



**Operating Great Britain's Electricity
Transmission System**

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Agenda

GB Electricity System

GB Decarbonisation Journey

Power Outage – 9 August 2019

Zero Carbon Operation

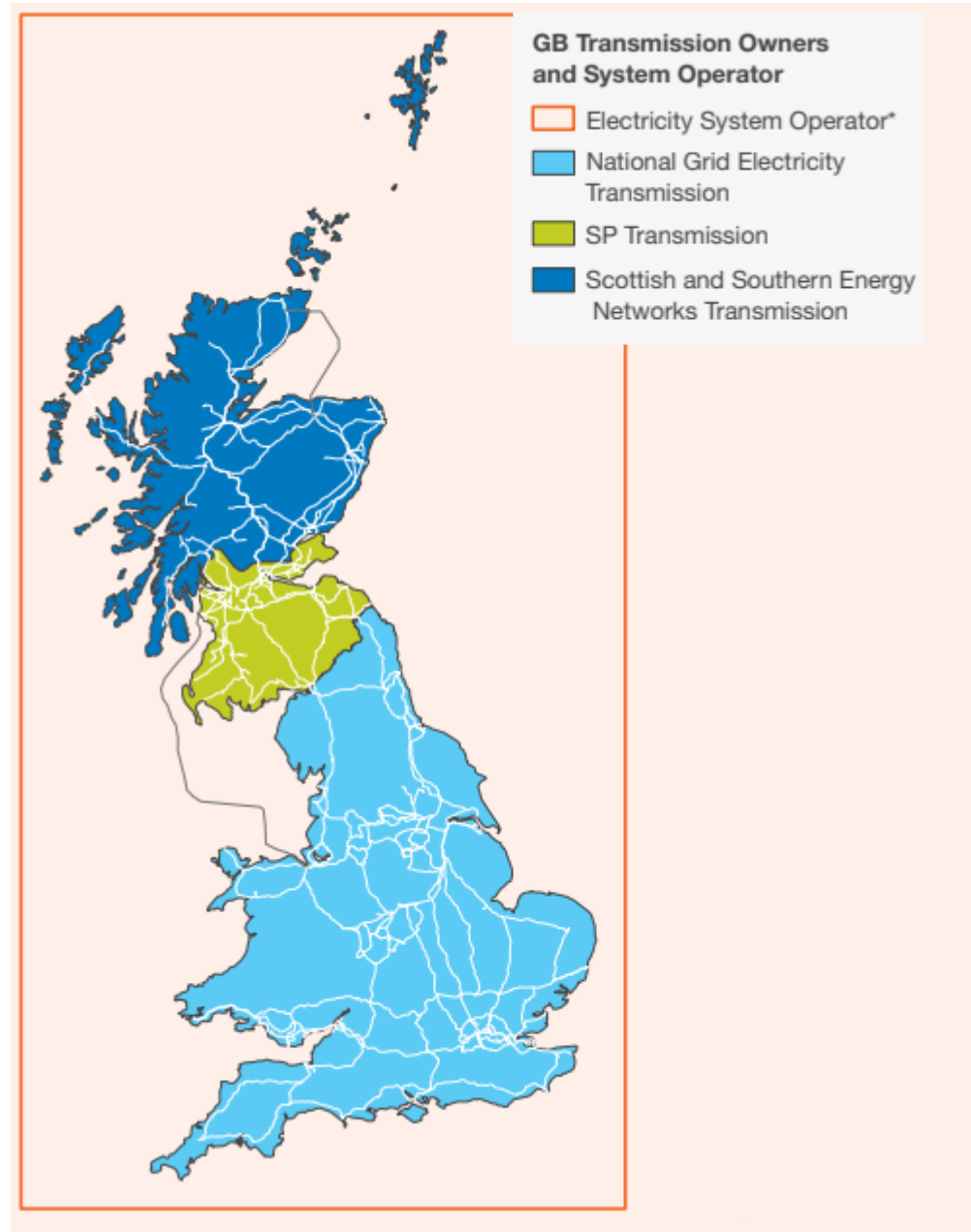
Future Challenges

General discussion

GB Electricity System

Background

- Islanded AC transmission system
- 132kV – 400kV
- Some internal HVDC connections
- 10GW of HVDC Interconnection to:
 - France
 - Belgium
 - Netherlands
 - Norway
 - Denmark
 - Northern Ireland
 - Republic of Ireland
- Peak demand – 58GW¹
- Installed generation capacity – 112GW¹
- Wind and solar capacity – 35GW¹



¹ data from [Future Energy Scenarios 2023](#)

