UNLOCKING FLEXIBILITY

Can we build a truly flexible power system?

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Achieving a flexible power system brings accelerated decarbonisation and economic gains

Flexibility is not optional

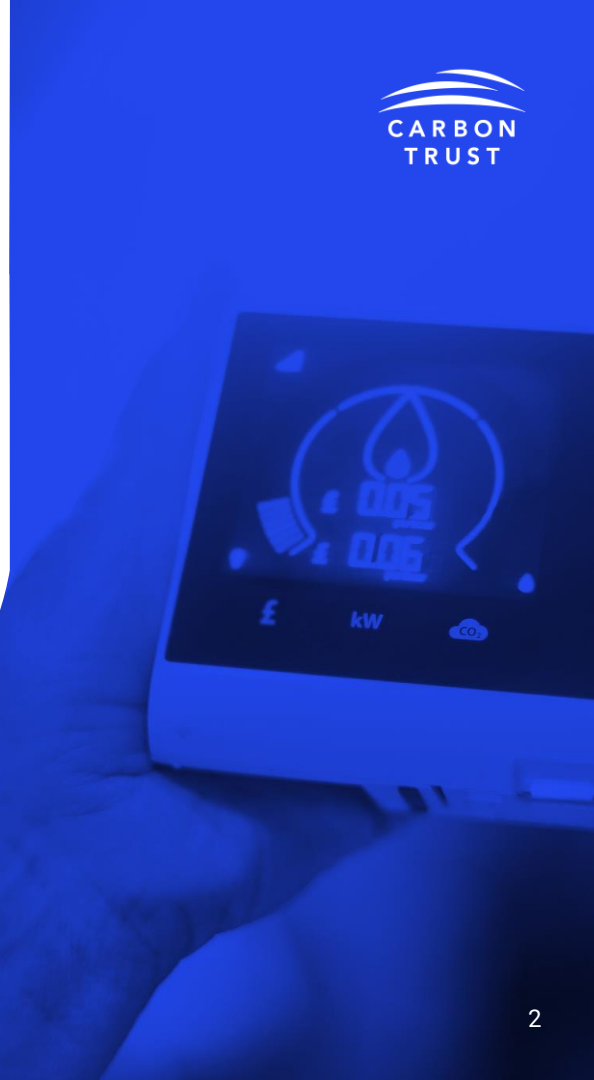
Flexibility is an inherent reality of future power systems. It is fundamental for balancing supply and demand, integrating renewables, and ensuring system stability.

Flexibility delivers economic uplifts to the system and consumers if done right

Flexibility can save the UK up to £17bn/yr in 2050*. It drives investment, optimises grid and generation investments, and minimises system costs.

Transitioning to a flexible system is unique for each country

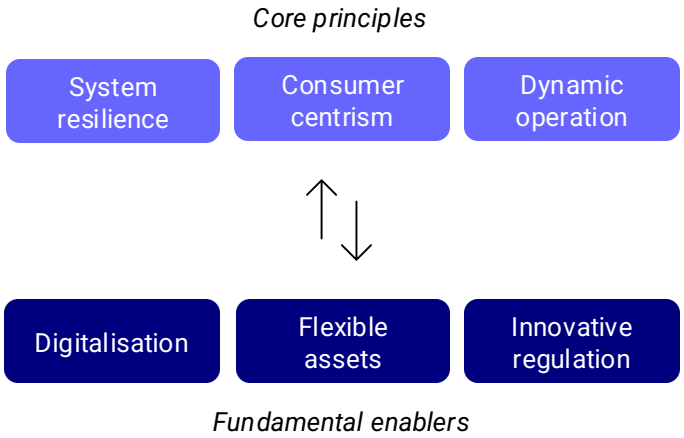
88 countries are actively developing power systems with flexibility at their operational centre**. Each country will have its own characteristics and starting point, however coordination, data, and governance are common requirements.



* Flexibility in Great Britian Report, 2021
** Ember, Global Electricity Review, 2025

Defining flexibility in power systems

Flexibility is the ability to modify generation or consumption in response to external signals. Achieving this requires core principles to guide system design and key enablers to put them into practice.



Flexibility demands a dynamic network of producers and consumers.

