Department for Energy Security & Net Zero

ofgem

NESO National Energy System Operator

Clean Flexibility Roadmap

Mapping the path to a clean, flexible, consumer-focused electricity system

July 2025

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Foreword from the Minister for Energy

We are on a mission to speed up the transition away from fossil fuels and deliver clean power by 2030 and net zero by 2050. The challenge ahead of us is significant, but we are committed to being a government that tackles big challenges head on with long-term solutions.

The Clean Energy Superpower mission is galvanising the nation into moving faster than we have ever moved before to deliver energy security; reduce our dependence on imported fossil fuels; lower emissions; create jobs and new industries across the country; and more than anything, protect consumers from volatile gas prices.

The country needs an energy system that is more flexible as we meet the needs of homes and businesses through harnessing the intermittent nature of renewable energy. Britain is a world leader in a range of exciting new clean flexibility technologies and services that support this ambition, such as consumer-led flexibility and batteries. The government is working with Ofgem, the National Energy System Operator (NESO) and other stakeholders to break down the barriers to flexibility deployment, including planning, the grid, market access, supply chains and skills.

In December 2024, we published our Clean Power 2030 Action Plan, which set out plans for a two to three-fold increase in clean flexibility capacity, to a range of 51GW to 66GW, by 2030. To meet clean power by 2030, we need to develop a flexible system that can accommodate and store the outputs of Britain's renewable resources. By keeping consumers at the heart of our approach to flexibility, we can deliver benefits to households, businesses and the environment. Our approach to supporting consumer-led flexibility will allow all consumers to see the benefits of both lower energy bills and greater control over their bills.

Building on the Clean Power 2030 Action Plan, the Clean Flexibility Roadmap sets out the government's vision for flexibility and how we will deliver it. The scope includes short and long duration flexibility technologies, as well as broader policies to accelerate the growth of flexibility capacity. The Roadmap contains actions for DESNZ, other government departments, Ofgem, NESO and industry, and crucially establishes a governance framework, so that all parties deliver on their actions. This publication marks the beginning of the journey to clean energy flexibility, not the end.

We are doing this to make British energy cleaner, cheaper and more secure as part of our mission to make Britain a clean energy superpower.

Rt Hon Michael Shanks MP

Minister for Energy

Foreword from the CEO of Ofgem

We as the regulator and indeed industry have been talking for years about ‘flexibility’ and ‘demand side response’. But regardless of the technical language, the idea is very simple. If we can enable households and businesses to use electricity when it is abundant – such as when the sun is shining or the wind is blowing – they will save money because it will be cheaper.

Over time, if many of us do this, everyone will save, because we will need to build out fewer pylons and power stations. This in turn will help us manage the energy system better as the proportion of renewables sources in our energy system rises, reducing demand when supply is lower.

That is why we are rolling out measures to enable a smarter, more flexible grid: rolling out long duration electricity storage, streamlining the registration process for aggregators of smaller assets like solar panels, EV chargers and home battery storage systems, and updating, managing and reviewing our price controls and code modifications, to ensure the flexibility market can be accessed by and benefits consumers at the pace we need.

We also expect suppliers to spare no effort to roll out smart meters to their customers, ensure faulty meters are repaired in a timely way, and that half-hourly settlement is deployed at pace. We will continue to monitor them to make sure their performance matches the ambition we have for the sector.

Equally, we recognise that not all consumers are able to vary their energy use easily, such as those who need to use a lot of electricity at a specific time of day, or who do not have the money to pay for or easily access these new flexible options as they develop. This will make it more important than ever to ensure we are protecting consumers, both now and in the future, enabling the transition to a greener, more flexible energy system in a way that works for them. This Roadmap is about how we intend to get there: changing our market arrangements, building the architecture needed, and making sure customers can access these opportunities.

We know that this market will continue to evolve rapidly and this will require fresh thinking, working collaboratively with the sector, NESO, and across government. For this reason, this document marks the beginning of our work as we work collaboratively across all interested stakeholders. We will take further action if the evidence shows it is required to ensure this new and very different form of retail market protects consumers and works in their best interests.

Working together, we can ensure that people do not miss out on what can be a big win for customers and the energy system they rely on.

Jonathan Brearley

Chief Executive Officer

Ofgem

Foreword from the CEO of NESO

Last year, NESO provided independent advice to the government on the routes to achieving a clean power system by 2030 in Great Britain. In that advice we were crystal clear that clean power by 2030 will require industry, government and regulators to work in new and innovative ways alongside delivering flexibility on a scale which has never been done before.

This Clean Flexibility Roadmap is a clear demonstration of how seriously government, Ofgem and NESO take this commitment and sets out what needs to be done, by whom, and when to deliver this.

At NESO we think about flexibility in every decision we make, whether that is part of both operational decision-making on a day-to-day basis, as well as strategic planning over the longer term, enabling us to take great strides in the area.

Back in 2022, at the height of the energy crisis, brought on by Putin's illegal invasion of Ukraine, we worked with the government, industry and regulators to introduce the Demand Flexibility Service (DFS). More than 2.5m consumers took part, adjusting their usage to help with system demand during tight periods, delivering the security we needed, in return for financial reward.

DFS represented a significant change in the way that consumers historically interacted with the energy system and market design whilst demonstrating the opportunities that flexibility can bring.

We have more recently been working with Ofgem and businesses across the industry as part of our CrowdFlex programme, exploring how domestic flexibility could lower customers' bills and support the transition to a zero-carbon grid.

These examples show what can be done. However, it has become increasingly clear to NESO that for Great Britain to continue to reap the rewards that a flexible system can bring, there is more we need to do in this space.

This Clean Flexibility Roadmap is the starting point for this, providing a clear statement of the intent to make flexibility part of day-to-day life for both consumers and industrial energy users. This will deliver benefits in reduced energy bills, improved system operability and energy security and enable the delivery of clean power by 2030.

The journey towards a decarbonised system will not be easy, but this Roadmap provides clear direction and sets out the actions needed to increase the levels of flexibility across Great Britain and realise the rewards it will bring to industry and consumers.

Fintan Slye

Chief Executive Officer

National Energy System Operator

Executive summary

The government is on a mission to make Britain a Clean Energy Superpower – delivering clean, affordable and secure power for households and businesses, creating high-quality jobs, and driving economic growth across the country. At the heart of this mission lies a smarter, more flexible electricity system that can fully integrate variable renewables, reward consumer participation, and maintain security of supply in a net zero future.

Consumers can save money by choosing, where their smart appliances or commercial processes have flexibility, to shift some of their demand to when electricity is cheapest and renewable generation most abundant. This in turn frees up grid capacity, reduces the need to build new generation and associated network infrastructure in the long term, and lessens our reliance on unabated gas, making it easier to meet clean power by 2030 and minimising electricity bills for all.

In the Clean Power 2030 Action Plan government committed to publishing, in partnership with Ofgem and the National Energy System Operator (NESO), the further flexibility measures and milestones required for clean power in 2030 and net zero by 2050, with a framework for planning and tracking their delivery. This is the purpose of the Clean Flexibility Roadmap.

Both Ofgem, as the independent economic regulator for energy, and NESO, as the independent energy system planner and electricity system operator, are clear on the importance of flexibility in creating an affordable, clean and secure electricity system. It is for this reason that these organisations have collaborated with government to develop, set out and deliver the actions within this Roadmap.

Clean flexibility is the ability to shift demand or supply of electricity while reducing emissions. It encompasses consumer-led flexibility (CLF), battery storage, interconnection with neighbouring countries, long duration electricity storage (LDES), and low carbon dispatchable power. These technologies will work in concert to balance the grid, maximise use of low-cost renewable electricity, and provide resilience during periods of low generation.

Flexibility is an integral part of a whole-system approach to delivering a clean power system. This document is therefore accompanied by a package of publications aimed at:

- Increasing consumer awareness of and engagement in flexibility
- Supporting network planning and operation, and market participation, by improving system visibility of energy assets
- Exploring the benefits of secure data sharing to unlock innovation and create growth across the economy

The Roadmap is structured into four sections. The first two focus on short- and long-duration flexibility. The third outlines the cross-cutting enablers required to support delivery: market reform, network upgrades, digitalisation, and improvements to planning and supply chains. The final section sets out the Roadmap's governance framework, which establishes clear accountability for delivery across DESNZ, Ofgem, NESO and other delivery partners.

Throughout the Roadmap, we have identified long-term priorities or path building actions that underpin the development of various types of flexibility through the 2030s and beyond to support government's vision for a clean, affordable and secure energy system. We have

broken down path building actions into short-term milestones, with clear owners and timelines. We have provided an update on relevant actions from the Clean Power 2030 Action Plan and included any outstanding actions alongside the new milestones to provide a full picture of the road ahead.

Government's vision for flexibility and its contribution to growth

Great Britain will be powered by a smart, secure, and decarbonised electricity system with clean flexibility at its core. This vision is of a future where flexibility is not just a technical solution – it is a foundational principle shaping a resilient, low-cost, and consumer-driven energy system. Based on current NESO scenario modelling, we could see an eight-fold increase in clean flexibility capacity (excluding storage heaters) from 2024 to 2050. The system will be able to dynamically balance high levels of renewable generation, adapt to rising electricity demand from sectors like AI and electrified transport and heating, and ensure supply is secure even as we retire fossil fuel infrastructure.

Flexibility will be embedded throughout the system – from households choosing rooftop solar, home batteries and smart tariffs,[1] to businesses earning revenue from small fluctuations in their power use, to large-scale storage and low carbon dispatchable generation responding to system needs in real time. Participation in flexibility will be voluntary and attractive, empowering consumers with greater control over their energy use and unlocking tangible savings without disrupting their everyday lives. Businesses and households alike will benefit from a more predictable and affordable energy landscape.

Underpinned by an accessible, market-based approach, planning reforms, and digitalised infrastructure, the system will deliver flexibility where it is needed most. Strategic coordination through planning, secure supply chains, and a skilled workforce will ensure the system remains robust against future challenges and international volatility.

Electricity demand in Great Britain is projected to at least double by 2050 as we electrify transport, heating and industry to decarbonise the economy. At the same time, an increasing share of our electricity will be provided by variable renewable sources such as wind and solar. To integrate these cheaper, homegrown sources of electricity and manage this transformation, Great Britain is developing a highly flexible grid that can shift clean electricity supply and demand in time and location, across hours, days, and seasons.

The government views a smarter, more flexible clean energy system as part of our effort to bring down energy bills, unlock jobs, and ensure reliable power for all. As Great Britain moves towards clean power by 2030, consumers are at the heart of this transformation.

Lower bills, more control

Consumers are already benefiting from using electricity flexibly, whether through smart charging an electric vehicle (EV) or taking part in discounted sessions from their electricity supplier. Depending on their usage, some can save even without changing their usage habits. Those who do not generally use electricity at peak times (4-7pm) could save over £200 a year by switching from the price cap to a tariff that changes throughout the day based on market

[1] Energy pricing plans that vary the cost of electricity based on the time of day

rates.[2] It is possible to save even more money by shifting small loads away from peak times. For example, shifting washing machine and dishwasher use could save an additional £38 per year.[3]

Households with additional low carbon technology can also save on their energy bills by switching to tariffs with rates that are designed to encourage flexible use. For example, an EV driver could potentially save £330 annually by smart charging overnight.[4] Households with heat pumps could save more than £250 annually by shifting to a smart tariff and using their heat pump flexibly to pre-heat their homes during cheaper periods.[5]

Businesses have a growing number of ways to save and earn through their energy use. Whether responding to time-of-use signals in their tariff, or selling flexibility into energy markets, businesses of all sizes can reduce their costs. Some will be experienced in reducing their demand on request. Others will be able to earn revenue automatically, for example setting freezers or air conditioning to fluctuate within a set temperature range. For many businesses investing in new technologies, such as batteries, participating in flexibility can increase the return on those investments.

Jobs and growth

The UK is a global leader in smart, flexible electricity technologies, with the sectors that include smart control and storage systems directly generating £3.6bn in turnover and supporting 29,200 full-time jobs in 2023.[6] By 2030, these sectors are projected to grow by 45%, adding 13,000 additional direct jobs.[7] A 2023 report by BiGGAR Economics[8] estimated that the delivery of six specific Pumped Storage Hydropower (PSH) projects, a form of LDES, could create up to 14,800 local jobs during construction. In addition, the carbon capture, usage and storage (CCUS) industry, which Power CCUS is a part of, is expected to support up to 50,000 jobs as the sector matures into the 2030s and capture up to £4-5bn of Gross Value Added (GVA)[9] per annum by 2050.[10] The hydrogen industry will create investment and jobs across the UK's industrial heartlands, with projects from the first Hydrogen Allocation Round set to commit over £400m of private capital investment between 2024-26 and create over 700 direct jobs in construction and operation.[11]

[2] DESNZ analysis: £233 annual saving compares a household using3,149kWh of electricity and 12,193kWh of gas using Octopus' Agile tariff compared to Electricity price cap unit rates between July 2023 - July 2024, with a typical consumption profile. These are indicative based on historic market rates and do not reflect how the respective prices may change in the future

[3] DESNZ analysis: the additional white goods savings are based on Citizen Advice's electrical appliance calculator, running a dishwasher in ECO mode every day and a washing machine in ECO mode three times per week at off peak times instead of peak. Electricity price cap unit rates from March 2024 to February 2025 were used as a proxies for the standard variable tariff and average off peak prices of Octopus' Agile tariff in the same period

[4] Future default tariffs: call for evidence, GOV.UK (2024): based on tariffs as of October 2023 and based upon driving 7,400miles a year. A tariff 31.5p/kWh at peak and 9p/kWh off peak was compared against the default tariff cap over the same period

[5] DESNZ analysis: based on Octopus' Cosy tariff compared to the electricity price cap unit rates between July 2023 - July 2024. For flexibility behaviour the heat pump is assumed not to operate at peak times

[6] Low Carbon and Renewable Energy Economy Estimates (LCREE), Office for National Statistics (2025)

[7] Internal DESNZ analysis based on historic LCREE estimates for the sector, projected for future years

[8] The Economic Impact of Pumped Storage Hydro, BiGGAR Economics (2023)

[9] Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector

[10] UK carbon capture, usage and storage (CCUS), GOV.UK (2025)

[11] Hydrogen Production Business Model / Net Zero Hydrogen Fund: HAR1 successful projects, GOV.UK (2023)

Reliable power at all times

We must meet rising electricity demand while simultaneously managing seasonal peaks in demand and potential winter weather that has little light or wind. While gas generation will continue to play a reserve role, we need to build new infrastructure to deploy more clean flexible technologies to meet these peaks in demand and troughs in supply. New hydrogen to power (H2P), power CCUS infrastructure and LDES plants, such as PSH, will be critical for ensuring security of supply during these periods, alongside other sources of clean flexibility, like batteries.[12]

Turning ambition into action: focus areas of the Clean Flexibility Roadmap

We have already laid a strong foundation for a flexible, decarbonised energy system by implementing a series of strategic initiatives and market reforms. The Market-wide Half-Hourly Settlement (MHHS) programme will expose electricity suppliers to the true cost of serving customers, incentivising suppliers to provide smart tariffs that reward CLF. The government is putting in place the cyber security, technical interoperability and consumer protection framework to enable a mass market in CLF through the Smart Secure Electricity Systems (SSES) programme.[13] The nationwide rollout of smart meters empowers consumers with the data needed to take control of their energy use and leverage new opportunities to save money with flexible tariffs and products. Earlier this year, the government introduced a cap and floor mechanism for LDES, providing investor certainty for technologies critical to balancing intermittent renewables.[14] Coupled with significant funding commitments for hydrogen infrastructure and CCUS, these policies collectively establish the infrastructure, market signals and consumer protections essential for a smarter, cheaper and more adaptable energy system.

We must build on these foundations with progress across policy, regulation and operations. The actions set out in this Roadmap have been developed collaboratively by government, Ofgem and NESO, and we will continue to work together closely to drive delivery, track progress and adapt our approach.

Consumers at the heart of the transition

A consumer-driven flexibility transition is essential – households and businesses must be empowered to participate if and when they choose, and be rewarded for doing so. Government will support the rollout of **energy smart appliances** through the Warm Homes Plan and ensure, through the SSES programme that these appliances are set up for flexibility and are interoperable across systems. Through SSES, new **consumer protections and cybersecurity standards** will be introduced by 2027 via an Ofgem-administered licensing regime for flexibility service providers and load controllers.

[12] 'Batteries', being any cellular store of chemical energy, have applications across the flexibility landscape. When referring to those with large power output connected directly to the transmission or distribution networks, we refer to 'grid-scale' batteries; those installed within residential, commercial or industrial premises are 'small-scale' batteries. In general, at both scales, these use lithium-ion chemistry unless stated otherwise, but 'batteries' in a general sense may include rival technologies and 'flow' batteries, which are covered under Long Duration Electricity Storage

[13] Delivering a smart and secure electricity system: implementation, GOV.UK (2025)

[14] Long Duration Electricity Storage: technical details of the scheme and its operation, GOV.UK (2025)

Opportunities to benefit from flexibility will be promoted during key moments in the user journey (e.g. during installation of EV chargepoints and heat pumps), whilst government will ensure **fair access to smart charging** in public as well as private settings. Government wants to create opportunities across all consumer groups so it will **investigate participation barriers for low-income and vulnerable consumers**.

Leadership, accountability, and coordination

Leadership, accountability and coordination are vital to ensuring flexibility evolves in line with system needs and national goals. Government will therefore establish an **Electricity System Flexibility division** in DESNZ to oversee flexibility strategy and delivery and will appoint a **Flexibility Commissioner** focused on accelerating progress in short duration flexibility and unblocking cross-sector barriers.

The Roadmap establishes an annual **Roadmap Forum** which government envisages will be chaired by ministers and attended by the Flexibility Commissioner. The Roadmap Forum will take stock of progress against Roadmap commitments and build in new commitments to increase ambition year-on-year.

The overarching principle is that the Roadmap is the beginning, not the end, of action development and to support this we will organise **quarterly open workshops** to bring together stakeholders to identify new barriers and solutions. Government will **align Roadmap delivery tracking** with monitoring of progress against the Clean Power 2030 Action Plan.

Markets that drive investment and unlock value

Energy markets must be open to flexibility service providers where these services can meet market needs (often at lower cost). This means removing barriers, improving price signals, and ensuring whole-system alignment across all relevant energy markets while ensuring consumers are protected. Government, Ofgem and NESO, working together with Elexon in its new capacity as market facilitator, will collaborate to monitor and **address market barriers,** as far as practicably possible.

NESO will report quarterly on progress with unlocking barriers identified it its **Demand Side Response Flexibility Routes to Market Review** and will continue work to address missed flexibility dispatch opportunities, also known as skip rates, working towards targeting **parity across technology types.**

Government will also ensure that households exporting stored power to the grid **only need to pay final consumption levies on the energy they use,** ensuring consumers are not unfairly penalised.

In parallel, government and Ofgem will **reflect flexibility in their retail market reform** work and consider what changes are needed to ensure the price cap is not a barrier to consumer flexibility and that consumers remain adequately protected.

Embedding flexibility

To unlock the full potential of flexibility, it must be **embedded as a standard consideration** across all parts of the energy system – from market signals to long-term planning. We will continue to deepen understanding of how different signals interact, helping to create a more coherent, **whole-system approach** that guides effective investment and operational decisions.

Flexibility will be embedded in **strategic system planning** with NESO, Ofgem, and government working to ensure that **Regional Energy Strategic Planning (RESP) methodology** transparently models flexibility and allows for robust stakeholder challenge. Future iterations of both RESP and the Strategic Spatial Energy Plan (SSEP) will adopt a consistent, system-wide approach to modelling flexibility, underpinned by a shared commitment to **greater data transparency** and **alignment** across all strategic planning processes.

New and existing strategic enablers

NESO will drive greater **non-domestic flexibility** by setting a clear target by December 2025 for annual growth in large consumer participation through to 2030. To help businesses track their impact, by April 2026, NESO will explore options to allow **carbon reporting for flexibility actions**, enabling large industrial and commercial users to measure the carbon savings from their flexible energy use.

In parallel, government will explore whether **enhanced data sharing through a smart data scheme** could create the **trusted environment** in which consumers can more easily benefit from innovative products, for example personalised retrofit recommendations, building on the delivery of MHHS and the rollout of smart meters.

To strengthen electricity equipment supply chains, **government will support, public finance institutions and Great British Energy (GBE)** to develop targeted **funding** through 2025, helping to **boost domestic manufacturing** of critical clean energy components and support local based jobs and investment.

Consolidating progress, expanding ambition

Building on strong foundations, we will expand international and cross-sector collaboration to strengthen flexibility and system resilience. The government is working with the European Union (EU) to ensure more **efficient electricity interconnector trading and balancing arrangements**, while also working with NESO to **include future electricity interconnection in strategic energy planning** and Ofgem to ensure a regulated delivery path for strategically aligned projects.

To unlock next-generation flexibility, the government will also explore **blended finance** to help LDES and will develop a **H2P business model** to de-risk investment. Ofgem will set out **timings for a second LDES cap and floor application window by Q1 2026**. Support for CCUS will continue, consolidating progress to date while pushing further to enable a net zero power system.

Delivering a flexible, consumer-centred electricity system is a national priority. The actions set out in this Roadmap are just the start. Through enhanced flexibility leadership and collaborative governance, market reform, strategic enablers and consumer empowerment, Great Britain can unlock the flexibility required for a clean, affordable and secure power system.

Introduction

The government's Clean Energy Superpower Mission

The Clean Power 2030 Action Plan, published in December 2024, set out how clean power (as part of the Clean Energy Superpower Mission) can be achieved, and that clean flexibility will play a key role. The Plan set out a flexibility capacity range of 51GW to 66GW by 2030, marking a two to three-fold increase on the 24GW of capacity installed in 2023.

Electricity demand in Great Britain is set to increase significantly over the next few decades as we electrify transportation, heat and industry to cut emissions. To meet this growing demand, we are transitioning away from fossil fuels and increasing our use of clean electricity sources. Since these clean energy sources include forms of renewables which cannot be dispatched at will, we will need to significantly increase our flexible electricity capacity to ensure that supply continues to meet demand.

Consumer-led flexibility (CLF)[15], such as smart electric vehicle (EV) charging, smart heat pumps, and use of home batteries, will shift demand to times when energy is abundant, whilst grid-scale batteries, long duration electricity storage (LDES) and interconnectors enable us to capitalise on cheap renewable electricity when it is most abundant. Finally, after 2030, we will increasingly displace the residual role of unabated gas generation with low carbon dispatchable power, as we transition towards net zero.

Transitioning to a clean, flexible electricity system will bring numerous benefits. The energy system will become more cost-effective by utilising low-cost renewable energy. By using flexibility to reduce peak demand and distributing sources of generation, we will minimise the amount of costly generation and associated network infrastructure that needs to be built in the long term, which will help to minimise consumer[16] bills. This flexibility will also help Great Britain to build the clean homegrown energy we need to maintain security of supply, provide good jobs and growth, and protecting future generations by reducing emissions.

The Clean Power 2030 Action Plan positioned consumers at the heart of this flexible system. For example, domestic consumers will have more choice and greater control of their energy use by using clean technologies such as electric vehicles, heat pumps and other smart appliances with innovative[17] tariffs. Those that cannot or choose not to participate directly will still benefit, as the total system cost of a decarbonised electricity system is expected to be lower with higher levels of flexible capacity.

Delivering these ambitions requires significant coordination across the primary public bodies: government, Ofgem and the National Energy System Operator (NESO), as well as industry. We must overcome challenges collectively, to ensure that the necessary reforms can provide the right market signals and that the appropriate framework and governance is in place to enable, support and protect businesses and consumers.