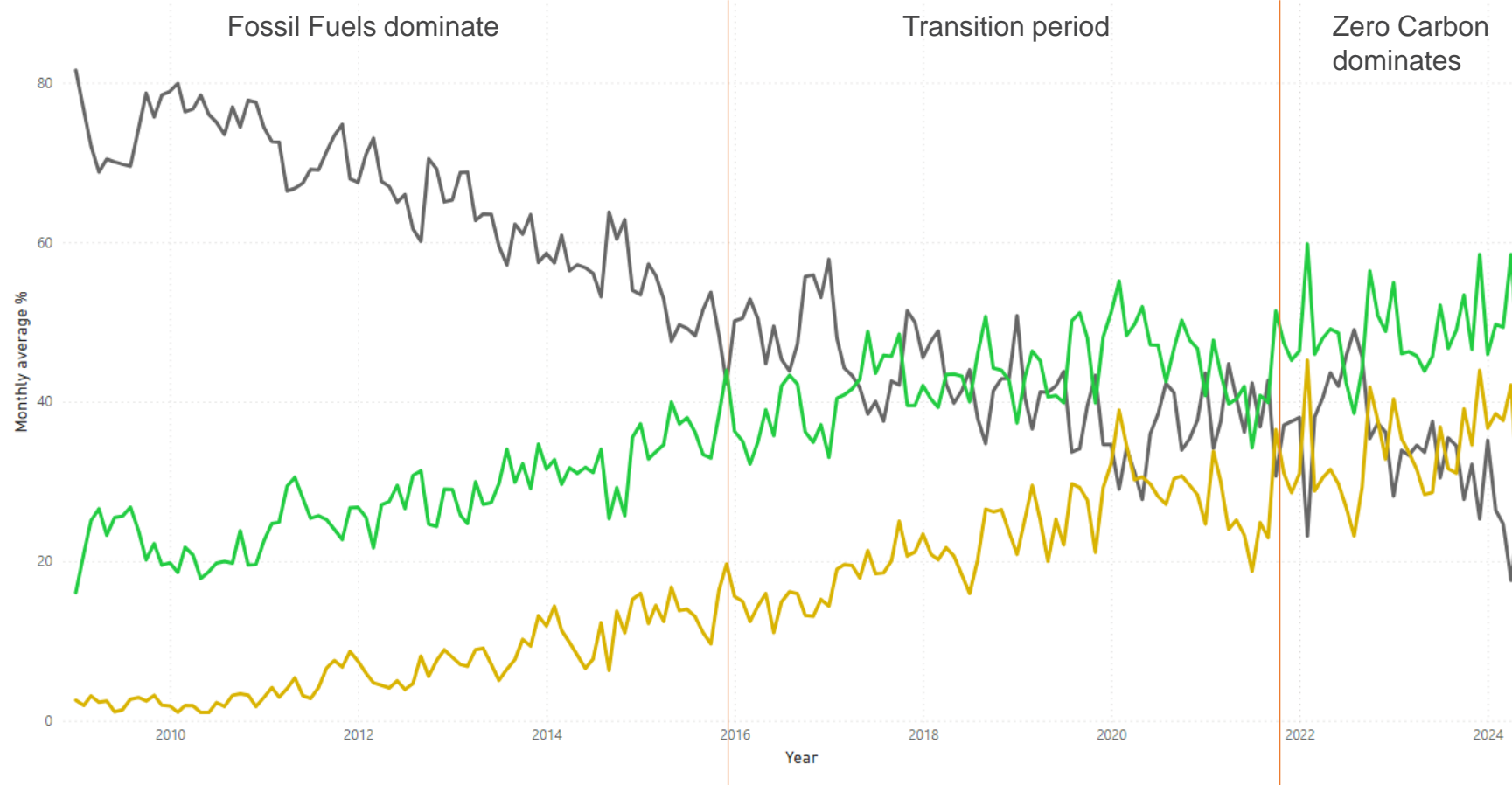
GB Decarbonisation Journey

Journey so far

- Fossil fuels have decreased 60% in a decade
- Zero carbon sources have been largely dominant since 2020
- Zero carbon sources¹ have generated more than fossil fuels for 21 continuous months
- Renewable sources² have generated more than fossil fuels for 9 continuous months

Monthly Fuel Mix Average %

● Fossil Fuel ● Zero Carbon ● Renewable



¹ zero carbon sources are wind, solar PV, hydro and nuclear

² renewable sources are wind, solar PV and hydro

Decarbonisation

What do we mean by decarbonisation?