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	Low flexibility	High flexibility
Generation	Few larger plants	Many medium-small power producers
System	Centralised	Decentralised, cross-boundary
Transmission	Large power lines	Small-scale transmission, regional balancing
Distribution	Top to bottom	Bi-directional
Consumer	Passive consumers	Active prosumers

Flexibility creates system value through reduced build-out needs while operating and decarbonising the system more efficiently

A fully flexible energy system could deliver net savings of between £10-17bn per year in 2050

Avoidance of gas generation

Minimise carbon negative technologies

Reduced network reinforcement

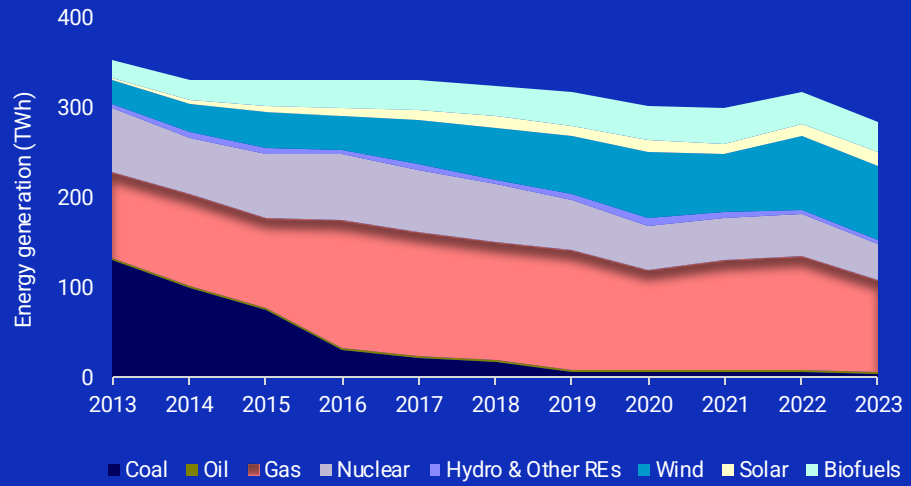
£16.7bn
Electric heating

£15.4bn
Hybrid heating

H_2 £9.6bn
Hydrogen heating

Flexibility has been transformative in the UK's transition

The development of a flexible power system in the UK has enabled the rise of low-carbon technologies, slashed fossil fuel reliance, and boosted energy security



Source: Adapted from DESNZ (2024) Digest of UK Energy Statistics (DUKES)
Biofuels: Represents a mix of thermal renewables
**Full stack of generation sources not included in chart*

↓ 0%

Complete coal phase out

↑ *from* 0 *to* 3.5 GW

↑ 450%

13.3 GW

↑ 170%

18.9 GW

↑ 127%

10.34 GW interconnectors

↓ 18%

293,000 TWh total* UK electricity supply

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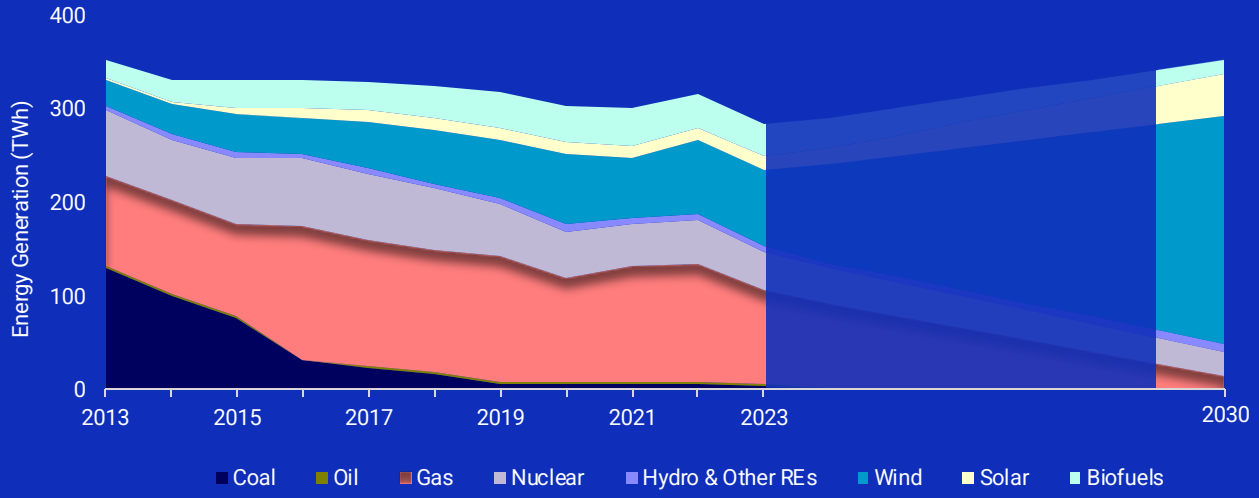