[15] CLF, previously referred to as "demand-side response" or DSR, including the flexible usage of EV chargers, small-scale batteries, appliances, heat pumps, storage heaters, etc.
[16] Here and in the remainder of the document, "consumers" refers to both domestic and non-domestic users of energy
[17] Throughout this document we refer to these innovative tariffs collectively as smart tariffs, unless explicitly referring to a certain type of smart tariff e.g., dynamic time-of-use tariffs

The publication of this Clean Flexibility Roadmap with Ofgem and NESO marks a critical milestone in the government's Clean Energy Superpower Mission. It is a pivotal document that will guide industry, government, regulators, consumers and other stakeholders as we collectively focus on achieving this mission.

What do we mean by clean flexibility?

Clean flexibility is the ability to shift in time or location the demand or supply of electricity, over hours, days or seasons, while reducing emissions. It includes storing clean energy for times when demand outstrips supply, offering rewards to consumers who choose to shift demand away from peak times, importing and exporting electricity, and generating low carbon dispatchable power.

What is short duration vs long duration flexibility?

Short duration flexibility encompasses technologies that can respond to changes in supply and demand over minutes to several hours. Various technologies and services provide short duration flexibility, including CLF, batteries and interconnectors. The opportunity for these technologies is significant; the Clean Power 2030 Action Plan confirmed that a significant increase of 28GW to 36GW in short duration[18] flexibility from 2023 levels is possible and must play a key role in achieving clean power by 2030.

Long duration flexibility technologies can provide a reliable source of electricity for managing daily, weekly or seasonal periods of low renewable output. This can be provided by LDES, via technologies such as pumped storage hydro, and by low carbon dispatchable generation technologies like Hydrogen to Power (H2P), power Carbon Capture Usage and Storage (power CCUS) and biomethane, which can provide continuous generation over days and weeks. The Clean Power 2030 Action Plan estimated that 6GW to 13GW of LDES and low carbon dispatchable power could be needed by 2030.

The government's vision for clean flexibility

By 2030, government envisions a dynamic energy system where clean flexibility is at the heart of a cleaner, fairer, and more secure future for all consumers. Great Britain will have used clean flexibility to help minimise system costs and thereby electricity bills, foster resilience against international energy volatility, and secure electricity supply under all likely circumstances.

Government will ensure that flexibility is delivered to where it is needed most via targeted interventions, like planning reform and the Strategic Spatial Energy Plan (SSEP). Government will maintain a competition and markets-focused approach to ensure that price signals provide the right incentives to reach its clean flexibility vision. The energy system will be digitalised, its workforce will be highly skilled, and its supply chains will be secure.

CLF will give households and businesses who choose to participate greater control over their energy usage, and the opportunity to save money. Households with smart meters will be able to access innovative tariffs that incentivise people to smart charge EVs and use heat pumps flexibly, without disrupting their everyday life. This will also provide consumers with greater

[18] Across battery storage, consumer-led flexibility and interconnection capacity

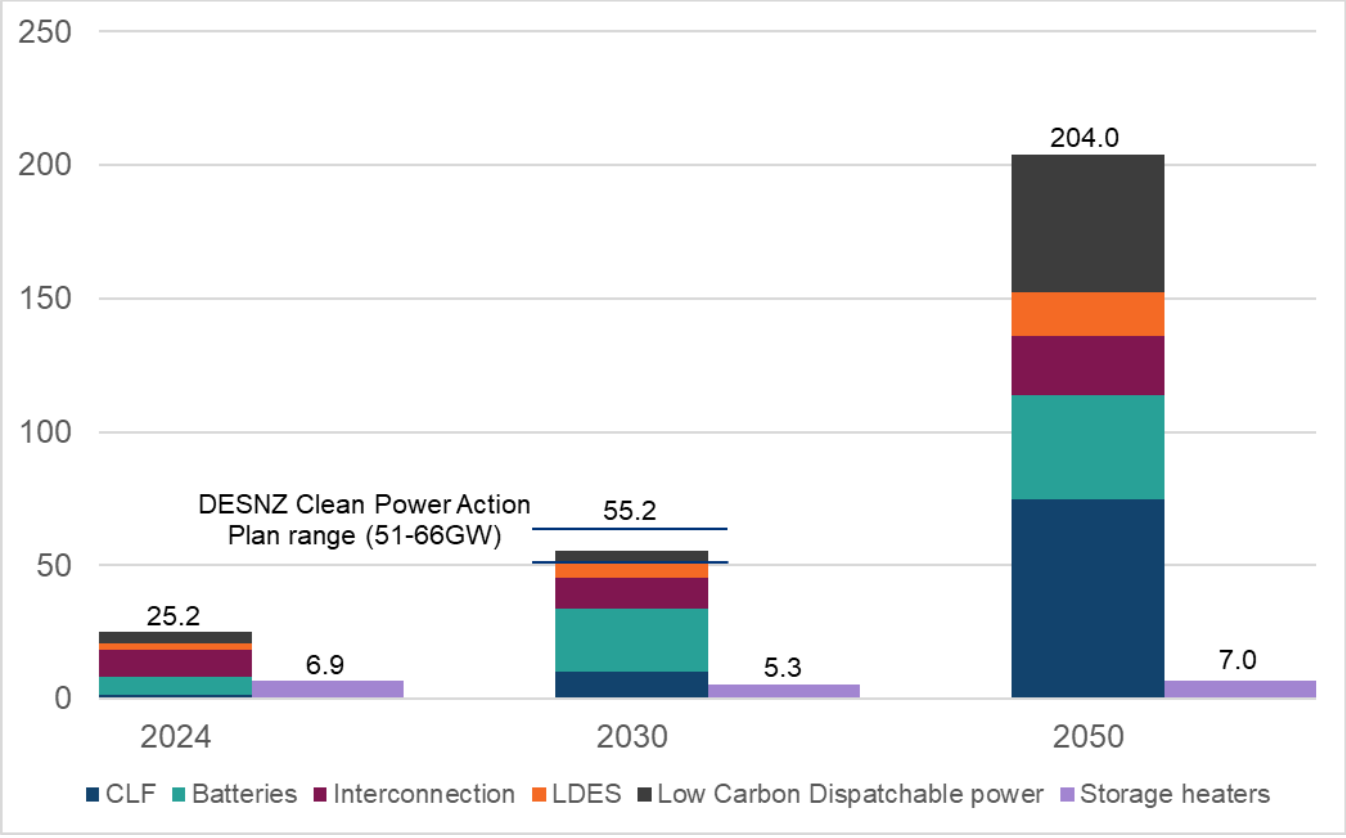
control and visibility of their energy data. Small-scale batteries will be available to best utilise the energy generated by rooftop solar, spreading demand across the day to minimise bills. Flexing energy use will remain voluntary for all consumers.

Great Britain will be powered by a smart, secure, and decarbonised electricity system with clean flexibility at its core. This vision describes a future in which flexibility is not just a technical solution – it is a foundational principle shaping a resilient, low-cost, and consumer-driven energy system. Based on current NESO scenario modelling, we could see an eight-fold increase in clean flexibility capacity from 2024 to 2050.

DESNZ expects a significant increase in several CLF sources and batteries for 2030, whilst vehicle to everything (V2X) bidirectional charging[19] is expected to grow significantly beyond 2030. LDES and low carbon dispatchable power will play an increasingly important role in achieving net zero in 2050, whilst interconnectors already contribute 10GW. This vision reflects the build time required for each technology and is mirrored by the quantity and timelines of actions listed below. These sources of clean flexibility will help manage future demands on the energy system, such as from the electrification of heat, transport and industrial processes.

Figure 1 below shows indicative clean flexibility GW capacities over time by flexibility technology using DESNZ's Clean Power 2030 Action Plan range (horizontal lines) and NESO's Future Energy Scenarios (FES) 2025 Holistic Transition scenario (bars). It illustrates the scale of transformation across flexible technologies from 2024, 2030 and 2050. The accompanying Table 1 provides the underlying data for figure 1, including the CLF breakdown by technology.

Figure 1: indicative clean flexibility capacity scenario (GW), 2024-2050



[19] V2X charging means vehicle to everything – it is the broad term for transferring electricity stored in electric vehicle batteries to the grid, buildings, houses, and other energy-consuming destinations

Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars – FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)
In line with CPAP methodology, storage heater flexibility has been excluded from CLF capacity totals

Table 1: 2030 and 2050 indicative flexibility capacity by technology scenarios, GW

Source of flexibility	2024	2030 DESNZ CPAP	2030 FES 2025 HT	2050 FES 2025 HT
Industrial and commercial	0.8		1.7	3.9
Residential appliances	0.3		3.0	6.3
Smart charging	0.2		2.7	10.1
V2G	0.0		1.2	40.6
Hybrid heat pumps	0.0		0.0	0.2
Thermal storage	0.1		0.9	7.2
District heating	0.1		0.8	6.2
Total CLF	1.6	10-12	10.3	74.6
Storage heaters	6.9		5.3	7.0
Batteries	6.8	23-27	23.2	39.3
Interconnectors	9.8	12-14	11.7	21.8
LDES	2.8	4-6	5.3	16.5
Low Carbon Dispatchable Power	4.3	2-7	4.7	51.8
Total	25.2	51-66	55.2	204.0

Source: DESNZ Clean Power 2030 Action Plan, NESO FES 2025 holistic transition 2024-2050
In line with CPAP methodology, storage heater flexibility has been excluded from CLF capacity totals. FES 2025 includes storage heaters within CLF capacity, so FES 2025 totals have been adjusted accordingly

Bill savings

Flexible electricity use is already delivering benefits to consumers, whether through smart charging an EV or taking part in discounted sessions from their supplier. Depending on their current usage, some will be able to save even without changing their usage habits. Those who do not generally use electricity at peak times (4-7pm) could save over £200 a year from switching from the price cap to a tariff that changes through the day based on market rates.[20] It is possible to save more by shifting small loads away from peak times, for example, shifting washing machine and dishwasher use could save an additional £38 per year.[21]

[20] DESNZ analysis: £233 annual saving compares a household using3,149kWh of electricity and 12,193kWh of gas using Octopus' Agile tariff compared to Electricity price cap unit rates between July 2023 - July 2024, with a typical consumption profile. These are indicative based on historic market rates and do not reflect how the respective prices may change in the future
[21] DESNZ analysis: the additional white goods savings are based on Citizen Advice's electrical appliance calculator, running a dishwasher in ECO mode every day and a washing machine in ECO mode three times per

Households with additional low carbon technologies can further save on their energy bills by switching to tariffs with rates that are designed to encourage flexible use. For example, an EV driver could potentially save £330 annually through smart charging overnight.[22] Households with heat pumps could save more than £250 annually by shifting to a time-of-use tariff and using their heat pump flexibly.[23]

Clean flexibility helps minimise the total system cost of a decarbonised electricity system, by making it more adaptable and efficient at managing supply and demand, delivering benefits for all energy users. Better demand management will reduce the need to invest in new generation and associated network infrastructure in the long term. Modelling from 2021 found that short duration flexibility alone could help reduce system costs by £30-£70bn from 2020 to 2050.[24]

Additionally, in winter 2024/25, around 2m households and businesses participated in the Demand Flexibility Service (DFS) and saved money by reducing their usage during peak times. Over this period 5.4GWh of bids were accepted for electricity to be saved or shifted over 44 separate events.[25]

Non-domestic consumers can also save and earn through their energy use, for example by shifting their demand away from peak times or selling flexibility into energy markets. There are many ways to do this automatically without affecting business processes, such as adjusting temperature control systems. This can help businesses of all sizes to reduce their costs and increase their return on investment for new technology such as batteries.

Economic growth

Developing an energy system with enhanced clean flexibility will create significant economic growth opportunities. As emphasised in the Industrial Strategy's Clean Energy Industries Sector Plan, the clean power transformation will create a wealth of jobs across Great Britain, from skilled battery installers to construction workers on low carbon dispatchable plants.

The UK is already a global leader in science and technologies driving a smarter and more flexible energy system, significantly contributing to the national economy. In 2023, the energy monitoring, saving or control systems[26] and fuel cells and energy storage systems sectors generated £2.4bn and £1.1bn respectively in direct turnover. These sectors supported 11,000 businesses and directly supported 29,200 full-time equivalent jobs.[27] By 2030, government projects in these sectors could directly increase full-time jobs by around 13,000, representing a 45% increase from 2023 levels.[28]

Certain technologies, such as LDES, require building new infrastructure which will lead to more jobs. For example, research found that developing six pumped storage hydro projects would

week at off peak times instead of peak. Electricity price cap unit rates from March 2024 to February 2025 were used as a proxies for the standard variable tariff and average off peak prices of Octopus' Agile tariff in the same period

[22] Future default tariffs: call for evidence, GOV.UK (2024): based on tariffs as of October 2023 and based upon driving 7,400miles a year. A tariff 31.5p/kWh at peak and 9p/kWh off peak was compared against the default tariff cap over the same period

[23] DESNZ analysis: based on Octopus' Cosy tariff compared to the electricity price cap unit rates between July 2023 - July 2024. For flexibility behaviour the heat pump is assumed not to operate at peak times

[24] Smart Systems and Flexibility Plan Appendix I: Electricity System Flexibility Modelling, GOV.UK (2021)

[25] Demand Flexibility Service (DFS) Winter 24/25 – Overview Report, NESO (2025)

[26] The design, manufacture and installation of systems that reduce energy consumption through effective heat or energy management. Examples include smart heating controls, condensation control, control system components, energy management systems and energy management software

[27] Low carbon and renewable energy economy UK, Office for National Statistics (2023)

[28] Internal DESNZ analysis based on historic LCREE estimates for the sector projected for future years

create 14,800 jobs during construction.[29] Moreover, these projects will support employment in operations and maintenance for local communities, decades after construction is complete.

Similarly, low carbon dispatchable power generation sites will create high skilled jobs, including in the industrial heartlands. Significant government funding, such as the announcement in the 2025 Spending Review to allocate £9.4bn in capital budgets to UK CCUS, is testimony to the predicted growth in low carbon dispatchable power. The CCUS industry, which Power CCUS is a part of, is expected to support up to 50,000 jobs as the sector matures into the 2030s and capture up to £4-5bn of Gross Value Added (GVA)[30] per annum by 2050.[31] The hydrogen industry will create investment and jobs across the UK's industrial heartlands, with projects from the first Hydrogen Allocation Round set to commit over £400m of private capital investment between 2024-26 and create over 700 direct jobs in construction and operation.[32]

As part of the Clean Power 2030 Action Plan in December, DESNZ published an assessment of the clean energy skills challenge, and outlined how government will support industry to build the skilled workforce they need. Later this year, government will publish the Clean Energy Workforce Strategy. This Strategy, led by the Office for Clean Energy Jobs in DESNZ, will set out how government, industry and trade unions will come together to address skills and workforce challenges to deliver the Clean Energy Superpower Mission, including for clean flexibility.

Innovation

Innovation funding for flexibility creates substantial opportunities for economic growth. For example, DESNZ invested over £110m across the Energy Storage and Flexibility themes between 2021 and 2025. This accelerated the development and commercialisation of innovative energy storage technologies such as flow batteries, advanced heat batteries and hydrogen-based storage systems. In addition, DESNZ innovation funding unlocked over £750m in private investment and supported 6,300 high-skilled jobs. In the 2025 Spending Review, government announced £500m for the new R&D Missions Accelerator Programme, which will leverage a further £1.5bn of private investment into innovation challenges that support the government's missions (including the Clean Energy Superpower Mission).

In addition, Ofgem is funding electricity and gas network innovation within the RIIO-2 price control period, through the £450m Strategic Innovation Fund (SIF). The fund is focused on supporting large-scale, collaborative projects that enable net zero. Meanwhile the £280m Network Innovation Allowance (NIA) is focused on smaller, earlier stage projects. The SIF and NIA have supported a range of flexibility projects, including the SIF funding £40m for demonstrator projects and £3.4m for exploratory stage projects. For example, the SIF has funded CrowdFlex, a £20m NESO-led project exploring the role of domestic flexibility in managing the electricity grid, and Heatropolis, a £10m UKPN-led project exploring a novel commercial framework for both Distribution Network Operator (DNO)[33] planning and heat network design. Both the SIF and NIA will continue at similar funding levels in the upcoming

[29] The Return of Pumped Storage Hydro, BiGGAR Economics (2023)
[30] Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector
[31] UK carbon capture, usage and storage (CCUS), GOV.UK (2025)
[32] Hydrogen Production Business Model / Net Zero Hydrogen Fund: HAR1 successful projects, GOV.UK (2023)
[33] Distribution Network Operators (DNOs) are licensed companies who own and maintain the physical electricity distribution network (local networks of wires, cable, poles, towers and substations). These networks take high-voltage electricity from the transmission network and deliver it at a lower voltage to homes and businesses

RIIO-3 price control period (the third iteration of Ofgem's price control framework), with ongoing support for flexibility innovation.

Security of supply

As we transition to clean power and electrify transport, industry, and heating, we must meet rising electricity demand while managing seasonal peaks and low output from weather-dependent renewables, sometimes called 'dunkelflaute'[34] events. While gas generation will continue to play a role, we need to build new infrastructure to deploy more clean flexible technologies to meet these peaks in demand and troughs in supply. New H2P, power CCUS infrastructure and LDES plants such as pumped hydro storage will be critical for ensuring security of supply during these periods, alongside other sources of flexibility, like batteries.

Carbon emission reduction

By 2050, annual electricity demand is likely to at least double[35] due to the electrification of sectors such as transport and heat. Clean flexibility will enable low carbon assets to be used more efficiently and reduce emissions even with this increased demand. According to NESO's independent analysis, plans to achieve clean power by 2030 will reduce emissions by over 31MtCO2 per year by 2030, compared to 2023 levels.[36] The importance of clean flexibility in reducing emissions is reflected in the Climate Change Committee's Seventh Carbon Budget's 2050 net zero balanced pathway: "reliable, low-cost, and low carbon electricity can be delivered while coping with potentially long periods of low wind. Offshore wind forms the backbone of the future system. Storable energy, smart demand flexibility, and interconnection all help maintain security of supply, in much the same way as in the current electricity system."[37]

Overview of the Clean Flexibility Roadmap

The Roadmap commits accountable organisations to actions that will unblock barriers to greater flexibility capacity and sets out a governance framework for monitoring and adding to these actions.

Role of the three organisations in developing the Roadmap

Government, Ofgem and NESO have worked collaboratively to develop the Roadmap, its actions, and its governance framework.

Government is responsible for setting the strategic policy direction and regulatory framework for the energy sector in Great Britain. DESNZ sets overarching decarbonisation goals and is the sponsor department for Ofgem.

Ofgem is the independent economic regulator of gas and electricity markets in England, Scotland and Wales and makes decisions on business and investment plans. Ofgem also regulates NESO. Ofgem's primary objective is to protect the interest of current and future consumers. Ofgem's assessment is that delivering a more flexible electricity system is strongly

[34] A period of winter weather with low light and little to no wind
[35] Electricity networks strategic framework, Appendix 1 – Electricity Networks Modelling, BEIS (2022)
[36] Clean Power 2030 Annex 4: Costs and benefits analysis (2024)
[37] The Seventh Carbon Budget, Climate Change Committee (2025)

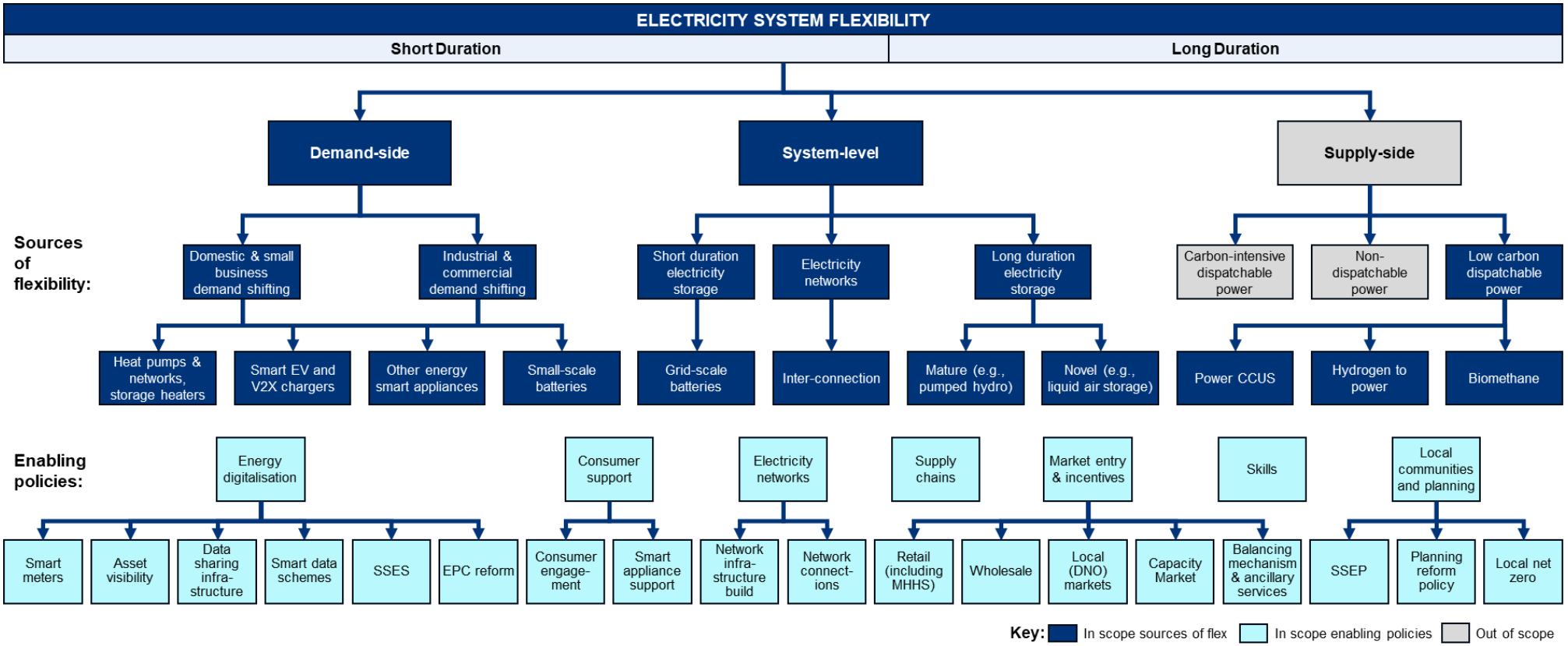
in consumers' interests. On that basis, it has co-developed this Roadmap with government and NESO, and committed to deliver its actions.

NESO is the independent electricity system operator, energy system planner and advisor to government. NESO's advice on how to achieve a clean power system played a critical role in shaping the government's Clean Power 2030 Action Plan, including the call for significantly more flexibility across the electricity system.

Roadmap scope

The Roadmap's scope, presented in figure 2 below, includes the sources of clean short and long duration flexibility, as well as the broader enabling environment which will facilitate an increase in capacity. The diagram also indicates the exclusion of carbon-intensive dispatchable power (e.g., unabated gas) and non-dispatchable power (e.g., wind and solar) from the Roadmap, which focuses solely on clean flexibility. The enabling environment includes the cross-cutting enablers required to support delivery: market reform, network upgrades, digitalisation, and planning and supply chain improvements.