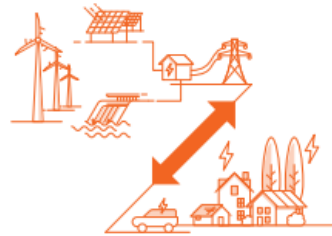
Less dispatchable generation



More asynchronous generation



More variable sources of generation



Generation moving to different areas



More variable and unpredictable demand

9 August 2019

Background¹

- Power outage affecting >1million customers
- Loss of 2GW generation
- 900MW demand automatically disconnected
- Tools and protection systems operated correctly
- Frequency restored within 5 mins
- Customers reconnected within 45 mins

Progress since

- Changes to protection settings
 - 0.125Hz/s to 0.5Hz/s
- New response and reserve products
 - Dynamic Containment
- Policy review
 - Frequency Risk and Control Report
- New network services
 - Inertia

¹ government final report [here](#)

Zero Carbon Operation

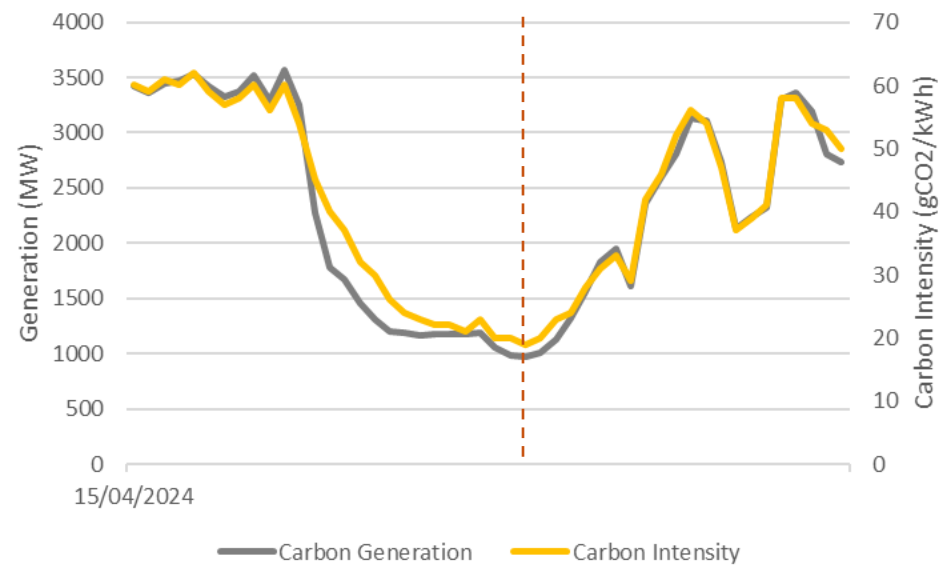
15 April 2024 at 14:00-14:30

19gCO₂/kWh

92% Zero Carbon

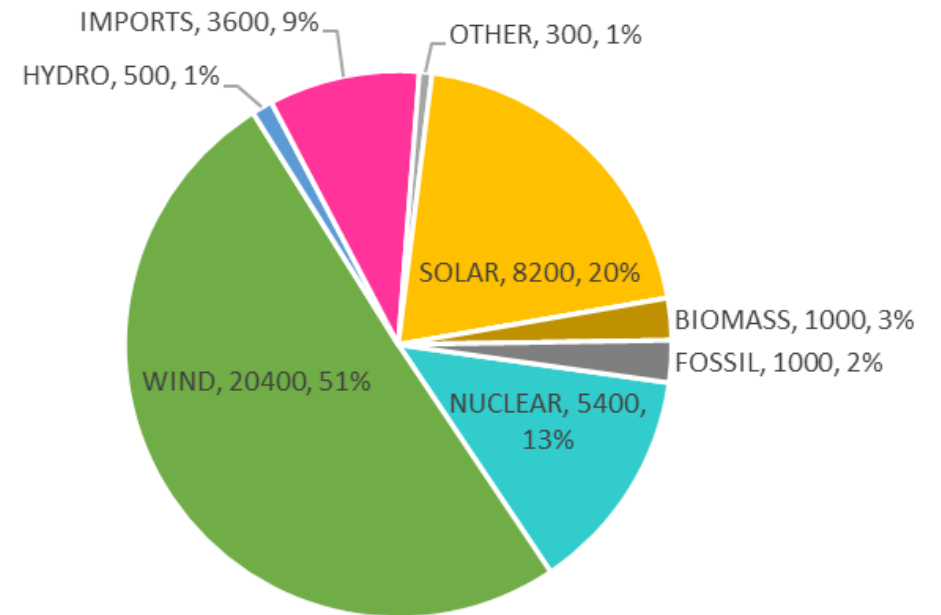
System demand – 27.1GW

*excludes embedded wind and solar



Generation Mix (MW)

*includes embedded wind and solar



Future Challenges

Increase in Inverter Based Resources

- Interaction between system controllers
- Reducing system strength
- Growth in Power Quality issues

Sufficient Energy Resources

- Large long duration storage and zero carbon generation

Flexibility

- Large demand and generation
- Consumers
- Distribution connected resources

Offshore Networks

- Meshed offshore networks

Discussion

