

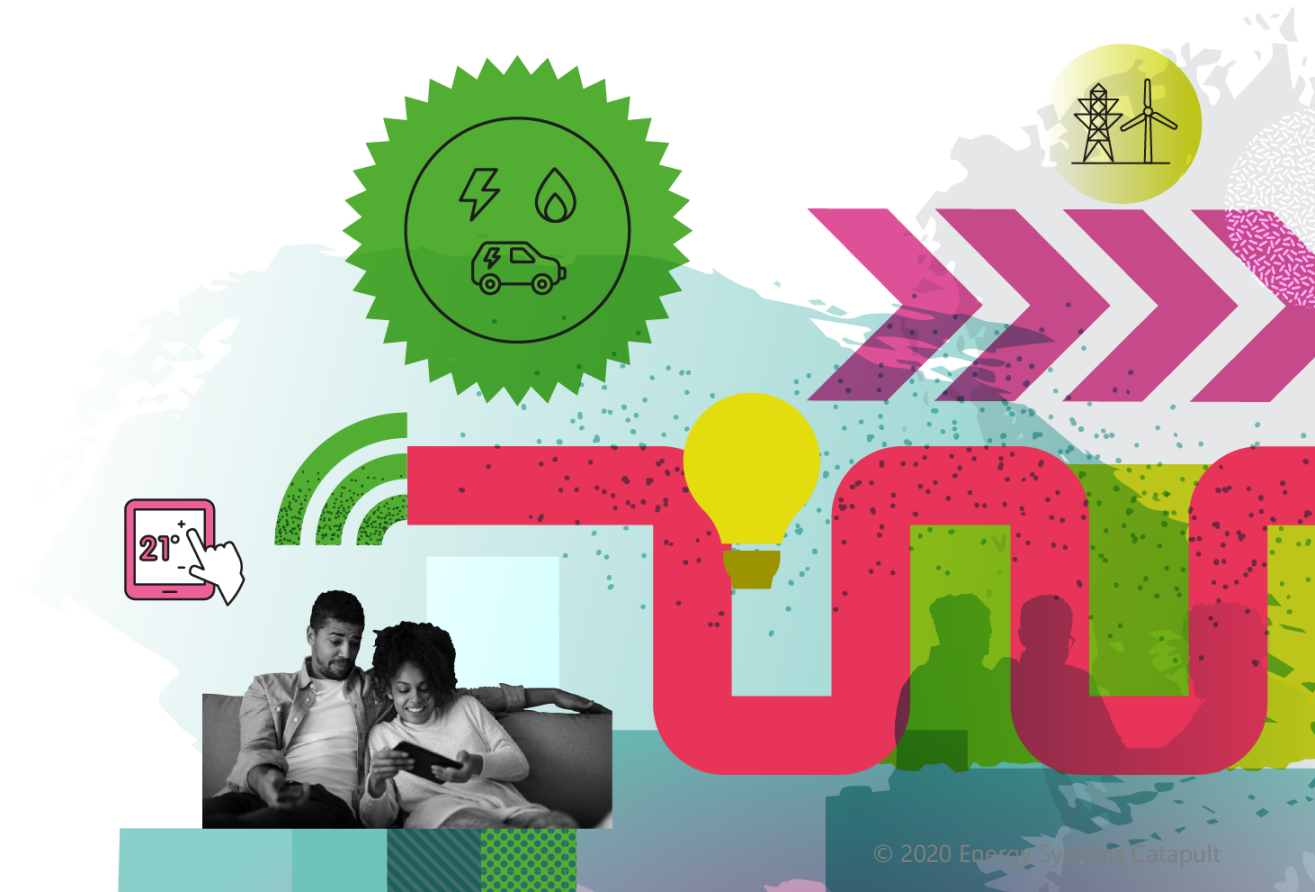
Integration of Renewable Generation onto the GB Electricity System

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 @EnergySysCat





About Energy Systems Catapult



Mission: Unleash innovation and open new markets to capture the clean growth opportunity

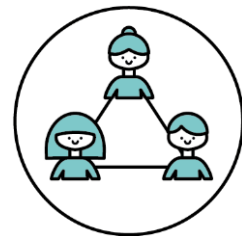
200 Innovation experts



Hubs in Birmingham and Derby



Established, overseen and part-funded by Innovate UK. Independent from Government. Not for profit