Figure 2: Clean Flexibility Roadmap scope diagram



Source: Internal DESNZ representation

Roadmap structure

The Roadmap is structured into four sections. The first three sections address short duration flexibility, long duration flexibility, and common enablers. Each section is broken into chapters on each technology or policy area. Each chapter begins with a narrative detailing the significance of the area to achieving the government's vision for clean flexibility, before providing an update on the actions in the Clean Power 2030 Action Plan.

We then outline our long-term priorities, supported by tables detailing Path Building Actions (PBAs) which demonstrate the high-level direction we envision for the area. The tables outline the hurdles to reaching each PBA and announce short-term milestones, naming the organisations accountable and a timeframe to be delivered within. Actions from the Clean Power 2030 Action Plan that remain outstanding are also included in these lists of milestones, to ensure all ongoing commitments can be seen in one place. The final section focuses on the Roadmap's governance framework.

Modelling used in the Roadmap

To support the Roadmap's policy commitments, the Roadmap uses DESNZ's Clean Power 2030 Action Plan capacity ranges (informed by NESO's CP2030 Advice) for 2030 and NESO's Future Energy Scenarios 2025 (FES 2025) throughout for the 2024 baseline, 2030 technology breakdowns and 2050 (represented by the bars in each chart). The DESNZ Clean Power 2030 Action Plan range is stated as a column in table 1 above and as two horizontal lines in the capacity graphs for each chapter. The Clean Power 2030 Action Plan capacity ranges are government-endorsed and so remain the reference for action to 2030.

NESO's FES 2025 analysis has been developed independently from government and provides the most up-to-date, widely accepted modelling of the whole system for 2050. It presents indicative scenarios, which have been used in combination with wider stakeholder engagement, to develop our post-2030 vision for each flexibility technology. We have used FES 2025's Holistic Transition (HT) pathway throughout the Roadmap as it most closely aligns to the current clean power trajectory, and it served as the base for NESO's Clean Power 2030 Advice figures. NESO's FES 2025 publication offers more detail on flexibility capacities.

We will outline the potential implications of any subsequent modelling published by government or NESO after the Roadmap (for example, the upcoming Strategic Spatial Energy Plan) via the annual Roadmap Forums described in section 4.

Section 1: short duration flexibility

Chapter 1: consumer-led flexibility

Consumer-led flexibility (CLF) involves the voluntary shifting of electricity use away from peak periods to times when supply is more abundant, cheaper and cleaner. These processes are increasingly easy and automated, such as smart charging an electric vehicle (EV) at night when there is lower demand on the local network or setting an industrial freezer to shift within a temperature range. CLF saves money for users who shift their usage, while also reducing system costs for all billpayers.

Contribution to the government's vision for clean flexibility

Consumers are already benefiting from using electricity flexibly, whether by smart charging an EV or taking part in discounted sessions from their supplier. Depending on their current usage, some will be able to save even without changing their usage habits. Those who do not generally use electricity at peak times (4-7pm) could save over £200 a year by switching from the price cap to a tariff that changes throughout the day based on market rates.[38] It is possible to save even more by shifting small loads away from peak times, for example, shifting washing machine and dishwasher use could save an additional £38 per year.[39]

Households with additional low carbon technologies can also save on their energy bills by switching to tariffs with rates that are designed to encourage flexible use. For example, an EV driver could potentially save £330 annually through smart charging overnight.[40] Households with heat pumps could save more than £250 annually by shifting to a time-of-use tariff and using their heat pump flexibly.[41]

In winter 2024/25, around 2m households and businesses participated in the Demand Flexibility Service (DFS) and saved money by reducing their usage during peak times. Over this period 5.4GWh of bids were accepted for electricity to be saved or shifted over 44 separate events.[42]

Businesses and public sector organisations also have the potential to benefit, either through variable pricing throughout the day, or by selling their flexibility into energy markets. Increasingly, these processes can be automated so that business processes are unaffected, such as temperature control systems or using small batteries.

[38] DESNZ analysis: £233 annual saving compares a household using 3,149kWh of electricity and 12,193kWh of gas using Octopus' Agile tariff compared to Electricity price cap unit rates between July 2023 - July 2024, with a typical consumption profile. These are indicative based on historic market rates and do not reflect how the respective prices may change in the future

[39] DESNZ analysis: the additional white goods savings are based on Citizen Advice's electrical appliance calculator, running a dishwasher in ECO mode every day and a washing machine in ECO mode three times per week at off peak times instead of peak. Electricity price cap unit rates from March 2024 to February 2025 were used as a proxies for the standard variable tariff and average off peak prices of Octopus' Agile tariff in the same period

[40] Future default tariffs: call for evidence, GOV.UK (2024): based on tariffs as of October 2023 and based upon driving 7,400miles a year. A tariff 31.5p/kWh at peak and 9p/kWh off peak was compared against the default tariff cap over the same period

[41] DESNZ analysis: based on Octopus' Cosy tariff compared to the electricity price cap unit rates between July 2023 - July 2024. For flexibility behaviour the heat pump is assumed not to operate at peak times

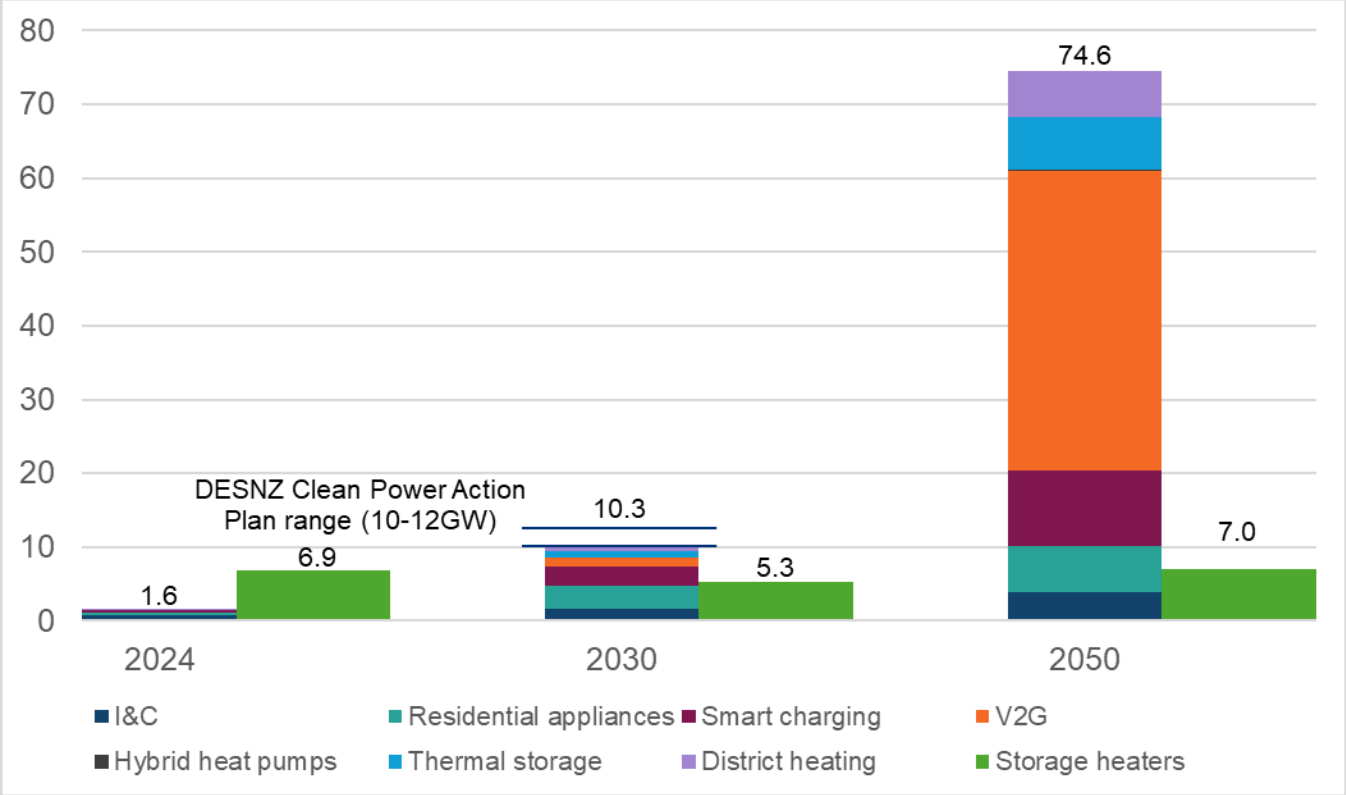
[42] Demand Flexibility Service (DFS) Winter 24/25 – Overview Report, NESO (2025)

This flexibility also benefits the whole system. Without EVs and batteries to store excess wind and solar power, we would waste abundant energy from renewables. If we used more power at peak, we would in the short-term use more expensive gas generation, and in the long term need to build more clean infrastructure. CLF lowers emissions and reduces overall system costs to drive down bills for all consumers.

Clean Power 2030 Action Plan update

In the Clean Power 2030 Action Plan, the government outlined a range of 10GW to 12GW of CLF in 2030 (excluding storage heaters), including around 4.5GW of smart charging, and 1.7GW of non-domestic CLF. Government expects significant further growth after 2030, driven by EV uptake and bidirectional charging. The graph below shows DESNZ's 2030 capacity range alongside NESO's FES 2025 holistic transition figures for 2024, 2030 and 2050, illustrating the substantial increase in CLF capacity needed to meet net zero.

Figure 3: indicative consumer-led flexibility capacity at peak scenario (GW), 2024-2050



Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars – FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)
In line with CPAP methodology, storage heater flexibility has been excluded from CLF capacity totals

We have taken significant steps since the publication of the Clean Power 2030 Action Plan. Ofgem has placed directions on industry to assure delivery of the Market-wide Half-Hourly Settlement Programme, as part of its review of delivery. DESNZ and DBT have both fulfilled commitments to consult on CLF consumer engagement and on metering display requirements for energy smart appliances. DESNZ met its commitment to set out the next steps to the Smart Secure Electricity Systems (SSES) programme via its response to consultations on energy smart appliance interoperability, a new licensing regime for CLF service providers, and tariff data accessibility.

DESNZ and Ofgem have committed to introducing new Guaranteed Standards of Performance relating to smart metering in 2025. Ofgem's statutory consultation will be published in due course. The Guaranteed Standards of Performance will require suppliers that do not offer a first-time smart meter appointment within six weeks on request, or do not address a smart meter not operating in smart mode within 90 days, to pay consumers £40 compensation.

DESNZ also committed to ensure the flexibility innovation needed to facilitate clean power 2030 and net zero is provided. DESNZ will continue to seek opportunities to support V2X innovation to reduce the cost of technology and to demonstrate its value at scale to the market.

Key priorities for 2030 and 2050

Government's approach is to create the right conditions for flexibility to flourish. All consumers will benefit from lower system costs, and government intends to create an environment in which everyone who wants and is able to flex can benefit from doing so. However, government expects most flexibility to come from those with large loads and so have particular focus on electric vehicles, flexible heating, small-scale batteries[43] and industrial and commercial processes. Government does not expect or need everyone to take part.

CLF is in its early stages of growth, with capacity in 2050 expected to be more than four times what it is today. Government is therefore taking an approach that recognises that the market could develop in different ways as we progress through the transition. We are seeing new customer offers come forward all the time, from 'energy-as-a-service' propositions to innovative rewards for customers on static time-of-use tariffs who shift their use.

Figure 4: conditions for consumer-led flexibility to flourish

Create the right rewards and incentives to use energy flexibly	➢ Deliver Market-wide Half-Hourly Settlement, with no further delays ➢ Remove clean flexibility access barriers to other energy markets (see markets chapter) ➢ Consider flexibility in retail market reform ➢ Unlock the value of demand turn up ➢ Reform final consumption levies
Support the rollout of flexible technologies	➢ Roll out heat pumps, EVs and batteries and ensure they have and maintain smart functionality through the SSES Programme ➢ Increase access to smart charging ➢ Ensure consumers can obtain a smart meter
Engage customers and ensure there are protections in place	➢ License providers and protect consumers through the SSES programme ➢ Ensure installers of flexible technology are trained to set them up to operate flexibly ➢ Take steps to include low-income and vulnerable customers ➢ Support large industrial and commercial users to participate in NESO markets ➢ Conduct trials and research to learn more about consumer behaviour

Creating CLF incentives

Variable generation and peaks in demand will create a market value for flexibility, but the conditions are not yet in place for that value to always be realised and passed on to

[43] We are referring to behind the meter batteries in this section

consumers. Government will take steps throughout markets to ensure incentives are present to encourage and reward flexible consumers.

By 2030, government expects to see significantly more consumers using smart tariffs and services, including a majority of households with large flexible loads. This will require Market-wide Half-Hourly Settlement (MHHS) Programme benefits to be delivered, and for suppliers to respond with more ways to reward consumers for flexibility. Ofgem is driving delivery of MHHS and will not accept any further delays.

We know that MHHS is necessary but not sufficient to deliver more choice of products for consumers and the right incentives to use them. Ofgem and DESNZ will therefore consider the changes needed to strike the right balance between ensuring the price cap does not hinder CLF and maintaining consumer protection. DESNZ will also ensure that final consumption levies do not create a disincentive to participation in CLF and will examine whether Renewable Electricity Guarantees of Origin (REGO) certificates could be updated to support flexibility as well as generation.

Government is aware and concerned that some Third Party Intermediaries (TPIs) do not always consider more innovative and flexible contract options when conducting procurements, displaying market prices and providing advice to their customers. DESNZ recently consulted on regulating TPIs, aiming to enhance consumer protection and support the transition to a cleaner energy system, and will outline next steps as soon as possible.

Path building actions	Hurdles	Short-term milestones
1. Ofgem and Elexon to ensure the timely delivery of the MHHS Programme, and that it incentivises the delivery of a diverse range of CLF products for all consumer types	Delays to the MHHS Programme may have postponed the rollout of smart tariffs and other innovative CLF products	**a) Regulatory changes:** Ofgem will publish a policy paper in summer 2025 outlining its considerations on licence condition changes for suppliers and Distribution Network Operators (DNOs) to mitigate the risk of further delays to MHHS. The proposed licence changes will take effect before the end of 2025
		b) Data consent rules: Ofgem to determine, by autumn 2025, whether existing data consent rules present a material barrier to the realisation of stated MHHS benefits and decide whether changes to relevant frameworks are needed
		c) Benefits realisation: Ofgem to produce a MHHS Benefits Realisation Plan by October 2026, track the realisation of MHHS benefits, and consider if further intervention is needed to expand or diversify the range of CLF products available
2. Government to consider how REGOs may be used to support flexibility	REGOs only support sources of renewable electricity generation, and so do not reflect the contribution of CLF	**a) Understanding the current market:** DESNZ, working with NESO and Ofgem, will assess how REGOs currently impact the flexibility market. DESNZ will update on progress at the 2026 Roadmap Forum
		b) Evolution of REGOs: DESNZ to explore how stakeholders interact with the REGO scheme, and whether scheme alterations may be appropriate. DESNZ will update on progress at the 2026 Roadmap Forum
3. Government and Ofgem to consider options for reforming	Current retail market arrangements	**a) Retail market reform:** building on the Future Retail Action announced as part of the Regulatory Growth Action Plan, DESNZ and Ofgem will consider by March 2026

Path building actions	Hurdles	Short-term milestones
retail energy market arrangements to support flexibility	may limit the realisation of the benefits of flexibility	how the future retail market could better support flexibility. DESNZ will also respond to its recent TPI consultation document and lay out next steps as soon as possible
		b) Price cap: Ofgem, working with DESNZ, to assess by March 2026 what changes are needed to ensure the appropriate balance between the price cap not being a barrier to voluntary consumer flexibility and consumers remaining adequately protected
		c) Accessible tariff data: by end 2026, through the SSES programme, DESNZ will amend electricity suppliers' licence conditions, requiring them to make tariff data available to domestic consumers in a standardised format, making it easier to optimise appliances against smart tariffs including more advanced, 'dynamic' tariffs where the tariff rate updates frequently
		d) Energy Cost Allocation and Recovery Review: in Summer 2025, Ofgem will publish a call for input as part of its Energy Cost Allocation and Recovery Review, exploring and seeking views on how energy system costs could be allocated in future. This will consider flexibility incentives among other criteria for how network costs are allocated and recovered
4. Government and Ofgem to work towards removing financial barriers to EV and small-scale battery owners exporting electricity to the grid	Final consumption levies on home and EV batteries are paid on electricity imports but not refunded on exports, creating a disincentive to CLF participation	**a) CPAP Action:** DESNZ and Ofgem will review the options available to remove final consumption levies for home batteries and vehicle-to-grid EV batteries and set out next steps in the 2025 Clean Flexibility Roadmap **Progress update and next milestone:** DESNZ and Ofgem have reviewed options available and agreed that DESNZ will introduce legislation when parliamentary time allows to enable the establishment of a potential final consumption levy rebate scheme
5. Government, Ofgem and NESO to consider solutions to unlock potential of demand turn up (DTU)	Persistent barriers are limiting the ability to deploy DTU at large-scale as a flexibility resource	**a) Explore DTU barriers and solutions:** Ofgem to review DTU whole-system value, potential, barriers and solutions with input from DESNZ, NESO and industry and report on findings at the 2026 Roadmap Forum
6. DESNZ will take steps to deepen its understanding of the whole system value of CLF	CLF has effects on the whole system, and we may not yet have captured its whole value	**a) Published modelling:** DESNZ will publish modelling on the whole system value of CLF. DESNZ will update no later than the 2026 Roadmap Forum

Non-domestic CLF

By 2030, government expects open and competitive markets for flexibility to create stronger revenue streams, including for non-domestic users such as data centres. Government is optimistic about the potential to significantly increase non-domestic flexibility through the actions here and in the markets chapter.

Businesses of all sizes may be able to save by using electricity flexibly. For some, this will involve building new revenue streams by trading flexibility in energy markets, with the help of aggregators or suppliers. Others may benefit from turning down their peak consumption by using electricity at times of the day when it is cheaper. These processes can increasingly be automated within defined ranges, such as by setting a defined temperature zone on a freezer system, so that business processes are unaffected. NESO will launch an open call this autumn to support large loads to take part in its markets and will set up a dedicated onboarding team.

In addition to these market changes, we will work with large users to help them unlock their potential flexibility and take opportunities to increase CLF via other government programmes, such as Great British Energy (GBE) and industrial decarbonisation schemes.

Case study

Reed Boardall,[44] one of the UK's largest temperature-controlled food distribution businesses, extended its partnership with npower Business Solutions (nBS) to enhance energy efficiency and sustainability. The company's Boroughbridge site spans a huge 55 acres and operates 24 hours a day, so is constantly drawing power.

"This provides great potential for flexibility around energy use, so we started trialling our Demand Shift service, which enables them to reduce power consumption during peak times by managing assets for short periods of time and sell back the pre-hedged volume in the short-term markets to generate revenue," explains Liz Stone, Client Lead at nBS. "Cold storage provides an excellent opportunity for flexible energy use without breaching operational quality or agreed terms with suppliers, and turning down supply for a short period during peak demand periods had no impact on the day-to-day operations, so this was an easy win for them," continues Liz.

As the UK relies on increasing volumes of renewable generation for electricity supply, there are increasing opportunities for flexibility services in the summer months too. "We're delighted with the potential these initiatives present to save money and carbon emissions – and we're grateful for the team's professional approach in supporting us," says Reed Boardall's Managing Director, Andrew Baldwin

Path building actions	Hurdles	Short-term milestones
7. Government, Ofgem and NESO to take steps to remove barriers to non-domestic CLF participation and reinvigorate the non-domestic CLF market	CLF from non-domestic consumers has declined sharply since 2019, following various policy changes	**a) Capacity target:** NESO will set a public target by the end of December 2025 for how much non-domestic CLF capacity will be added to NESO markets for each year to 2030
	Some users are not aware of their CLF potential, or find the onboarding process onerous	**b) NESO engagement:** by the end of October 2025, NESO will launch an open call for industry to bring forward propositions for large loads that could participate in NESO flexibility markets (e.g. supermarket cold storage) and commit to working with them to explore how this capacity could be brought into NESO markets. NESO will also proactively engage senior members of GB's

[44] Reed Boardall

Path building actions	Hurdles	Short-term milestones
		largest energy consumers to promote the benefits of flexing their energy consumption
		c) Onboarding support: NESO to set up a dedicated onboarding team by October 2025 to work with non-domestic consumers and their suppliers/aggregators to identify and bring forward new flexibility to NESO markets
	CLF is not yet central to businesses' decarbonisation efforts	**d) Carbon reporting:** by April 2026, building on the DFS scheme, NESO will explore the potential to report on consumer carbon savings resulting from flexibility actions. This would enable large industrial and commercial consumers to see the carbon savings directly attributed to their flexibility to further support their commitments to reducing emissions
	We have more to learn about the potential capacity in non-domestic sectors	**e) Non-domestic evidence base:** DESNZ, Ofgem and NESO will collaborate to build the non-domestic CLF evidence base. This will include launching an information-sharing forum, led by DESNZ, with support from Ofgem and NESO, before the end of 2025. The forum will be made up of a wide range of industry experts and stakeholders to share data and improve our overall understanding of the non-domestic CLF landscape

Consumer engagement

We understand that consumers need information they can trust to understand how CLF can work for them. DESNZ is therefore consulting on the best way to engage consumers of all types.[45] Government will also take opportunities in the user journey to explain and promote flexible usage, such as through installers of flexible technology when customers have heat pumps or EV chargepoints installed.

Case study

CrowdFlex[46] is the largest trial of consumer-led flex globally, involving over 100,000 households across Great Britain. Funded through Ofgem's Strategic Innovation Fund (SIF), it is delivered by NESO in partnership with the energy industry, network operators, technology providers and researchers.

The primary purpose of CrowdFlex is to unlock consumer-led flexibility by providing data that will help underpin NESO's real time forecasting models. This will help NESO to better predict how consumers respond to different types of events, enabling greater use of consumer-led flexibility in its markets.

However, CrowdFlex has also created an unprecedented opportunity to learn about domestic consumers' experiences, responses, and attitudes towards flexibility.

Over three trial periods since 2024, CrowdFlex has tested various methods to encourage domestic consumers to flex their electricity use, including financial and non-financial incentives, and both manual and automated participation in "turn-up" and "turn-down"

[45] Consultation on the best approach to consumer engagement on consumer-led flexibility, GOV.UK (2025)
[46] CrowdFlex, NESO

events. The trials revealed that financial incentives are effective in stimulating consumer-led flexibility, automation tools can help users shift 30% more electricity, and one-third of consumers continued to engage through habit even after their interest in the financial benefits declined. Over two-thirds of customers reported that they felt they were making a positive difference by participating and most consumers enjoyed joining in the trial.

The findings of the Winter 2024/25 trials will be published in summer 2025, with the final results (summer 2025) published in winter 2025, providing key evidence for developing future policy and market approaches.

