

Upgrading the grid



Some major UK infrastructure projects are often headline news for reasons such as cost overruns, environmental impacts or protests. Others happen in the background but are no less significant. An example is the Great Grid Upgrade, spending up to £70 billion updating the UK's national electricity grid. **Cameron Dunn** investigates

The UK's electricity supply is distributed by National Grid plc. It owns the high voltage (275 and 400 kV) network of cables and pylons that transmit electricity around the UK. It also manages nine 'interconnectors' to Europe. These are submarine cables allowing electricity to be imported or exported via the European grid. Balancing electricity generation (supply) with demand is highly complex.

In April 2025 the Spanish and Portuguese grids collapsed, causing a 10-hour blackout with significant impacts on transport, communications (mobiles and the internet), businesses and up to 60 million people. This event shows how reliant people are on an uninterrupted electricity supply, but also how

technically challenging maintaining grid stability is. Since 2024 the job of balancing the electricity supply system has been done by the nationalised company National Energy System Operator (NESO).

Old grid, new sources

The UK's electricity grid was built during a time when power stations were very large and powered by coal or nuclear energy (see Figure 1, 1990). In the last 35 years UK electricity generation has been transformed so that wind, natural gas, solar, biofuels and imports from abroad are all now important (see Figure 1, 2024). In 2024 the UK's last coal-fired power station (Ratcliffe-on-Soar) closed.

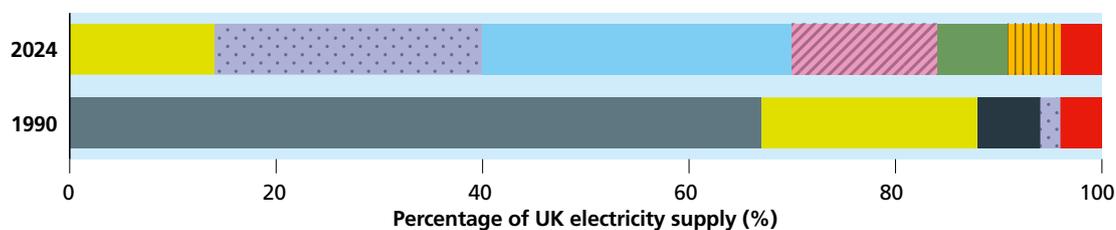


Figure 1 UK electricity generation in 1990 and 2024



Changes in energy sources used for electricity generation are significant:

- Solar and wind generation are seasonal, changing over the course of a year, whereas coal, nuclear and gas can generate electricity all year round.
- Wind and solar renewables are intermittent in terms of supply, whereas more traditional energy sources are not.
- Today's sources are more geographically dispersed, with wind and solar farms located across the country and out at sea (offshore wind), each requiring a grid connection. In the past, coal-fired power stations were concentrated above coalfields and nuclear plants were mostly coastal.

A key reason for upgrading the grid is to increase capacity to transmit electricity generated by offshore wind power in the North and Irish Seas south to where the demand is, in the Midlands and southern England.

Changing demand

Electricity demand is also changing. UK demand is expected to increase 50% by 2035 and 100% by 2050. As transport moves away from petrol and diesel engines to EVs, demand for electrical charging capacity will increase. Space-heating is likely to shift from natural gas to electricity as the UK continues to decarbonise and move away from fossil fuels. Plans for large AI data centres will ramp up demand even more. Much of the increase in demand will be met by wind and solar, and an upgraded electricity grid is needed to make this possible.

Controversial plans

The Great Grid Upgrade has two major components:

- 1 New north–south high-voltage offshore cables, mostly off the east coast.
- 2 A number of new high-voltage overhead transmission lines on land, such as a 180 km line in East Anglia.

The overhead lines are locally very controversial and have led to protests. Campaigners argue

electricity pylons spoil rural landscapes and negatively affect property prices. Many argue for burying transmission lines underground or re-routing them offshore. The industry counters that these options are too expensive to justify as extra costs would be passed on to consumers via higher bills in the future. An upgraded national grid, crucial to energy security and the move towards net zero, is not going to be cheap or without controversy.

Questions

- 1 Could energy conservation and energy efficiency reduce the need to upgrade the UK's national grid?
- 2 How should local concerns about the impact of new pylons and other infrastructure be balanced against the need to upgrade critical national infrastructure?
- 3 Would it be better to encourage economic development and growth in the UK's north, to reduce the need to transfer electricity to the south?

Further research

The European Commission EDGAR database has an inventory of greenhouse gas emissions by country:

https://edgar.jrc.ec.europa.eu/report_2024

You can explore the websites of the COP meetings here: www.cbd.int/conferences/2024 (COP16 on biodiversity) and <https://cop29.az/en/home> (COP29 on climate change).

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