

UK electrification: the road to 2050

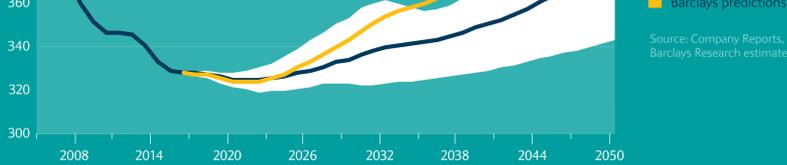
In the coming decades, transportation and heating in the UK will increasingly be powered by electricity. To ensure this rise goes hand-in-hand with a reduction in greenhouse gases, renewable energy will become even more important.

So what will it take for the UK to seize the opportunities and overcome the challenges ahead in the Energy Revolution?

Hungry for power

With the electrification of transport and heating, the UK's appetite for power will increase. It will need to be met in new and innovative ways over the coming decades to meet demand and reduce emissions. Compared to 2016, demand for power will grow 6% by 2030 and 22% by 2050.

Total electricity demand



Source: Company Reports, Barclays Research estimates

The biggest emitters

Currently, ground transport and heating are two of the largest carbon emitters, together producing nearly two and a half times the amount of CO₂ generated by power stations in 2016. They're also huge energy consumers, using roughly the same amount of energy that was electrified in 2016.

17%
UK power stations' contribution to greenhouse gases in 2016

40%
Heating & ground transport's contribution to emissions in 2016

Source: Committee on Climate Change, UK Government, Barclays Research Estimates.

How the UK has reduced its CO₂ emissions between 1990 and 2016

1990 2016

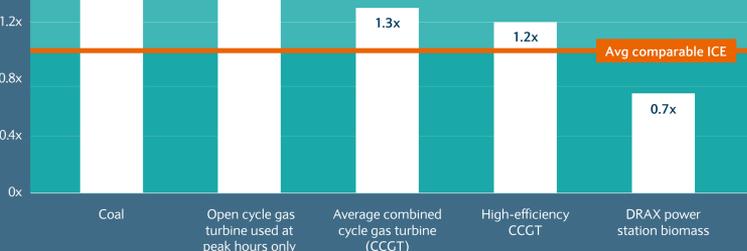


Electric vehicles to the rescue?

Electric vehicles (EVs) could help lower pollution, but it depends on where they source their electricity. If, for example, an EV is charged by electricity from a standard coal power station, it will emit nearly twice as much CO₂ during its lifespan as a similar vehicle with an internal combustion engine (ICE).

Emissions depend on the energy source

Comparing the emissions of electric* and internal combustion engine (ICE) vehicles over their life cycle



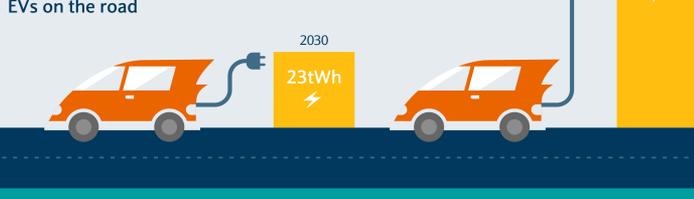
*265 mile range. Source: Drax, UCSUSA, IVL, UK Government, RAC, Barclays Research estimates

Power-guzzlers

Under the UK's new electric vehicle policy, electric vehicles are likely to need 23 teraWatt hours by 2030 and 56tWh by 2050, equivalent to 7% and 17% of total 2016 UK power demand.

Source: Company reports, Barclays Research Estimates.

One teraWatt = 1,000,000,000,000 Watts
An average fridge consumes 35 Watts per day



Investment needed
Supporting the growth in demand for energy will require significant investment in renewable energy, replacing ageing infrastructure, installing smart energy systems and electric vehicle charging stations, and providing adequate energy storage facilities.



The law of the land

The UK is committed to reducing greenhouse gas emissions by 80% between 1990 and 2050

2040
Sale of ICE cars and vans banned

2050
Use of ICE vehicles banned

Harnessing weather to meet demand

Solar and wind power are known as intermittent renewables, and in the UK supply is well matched to demand on a monthly/seasonal basis: more sun in summer and even wind in winter.

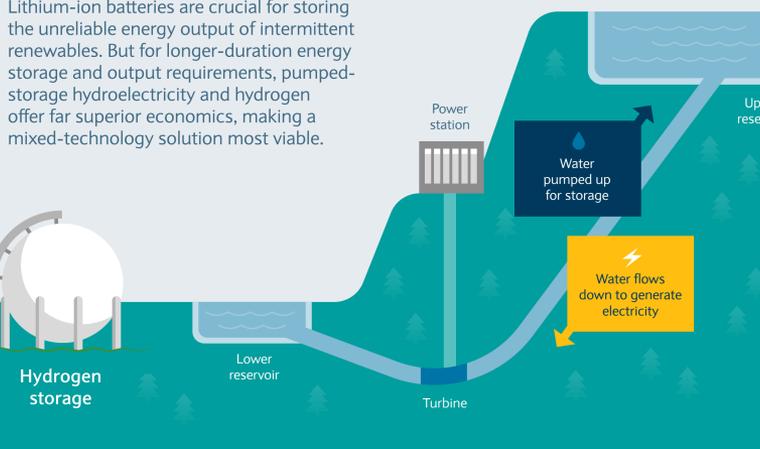


However, on a daily basis in winter when demand is at its highest, the coldest temperatures are typically accompanied by low wind speeds. This results in an inverse correlation between demand and supply. Reliable energy storage is thus essential.

Storing good energy

Lithium-ion batteries are crucial for storing the unreliable energy output of intermittent renewables. But for longer-duration energy storage and output requirements, pumped-storage hydroelectricity and hydrogen offer far superior economics, making a mixed-technology solution most viable.

Pumped-storage hydroelectricity



Hydrogen storage

The Energy Revolution

The way energy is generated is changing rapidly around the world, and governments, organisations, investors and individuals are all in search of effective ways to adapt. A successful transformation to a low-carbon future requires a focus on new technologies low on CO₂ with substantial investment in efficient energy storage, electric vehicle charging infrastructure and smart energy systems.