Path building actions	Hurdles	Short-term milestones
8. Government and Ofgem to work together to support awareness and understanding of CLF products and supporting technologies across all consumers	Low consumer awareness and understanding of how to participate in CLF limits uptake across all consumer types	**a) Consumer engagement:** DESNZ to publish a response to the July 2025 consumer engagement consultation in early 2026
		b) Non-price CLF interventions: Ofgem will assess by end-2026 the impact and feasibility of various CLF non-price signals and interventions based on existing trials and research
		c) Price Response Trial: Ofgem will lead a voluntary trial assessing how a representative sample of consumers responds to an opportunity to lower their standing charge through avoiding peak times. Findings will be published by the end of 2026
		d) CLF-ready label: DESNZ will explore the case for a "CLF-ready" label to support consumer awareness of energy smart technology, subject to existing legislative requirements. DESNZ to decide by summer 2026 if and how this could be implemented
9. DESNZ and Ofgem to take steps to increase trust and confidence in CLF among users of all kinds	Some consumers may need reassurance to trust automated CLF propositions	**a) Licensing scheme:** DESNZ will strengthen consumer confidence and improve energy security by introducing new consumer protections and cyber security measures for load controllers and flexibility service providers by the end of 2027, through a new licensing scheme administered by Ofgem
	Perception of unequal access could undermine wide participation in CLF	**b) Inclusive CLF:** DESNZ to assess the findings of the Inclusive Smart Solutions Programme[47] with industry by early 2026, to develop measures focused on overcoming barriers to the participation of low-income and vulnerable consumers in CLF

Smart metering

Smart meters are crucial for enabling CLF. They provide the data needed for suppliers to offer and consumers to use smart tariffs to incentivise demand shifting. Government, Ofgem and industry will ensure that the vast majority of households and smaller non-domestic premises have a smart meter operating in smart mode, and that consumers looking to participate in CLF have a smart meter or can obtain one quickly.

[47] Inclusive Smart Solutions, Energy Systems Catapult (2023) – the report from this programme is expected to be published in late summer 2025

Path building actions	Hurdles	Short-term milestones
10. Government, Ofgem and industry to ensure the vast majority of properties have a smart meter operating in smart mode by the end of 2030, and that consumers who want to participate in CLF can obtain a smart meter quickly	Some consumers cannot participate in CLF because they cannot access a working smart meter	**a) CPAP Action:** DESNZ is working with Ofgem to introduce new Guaranteed Standards of Performance relating to smart metering in 2025. These may include standards relating to the timely installation and maintenance of smart meters, compensating consumers where they are not met
		b) Maximise the number of smart meters installed and in smart mode: Ofgem and DESNZ are committed to continuing to improve delivery and consumer experience of the smart meter roll out. DESNZ will shortly consult on regulatory interventions to improve the smart metering consumer experience, including by tackling the number of smart meters not sending automatic readings, and will continue to drive the rollout so that the vast majority of households and small businesses can benefit, to support the flexibility needed to deliver clean power by 2030
		c) Implementation: industry to fulfil its obligations to install smart meters, and ensure they are operating correctly, to the timelines and standards set out in licence conditions. Ofgem will monitor suppliers' compliance with their obligations and take enforcement action where appropriate

CLF and smart technology uptake

CLF and the rollout of smart technology are closely linked. As we electrify heat and transport, we are increasing the demand on the system during peak times, so we need to ensure that the demand we add is as flexible as possible. Through the Smart Secure, Electricity Systems (SSES) programme, DESNZ is working to ensure that energy smart appliances, such as EV chargepoints and heat pumps, are secure and interoperable, and that owners of relevant technologies can participate in flexibility as simply and equitably as possible.

We want to ensure that as many homes as possible benefit from CLF. In addition to new technologies, government will also consider how we can use existing solutions such as storage heaters to provide opportunities for cost savings.

Case study

The Coventry Affordability Trial,[48] led by E.ON Next, addresses the struggles of "fuel poor households" – those with low incomes, limited disposable funds, and energy-inefficient homes, who find engaging with net-zero challenging amidst the cost-of-living crisis. Specifically targeting "vulnerable families" and "struggling elders", the project moves beyond traditional support to offer a joined-up proposition. This initiative aims for permanent bill reduction by tackling both symptoms and root causes.

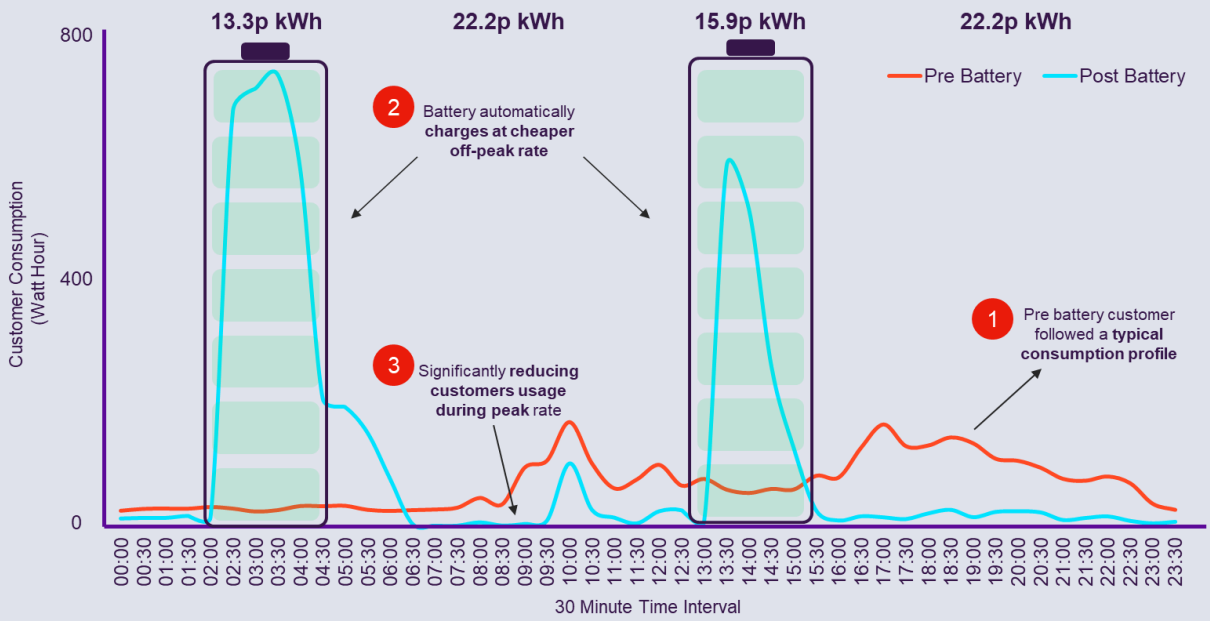
Key elements include debt relief through an Energy Fund, energy efficiency improvements, and the provision of an innovative battery and time-of-use tariff. This is offered to consumers at no cost by leveraging existing funds and simplifying complex schemes into one for customers.

[48] E.ON Next powers up ground-breaking support scheme with first free battery installation, E.ON (2024)

The battery is fully funded and installed for free, with the customer taking full ownership. It is coupled with a time-of-use tariff, which allows customers to store cheaper off-peak electricity for use during peak times, leading to significant, recurring savings. E.ON Next estimates annual savings of up to £250-£300 for a typical household for up to 20 years.

For example, an elderly couple whose energy consumption grew not through choice, but due to them becoming medically far more dependent on energy, are now estimated to save over £300 in the first year. This is all through automation and at no inconvenience to how the couple lives their lives. Government will set out more detail on its approach to home batteries in the upcoming Warm Homes Plan.

Figure 5: an example of how installing a battery can shift electricity use to when it is cheapest



Source: actual average daily pre and post battery, smart meter data from a customer, between 01/11/2024 to 01/02/2025, E.ON Coventry Affordability Pilot

Path building actions	Hurdles	Short-term milestones
11. Government to support the rollout of energy smart appliances, such as EV chargepoints and heat pumps, and ensure they are well set up for flexibility	Appliances are not always set up to make flexibility easy	**a) Smart mandate:** through the SSES programme, DESNZ to legislate by early 2026 to ensure that all heat pumps sold in GB have smart functionality, ensuring that heat pump owners can more easily take advantage of flexibility tariffs and services, while putting in place additional cyber security and grid stability measures. The legislation will also introduce equivalent requirements for domestic-scale battery storage systems sold with smart functionality
		b) Smart technology installers and CLF uptake: DESNZ to explore the case to update guidance and standards for installers of smart technology to support consistency in how they engage consumers on CLF, with a decision by summer 2026 on if and how this will be implemented

Path building actions	Hurdles	Short-term milestones
		c) Heating installation standards: DESNZ will update formal standards[49] for installer certification by 2027 to support workforce upskilling and establish smart-enabled electric heating as the default. This includes working with the Microgeneration Certification Scheme (MCS) to review MCS-certified electric heating installation standards, and with MHCLG to embed smart competency requirements into Competent Person Scheme criteria for qualified installers
		d) Interoperability to support switching: DESNZ is working with industry via SSES to develop interoperability standards for key energy smart appliances, ensuring consumers can easily switch between advanced smart services that offer active management of their appliances, with the aim of legislating in 2027 to mandate their use
	The number of storage heaters could decrease by 2030 as more options become available for electric heating, reducing their CLF contribution	**e) Storage heaters:** DESNZ to undertake modelling to better understand what role storage heaters can play in delivering CLF. DESNZ will look into how households can benefit from using storage heaters flexibly, such as through demand turn-up, and will update on next steps at the Roadmap Forum in July 2026
	The upfront costs of home batteries can be high for consumers, particularly those on low incomes	**f) CPAP Action:** DESNZ will consider the financing options for retrofit works, including batteries, in the Warm Homes Plan
	Existing Energy Performance Certificates (EPCs) do not consider a building's potential to optimise energy usage and participate in CLF	**g) EPC reform:** MHCLG to publish the response to the December 2024 EPC reform consultation. DESNZ is closely collaborating with MHCLG to ensure new EPCs are in place by end 2026

<u>EV smart charging and bidirectional charging</u>

By 2050, government expects the majority of CLF capacity to come from EVs, so it is vital we unblock barriers to their adoption by a broader range of consumers. Government is seeking to optimise access to smart charging tariffs by enabling EV drivers to smart charge their vehicles, whether in private or in public settings, and enabling open data sharing to support tariff access. Government is also focused on removing barriers to V2X deployment and uptake to maximise flexibility and EV driver cost savings. This includes reducing regulatory barriers to its interaction with the grid and incentivising its uptake.

[49] Mandatory criteria set out in formal documentation for installers to meet in schemes to ensure their compliance

Case study

In 2024, EO Charging[50] helped Stagecoach electrify its Romford bus depot. EO's Load Management solution, as part of EO's *Charge Assurance*™ offering, allows a significantly larger number of charging stations to be deployed to a customer site than the grid connection would naturally allow. In this instance, all the Stagecoach charging stations could consume 175% of the site supply. Without EO's Load Management solution, the site limit would be breached and the high voltage fuses would trip, incurring service penalties and fines for reconnection costs, as well as jeopardising operations.

The solution constantly monitors the charging stations and adjusts power consumption to ensure that the site limit is never breached. It also ensures that all buses charge over a longer period of time.

The Romford site has a timed schedule configured that sets a low charging limit during the day whilst having a higher limit during the night. This means that the buses predominantly charge at night when the electricity is cheaper.

By deploying EO's Load Management Solution, Romford's busy depot has been able to install the optimum number of charging stations to manage its fleet (within the constraints of the power and vehicle dwell time) and is also able to charge vehicles in the most cost-effective manner.

Path building actions	Hurdles	Short-term milestones
12. Government and Ofgem to unlock the full flexibility potential of EVs by addressing regulatory gaps, ensuring fair access to smart charging, and enabling secure data sharing to support tariff access	EV drivers in leasehold multi-tenancy properties do not have the same price protections as consumers with domestic tariffs, allowing landlords to inflate costs for tenants using communal smart chargers	**a) CPAP Action:** Ofgem will consider reform on the Maximum Resale Price, seek views on what needs to change to address identified issues and update the current requirements, as required, setting out progress and next steps in the 2025 Flexibility Roadmap **Next milestone:** Ofgem will consult during 2025 on reforming the Maximum Resale Price, including the potential to apply a Maximum Resale Price to landlords providing EV chargepoints to their tenants
	Limited availability of smart tariffs from chargepoint operators is restricting the contribution of public on-street EV charging to CLF capacity	**b) CPAP Action:** DESNZ together with DfT will explore with industry options to accelerate deployment of smart charging at public chargepoints and set out progress and next steps in the 2025 Flexibility Roadmap **Next milestone:** DESNZ and DfT to provide guidance as part of their ongoing capability building programme for local authority EV infrastructure officers in 2025-26 financial year to support local authorities procure public flexible EV charging tariffs for their residents
	Many EV drivers struggle to access smart charging tariffs due to data	**c) Open data:** government to consult by early 2026 on approaches to enable open data communication between EVs, chargepoints, energy suppliers and aggregators

[50] EO Charging

Path building actions	Hurdles	Short-term milestones
	sharing arrangements with energy suppliers	including consideration of specific EV-chargepoint communication standards
13. Government and Ofgem to accelerate the deployment and integration of bidirectional charging (V2X) technologies	V2X has strong potential as a flexibility source but faces high costs, slow uptake and regulatory barriers to grid export	**a) Incentives:** government to consider over FY2025-26 how best to incentivise vehicles with V2X capability, such as using innovative credit models within the zero emission vehicle (ZEV) mandate
		b) Grid connection and interoperability: Ofgem and DESNZ to consider with industry in 2025 how to improve grid connection processes and technical interoperability for V2X

Heat network flexibility

Low carbon heat networks are expected to meet 20% of UK heat demand by 2050, up from 3% now.[51] The government's forthcoming Heat Network Zoning policy will drive this growth and ensure that heat networks are built where they are the lowest cost low carbon option. Amongst other benefits, district heat networks require less electricity than individual building solutions and can offer greater flexibility (e.g., via larger-scale thermal storage). Government will set out a clear route to unlocking heat network flexibility by outlining a vision for its role and exploring regulatory options to optimise capacity.

Case study

Smart tariffs are emerging as a key enabler of clean flexibility in domestic heating, helping households reduce costs while supporting a more resilient, clean energy system. For example, EDF's Heat Pump Tracker Tariff[52] offers guaranteed daily discounts of 10p/kWh during off-peak windows (4–7am and 1–4pm), with no peak-time penalties. According to EDF, over 1,000 customers have enrolled, saving an average of £164 annually by scheduling heating use to discounted periods. A before-and-after study confirmed that customers responded to these price signals, reducing peak-time consumption and easing pressure on the grid.

Octopus Energy's Cosy Octopus tariff[53] also showcases the power of smart pricing to unlock household flexibility in an automated way. Designed for homes with electric heating systems (such as heat pumps), it uses a three-rate structure to encourage off-peak usage, offering eight hours of discounted "Cosy Dip" pricing at 51% below the day rate. According to Octopus, customers responded overwhelmingly, shifting 52% of their daily energy use to off-peak periods – nearly double that of standard tariff users – and halving their peak-time consumption. With average household savings of over 20%, Cosy Octopus demonstrates how smart tariffs can turn price signals into action, making electric heating more affordable while driving system decarbonisation and resilience.

[51] Internal DESNZ modelling. Government will set out its deployment targets for heat networks in the forthcoming Warm Homes Plan
[52] EDF Heat Pump Tracker tariff
[53] Octopus Energy's Cosy Octopus tariff

Path building actions	Hurdles	Short-term milestones
14. Government to maximise the role of low carbon heat networks as flexible grid assets in meeting net zero	Heat networks are not commonly set up to maximise their grid flexibility due to misaligned frameworks and incentives	**a) Heat networks vision:** DESNZ to set out its vision for low carbon heat network growth, including the potential role of flexibility, as part of the Warm Homes Plan in 2025, as well as the role of Heat Network Zoning in supporting long-term electricity network planning
		b) Thermal storage in heat networks: DESNZ to publish its commissioned research into the utilisation of thermal energy storage in UK heat networks in summer 2025 and consider its recommendations
		c) Optimising flexibility from low carbon heat networks: following the launch of Heat Network Zoning, DESNZ to explore regulatory options to ensure low carbon heat networks can fully support flexibility, particularly via thermal storage, fuel switching, and connections, and align incentives across markets to deliver the lowest cost decarbonisation pathway for consumers. DESNZ will work with Ofgem and NESO to provide an update at the 2026 Roadmap Forum

Community energy

Government will support community groups to own and benefit from clean power in their local area and play a role in reaching clean power by 2030 and net zero by 2050. Government recognises the complex nature and landscape of community and local energy and so will work to ensure regulatory, market and institutional frameworks to support community-led local demand management are in place.

Path building actions	Hurdles	Short-term milestones
15. Government and Ofgem to understand the barriers and explore adjusting regulatory, market and institutional frameworks to support community-led local demand management	Current regulatory and market frameworks do not accommodate community-led local demand management, limiting the role of smart local energy solutions in the inclusion of diverse, especially vulnerable, consumers in flexibility markets	**a) Business case and operational model:** DESNZ to work with Ofgem and GBE to set out its vision in 2026 to assess the case for and operational models of community-led responses to local system needs. It will use the findings to inform potential institutional roles and mechanisms (e.g., RESP programme implementation, roles for Elexon as market facilitator in product development, and using GBE's Local Power Plan) to enable these approaches. The assessment will consider community-led collective solutions to whole system issues and opportunities: market mechanisms and DNO tools (constraint management zones and active network management), insights from innovation schemes piloting local balancing models, and the EU Citizen Energy Community enabling regulatory model

Chapter 2: grid-scale batteries

Grid-scale battery storage presently consists of large lithium-ion batteries connected directly to the electricity transmission and distribution networks. As we shift from a fossil fuel-based energy system to a renewable-based system, grid-scale batteries enable us to store energy for times when the sun shines less, the wind does not blow, or for prolonged periods of cold weather. They are the first port of call for keeping our electricity system at the right frequency, whilst ensuring there is enough power in the right place at the right time, covering shortages from a few milliseconds to a few hours.

Contribution to the government's vision for clean flexibility

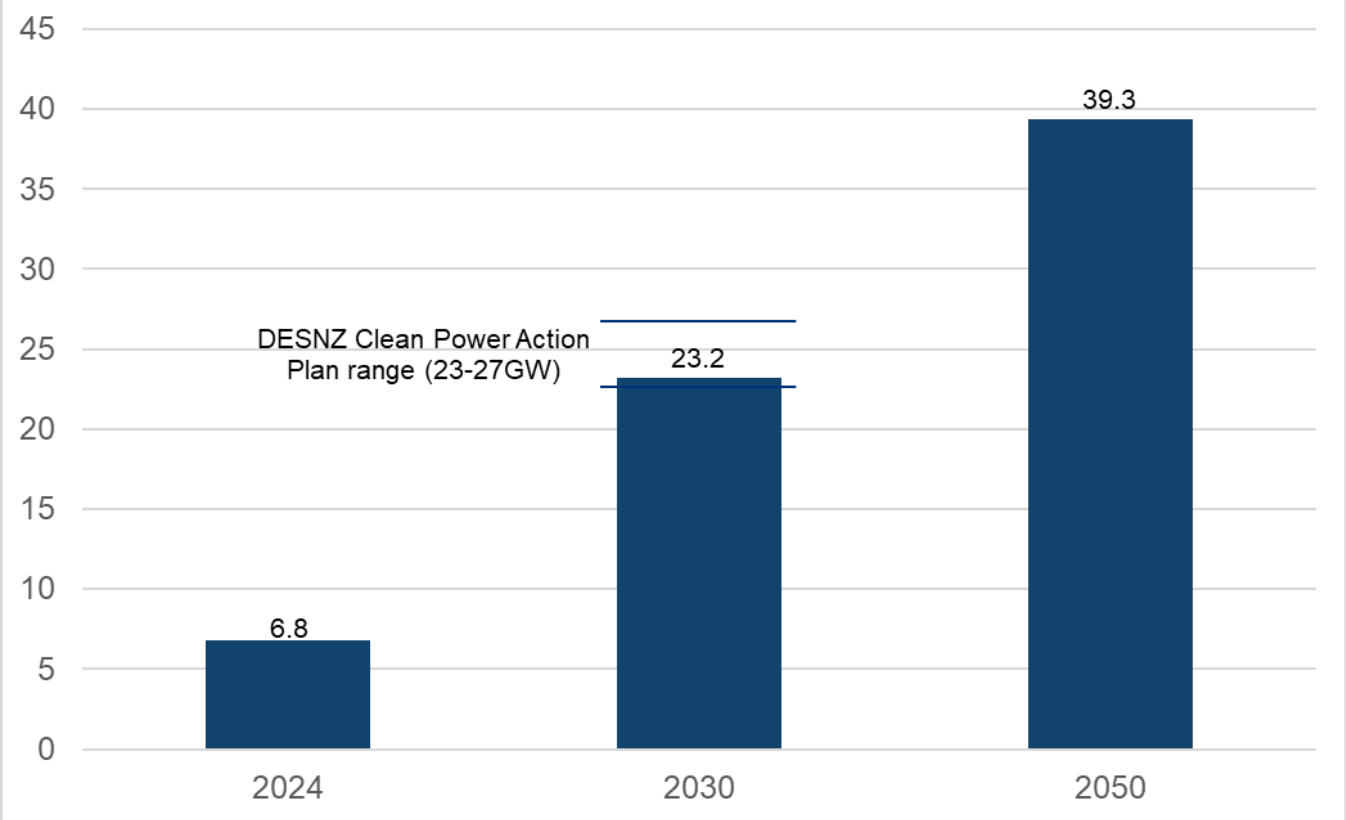
Grid-scale batteries are central to Britain's power system flexibility and are a vital technology for achieving clean power by 2030. Grid-scale batteries help to store renewable electricity at the system level and thus minimise the need for investment in new generation capacity and associated network upgrades in the long term to meet peak demand.

Clean Power 2030 Action Plan update

In the Clean Power 2030 Action Plan, the government outlined an ambition for 23GW to 27GW of grid-scale batteries in 2030. There are over 5GW of batteries on the grid today.[54] With over 17GW more grid-scale batteries with a Capacity Market agreement in place up to 2029,[55] and another 17GW with planning approval,[56] the government is confident that Britain is providing a strong framework to meet this ambition. The graph below shows DESNZ's 2030 capacity range alongside NESO's FES 2025 holistic transition figures for 2024, 2030 and 2050, illustrating the substantial increase in battery capacity needed to meet net zero.

[54] The Buildout Report GB, Modo Energy (2025)
[55] Capacity Market Register, NESO (2025)
[56] Renewable Energy Planning Database, GOV.UK (2025)

Figure 6: indicative battery capacity scenario (GW), 2024-2050



Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars - FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)

We are continuing to work to remove barriers to grid-scale battery delivery. NESO is in the process of implementing a reformed grid connection process that will include prioritising battery projects for connection that align with the permitted capacities for 2030 and 2035 as set out in the government's Clean Power 2030 Action Plan.[57] Battery projects that do not align with the 2035 permitted capacity, or that cannot demonstrate appropriate land rights for their project, will be deprioritised within the connections queue as part of the reforms to be implemented this year. This will accelerate connections for the most mature battery projects and ensure that our energy system operates at the lowest cost.

The Strategic Spatial Energy Plan (SSEP), which has a time-horizon of 2030-2050, will also provide industry more confidence to build with certainty, acting as a guide so we can better plan the shape of our future energy system.[58] DESNZ continues to work with MHCLG to provide further clarity on terminology and the application of policy for grid-scale batteries. Meanwhile Defra will consult shortly on including grid-scale batteries within Environmental Permitting Regulations.

A potential challenge for battery projects is the shortage of workforce and supply chain for high voltage cabling, transformers and switchgear. DESNZ has convened the Clean Power 2030 Supply Chains and Workforce Industry Forum to identify barriers, build an evidence base and develop bold solutions as required.

[57] Connections Reform, NESO (2025)
[58] Strategic Spatial Energy Planning (SSEP), NESO

Key priorities for 2030 and 2050

We expect grid-scale batteries to continue to play an important role in the power sector alongside other sources of short and long duration flexibility. Government will need to ensure that momentum is maintained beyond 2030 through new projects and repowering. As such, DESNZ's initial priorities for post-2030 include working with NESO to clarify further how the connections process should operate post-2035 and working with industry and Defra on recycling, reuse, and repowering of battery sites coming to their end of life.