Bridge the gap between stakeholders in the sector



Supporting innovators



Research



Trials



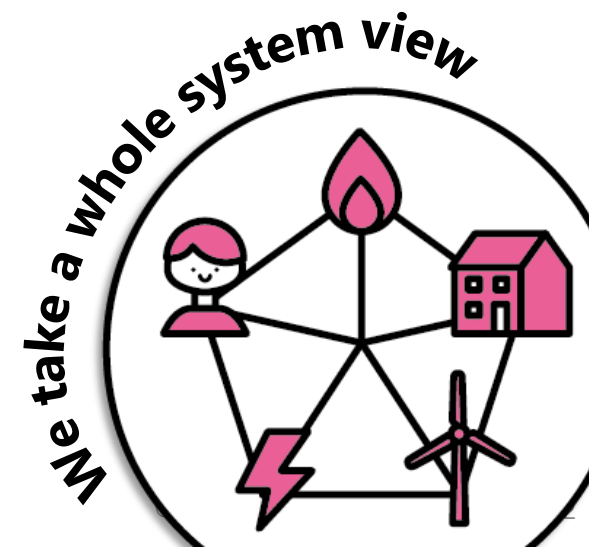
Systems engineering



Digital



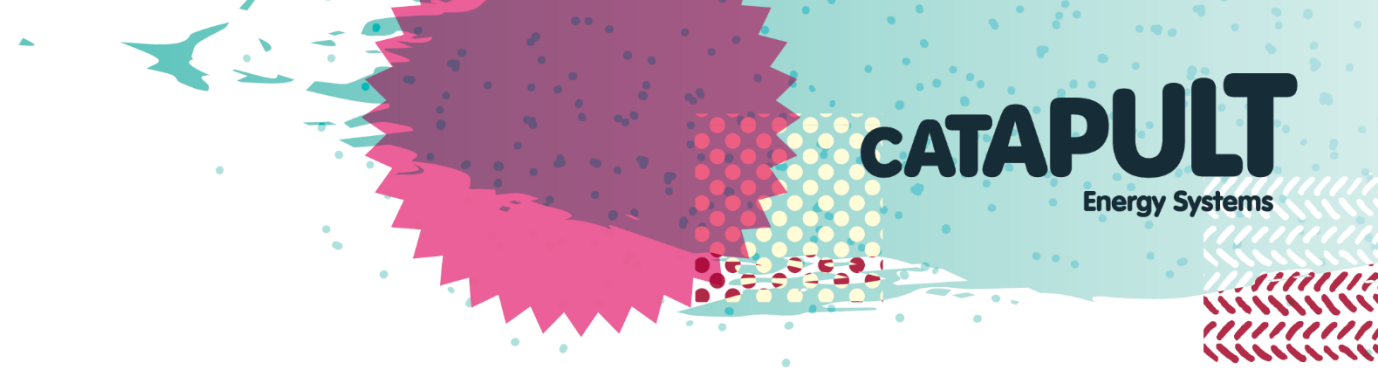
Modelling and simulation



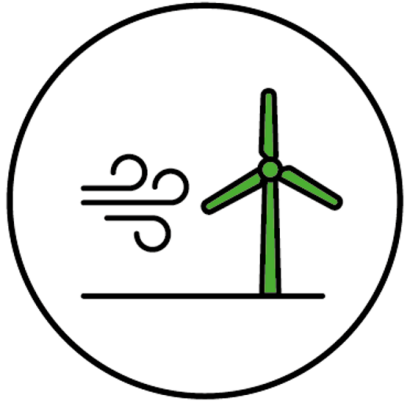
Burning coal for electricity



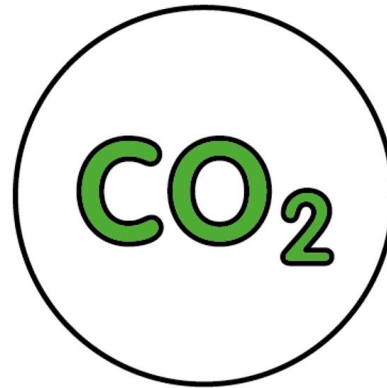
- In 1882 Holburn Viaduct power station, named the Edison Electric Light Station, was the world's first coal-fired power station generating electricity for public use.
- Fast forward to Friday 21st April 2017 and Great Britain had its first 24 hour period without coal-fired power stations
- In 2020 5,147 hours were coal free including a continuous period of 1,630 hours (almost 68 days)



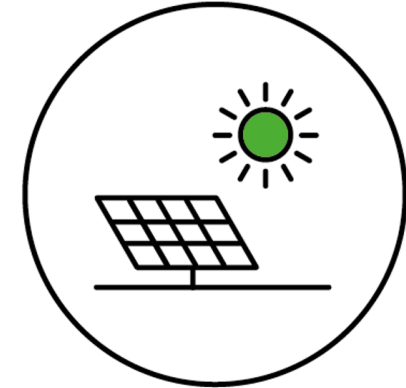
Green records



- 21st May 2021: highest ever level of wind power (17.7GW)
- 21st May 2021: highest ever share of wind power (62.5%)