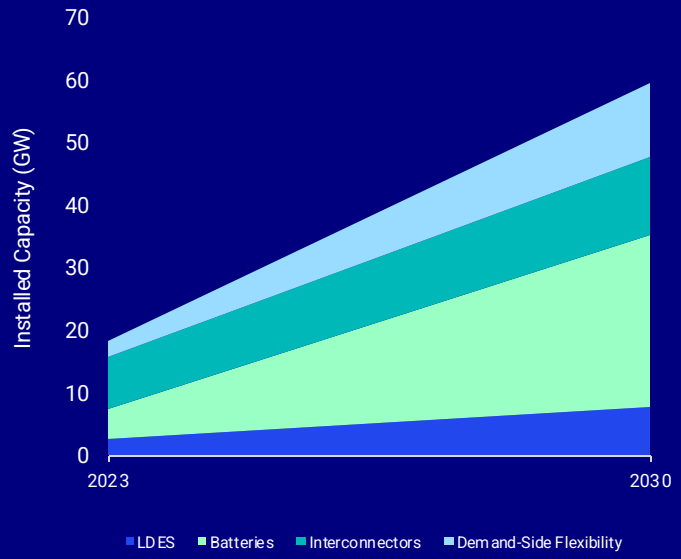
Clean Power 2030*

- Dominated by wind and solar
- Decommissioning of oil
- Minimal reliance on gas (reserve capacity)
- Intermittent generation mix

Source: Adapted from DESNZ (2024) Digest of UK Energy Statistics (DUKES)
Biofuels: Represents a mix of thermal renewables
**Chart not reflective of total energy supply but for sources of interest*

Clean Power 2030 demands a rapid scale-up of mature and nascent technologies

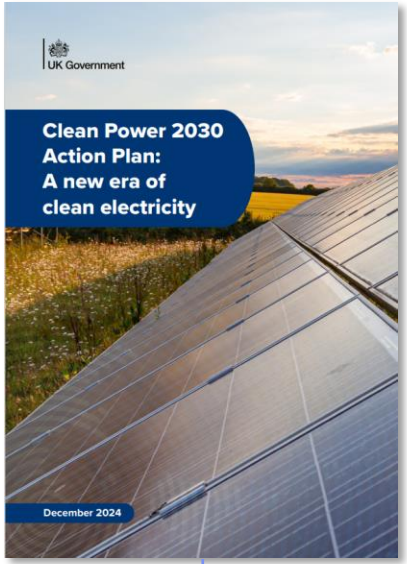
Clean Power 2030 requires rapid scaling up of existing technologies such as battery storage, hydrogen-to-power (H2P), and smart grid networks to integrate consumer-led demand technologies



Clean Power 2030 seeks to add over 40 GW of new flexibility capacity

2030 Further Flex and Renewables Pathway

GW		
	11.7	Demand-Side Flexibility
	12.5	Interconnectors
	27.4	Batteries
	7.9	LDES
	0.3	CCUS & H2P



Flexibility is underpinned by key levers, each shift the Net Zero dial

Key lessons from the UK's energy transition

Markets

Competitive, consumer-led markets drive flexibility and inclusively delivers economic benefits.

- Capacity Market / CfD scheme - supports acquisition and build out of low-carbon, dispatchable power
- NESO Pathfinders - opens access to ancillary markets for consumers, storage providers, and generators
- Flexibility platforms - enhances participation in local flexibility markets

Policy & Regulations

Reforms are critical for unlocking investment in flexible technologies and opening markets beyond system operators.