Investment finance

Great Britain's grid-scale battery deployment relies on private investment. Government remains confident that there is sufficient financing available to deploy grid-scale batteries at the scale required. We will monitor battery deployment and engage with external stakeholders to keep our position under review.

Path building actions	Hurdles	Short-term milestones
16. The government will maintain a watching brief on the state of the grid-scale battery sector, and will consider further supporting actions if necessary	Significant investment is needed to reach scale of batteries needed for 2030	**a) Investment environment:** DESNZ to commission external advice on the state of the market for grid-scale battery investment in 2025
		b) National Wealth Fund (NWF): where projects which support the delivery of clean power by 2030 face shortfalls in private capital, the NWF will explore finance solutions which it can provide, building on the investments it has already made in storage

Co-location

Government recognises that co-locating storage with renewables could make more efficient use of existing grid infrastructure and potentially reduce both the need for additional network buildout, and in some cases the capital costs for individual projects. DESNZ will continue to work closely with NESO to address hurdles relating to the deployment of co-located projects ahead of 2030. This includes consideration of hybrid metering arrangements to enable storage to be co-located with Contracts for Difference (CFD) generators.

Path building actions	Hurdles	Short-term milestones
17. NESO will look for opportunities to ease and encourage the development of hybrid and co-located assets where these have clear system benefits (above and beyond battery-only assets)	Limited evidence on the network impacts of in-front-of-meter co-located storage and a lack of hybrid metering provisions in markets is hindering co-location of storage with renewables	**a) Co-location potential:** NESO to review the methodologies giving effect to connections reform by April 2026. As part of this review, NESO will include consideration of whether co-located projects should be prioritised within the connections queue
		b) Metering arrangements: NESO to assess the challenges and opportunities of hybrid metering arrangements for Balancing Mechanism Units (BMUs) by the end of 2025, including for co-located assets, to identify the value of making wider market changes in this area

Safety

Grid-scale batteries pose no greater danger than other infrastructure, but it is of course vital that any risks are appropriately managed to maintain public safety and trust. While fires have occurred at battery sites in Great Britain, they are rare and are mitigated by a robust regulatory framework overseen by the Health and Safety Executive (HSE). This framework requires responsible parties to take measures to ensure health and safety throughout all stages of a battery system's deployment. Battery developers and operators work closely with fire services in drawing up Emergency Response Plans. Fires at grid-scale battery sites appear to be less likely than those at non-domestic buildings in general from all sources. The latest available five-year annual average fire incidence rate for GB batteries is 0.7% (2020/21 to 2024/25),[59] lower than that for wider non-domestic building fires in England at 0.8% (2019/20 to 2023/24).[60]

The government, through the industry-led Electricity Storage Health and Safety Governance Group, will continue to monitor the sector closely. Defra will also consult shortly on including grid-scale batteries within the Environmental Permitting Regulations, to provide further safeguards and assurance.

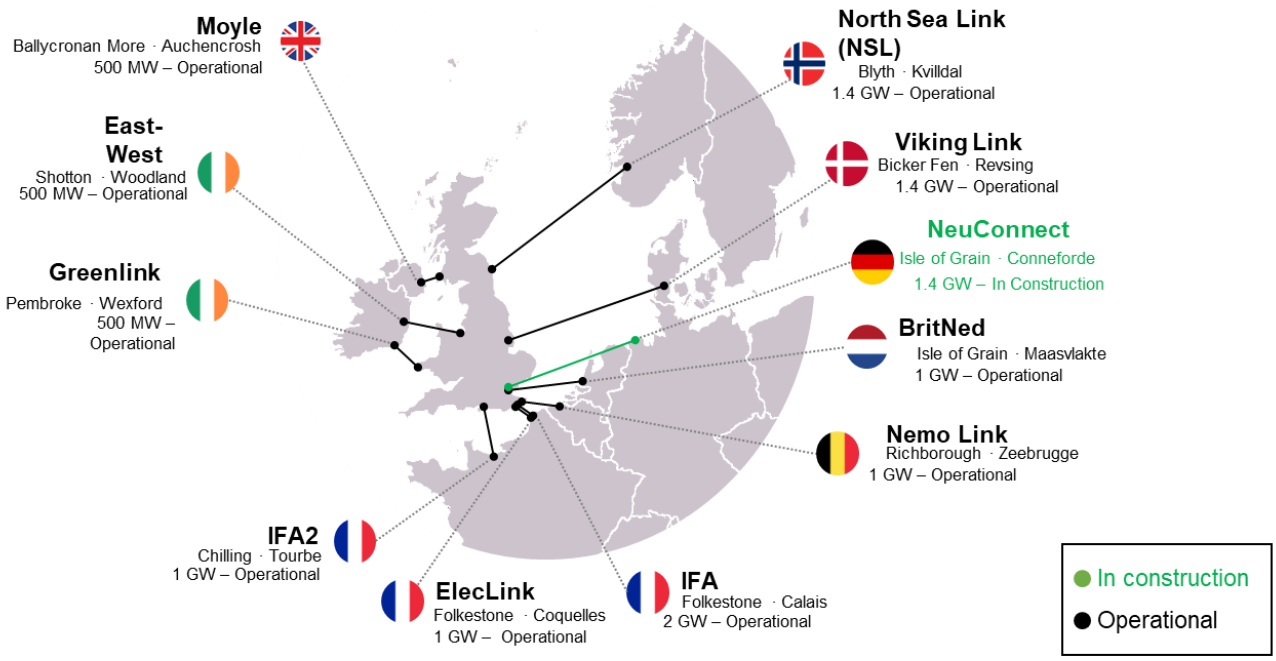
Path building actions	Hurdles	Short-term milestones
18. As the grid-scale battery sector expands and innovates, the government will ensure that the cross-departmental, national and local framework to ensure their safety keeps pace and minimises risks to the public	As grid-scale battery deployment accelerates, maintaining a robust health and safety framework is essential to ensure continued safe operation and public confidence	**a) CPAP Action:** Defra will consult on including grid-scale batteries within the Environmental Permitting Regulations by June 2025 **Progress update and next milestone**: Defra has been engaging with various stakeholders to develop a consultation on including grid-scale batteries within the Environmental Permitting Regulations and will publish it shortly
		b) Safety governance: DESNZ will monitor sector safety on an ongoing basis, including via its engagement in the industry-led Electricity Storage Health and Safety Governance Group

[59] Modo Energy (2025)
[60] Fire and rescue incident statistics, GOV.UK (2025)

Chapter 3: interconnection

Electricity interconnectors are subsea cables that connect the GB energy market to those of neighbouring countries, enabling the import and export of electricity via cross-border trade. Interconnection plays a key role in the electricity system, providing 13.3% of gross UK electricity supply in 2024 through imports, and enabling the export of surplus GB renewable electricity. [61] With the right framework, interconnectors can provide many benefits as we transition to a decarbonised power system, including diversifying our generation mix, enabling access to markets with potentially lower-cost electricity for GB consumers, supporting European decarbonisation, and increasing flexibility via imports and exports capability.

Figure 7: map of operational and in construction interconnectors to GB

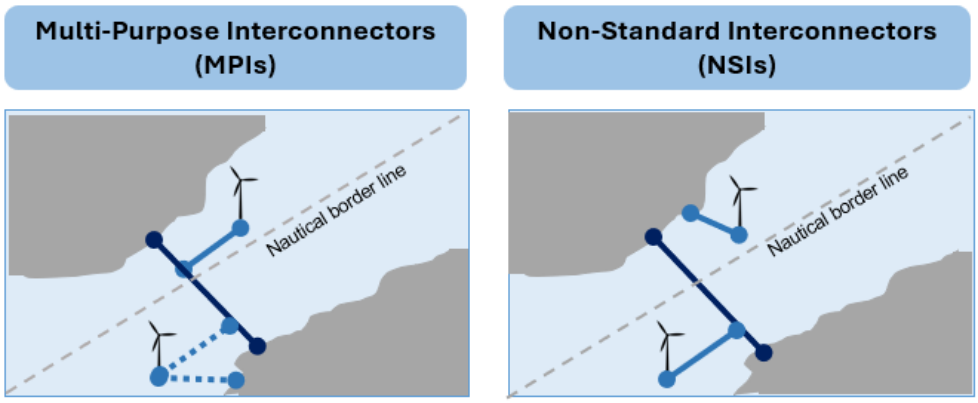


Source: Internal DESNZ representation

Alongside traditional point-to-point interconnectors, Offshore Hybrid Assets (OHAs) offer the advantage of combining interconnection and offshore transmission from windfarms. OHAs are currently at pilot project stage of development with two proposed forms: Multi-Purpose Interconnectors (MPIs) which include connection to GB offshore wind, and Non-Standard Interconnectors (NSIs) that only include a connection to foreign offshore wind.

[61] Energy Trends: March 2025, GOV.UK (2025)

Figure 8: multi-purpose and non-standard interconnectors diagram



Source: Internal DESNZ representation

Contribution to the government's vision for clean flexibility

Interconnectors provide flexibility for our grid by helping the system to respond rapidly to changes in supply and demand, and balancing periods of higher or lower generation. As our renewable energy capacity expands, government expects that interconnection will enable the export of surplus renewable electricity, participating in European-wide decarbonisation, while reducing GB system costs. This will increase efficiency of generation between connected countries via the right market and planning frameworks.

Case study

The interconnection cap and floor regime is the regulated route for electricity interconnector development in Great Britain (GB) and has been successful in bringing forward investment. Introduced in August 2014, it has incentivised developers to deliver interconnector capacity by mitigating electricity market price risks. The cap and floor model has now been extended to long duration electricity storage by this government (see chapter 4).

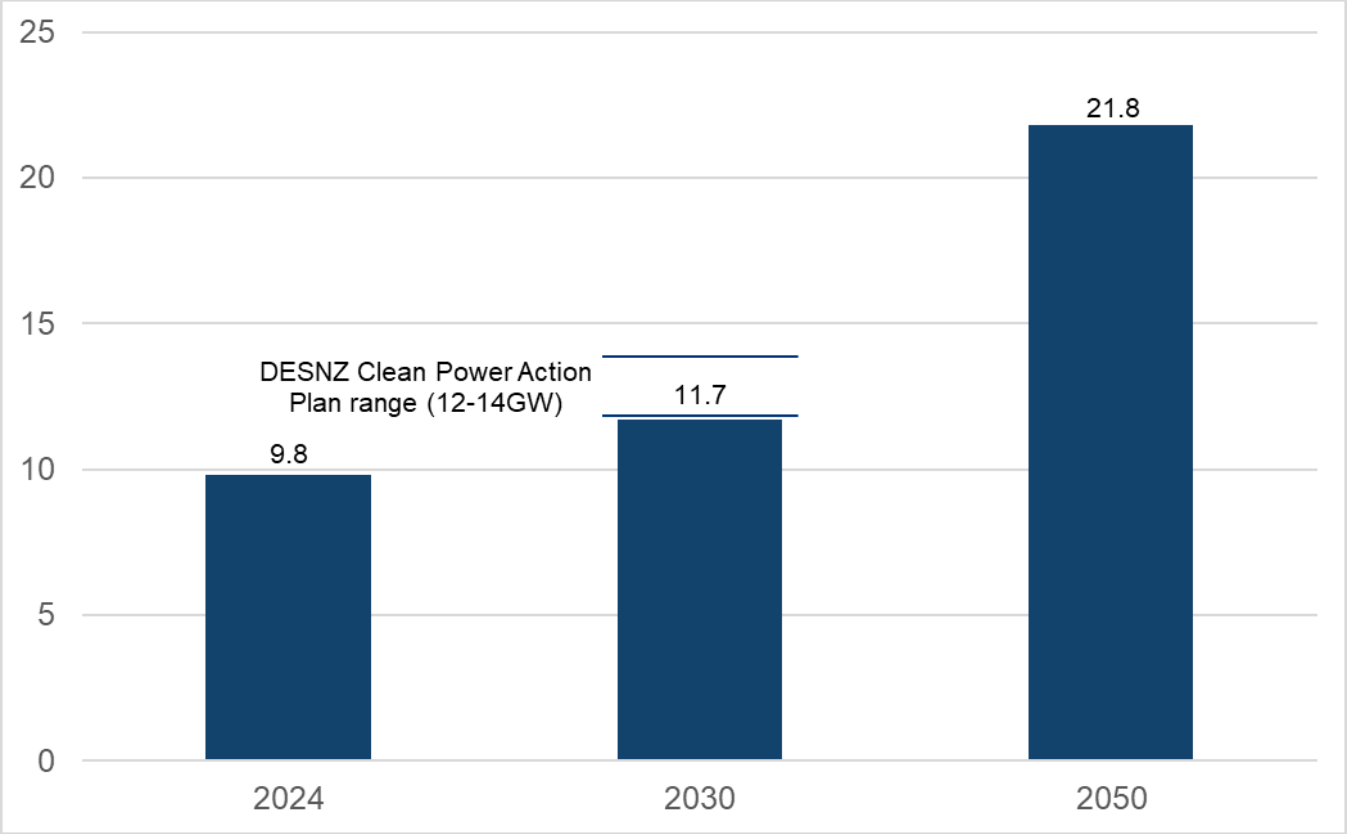
Before the regime was introduced, only a limited number of electricity interconnectors had been built, which were developed as standalone projects on a merchant basis. Then the Nemo Link interconnector (1GW) to Belgium was built as the cap and floor regime pilot project. Ofgem has since held three application windows between 2014 and 2022, awarding a regime in principle to a further twelve interconnectors, totalling 14.55GW in cross-border capacity. This puts us on track to meet our 2030 ambitions and beyond in the early 2030s.

Clean Power 2030 Action Plan update

The Clean Power 2030 Action Plan outlined the need for 12GW to14GW electricity interconnection by 2030. Since publication, one new electricity interconnector has become operational, bringing the total 2025 installed capacity to 10.3GW.[62] The graph below shows DESNZ's 2030 capacity range alongside NESO's FES 2025 holistic transition figures for 2024, 2030 and 2050, illustrating the substantial increase in interconnection capacity needed to meet net zero, particularly after 2030.

[62] The 2025 installed capacity differs with the FES 2025 figure because FES 2025 is calculated from 2024 figures

Figure 9: indicative interconnection capacity scenario (GW), 2024-2050[63]



Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars – FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)
The 2030 figure is based on NESO's FES 2025 Holistic Transition scenario. DESNZ expects to achieve an interconnection capacity of 12-14GW by 2030, as set out in the Clean Power 2030 Action Plan

The Clean Power 2030 Action Plan committed Ofgem and NESO to support the increase in interconnection capacity through grid connections reform and set out commitments for DESNZ to de-risk interconnection supply chains. Updates are provided in Chapters 7 and 9 respectively.

Key priorities for 2030 and 2050

To meet the 2030 capacity scenarios, our priority is to actively address delivery and supply chain hurdles to ensure the timely delivery of existing projects in development.

In the longer term, the government is supportive of additional interconnection and in bringing forward OHAs (especially MPIs in GB), where future projects provide system benefits. To deliver this, DESNZ is collaborating with Ofgem and NESO to plan future interconnection more strategically, whilst also working internationally to ensure efficient electricity trading arrangements and facilitate the development of OHAs.

Strategy

[63] Note that the projected figures represent possible trajectories and should not be interpreted as targets

The government will explore the role of interconnection in the future system to ensure that projects bring the right mix of benefits, such as enhancing our energy security, supporting European decarbonisation, facilitating the export of surplus renewable electricity and decreasing the impact on coastal communities and the environment.

Government is working with NESO to include future interconnection in strategic energy planning to provide a clear indication of where interconnection capacity may be best able to deliver benefits for GB and align with the lowest system cost pathway to net zero. DESNZ will work with Ofgem to provide a regulated delivery path for strategically aligned projects. This approach will provide certainty to industry via clear and consistent timelines and processes.

Path building actions	Hurdles	Short-term milestones
19. Government, Ofgem and NESO to establish a strategically planned approach to electricity interconnection. This will provide direction to industry stakeholders, utilising the Centralised Strategic Network Plan (CSNP) in 2027 to identify the priorities for future interconnection and potential projects that will support the GB system	There are limited incentives for interconnectors and OHAs to connect to locations that might be preferable for the GB system, so the best projects for the system and consumers might not always come forward	**a) Strategic Planning:** DESNZ to work with NESO to inform the development of the Strategic Spatial Energy Plan (2026) and CSNP (2027)
		b) Route to market: DESNZ to work with Ofgem to ensure an appropriate and efficient regulated route to market is in place to deliver on the outputs of the CSNP (2027)

International cooperation

We need to collaborate internationally to ensure efficient trading arrangements are in place, which allow interconnectors and potential future OHAs to lower system costs, and support security of supply and decarbonisation. The government is working with the EU to explore GB participation in efficient trading arrangements and balancing tools of the EU's internal energy market. NESO requires efficient balancing tools to manage interconnector flows which cannot otherwise be secured. It is working with connected Transmission System Operators (TSOs)[64] to improve existing and develop additional tools on individual interconnectors.

Path building actions	Hurdles	Short-term milestones
20. DESNZ, NESO and Ofgem to collaborate with counterparts in connecting countries to ensure availability of efficient balancing tools for managing	Interconnector flows are price-driven, separate from connecting network conditions	**a) UK-EU reset:** government to explore potential GB participation in EU balancing platforms as part of the UK-EU Reset, further to the 19 May 2025 UK-EU Summit agreements
		b) TSO collaboration: NESO to continue to cooperate with connected TSOs to improve or complement existing balancing tools, in compliance with the operational

[64] Transmission System Operators (TSOs) are responsible for managing the flow of electricity across high-voltage networks at a national level, including over interconnectors, ensuring the continuous balance between electricity supply and demand

Path building actions	Hurdles	Short-term milestones
cross-border electricity flows		frameworks and with a continued focus on ensuring the security and stability of the system

Offshore Hybrid Assets

Government supports the development of OHAs, especially MPIs, to GB. As with standard point-to-point interconnectors, OHAs can help us achieve our energy needs by more efficiently integrating renewable energy onto the grid and providing access to a diverse generation pool. MPIs also have the potential to reduce infrastructure requirements by combining point-to-point interconnectors with GB offshore wind farms, thereby decreasing the impact on coastal communities and the environment. They can also offer a route to export markets for surplus GB wind power at times of high renewable energy production relative to demand. We are therefore implementing policies to support MPI delivery.

Path building actions	Hurdles	Short-term milestones
21. Ofgem and DESNZ, with support from NESO, to implement policy and regulatory frameworks that support the delivery of MPIs	Novel assets like MPIs offer benefits but require policy and regulatory development and amendments to support deployment	**a) MPI delivery:** Ofgem and DESNZ, with support from NESO, will develop the policy, regulatory and legal framework to unblock barriers to MPI delivery, assess wider market and political environments, and engage with industry

Section 2: long duration flexibility

Chapter 4: long duration electricity storage

Long duration electricity storage (LDES) is a category of electricity storage that, when fully charged, can provide full power for eight hours or longer before needing to recharge. This gives them a special role in managing peaks and troughs in demand, akin to the part played by unabated gas under the current system. For many decades, the dominant form of LDES in Great Britain and internationally has been Pumped Storage Hydropower (PSH), which is the most mature LDES technology. PSH uses excess electricity to pump water up a mountain, and then releases that water to generate electricity when needed. GB currently has 2.8GW of LDES across four PSH facilities in Scotland and Wales. The government expects a variety of sources of LDES to complement further PSH. More novel technologies at an advanced stage of development include liquid air and compressed air energy storage, as well as new forms of batteries such as flow batteries.

Contribution to government's vision for clean flexibility

LDES complements both grid-scale batteries (which are highly efficient at shorter durations) and hydrogen (which will enable larger volumes and longer durations of stored power than most LDES technologies provide). Additionally, LDES will play an increasingly crucial role in ensuring that long periods of excess wind generation can be used efficiently. It also has the potential to reduce our reliance on unabated gas in covering peak demand when renewable energy is not being generated. NESO's most recent estimate is that a total of 13.2GW to 16.6GW of LDES will be required by 2050 to achieve net zero in an efficient manner.[65]

Case study

Highview is a UK-based LDES developer which has designed and built its own proprietary Liquid Air Energy Storage (LAES) system to store excess renewable energy. The system was developed over the past 17 years with significant government support.

Highview launched the first near-commercial scale 5MW LAES plant in 2018 near Bury in Greater Manchester and operated it successfully for two years, providing flexibility services to the grid.

Following this success, construction began in 2020 of a fully operational grid-scale LAES demonstrator plant in Carrington. For this project, Highview received a £10m award from the DESNZ Storage at Scale competition. Building on this, Highview secured a £300m investment package in June 2024, anchored by £165m of investment from the National Wealth Fund (NWF), and supported by a consortium including Centrica, to develop its Carrington project.

Scheduled to come online in 2026, Carrington will be the UK's first commercial-scale LAES facility, with a storage capacity of 300MWh (50MW for 6 hours). It will deliver critical grid stabilisation services and enable the long-term replacement of fossil fuel-based power plants for system support. While Carrington does not itself meet the

[65] FES 2025, NESO (2025)

definition of LDES for the cap and floor scheme, Highview intend to develop a series of longer-duration projects nationwide.

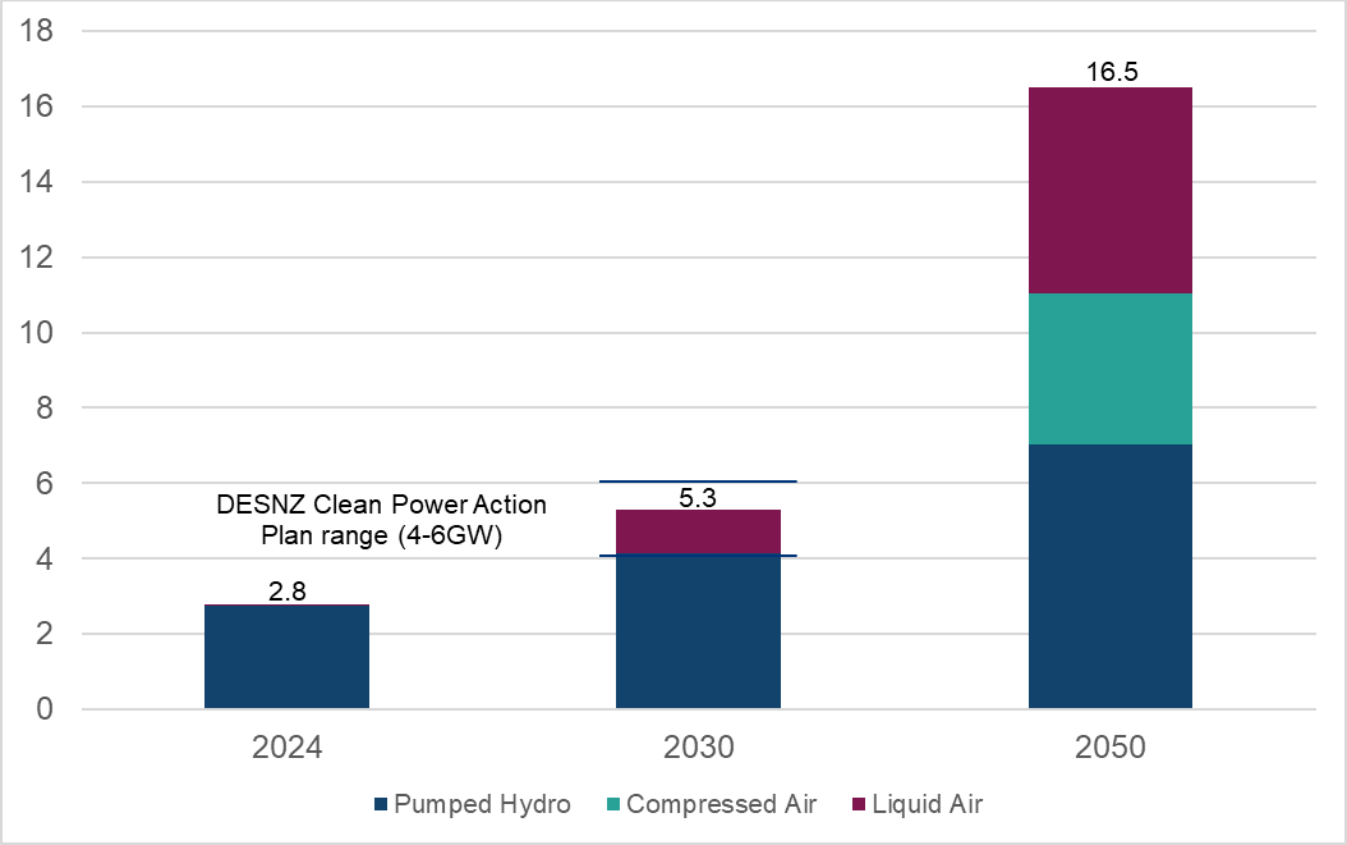
Clean Power 2030 Action Plan update

The Clean Power 2030 Action Plan estimated that we could need 4GW to 6GW of LDES by 2030, and set out actions to support deployment. Strong progress has been made in supporting the development of new LDES capacity since we announced a new cap and floor scheme last year. A major milestone was reached in April 2025 when Ofgem launched the new scheme and opened, from April to June, the scheme's first application window.[66] The scheme is open to projects that can discharge at full power for eight hours or longer,[67] and aims to boost investor confidence to develop new LDES assets. The graph below shows DESNZ's 2030 capacity range alongside NESO's FES 2025 holistic transition figures for 2024, 2030 and 2050, illustrating the substantial increase in LDES capacity needed to meet net zero, particularly from compressed and liquid air post-2030.