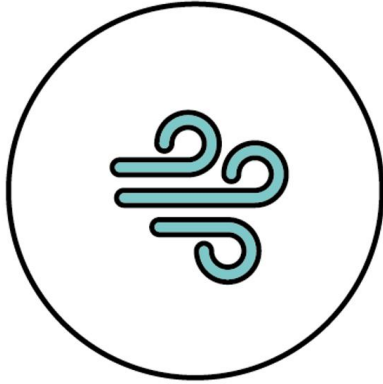


- 5th April 2021: lowest ever carbon intensity (39 gCO₂/kWh)
- 28th March 2021: highest ever share of low carbon generation (84.4%)

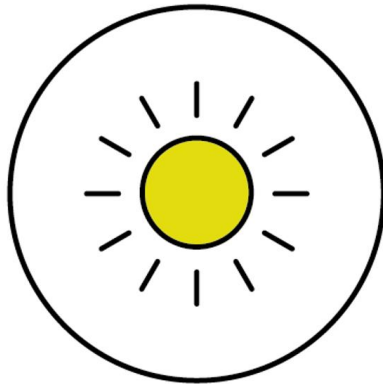


- 20 April 2020: highest ever level of solar power (9.7GW)
- 30 May 2020: highest ever share of solar power (34%)

Security of supply



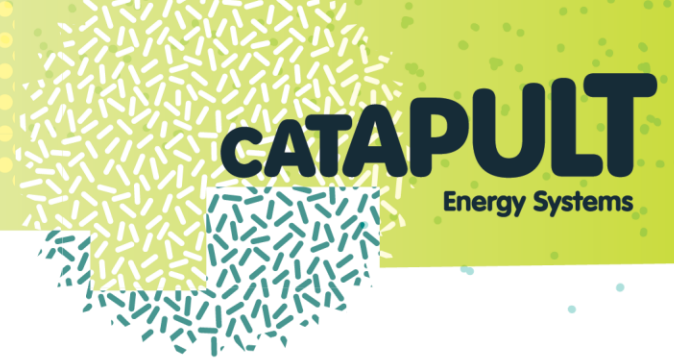
July 2020 wind generated 16% of our electricity, in July 2021 it was 11%



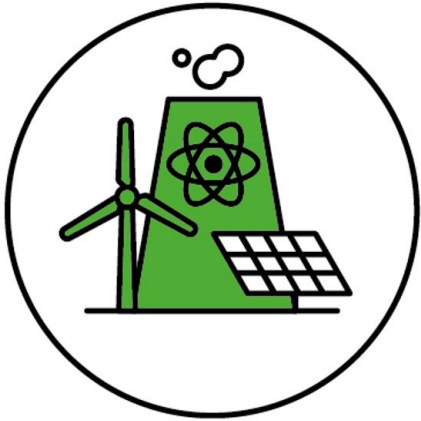
July 2020 solar generated 8% of our electricity, in July 2021 it was 7%

Managing security of supply

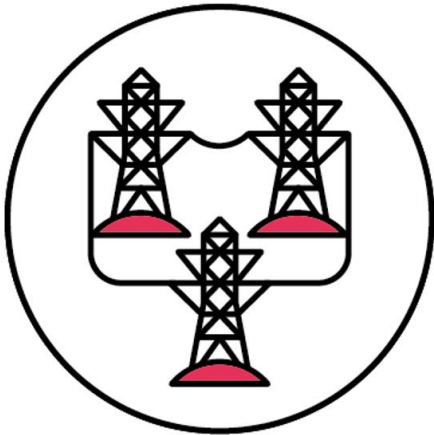
- Different storage technologies and durations
- Markets can support the security of supply
- Managing demand



Location of Generation



Large generators are being replaced by smaller energy resources



Generation is connecting to the distribution network

Visibility and control of distributed energy resources

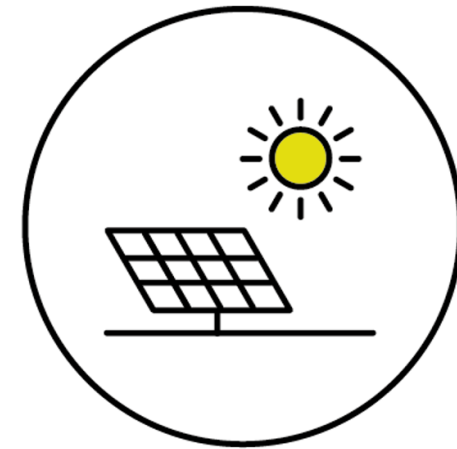
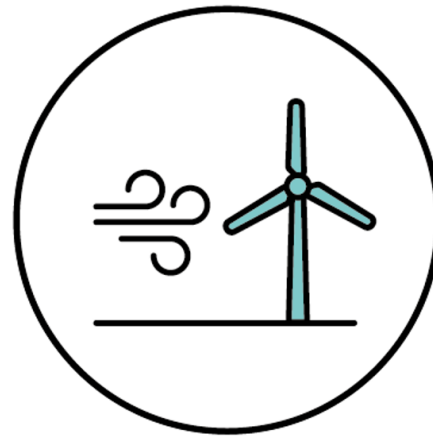
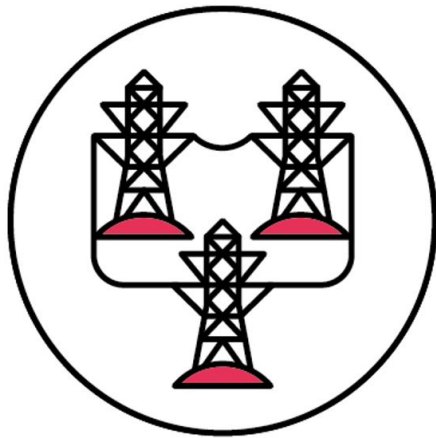


