to the evolution of the electricity demand in the UK.

Moreover, residential heating is highly seasonal and weather-sensitive. Indeed, peak winter days could see an extra 20 to 30 GW of additional demand, while mild-season averages will remain the same (*5*).

### *b. Impact on Electricity Prices and Volatility*

If fully deployed, the "Heat Pump Ready" program could increase the total electricity demand by almost 35% in 2050. In this scenario, supply margins will be strongly tightened in the winter season, which will push the average prices up.

Residential heating is temperature-dependent. Therefore, this transition will only intensify winter price peaks and widening summer-winder spreads. Cold spells could cause short, sharp spikes in demand, producing extreme intraday price movements (*5*).

Unlike EVs, most heat pumps do not yet dispose of techniques such as smart changing that can flatten out peaks in electricity demand and therefore soften average price effects. Even if innovations were made in the sector of smart heat pumps with thermal storage, seasonal volatility would still keep on rising over time.

## 3. Implications for Energy-Trading Firms

The electrification of both transport and residential heating in the UK represents a structural transformation of electricity demand patterns, creating new challenges but also considerable opportunities for trading firms.

As we previously saw, the introduction of EVs and electric heating will increase intraday and seasonal price dispersion. This means an even wider range of opportunities for trading firms to trade on the spread and volatility of the UK electricity market.

Moreover, smart techniques, such as off-peak EV charging or smart heat pumps, will create predictable shifts in hourly demand. These companies can exploit these new predictable patterns via forecast-driven trading.

Furthermore, these two structural transitions in the UK electricity market will also heighten the seasonal spread between winter and summer. This effect could enable trading firms to trade forward and options strategies on UK power markets.

**Ressources**:


(1) Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy. *Digest of UK Energy Statistics*, July 31st 2025. URL: https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

(2) Zapmap. *EV market stats 2025*, November 5th, 2025. URL: https://www.zap-map.com/ev-stats/ev-market

(3) R. Agrawal, D.C.H Wallom. *Electricity demand in electrified UK homes*: the role of heat pumps, seasons and property type, June 28th, 2025. URL: https://doi.org/10.1016/j.enbuild.2025.116647

(4) Electric Vehicle Council. *How much electricity does charging an electric vehicle consume compared to typical household usage*, 2017. URL: https://electricvehiclecouncil.com.au/docs/how-much-electricity-does-charging-an-electric-vehicle-consume-compared-to-typical-household-usage/

(5) National Energy System Operator. *Future Energy Scenarios*, 2025. URL: https://www.neso.energy/publications/future-energy-scenarios-fes

(6) Office for National Statistics (ONS). *Families and Households in the UK*: 2024, July 23rd 2025. URL: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2024

(7) M. Robinson. *How much electricity does an air source heat pump use*, May 8th 2025. URL: https://futureheatltd.co.uk/heat-pumps/how-much-electricity-does-an-air-source-heat-pump-use/