[66] Long Duration Electricity Storage: cap and floor application window one, Ofgem (2025)

[67] The government and Ofgem will require projects to be able to discharge continuously at full power for at least eight hours to be eligible for the cap and floor scheme. Projects at TRL 8 need to be rated at least 50MW; more mature projects at TRL 9 will need a power capacity of at least 100MW to be eligible. Long Duration Electricity Storage: technical details of the scheme and its operation, GOV.UK (2025)

Figure 10: indicative LDES capacity scenario (GW), 2024-2050



Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars – FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)

The indicative capacity range for the first application window is between 2.7 and 7.7GW. Combined with existing capacity, this would put GB on track to meeting the Clean Power 2030 Action Plan's 2030 range of 4GW to 6GW.

Government also supported LDES projects to access additional revenue streams through the Capacity Market (CM) Rule changes in 2025 (as referenced in the markets chapter). This allows generators, including LDES projects, to request a 24-month extension at the point of application to give them up to 6 years to come online in a T-4 Capacity Market (CM) agreement. This option provides further support for projects such as pumped storage hydro, which may have previously been excluded from CM agreements due to long build times.

Separately, the NWF is engaging with LDES projects to address barriers to private investment, for example, high upfront costs, long construction times or technology risk.

Key priorities for 2030 and 2050

No new LDES projects have been built for forty years, partly due to high upfront costs. The government's principal mechanism for the deployment of LDES for both 2030 and 2050 is the cap and floor scheme. The government will put it on a secure long-term footing through the Planning and Infrastructure Bill which is going through Parliament. Projects supported through the first window are expected to be delivered via two tracks, either by 2030 or by 2033; Ofgem is aiming to decide which projects are successful in the first half of 2026. Ofgem also aims to inform stakeholders by Q1 2026 on the expected timing for a second window. Ofgem will work

with NESO to determine how the second application window will align with the Strategic Spatial Energy Plan (SSEP). The SSEP will assess the optimal locations and quantity of LDES required up to 2050, alongside other energy infrastructure.

Great British Energy (GBE) and the NWF will provide a strong end-to-end development and finance offer, playing distinct and complementary roles of developer and policy bank. GBE can help bring forward LDES and encourage investment. Building on the investments it has already made in the sector, the NWF will continue engaging with LDES projects at Technology Readiness Level 7 and above, including those preparing to apply for the cap and floor, exploring financing solutions where there are barriers to private investment. The NWF can invest across the capital structure (offering debt, equity and guarantees), tailoring to the specific financing needs of the project, and targets investments of £25m and above.

LDES cap and floor and innovation

Path building actions	Hurdles	Short-term milestones
22. Ofgem to monitor cap and floor uptake and, with NESO, plan application window two, based on system needs and lessons from window one	Balancing strict eligibility criteria to ensure deliverability with the need to meet system capacity targets	**a) Second application window:** Ofgem to outline expected timings for a second cap and floor application window by Q1 2026, based on NESO advice on future capacity requirements for 2035 and 2050. This should also align with the SSEP. If LDES capacity from window one does not meet these requirements, Ofgem may open a second application window earlier
23. Government to continue supporting the scale up of novel LDES technologies	Potential for insufficient commercial support between early-stage funding and cap and floor scheme	**a) Blended finance:** DESNZ to continue to work with public finance institutions to explore how blended finance could play a role in scaling up novel LDES technologies

Chapter 5: low carbon dispatchable power

Low carbon dispatchable power includes technologies such as Hydrogen to Power (H2P), Power Carbon Capture, Usage, and Storage (CCUS), and the use of biomethane in power generation.

H2P refers to the conversion of hydrogen to generate electricity. It can deploy at a range of scales and is dependent on large-scale hydrogen production, transport and storage infrastructure, which enable H2P to function as a key technology providing low carbon inter-seasonal energy storage.

Power CCUS refers to dispatchable gas-fired power generation with facilities to capture CO2 for re-use in various industrial applications or permanent storage in geological formations deep underground.

Biomethane is a domestically produced low carbon gas which can be used flexibly across many different end-uses, including industry, transport, and low carbon dispatchable power generation at gas-fired power plants.

Contribution to government's vision for clean flexibility

These technologies will play an important role in a clean power system by generating low carbon electricity continuously over days and weeks, to complement more duration-limited technologies such as batteries and LDES. This helps ensure a reliable electricity supply during prolonged periods of high electricity demand and/or low renewable output, sometimes referred to as "dunkelflaute".

After 2030, low carbon dispatchable power will increasingly displace the residual role of unabated gas, which will move to a back-up role to be called upon only in instances where clean alternatives are unable to meet demand. Low carbon dispatchable power will help maintain security of supply, whilst reducing emissions and reliance on volatile international energy sources.

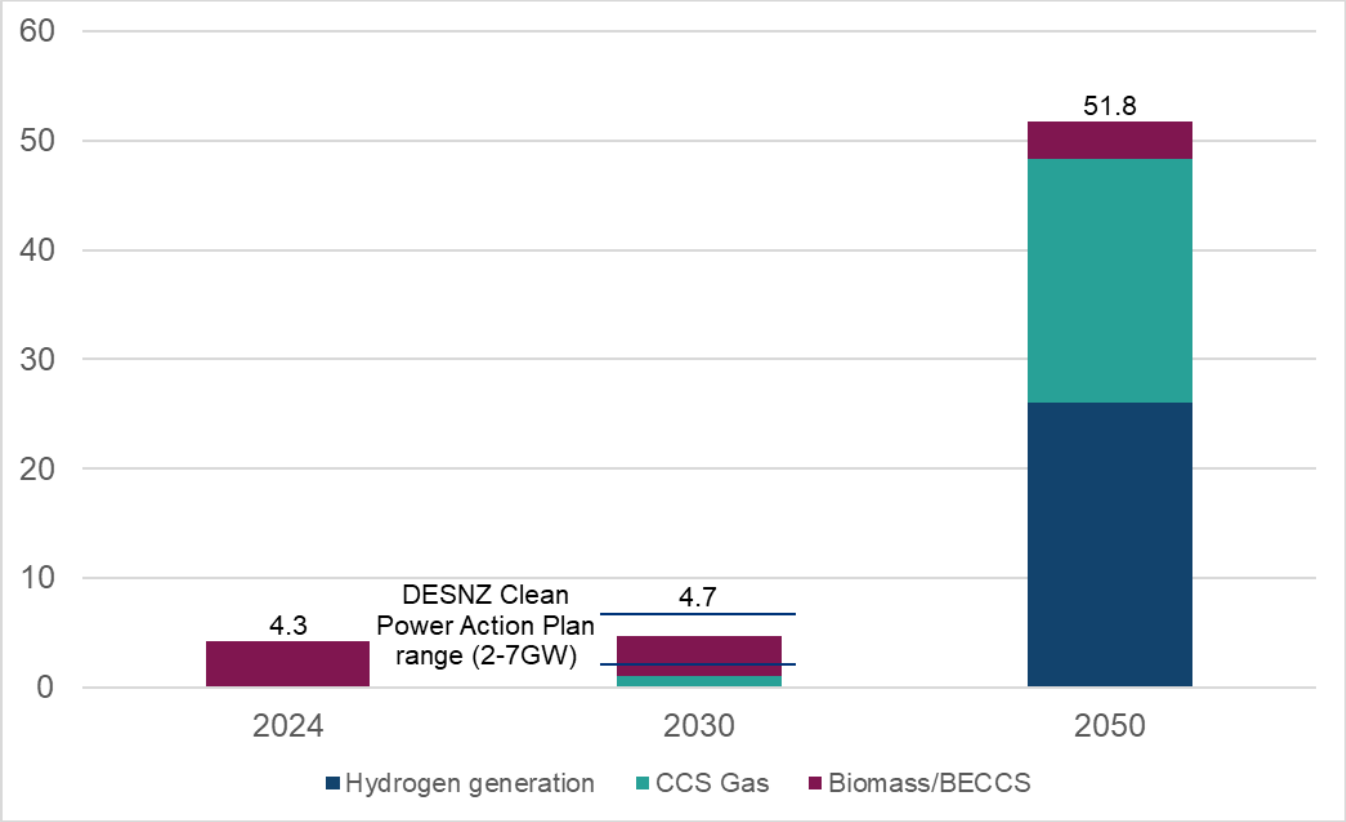
Clean Power 2030 Action Plan update

The Clean Power 2030 Action Plan outlined a range of 2GW to 7GW of low carbon dispatchable power capacity by 2030. Government also recognised that biomethane is currently used to decarbonise heating, but can be used flexibly across many different end-uses including industry, transport, and low carbon dispatchable power generation at gas-fired power plants.

In February 2025, government introduced legislation to require new build and substantially refurbishing power plants to have viable decarbonisation plans, either through conversion to hydrogen firing technology or power CCUS retrofit. This followed the October 2024 government response to the Decarbonisation Readiness consultation. The decarbonisation readiness requirements will come into force from 28 February 2026 and provide a clear decarbonisation pathway for combustion power plants that can keep pace with the evolving nature of both technologies as their accompanying infrastructure expands.

The graph below shows DESNZ's 2030 capacity range alongside NESO's FES 2025 holistic transition figures for 2024, 2030 and 2050, illustrating the substantial increase in low carbon dispatchable power capacity needed to meet net zero, particularly for power CCUS and H2P after 2030.

Figure 11: indicative low carbon dispatchable power capacity scenario (GW), 2024-2050



Source: DESNZ Clean Power 2030 Action Plan range (horizontal lines), NESO FES 2025 holistic transition 2024-2050 (bars – FES is an independent modelling exercise. Its scenarios are not conditioned on government's CP2030 or wider interim climate targets)

Hydrogen to power

Since the publication of the Clean Power 2030 Action Plan, government has announced over £500m support for hydrogen infrastructure through the 2025 Spending Review. This will enable the development of the UK's first regional hydrogen transport and storage network, including unlocking hydrogen's role in clean power by connecting producers with end users. This is expected to bring in the investment needed to drive deployment of H2P.

Government has also announced it will publish a refresh to the UK Hydrogen Strategy in autumn this year to ensure that hydrogen achieves its role in delivering Government's Clean Energy Superpower and Growth Missions. Government will also continue to highlight progress through our regular 'Update to Market' publications.

In line with its commitment in the Clean Power 2030 Action Plan, the government published, on 7 April 2025, a shortlist of 27 hydrogen production projects advancing to the next stage of the second Hydrogen Allocation Round (HAR2), including projects to support hydrogen use in clean power generation, glass manufacturing and sustainable aviation fuel production.

Carbon Capture, Usage and Storage

Since the publication of the Clean Power 2030 Action Plan, the government has closed a financial decision with energy company ENI to develop the Liverpool Bay Carbon Capture and Storage Project. Located in north-west England and north Wales, this CCUS cluster could potentially enable delivery of further Power CCUS deployment alongside the East Coast Cluster that reached financial close in late 2024.

In the recent 2025 Spending Review, the government announced that it is providing increased backing to UK CCUS by allocating £9.4bn in capital budgets over the Spending Review period. This will maximise deployment to fill the storage capacity of the East Coast Cluster and HyNet Cluster. The government announced its support for the Acorn and Viking clusters and is providing the development funding to advance their delivery. A final investment decision will be taken later this Parliament, subject to project readiness and affordability.

Key priorities for 2030 and 2050

The government is developing business models to enable the deployment of Power CCUS and H2P, and unlock their potential contribution to economic growth.

The deployment of both Power CCUS and H2P requires grid-scale transport and storage (T&S) networks and corresponding infrastructure to be installed. As with any large infrastructure development, it is important that the government continues to work closely with industry to find ways to minimise costs and ensure value for money for UK taxpayers.

Hydrogen

To drive deployment of H2P, the government committed in the December 2024 H2P market intervention consultation response to implement a Hydrogen to Power Business Model (H2PBM) to de-risk investment and mitigate barriers to deployment. This business model will be launched in 2026. To support delivery of the H2PBM, government will launch a market engagement exercise in 2025 outlining the design of the H2PBM and including minded-to positions on the approach to eligibility criteria, assessment and approach to allocating the H2PBM. Government will also continue to engage with industry in developing the H2PBM, including through the H2P Expert Working Group which met for the first time in February 2025.

In March 2025, government published the Innovative Hydrogen to Power projects call for evidence to support delivery of hydrogen-fired power as part of the Clean Power 2030 Mission. Responses are being reviewed and an update will be provided soon.

To support the effective development of H2P, government is committed to delivering business models across the hydrogen value chain, including hydrogen production business model (HPBM), hydrogen transport business model (HTBM) and hydrogen storage business model (HSBM). 27 hydrogen production projects have been shortlisted under HAR2 and government expects to announce successful projects in early 2026. Government intends for HAR3 to be launched by 2026, as announced in the Industrial Strategy.

Following the outcome of the Spending Review, the development of the UK's first regional hydrogen transport and storage network from 2031 will connect hydrogen producers with vital end users, such as power and industry, for the first time. This will unlock hydrogen's role in clean power and constitutes much-needed progression for hydrogen in the UK, building on the initial small-scale projects that have helped kick-start the industry, and paving the way for the large-scale hydrogen infrastructure needed for future decades. In the Industrial Strategy, government set out the intention for the first transport and storage allocation rounds to be launched in 2026. These business models will help developers overcome market barriers including high costs, long-lead times and uncertainty around when demand for transport and storage will emerge. This will ensure that the HTBM and HSBMs complement and align with the HPBM and support hydrogen's use in key regional sectors. Government will provide more details in a revised Hydrogen Strategy to be published in autumn this year.

To secure key growth opportunities across the hydrogen value chain, and unlock investment in skills and high-quality jobs, government will ensure the sector benefits from the comprehensive public financial institution offer set out in the Industrial Strategy. This includes exploring Great British Energy supply chain investment levers and potential expansion of the Clean Industry Bonus to hydrogen; government will consult on any future proposals.

GB must build a pipeline of workers to meet future demand as hydrogen is a nascent industry. Government has committed seed funding and is working with industry to design a comprehensive hydrogen and CCUS curriculum, while building a robust network of provider expertise to support workforce development and drive growth. The Clean Energy Workforce Strategy will complement this with cross-cutting actions across clean energy sectors.

Path building actions	Hurdles	Short-term milestones
24. Government to continue developing a Hydrogen to Power business model (H2PBM) based on a Dispatchable Power Agreement-style mechanism to de-risk investment	Developers face investment barriers including first-of-a-kind technology costs, supply chain challenges and dependence on nascent critical enabling infrastructure, leading to 'cross-chain risks' and challenges securing low carbon hydrogen fuel supply	**a) Market engagement:** DESNZ to publish the H2PBM market engagement exercise in 2025 to follow the H2P Government Response in 2024 committing to the introduction of a H2PBM
		b) Strategy refresh: DESNZ to publish a refreshed Hydrogen Strategy in 2025 to set out more detail on how government plans to build on the first regional network, to realise the value of the hydrogen economy for the UK
		c) H2PBM launch: DESNZ to launch the H2PBM in 2026 following the outcomes of the H2PBM market engagement exercise
25. Government to design new business models for hydrogen transport and storage infrastructure to address barriers and unlock private investment	Investment is curbed by high costs, long lead-times, and uncertainty around how quickly demand for transport and storage will increase	**a) Transport and storage allocation rounds:** DESNZ to launch the first transport and storage allocation rounds in 2026. DESNZ expects to make the final investment decision on the first regional network this Parliament, for it to become operational from 2031
26. Government to continue to support development of hydrogen production	Investment is curbed by the cost of low carbon hydrogen relative to high carbon alternatives, technological and commercial risks for first-of-a-kind projects, and demand uncertainty due to the current limited	**a) HAR2 projects:** DESNZ to announce successful HAR2 projects in early 2026, following announcement of 27 shortlisted projects in April 2025
		b) Future production allocation rounds: DESNZ to launch HAR3 allocation round in 2026 and HAR4 in 2028, providing further deployment and timeline certainty

Path building actions	Hurdles	Short-term milestones
	use of low carbon hydrogen	
27. Government to monitor the applicability of existing market frameworks to hydrogen and introduce amendments if needed	Uncertainty over the ability of existing market frameworks to support a hydrogen economy	**a) Economic regulatory framework:** DESNZ to consult in summer 2025 on an economic regulatory framework for 100% hydrogen pipeline networks. Consultation proposals have drawn on a range of evidence, including outputs from the Hydrogen Delivery Council's Transport & Storage Working Group

Power CCUS

To enable CCUS deployment, the government has developed separate business models for Transport and Storage operators in the selected clusters that support the rollout of Power CCUS and CCUS-enabled hydrogen production projects.

Path building actions	Hurdles	Short-term milestones
28. Government to support the development of CCUS infrastructure	Uncertainty over next steps in CCUS	**a) Development funding:** DESNZ to provide Acorn and Viking clusters the development funding to advance their delivery. A final investment decision will be taken later this Parliament, subject to project readiness and affordability

Biomethane

Biomethane is currently used to decarbonise heating but can be used flexibly across several end-uses including industry, transport, and low carbon dispatchable power generation at gas-fired power plants. Government recognises the need to clarify biomethane's optimal role in the energy system, including the level of contribution it makes to low carbon dispatchable power.

Path building actions	Hurdles	Short-term milestones
29. Government to work with NESO to clarify the role of biomethane in providing low carbon dispatchable power and refine its vision for biomethane's 2030-2050 role alongside hydrogen and gas	The role of biomethane in providing low carbon dispatchable power requires clarification, with competing potential end uses	**a) Future biomethane policy:** DESNZ expects to publish a consultation on a holistic future policy framework for biomethane in FY2025-26, to follow the current Green Gas Support Scheme, which closes to new applications in March 2028. This will include consideration of biomethane's role in dispatchable power generation
30. Ofgem and DESNZ to enable an increase in the injection of biomethane into the gas network which could deliver more low carbon dispatchable power	Biomethane producers face cost, grid capacity, and processing timeline challenges when connecting to the gas network	**a) Biomethane and RIIO-3:** Ofgem is addressing specific proposals to enable increased biomethane injections through the RIIO-3 process. A new mechanism has been proposed in the Draft Determinations.[68] Final Determinations to be published by the end of 2025

[68] RIIO-3 Draft Determinations – National Gas Transmission, Ofgem (2025)

Section 3: common enablers

Chapter 6: markets

Markets have a crucial role in helping guide and inform investment and operational decisions for clean flexibility assets and providers. Consumer-led flexibility (CLF) and battery investments are made on a merchant basis and so are fully dependent on fair access to markets like wholesale markets, the retail market, the Capacity Market (CM), NESO's markets and Distribution System Operator (DSO)[69] markets.

We need to ensure our markets offer the right incentives for clean flexibility, so its full potential and true value to the whole system are properly recognised – especially since these markets were not originally designed with technologies like CLF and batteries in mind.

This means sending signals in the right place, at the right time, and via the right market mechanisms so that clean flexibility providers and assets like batteries, electric vehicles (EVs) and heat pumps can respond. Markets should be competitive, coordinated, innovative, reliable, fair and free from unnecessary barriers to access for clean flexibility. These market arrangements need to be fit for now, the 2030s and beyond.

Contribution to government's vision for clean flexibility

Removing market access barriers and improving operational signals for clean flexibility provides several opportunities in the clean power and net zero transition. It can:

- Improve energy security by enabling more clean flexibility to access markets, ensuring supply can better meet demand and providing more efficient system balancing
- Encourage market competition, improving choice and value for money for consumers
- Improve market coordination and operational efficiencies to improve competition long term and ensure we get the right responses from clean flexibility to optimise the system
- Provide a clearer business case for flexibility providers' investment and operation

Capitalising on these opportunities should lead to lower system costs and a more secure electricity system, because an optimised system lowers the need for additional supply.

Clean Power 2030 Action Plan update

The Clean Power 2030 Action plan outlined several commitments to improve access for low carbon flexible technologies and providers in the CM and NESO markets.

In the CM, the government has since implemented the commitment to allow storage augmentation which means grid-scale batteries can better manage their natural decline in capacity and have opened up three-year CM agreements to low carbon new build and unproven CLF with £0/kW CAPEX to provide greater revenue certainty and incentivise further

[69] A Distribution System Operator (DSO) manages the flow of electricity and ensures the stability and efficiency of the local and regional energy distribution network, which transports electricity to end users

participation in the CM. Additionally, in its December 2024 publications,[70] DESNZ committed to reducing administrative burdens by streamlining CLF business model submissions and sought views on expanding and enhancing CLF in the CM.

In the Clean Power 2030 Action Plan, NESO agreed to set out in the Clean Flexibility Roadmap, progress on, and further actions to support, fair access for flexibility assets in the markets it manages, including:

- Removing barriers to participation to the greatest extent possible, allowing access to more types of flexibility assets to bolster the potential of clean flexibility for 2030
- Providing increased transparency as well as improvement to the systems NESO uses to dispatch flexibility, with evidence of reductions in flexibility asset skip rates
- Further facilitating revenue stacking across different markets
- An assessment of potential developments to Local Constraint Market (LCM) and Demand Flexibility Service (DFS) to enable a wide range of flexibility providers to offer services to meet system needs (including constraint management)

Progress on these commitments is outlined in the NESO Markets section below. Additionally, NESO has set out within its Demand Side Flexibility Routes to Market Review Stage 3 Report further plans to remove barriers to consumer-led flexibility, batteries and other forms of low carbon flexible assets within its markets.

