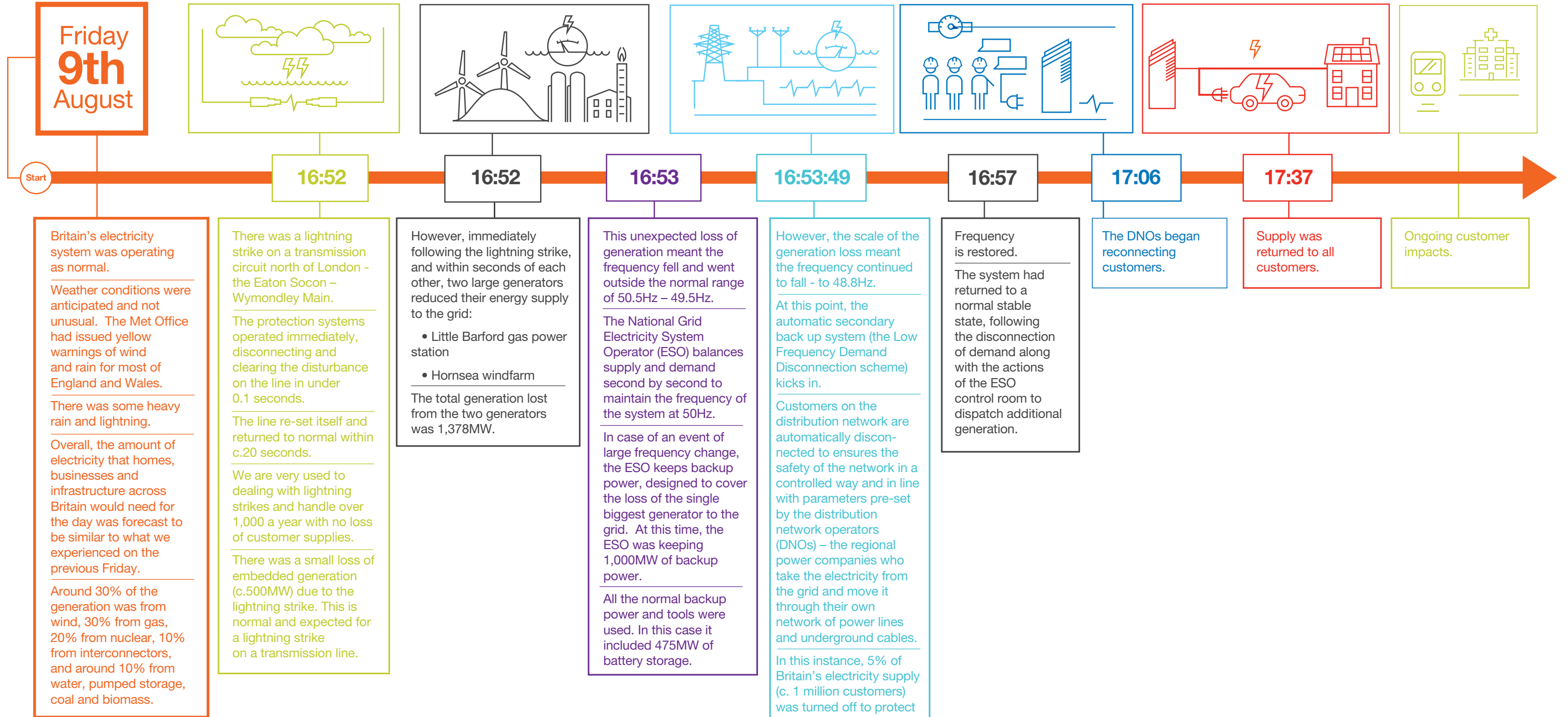


# The sequence of events of Friday 9th August 2019



Britain's electricity system was operating as normal.

Weather conditions were anticipated and not unusual. The Met Office had issued yellow warnings of wind and rain for most of England and Wales.

There was some heavy rain and lightning.

Overall, the amount of electricity that homes, businesses and infrastructure across Britain would need for the day was forecast to be similar to what we experienced on the previous Friday.

Around 30% of the generation was from wind, 30% from gas, 20% from nuclear, 10% from interconnectors, and around 10% from water, pumped storage, coal and biomass.

There was a lightning strike on a transmission circuit north of London - the Eaton Socon - Wymondley Main.

The protection systems operated immediately, disconnecting and clearing the disturbance on the line in under 0.1 seconds.

The line re-set itself and returned to normal within c.20 seconds.

We are very used to dealing with lightning strikes and handle over 1,000 a year with no loss of customer supplies.

There was a small loss of embedded generation (c.500MW) due to the lightning strike. This is normal and expected for a lightning strike on a transmission line.

However, immediately following the lightning strike, and within seconds of each other, two large generators reduced their energy supply to the grid:

- Little Barford gas power station
- Hornsea windfarm

The total generation lost from the two generators was 1,378MW.

This unexpected loss of generation meant the frequency fell and went outside the normal range of 50.5Hz - 49.5Hz.

The National Grid Electricity System Operator (ESO) balances supply and demand second by second to maintain the frequency of the system at 50Hz.

In case of an event of large frequency change, the ESO keeps backup power, designed to cover the loss of the single biggest generator to the grid. At this time, the ESO was keeping 1,000MW of backup power.

All the normal backup power and tools were used. In this case it included 475MW of battery storage.

However, the scale of the generation loss meant the frequency continued to fall - to 48.8Hz.

At this point, the automatic secondary back up system (the Low Frequency Demand Disconnection scheme) kicks in.

Customers on the distribution network are automatically disconnected to ensure the safety of the network in a controlled way and in line with parameters pre-set by the distribution network operators (DNOs) - the regional power companies who take the electricity from the grid and move it through their own network of power lines and underground cables.

In this instance, 5% of Britain's electricity supply (c. 1 million customers) was turned off to protect the other 95%.

This has not happened in over a decade and is an extremely rare event.

Frequency is restored.

The system had returned to a normal stable state, following the disconnection of demand along with the actions of the ESO control room to dispatch additional generation.

The DNOs began reconnecting customers.

Supply was returned to all customers.

Ongoing customer impacts.