- Smart Systems and Flexibility Plan - strengthened strategic guidance to unlock flexibility in the UK
- Connections reforms - prioritise assets build-out, expediting delivery and minimising grid queue congestion
- Local flexibility - broadens participation across diverse system actors, across scale

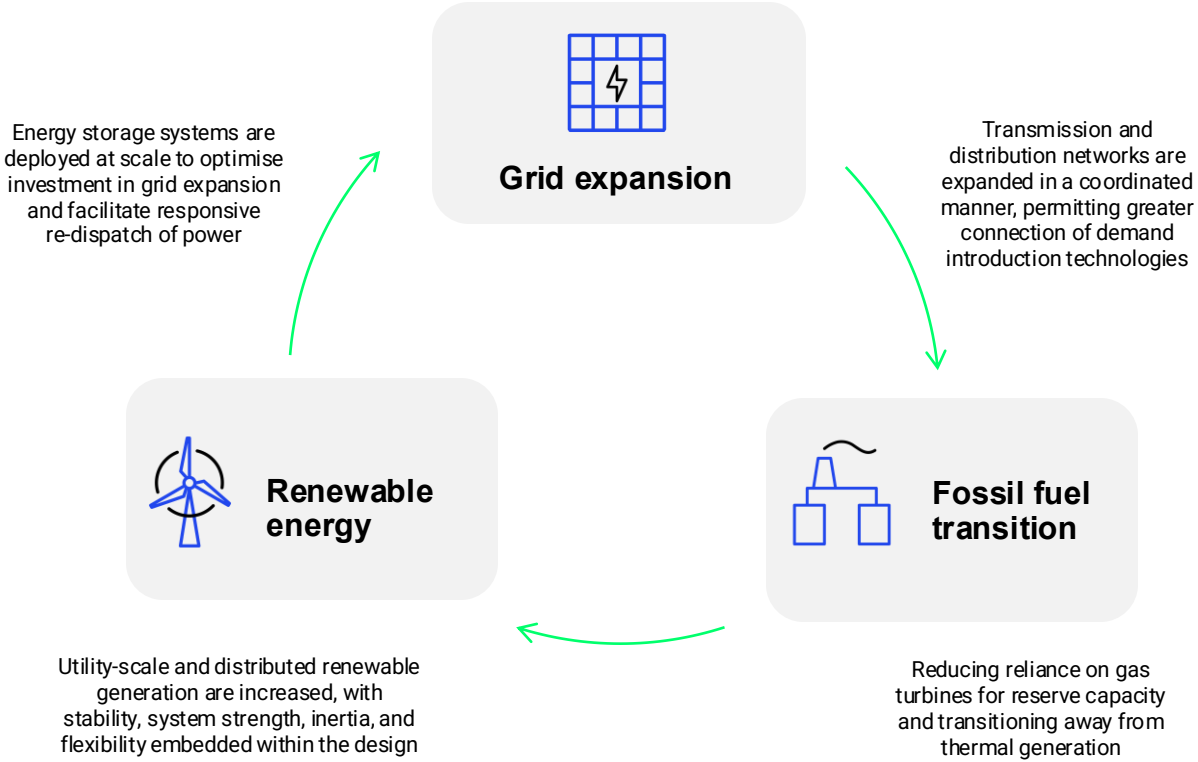
Technology

Portfolio of innovative technologies is required to flex a power system. Investment is critical to commercialise nascent technologies and to lower cost profile of mature technologies.

- Net Zero Innovation Portfolio - over £100m invested in energy storage and flexibility to innovate smart tariffs, digitalisation, and smart grids
- Smart meters - allowing consumer access to demand response markets with larger DSO visibility
- Investment in offshore wind and interconnections - build out of an interconnected power system, shared between regional markets

Barriers, however, remain in advanced digitalisation and asset visibility, market access, and coordinated governance

Clean Power 2030 offers significant opportunities for deeper decarbonisation and enhanced economic benefits if designed with system flexibility at its core



Holistic approaches, such as our Greenprint initiative, ensures that energy systems can adapt flexibly to changing conditions, while maintaining a stable, efficient, and resilient supply that meets growing demand

Contact us

To learn more about our work in accelerating energy transitions

Learn more

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