Key priorities for 2030 and 2050

Wider reforms across the Review of Electricity Market Arrangements (REMA) and wholesale markets, network charges, and the retail market[71] will affect the future direction of markets and the type of incentives and opportunities available for flexibility. DESNZ and Ofgem will ensure that these reforms areas consider the needs of households and businesses providing flexibility.

DESNZ and Ofgem will continue to coordinate with key parties such as Elexon, in its new role as market facilitator, and NESO in identifying any emerging issues, and monitoring for impacts when market barriers are being addressed. DESNZ and Ofgem will provide strategic input where needed and take steps to ensure issues are assessed and resolved as necessary by responsible parties in a timely manner. This includes market barriers that may not be directly within the remit of certain entities, such as NESO, DSOs or the market facilitator, to remove.

Beyond this, we need to continue to understand the interactions and implications of different implicit and explicit flexibility signals within the various markets, as well as the other important areas that interact with market signals such as network charges, connections, and spatial planning. Such understanding will inform whether further actions are needed to achieve government and Ofgem's desired long-term outcomes for flexibility and the whole system. This should help to provide an enduring market design that sends the right signals that are clear to industry in guiding investment and operational decisions for clean flexibility.

[70] Capacity Market: proposals to modernise Rules and improve participation and delivery assurance of consumer-led flexibility, GOV.UK (2024)

[71] The retail market is and will remain a critical market for signalling and rewarding value for clean flexibility, particularly for CLF. Reforms to the retail market are discussed in Chapter 1

Wholesale market and REMA

Government outlined in its summer 2025 REMA update[72] that it will implement an ambitious approach to Reformed National Pricing to lay the foundations for a fair, affordable, secure and efficient electricity market. Government will publish a Reformed National Pricing Delivery Plan later this year, setting out the next steps on design and delivery. Government is also working with NESO on further measures to reduce balancing costs, including to launch a balancing reform consultation later this year and completion of NESO's Constraints Collaboration Project. Potential areas of reform include a lower mandatory Balancing Mechanism participation threshold, which would allow smaller assets, such as small-scale batteries, to participate. The implementation of Reformed National Pricing could therefore have implications for clean, flexible assets, which government would look to factor into future updates to the Clean Flexibility Roadmap through the process set out in the governance chapter of this document.

Retail market

The retail market is and will remain critical for signalling and rewarding value for clean flexibility, particularly for CLF. The UK energy retail market is showing increased competition in the delivery of products that reward CLF, supported by the emergence of innovative business models, new approaches to customer engagement, and the growing role of aggregators in facilitating greater market participation. Retail market reforms are discussed in Chapter 1.

CLF independent aggregators are parties that bundle changes in consumer loads, or distributed generation output, for sale in organised markets, and do not simultaneously supply the customer with energy. Independent CLF aggregators present an opportunity to promote competition and innovation in the flexibility sector and reach more consumers.

Case study

A growing number of innovative business models are emerging in the GB energy retail market that aim to unlock CLF potential. These models often involve aggregating distributed electricity resources, such as EVs, home batteries, and heat pumps, to participate in energy and flexibility markets.

One example is Axle Energy,[73] which provides a technology platform that connects to and optimises consumer electricity devices – with the consumer's consent – on behalf of third-party businesses like EV charger manufacturers, battery providers, and energy suppliers. By shifting electricity demand to cost- and carbon-efficient times, platforms like Axle's can support grid management and reduce system costs, while lowering consumer bills.

Such platforms can also enable households to access financial benefits for participating in flexibility services, with earnings varying depending on technology type, usage, and market conditions. According to Axle Energy, consumers can earn an average of £100 per year from these flexibility services, with some consumers having earned over £250 in the past year from supporting the grid without any manual intervention.

CLF aggregator participation and interactions with other market entities

Since November 2024, the Balancing and Settlement Code P415 code modification has facilitated access to the GB wholesale market for flexibility dispatched by independent

[72] Review of electricity market arrangements (REMA), GOV.UK (2025)
[73] Axle Energy

aggregators under the role of Virtual Lead Party (VLP). The change helped remove a barrier to consumers offering flexibility through arrangements beyond their electricity supplier. This enables independent aggregators to offer consumers new, innovative products and services. Supporting new entrants in the wholesale market promotes competition and helps lower wholesale market prices, bolstering efforts to reduce consumer bills.

As of June 2025, following P415's implementation, four aggregators have already registered to participate in the wholesale market and numbers are expected to grow.

More work is needed to build on the success of P415 to ensure barriers are removed as far as possible and interactions between market participants such as aggregators and suppliers are fully considered.

Path building actions	Hurdles	Short-term milestones
31. Government and Ofgem to ensure suppliers and independent aggregators can provide flexibility services in markets in a fair and managed way	CLF aggregators face significant barriers to market access, while unclear roles and responsibilities between suppliers and aggregators risk market distortions and consumer confusion	**a) Review current arrangements:** DESNZ, with support from Ofgem, to review how suppliers, aggregators and other non-licenced entities participate and interact in the market and report on findings at the 2026 Roadmap Forum

Capacity Market

The Capacity Market (CM) is the UK's primary tool for maintaining electricity security, providing a revenue stream to incentivise all forms of capacity (both conventional and low carbon flexible technologies like CLF and storage) to be available during times of system stress. Government sets the policy framework for the CM, while the volume of capacity procured is based on NESO's annual Electricity Capacity Report, which models a wide range of future scenarios, including weather, demand, and delivery risks. These assessments are independently reviewed by a government-appointed advisory group. Capacity secured through CM auctions ensures the system meets the Reliability Standard, which balances security of supply with affordability for consumers.

As mentioned above, government recently introduced changes to the treatment of flexible technologies within the CM to both support their contribution to security of supply and reduce administrative burdens for those wishing to enter the CM. Government will continue to take a balanced approach, assessing policy options via continued engagement such that battery and CLF value to the CM is realised.

Path building actions	Hurdles	Short-term milestones
32. Government will continue to review CM policy such that it	CM rules risk reducing	**a) Call for Evidence response:** government will respond to the December 2024 CLF call for evidence[74] by the end of 2025

[74] Call for Evidence - Capacity Market: consumer-led flexibility, GOV.UK (2024)

Path building actions	Hurdles	Short-term milestones
appropriately values and integrates CLF to support the CM's core security of supply objective	participation of CLF technologies	**b) Reviewing scheme arrangements:** government will continue to review the scheme arrangements for CLF as part of the annual engagement process and will seek to identify adjustments – both on the part of Capacity Providers and Delivery Partners – to integrate CLF and support its contribution to CM objectives
		c) Engaging industry: government routinely makes changes to the CM to improve its functioning and to ensure it remains fit for purpose within the changing energy policy and technology landscape. As part of that annual process, government will work with industry stakeholders to assess further opportunities to integrate CLF to support its contribution to CM objectives

NESO markets

To ensure markets can fully unleash the potential of clean flexibility for 2030, it is important that NESO markets are presumed open and that there are no unjustified barriers to flexibility. It is essential that consumer-led flexibility is able to participate easily in NESO's core markets as a fundamental component of a zero-carbon operable system.

NESO has already made significant progress in utilising grid-scale battery capacity since the launch of the Open Balancing Platform (OBP) in December 2023. Comparing the period of October – December 2023 (pre OBP) to the period 1 January - 31 March 2025, the quarterly Balancing Mechanism (BM) dispatch volume of grid-scale batteries increased by 425% and the number of corresponding instructions increased by 1347%[75]. Progress through NESO's wider Balancing Programme, of which OBP is only one component, has also led to significant carbon savings and 2.5% of the total FY2021-24 savings can be attributed to the Balancing Programme, providing an estimated saving of £46m in FY2024.[76]

Path building actions	Hurdles	Short-term milestones
33. NESO to maximise participation of flexible assets in NESO markets	CLF is underrepresented across NESO services due to market rules, technology, policy and regulatory barriers	**a) Work programme:** NESO will continue to report on progress against its Demand Side Flexibility Routes to Market Review work plan and respond to stakeholder feedback and input during its quarterly programme updates. It will also report into the Roadmap governance process and progress tracking, including at the 2026 Roadmap Forum, to identify and prioritise of any new barriers that may emerge during delivery of the Routes to Market Review, and to enable greater participation in NESO's services
		b) Skip rates: by the end of Business Plan Cycle 3 (March 2026), NESO should have: • Delivered a substantial reduction in skip rates with a target of relative parity across technology types; • Worked with industry to develop an absolute numerical target for skip rates, and;

[75] RIIO-2 Business Plan 2 (2023-25) End-Scheme Incentives Report Annex A: Role 1 – Control Centre Operations, NESO (2025)
[76] NESO Balancing Programme Event (2024)

Path building actions	Hurdles	Short-term milestones
		• Developed a methodology to measure the skip rate of actions taken to manage system constraints A programme of work has been stood up within NESO to focus on actions targeted to reduce skip rates including root cause analysis; refinements to the methodology used to measure skip rates; regular data releases and monitoring; and reviewing of control centre dispatch practices. As part of this work: • **IT changes:** NESO will continue developing the OBP, focusing on fully replacing all its legacy BM systems by 2027 • **Building on the training programs** already delivered to NESO control room staff. NESO will continue delivering specialised training focusing on new capability being delivery via the OBP. This training programme will continue throughout 2025 as the OBP continues to deliver against its plan • **Continue developing Grid Code modification GC0166 which seeks** to introduce new parameters to allow the better use of Electricity Storage Modules within the BM. Based on current timelines, it is hoped that Ofgem will be able to take a decision on this modification by October 2025
		c) Local Constraints Market (LCM) and Demand Flexibility Service (DFS): to ensure its markets are inclusive and coherent, NESO is currently assessing a full range of development options for LCM and DFS. This includes considering the possibility of developing DFS into a single coherent route to market for volume (including demand turn-up), which cannot access NESO's core services. NESO aims to provide clarity on the direction of travel and communicate next steps for LCM and DFS no later than end of Q3 2025
		d) Distributed Energy Resources (DER) integration: NESO's Transformation to Integrate Distributed Energy (TIDE) programme to agree a roadmap by March 2026 for coordinated delivery of changes across industry to integrate DER and Consumer Energy Resources (CER)[77] and enable use cases across the system operations value chain[78], including improving the ability to forecast flexibility

[77] Distributed Energy Assets are all assets connected to distribution grid, between transmission system boundary (GSP) down to residential levels. These are segmented into DERs/CERs. DERs are distributed connected energy assets like solar panels, wind turbines, or battery energy storage systems (BESS), with outputs of >1MW owned by commercial entities. CERs are presented as aggregated volumes comprised of residential assets owned by consumers that can export/import, store and manage energy with outputs of <1MW. These assets are connected to the distribution grid at the consumer premises

[78] System operations value chain covering core functions like modelling & forecasting, network planning, restoration & resilience, market facilitation, service dispatch, real time operations & transparency & compliance

Market facilitator and Distribution System Operator markets

Ensuring coordination between markets will be essential for unlocking the maximum potential of clean flexibility. Elexon as market facilitator must implement its forward workplan and deliverables for flexibility markets. This includes but is not limited to improved NESO/DSO market coordination to address revenue stacking and primacy rules concerns, metering and settlement specifications, and baselining methodologies.

Case study

UK Power Networks has pioneered the development of local flexibility markets, from its first procurement in 2017 to contracting over 1GW in 2023.

In April 2024, it launched a day-ahead flexibility market to complement their long-term procurement, working in partnership with EPEX SPOT. Over 200 daily auctions took place in 2024/25, with 13GWh utilisation, up 68% from the previous year.

Additionally, UK Power Networks was the first DSO to procure demand turn-up,[79] to make use of excess renewable energy when it would otherwise be curtailed. During 2024/25, households participating in this service received an average of £54 in free electricity.[80]

There are now over 175,000 assets registered to provide local flexibility, including batteries, generators, electric vehicles, heat pumps and other demand in homes and businesses.[80]

Since April 2023, UK Power Networks' flexibility services have delivered £205m in savings from more efficient use of distribution network capacity.[80]

Path building actions	Hurdles	Short-term milestones
34. Elexon to ensure alignment between NESO and DSO markets to maximise the amount of flexibility	Revenue stacking between markets and primacy rules, as well as issues such as	**a) Delivery plan:** Elexon to finalise its market facilitator delivery plan for 2026/27 by the end of 2025, setting out next steps to ensure alignment between NESO and DSO markets for flexibility service providers

[79] UK-first large-scale flexibility product enabling more green power, UK Power Networks
[80] DSO Performance Panel Report 2024/25, UK Power Networks

Path building actions	Hurdles	Short-term milestones
participating in these markets	baselining, prevent the full participation of flexibility across all NESO and DSO markets	
35. Ofgem to ensure information on DSO flexibility procurement remains clear and easily accessible	Information on local flexibility procurement by DNOs and independent DNOs could be made more accessible	**a) Data Dashboard:** Ofgem to publish a Data Dashboard in autumn 2025, based on the Electricity Distribution Standard License Condition 31E Procurement Report and supporting data covering the flexibility products which have been tendered for, procured, and dispatched by each license holder. This will enable easy comparison of trends across procurement years across different license areas. This Data Dashboard will be updated annually when Ofgem receives the Procurement Reports

Energy Code Governance Reform

Several recent modifications to the Balancing and Settlement Code (BSC) helped facilitate flexibility. For example, P344 and P415 opened the BM and wholesale markets respectively to aggregators. Additionally, code modification P483 is currently looking to remove a barrier around the need for a consumer to be half-hourly settled for an aggregator to trade their flexibility. In the future, new barriers to flexibility may arise within the BSC or other industry codes. While not all barriers can be predicted, it is expected that code managers commit to identifying and addressing them as they emerge.

As part of the Energy Code Governance Reform programme, Ofgem and government are bringing in a new enhanced role of licensed code managers who will be able to drive forwards changes based on a strategic steer from Ofgem via the Strategic Direction Statement (SDS), which, in turn, will reflect strategic priorities from government. Ofgem and government will highlight areas where barriers exist and, through the SDS, may also ask code managers themselves to take a proactive role in identifying and tackling existing and emerging barriers to flexibility that relate to code rules, including driving forwards code modifications where appropriate. Ofgem and government expect code managers will develop code modifications in a holistic way, working alongside NESO, the market facilitator, and industry more widely.

Path building actions	Hurdles	Short-term milestones
36. Ofgem to work with Code Administrators and Code Managers when appointed to ensure code modifications that unlock barriers to flexibility are addressed in a timely manner	The code modification process can be time-consuming, limiting the ability to strategically and rapidly respond to flexibility issues	**a) Barrier removal:** Ofgem to decide within six weeks of receipt of the final modification report from Elexon, whether to approve BSC code modification P483, which looks to remove a barrier around the need for a consumer to be half-hourly settled for an aggregator to trade their flexibility
		b) Strategic Direction Statement: Ofgem to include flexibility related code modifications in its 2025 preliminary SDS, and the subsequent SDS expected to be issued in summer 2026

Chapter 7: electricity networks

The electricity network carries power from sources of generation to centres of demand, such as homes, businesses, industry and transport infrastructure. Transmission networks carry high-voltage electricity across the country and substations then convert the electricity so that it can be carried along lower-voltage local distribution networks, delivering it to consumers.

A major expansion of the electricity network is needed to electrify the economy and deliver clean power by 2030 and net zero by 2050. This expansion needs to be delivered at a scale and pace not seen for over fifty years, radically reforming how both generation and demand projects, including transport, heat and industry, connect to the network.

Contribution to government's vision for clean flexibility

Flexibility can reduce peak demand on the electricity network and therefore, in the long term, the need for new network capacity. However, to unlock the availability of cheap renewable energy and achieve our clean power and net zero targets, both increased flexibility and major expansion of the electricity network will be required. This will provide increased capacity on the network and support connection of sources of flexibility, such as electricity storage and interconnectors.

Acceleration of build at both transmission and distribution levels is required to enable this. In addition to supporting flexibility, this will:

- Reduce annual constraint costs
- Support energy independence by allowing connection of homegrown sources of clean energy
- Enable economic growth, helping to unlock on average £40bn per year in mainly private investment between 2025-2030[81]

Clean Power 2030 Action Plan update

The Clean Power 2030 Action Plan contains a comprehensive set of actions to reform the grid connections process and accelerate delivery of networks infrastructure. These actions span across the build process, and include reform to connections, regulatory processes and planning and consenting, alongside schemes to improve community acceptability and support the supply chain.

Significant progress has been made, including:

- Bringing forward legislation, through the landmark Planning and Infrastructure Bill, to reform planning, support Ofgem and NESO to deliver connections reforms, and introduce an explicit link between strategic planning and connections
- Announcement of two community benefits initiatives for new transmission network infrastructure
- Launch of a public communications campaign[82] developed by industry

[81] Undiscounted, 2024 prices. This includes £30bn investment in generation assets, and £10bn investment in transmission network assets. Clean Power 2030 Action Plan footnote 3, GOV.UK (2024)
[82] Moving the Grid Forward and Powering a Cleaner Future, ENA

Government is undertaking further work to support the skills pipeline and the supply chain, as set out in the government's Industrial Strategy's Clean Energy Industries Sector Plan, published in June 2025.

The Clean Power 2030 Action Plan committed Ofgem and NESO to enact grid connections reform to support Great Britain in achieving the generation, storage and interconnection capacity ranges required for clean power. In April 2025, Ofgem approved NESO's proposals for reforming the grid connections process which will ensure that only projects which meet the Readiness and Strategic Alignment criteria are prioritised in the reformed queue (as set out in NESO's Gate 2 methodology).[83] This will require developers, including for interconnection and grid-scale battery projects, to demonstrate key milestones including possession of exclusive land rights and planning consents to obtain and retain Gate 2 connection agreements. Projects will be allocated connection offers within the permitted capacity of the relevant designated strategic document (initially the Clean Power 2030 Action Plan and in future likely other strategic plans, including the Strategic Spatial Energy Plan (SSEP)). This process will mean the queue is made up of viable projects aligned with the government's Clean Energy Superpower Mission.

NESO has begun implementing the proposals that Ofgem agreed in April with a view to achieving this ambition. It expects to issue all pre-2030 revised connection offers by end-2025.[84]

Key priorities for 2030 and 2050

Expanding network build is fundamental to achieving clean power and net zero.

The Clean Power 2030 Action Plan set out the transmission projects that are required to achieve clean power by 2030. All key projects are in existing network plans and the government's priority for 2030 is ensuring that the projects are on track to deliver by 2030 and accelerated where necessary. Transmission build will also remain critical post-2030: the onshore electricity network could require £100-£240bn of investment by 2050 to meet net zero.[85]

In the next ten years, we also need significant expansion of the distribution network to accommodate the projected rapid increase in electricity demand as key parts of the economy electrify, notably heat, transport and industry. Robust distribution networks are also required to connect a large increase in demand flexibility that we need to operate a clean energy system efficiently. Ofgem's Framework Decision for the 2028 electricity distribution price control (ED3)[86] has signalled a shift to proactive investment and greater strategic planning to prepare the distribution network for net zero.

Ofgem's ED3 Framework Decision signals a more planned, proactive approach to investment in building new capacity to meet rising electricity demand, connect growing numbers of distributed energy assets, and enable consumers to provide demand flexibility to balance the wider system efficiently.

Distribution Network Operators (DNOs) will be required by Ofgem to use the Regional Energy Strategic Plans (RESPs) to inform their long-term development plans. RESPs will be an important strategic planning enabler for electricity distribution networks, setting the foundation

[83] Gate 2 Criteria Methodology, NESO (2024)
[84] Connections Reform, NESO (2025)
[85] Electricity Networks Strategy Framework, Appendix 1: Electricity Networks Modelling, GOV.UK (2022)
[86] Framework decision: electricity distribution price control (ED3), Ofgem (2025)

for determining the capacity required and the long-term strategic investment needed on a regional basis. The latter is particularly important to enable supply chains to scale up while at the same time building a sustainable, skilled workforce for the long term. RESPs are discussed in more detail in the planning and supply chains chapter.

Significant reinforcement of local distribution networks is needed to meet projected consumer demand and facilitate the participation of distribution and consumer-led flexibility (CLF) for the wider energy system. The ED3 Framework recognises that there are also valuable use cases for distributed flexibility on local networks for the DNOs to manage a range of local network issues efficiently, including accelerating connections, mitigating network risks and recovering from faults. DNOs will also utilise distributed flexibility in network planning, for example, to help manage potential delivery risks to a large programme of network investment. It is important that distributed flexibility connecting to local networks is integrated fully with the rest of the system so that these can help manage a clean electricity system efficiently.

Grid connections

Significant reforms to the connections process, which will be key for enabling clean power by 2030, are currently being implemented by NESO and network companies. In the Industrial Strategy's Clean Energy Industries Sector Plan, the government also set out its approach to strategic demand projects. These reforms will ensure that sufficient capacity of sources of flexibility such as interconnectors can connect to the grid to enable clean power by 2030.

Path building actions	Hurdles	Short-term milestones
37. NESO and Ofgem will work to ensure that the Gate 2 connections queue is made up of viable interconnection projects aligned with government's clean power and net zero ambitions	Interconnectors with cap and floor agreements may have been awarded a connection agreement for later than 2030, or may not be operational by 2030, due to grid connection and planning processes	**a) CPAP Action:** NESO and Ofgem will ensure that the grid connection reforms support the interconnection capacity required to meet the 2030 clean power capacity ranges, and MHCLG will consider how planning reforms can support this capacity for the 2030 clean power capacity ranges

Voltage management

Voltage management has the potential to provide flexibility and increase system security through better provision of demand control. Ofgem will consult in autumn 2025 on the approach to DNO voltage management in ED3, including increasing system flexibility capacity.

Path building actions	Hurdles	Short-term milestones
38. Ofgem to clarify the role of voltage management, particularly for providing flexibility capacity for clean power and net zero	Innovation projects tested the potential of DNO voltage management including for flexibility and	**a) Potential wide rollout:** Ofgem to consult by autumn 2025 on the potential wide rollout of voltage management for flexibility, including impacts for electricity consumers, whether this should be an operational or commercial service, how additional capabilities of voltage management can be supported, and consideration of funding models and dispatch options

Path building actions	Hurdles	Short-term milestones
	voltage optimisation, but no clear direction has been set to support investment	

Distribution Use of System

Distribution Use of System (DUoS) charges provide revenue to pay for distribution networks. Ofgem needs to consider reforms to DUoS to ensure that users get good information about how to use the system efficiently and to reduce the costs of networks. DUoS reforms will reflect the outcome of the Review of Electricity Market Arrangements (REMA) decision and any subsequent changes to transmission charges or other signals.

Path building actions	Hurdles	Short-term milestones
39. Ofgem to consider, through DUoS Significant Code Review (SCR), how DUoS and related mechanisms can contribute to flexibility goals	DUoS charging does not provide strong enough temporal price signals to reward load shifting	**a) Locational and temporal granularity:** Ofgem to progress the longer-term DUoS reform SCR immediately, including the locational and temporal granularity of the DUoS charges at all levels and inconsistencies in charging signals depending on voltage and location of connection across the transmission and distribution network

Chapter 8: digitalisation and smart data

A decarbonised energy system will look very different to the one we have today. Much of our energy will be generated by distributed, renewable sources. Many of these sources will be assets owned and managed by consumers. This will require a step-change in the way these assets communicate within the energy system. Communication will happen through the exchange of high-quality standardised data in real-time between multiple different systems and devices.