Balancing Mechanism and Wider Access

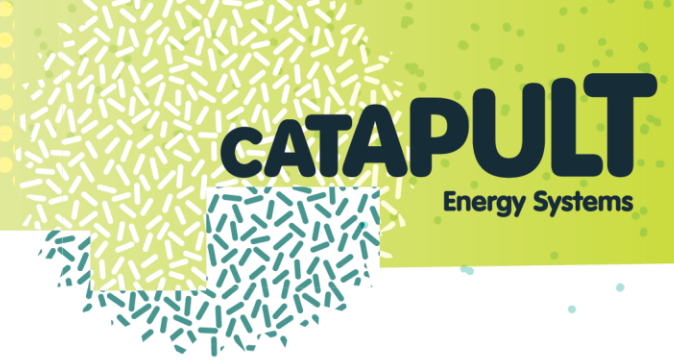


Asynchronous generation

Integration of asynchronous renewable generation has created new system constraints



Innovative solutions



Services

- Stability
- Voltage
- Frequency

Activities

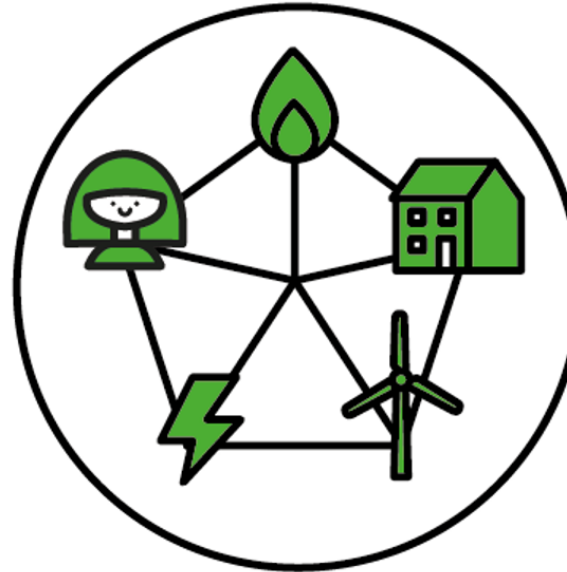
- Virtual Synchronous Machines
- Accelerated Loss of Mains Programme

Path to net zero

Government targets

- Net Zero by 2050
- 78% reduction by 2035

Future of the System Operator

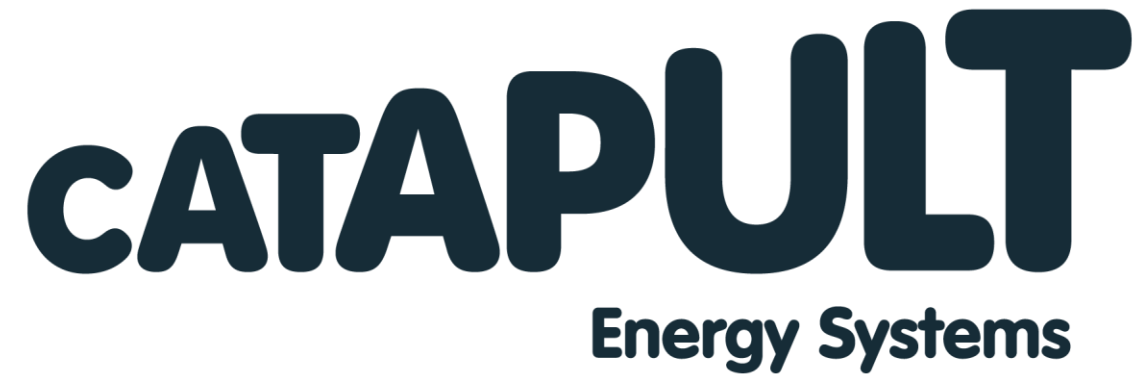


Distribution System Operators

Integration of other vectors

- Heat
- Transport

Innovation



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