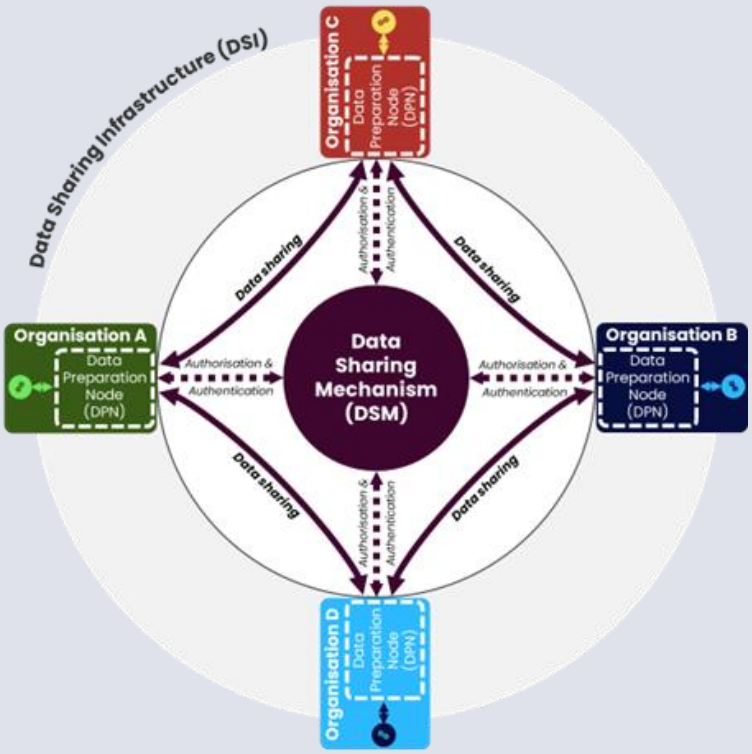
Digital tools and applications will need to be developed to support this data exchange, which will enable the system to operate flexibly and responsively whilst giving domestic and non-domestic consumers the opportunity to engage with their energy usage, saving them time and money. This is the digitalisation of the energy system: using digital technologies to change the way a system operates, with the goal of increasing efficiency, supporting decision making and unlocking new value and opportunities.

Case study

Data sharing is an essential foundation for digitalisation. NESO is developing a data sharing infrastructure (DSI), which is a secure framework for trusted data sharing across the energy sector by reducing barriers and improving oversight and governance.

Participating organisations deploy a Data Preparation Node (DPN) within their own organisations to manage data interfaces and apply security tagging. The Data Sharing Mechanism (DSM) then serves as a control plane for governance and authorisation. The secure data sharing takes place directly between the nodes.

Figure 12: data sharing infrastructure diagram



Source: DESNZ visualisation

Contribution to government's vision for clean flexibility

The change delivered by digitalisation is necessary to integrate flexibility into the system. The policies described in this Roadmap will drive an increase in flexible assets, but this still needs to be brought together through a digitalised system to deliver the required levels of flexibility to reach the government's 2030 goals. To maximise the potential for consumers who want to participate in flexibility, the technologies will need to be easy for consumers to use, with assets automatically optimising their responses to tariff or usage signals where the consumer has consented to this.

In August 2024, government published its response to the digital spine feasibility study[87] which supported NESO's continued development of the DSI into pilot and Minimum Viable Product (MVP) phases. The study contained five commitments and a pledge to publish an update against these five in 2025, detailed below.

Digital spine feasibility study update

Commitment 1: In 2024, NESO will deliver a pilot data sharing infrastructure, based on an outage planning use case.

NESO has successfully completed the pilot phase of the DSI. This was conducted in collaboration with the National Digital Twin Programme, and the network partners SSEN Transmission, SSEN Distribution, SPEN, and National Grid Electricity Transmission. A show and tell event was held in May 2025 to share insights with industry. The learnings from this phase are being incorporated into the MVP planning.

Commitment 2: NESO will build on this in 2025 by delivering an MVP of a data sharing infrastructure focussed on strategic planning.

The MVP mobilisation and preparation activities have started, alongside stakeholder engagement with the gas, electricity, and transmission networks. The MVP delivery is estimated to start Q4 2025 and last for around 12 to 18 months. Driven by stakeholder feedback and learning from the pilot delivery process, the MVP will seek to focus on core functionalities that deliver value across multiple use cases in the areas of strategic planning and flexibility.

Commitment 3: NESO will seek advice and guidance from National Cyber Security Centre (NCSC) to support the development of a security framework for the DSI pilot and MVP.

NESO has been seeking advice and guidance from the NCSC and the National Protective Security Authority (NPSA) throughout the pilot and will continue to do so throughout the MVP to support the development of the DSI security framework.

Commitment 4: the government will procure work in 2024 to assess the landscape of data standards related to the use cases described in the Digital spine feasibility study.

[87] Digital spine feasibility study, GOV.UK (2024)

DESNZ commissioned Zuhlke Engineering Ltd to assess the standards landscape, conduct a gap analysis, and recommend next steps for the development of technical standards that will enable the interoperable exchange of data across various actors within the energy system. The government is considering the recommendations and next steps set out in the final report.

Commitment 5: in winter 2024, Ofgem will publish a further consultation on DSI governance, setting out its view of an enduring governance structure.

In April 2025, Ofgem published its decision on interim governance of the DSI, appointing NESO as the Interim DSI Coordinator. Further work on enduring governance structures is being addressed as part of the broader digitalisation governance activities Ofgem and DESNZ are working on jointly.

The government's Smart Secure Electricity Systems (SSES) Programme is delivering data and technology standards to ensure interoperability of assets and tariff data, as well as make devices supplier-agnostic. Meanwhile, innovation competitions such as those launched by DESNZ for asset registration, smart meter data, and flexibility markets, help demonstrate viable digital solutions to a variety of digitalisation challenges. The next step in the digitalisation journey is to ensure coordination and coherence of the different initiatives.

NESO will publish a Sector Digitalisation Plan in summer 2025, supporting the outcomes of both this Clean Flexibility Roadmap and the Clean Power 2030 Action Plan. The Sector Digitalisation Plan will provide additional recommendations on the operational aspects supporting the digitalisation of the energy system to achieve clean power.

The improved flow of data will transform the way we govern and operate the energy sector by automating manual processes, improving decision making and providing responsive oversight. This high-quality data will be the foundation upon which AI-enabled innovative products and services can be built to support consumers.

Consumers will be at the heart of digitalising the energy system, with simple and secure consumer journeys that are designed with their needs and protections in mind. This will empower consumers to make informed choices that deliver the greatest benefit.

Clean Power 2030 Action Plan update

The Clean Power 2030 Action Plan highlighted the importance of distributed energy assets to unlock further flexibility and assist with network planning. In the Clean Power 2030 Action Plan, DESNZ and Ofgem committed to work with NESO to set out measures in the Roadmap to enable greater visibility of distributed energy assets to unlock further flexibility and assist with network planning. In the asset visibility call for evidence[88] published alongside the Clean Flexibility Roadmap, government has set out some of these measures and are seeking stakeholder views on these proposed options and any other options we should consider. Alongside this work, Ofgem has already confirmed that the market facilitator will be responsible for aligning national and local Flexibility Market Asset Registration (FMAR) processes and overseeing the design of new FMAR digital infrastructure to support this.

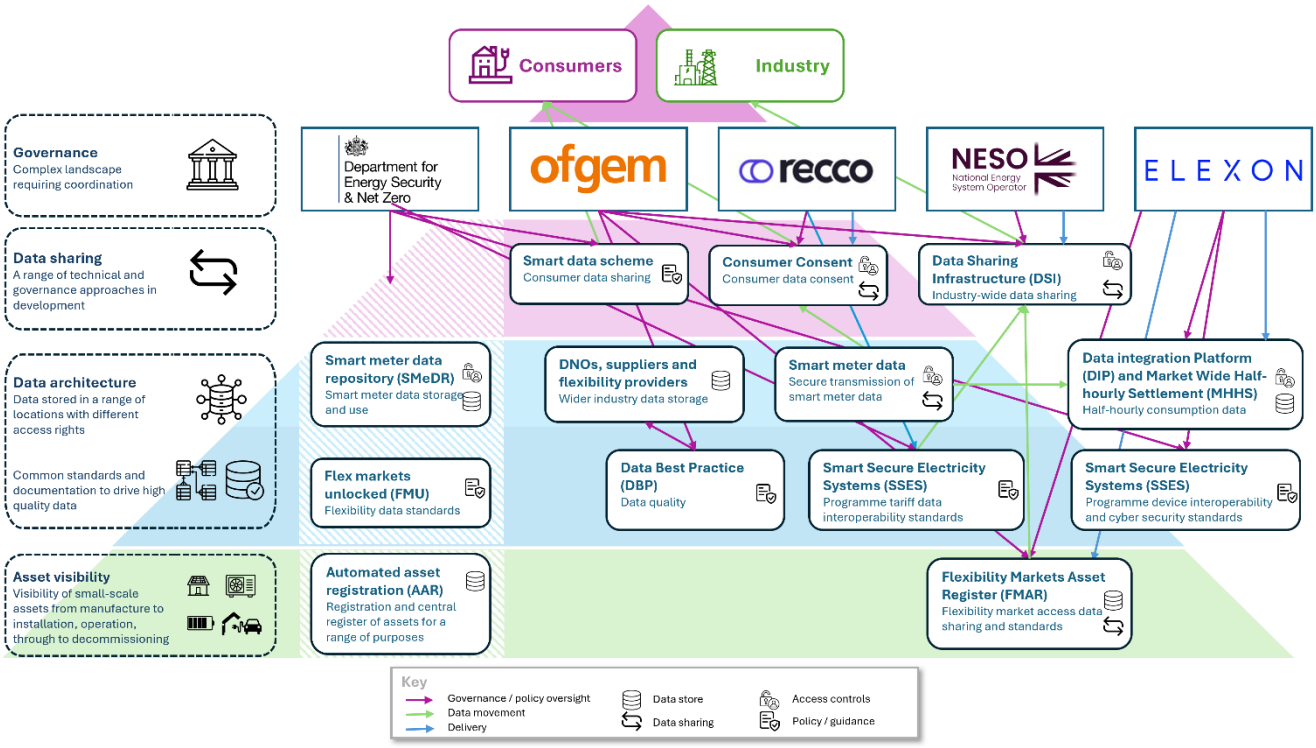
[88] Improving the visibility of distributed energy assets, GOV.UK (2025)

Key priorities for 2030 and 2050

We need to take a strategic approach to delivering the digitalisation agenda, ensuring all the required pieces are in place and work together in a seamless, coordinated manner, whilst delivering a smooth consumer experience. Strategic direction needs to be provided across the whole digitalisation landscape, underpinned with common tools, architecture and approaches. Coordination and governance of the different owners of key digital infrastructure through a clear governance framework is critical so that the different initiatives are designed for interoperability and avoid duplication.

The figure below shows the current key digitalisation elements in the energy system which are highlighted later in this chapter. The bottom layer, 'asset visibility', provides the foundations to support flexibility. The second layer 'data architecture' shows components composed of the data standards and the data itself stored in various locations. The third layer, 'data sharing' describes the projects underway to improve the sharing of data between various users for the benefits of consumers and industry. Finally, the 'governance' layer indicates the complexity in the emergent shared digital architecture which will be rationalised and coordinated as part of the actions being taken forward.

Figure 13: energy system digitalisation initiatives diagram



Source: DESNZ visualisation

Asset visibility

Many more small-scale assets will be installed in consumer premises and will be participating flexibly as part of the decarbonised energy system. Not only will these assets need to be visible to network owners and operators, but also to products and services that enable consumers to participate in flexibility markets. The journey of asset data starts from manufacture, through installation and operation, ending in decommissioning. This involves several actors who need to be aligned to maximise the visibility of this data at every stage. Policy frameworks that support asset visibility are needed to support this alignment.

Path building actions	Hurdles	Short-term milestones
40. Government, supported by Ofgem, to design an end-to-end framework to improve the visibility of assets for the energy sector and their ability to produce value for consumers	Insufficient visibility of, and sharing of data on, distributed energy, including local generation and flexible assets on the grid, is hampering the integration of these assets and their potential for utilisation within flexibility markets	**a) Policy framework:** DESNZ to issue a response to its asset visibility call for evidence by end-2025, setting out next steps and preferred approaches in developing policy frameworks that support asset visibility
		b) DNO licences: Ofgem to consult by end-2025 on new Distribution Network Operator (DNO) licence requirements to maintain asset registers which support data exchange to improve asset visibility
		c) Flexibility Markets Asset Registration (FMAR): Ofgem to finalise the market facilitator and FMAR policy framework, including NESO and DNO licence changes, by December 2025, streamlining the registration process to access flexibility markets

Data architecture

Data will provide the foundations for the digitalisation of the energy system. It involves needing a common language, or ontology, to describe how the data represents the real world, with open standards and definitions. The data itself needs to be of high quality and formatted to a common standard to support secure sharing between authorised users. Government then needs to ensure that the data is used effectively to monitor progress towards government's clean power and net zero ambitions. Underpinning all this will be a common digital infrastructure which supports standardised flexibility market processes.

We have seen progress in recent years on the integration of Data Best Practice: the framework which guides licenced entities in the energy sector to improve their data practices and promotes data sharing with the wider market. We now need to ensure this supports flexibility markets.

Path building actions	Hurdles	Short-term milestones
41. Ofgem, Elexon, NESO and Distribution System Operators (DSOs) to develop and implement a coherent data architecture to support the participation of flexibility in markets	The absence of common data standards across flexibility markets hampers efficient system operation, limits market access, and constrains the development of new services	**a) Flexibility market standards:** Elexon to drive flexibility data standardisation and alignment across flexibility markets by end-2027, improving consistency, transparency and interoperability of data through the implementation of the Flexibility Market Rules[89] and supported by the market facilitator governance
		b) Data ontologies: DESNZ, with support from Ofgem and NESO, to explore a common ontology and foundational data model for interoperable data exchange in the energy system with some elements delivered by end of 2026
		c) Flexibility Digital Infrastructure (FDI):[90] Ofgem to publish, by the end of 2025, the intended approach for monitoring and achieving wider Flexibility Digital

[89] The Flexibility Market Rules will ensure that flexibility markets across Great Britain are consistent, accessible, and interoperable

[90] FDI policy is being developed by Ofgem. It aims to increase the participation of small-scale assets in flexibility markets by considering whether common digital infrastructure is needed across NESO and DSO markets e.g. FMAR was the first FDI policy intervention

Path building actions	Hurdles	Short-term milestones
		Infrastructure[91] outcomes, beyond FMAR. This will consider what common IT systems might be needed across the end-to-end process, to support the participation of flexibility assets in NESO and DSO markets
42. Ofgem, supported by government, to ensure the quality of data is suitable to support flexibility	Data quality issues and the narrow application of Data Best Practice, are hindering the full use of data to support flexibility	**a) Suitability of Data Best Practice:** Ofgem to review, by end of 2025, if Data Best Practice is suitable for flexibility providers and market operators, including data standards and common approaches to documentation

Data sharing

To support consumer needs, DESNZ launched a call for evidence in 2025 to test the need for an energy smart data scheme, similar to Open Banking – a system that allows consumers and businesses to access better services like budgeting tools, payment solutions, and credit products. As detailed in the government response published alongside this Roadmap, the call for evidence has shown a clear appetite from both industry and consumer groups for such a scheme. Government will continue work over the course of 2025 to consider whether to introduce an energy smart data scheme.

Government will identify and cost options on scheme design and implementation to support a potential consultation on a detailed proposal.[92] Ofgem's Consumer Consent solution, the digital framework that enables consumers to safely grant, manage, and revoke access to their energy data, would form a core component of any potential smart data scheme by putting consumers in control of their data. In parallel we are continuing to enhance industry data sharing through the DSI, with additional use cases that support flexibility.

Case study

The new Data (Use and Access) Act introduces new opportunities to use smart data. The companies presented below, who were all finalists in the Smart Data Challenge Prize[93], all propose to use smart data from energy combined with data from other sectors to deliver real value to consumers and organisations:

BelowZero is aiming to use smart data from across energy, financial services and property sectors to create a solution that helps consumers save money. Its smart system identifies the best times of the day to use, store or sell energy based on weather, energy pricing, energy consumption and property data.

GlowTrack by Horizon Zero is combining financial service, energy and property data to create a "heating support priority index". This is aimed at supporting low-income

[91] A vision set out by Ofgem for a digital tool that unlocks distributed assets to participate in flexibility markets at pace and scale
[92] Government response to the call for evidence on developing an energy smart data scheme, GOV.UK (2025)
[93] Smart Data Challenge Prize

households to bulk-purchase wholesale energy ahead of winter to reduce heating prices whilst providing suppliers with demand certainty.

Mycelium is creating a free, open platform using smart meter and carbon accounting data to help businesses track and report their scope 1 and 2 carbon emissions. This also enables procurement teams to find low carbon suppliers from validated emissions data.

Smart Energy Marketplace tackles energy management by helping businesses cut energy waste, optimise energy costs, and get their buildings ready for new EPC rules coming in 2030.

Path building actions	Hurdles	Short-term milestones
43. Government to continue work over 2025 to consider whether to introduce an energy smart data scheme	Consumer participation in flexibility is limited by the absence of simple, trusted, and secure data-sharing frameworks that enable engagement and informed energy decisions	**a) Smart data scheme:** DESNZ to continue work over the course of 2025 to consider whether to introduce an energy smart data scheme. DESNZ will identify and cost options on scheme design and implementation to support a potential consultation on detailed proposals
44. NESO, with support from industry, to deliver and govern the development of the DSI to support data sharing for the entire energy sector	Full industry adoption will be required to maximise the value of the DSI once live	**a) Strategic planning use case:** NESO to complete, by the end of 2026, the building and testing of an MVP use case through the DSI to support strategic planning of the energy system
		b) Flexibility use case: Elexon, with support from NESO and Ofgem, to build a DSI-aligned flexibility use case of data exchange in 2027 as part of FMAR development
		c) Data sharing alignment: NESO, in its role as interim coordinator out to 2028, to ensure that the DSI evolution aligns with the development of other data sharing initiatives such as smart data and consumer consent
45. RECCo, with Ofgem oversight, to deliver a consumer consent mechanism, giving consumers control and transparency over their energy data usage	The absence of a standardised process for obtaining consent to share consumer energy data leads to lack of trust around data sharing, limiting participation in flexibility markets	**a) Consumer consent:** RECCo, with Ofgem oversight, to deliver a consumer consent mechanism by end 2026 to align with the delivery timescales of Market-wide Half-Hourly Settlement (MHHS). RECCo to consider proposed designs for both smart data and the DSI to ensure interoperability and alignment
46. DESNZ, Ofgem and NESO to work together to accelerate efforts to unlock the	Limited data sharing across the energy sector is hindering the full	**a) Streamlined information sharing:** DESNZ to work in partnership with Ofgem and NESO to map where improvements in data interchange between the three organisations and wider energy partners would accelerate

Path building actions	Hurdles	Short-term milestones
untapped potential of energy data to plan, deliver, regulate, and monitor progress towards flexibility	use of data for planning, regulation and flexibility delivery	delivery of flexibility and begin delivering improvements by end of 2025

Digitalisation coordination

As we start to govern and scale an increasing range of digital initiatives, it is important that our efforts are coordinated, drive innovation and common practices, and protect consumers. The governance landscape is complex, with the potential for gaps and duplication of roles. We shall ensure that digitalisation governance is streamlined with a clear vision for the future.

Path building actions	Hurdles	Short-term milestones
47. Government and Ofgem to establish an enduring governance framework for data and digitalisation initiatives within and beyond the energy sector. This will ensure the coordination and interoperability of initiatives, accelerating their delivery whilst minimising costs	The complexity of the governance landscape challenges coordination, risking duplication, gaps and increased costs to consumers	**a) Digitalisation vision:** DESNZ and Ofgem to publish, by Q1 2026, a vision outlining the technical and non-technical aspects of coordinating digitalisation initiatives and how these can be brought together and align with other sectors of the economy to ensure interoperability and coherence

Chapter 9: planning and supply chains

Planning and supply chains are crucial for realising the government's clean flexibility vision, especially for technologies that require significant infrastructure build: long duration electricity storage (LDES), grid-scale batteries, low carbon dispatchable power and interconnection.

Planning

The planning systems across Great Britain have not operated at the pace and efficiency required to drive growth, deliver the Clean Energy Superpower Mission, and achieve the government's clean flexibility vision. By reforming our planning system, government can ensure it works better for energy projects and wider infrastructure. The aim of reforms is to reduce delays associated with energy infrastructure consenting decisions and unlock growth while maintaining environmental safeguards, in turn boosting investor confidence in our deployment pipelines and incentivising investment into associated supply chains. To streamline the planning and consenting process, the government announced an ambitious suite of reforms in the Clean Power 2030 Action Plan in December 2024, including reforms to primary legislation within the Planning and Infrastructure Bill, which was introduced to Parliament in March 2025.

The Clean Power 2030 Action Plan also set government's direction for updating the National Policy Statements for energy in England and Wales to embed clean power objectives, and committed to reviewing resourcing across key organisations to assess whether they have the capacity and capability to handle the heightened volume of clean energy project applications expected in the coming years.

It is also crucial to take a consistent approach to flexibility in the future planning of the energy system. Regional Energy Strategic Plans (RESPs), for example, will set out how local energy systems need to be developed to reach net zero, considering both the national targets set by government, local needs, and the most appropriate approach in each area. RESPs sit alongside the Strategic Spatial Energy Plan (SSEP), which will provide greater clarity to industry, investors, consumers and the public on the shape of our reformed energy system. It is important that these strategic energy plans can effectively model and assess flexibility.

Path building actions	Hurdles	Short-term milestones
48. Government to unblock planning barriers for grid-scale batteries	Grid-scale batteries take a long time to gain planning approval	**a) Making the planning system work better for storage:** the government has amended the National Planning Policy Framework to give significant weight to the benefits of renewable and low carbon energy proposals and associated infrastructure including battery storage. This change aims to give greater policy certainty for developers and examining authorities and reflects the government's Clean Power 2030 ambitions. To provide further clarity on terminology and the application of policy for grid-scale batteries, MHCLG will update the Planning Practice Guidance in Autumn 2025, supporting these changes in practice
49. NESO, in collaboration with Ofgem and DESNZ, to ensure strategic energy plans can	A lack of robust and coherent approaches to how flexibility is factored into	**a) Consistent modelling which accounts for flexibility:** NESO to ensure the first RESP methodology (Q2 2026) has a transparent approach to modelling flexibility, with collaboration opportunities to enable challenge and review by stakeholders. Following this, for future iterations of the

Path building actions	Hurdles	Short-term milestones
appropriately model and assess flexibility	strategic energy planning may result in material inconsistencies and inaccuracies in strategic plans, which limit the potential benefits of a flexible system	SSEP and RESP methodologies, NESO will develop a coherent approach to how flexibility is modelled and assessed
		b) Transparency and coherence: NESO, Ofgem and DESNZ to ensure, where possible, that transparent data sharing arrangements are in place to enable a shared understanding of material assumptions and datasets, and that these, where possible, are coherent across all strategic planning processes

Supply chains

To deliver the government's clean flexibility vision, Great Britain needs secure, sustainable, competitive and reliable supply chains to provide the necessary components for all technologies. This involves both powering our domestic manufacturing and ensuring access and competitiveness in international markets. The government's ambition is to see a sustained increase in supply chain activity both up to 2030 and continuing out to 2050. The Clean Power 2030 Action Plan outlined how government will support cross-sectoral challenges, as well as more targeted actions, including the convening of a supply chains and workforce industry forum for key clean power sectors, such as batteries, first-of-a-kind technologies and electricity networks. In support of the action below, government is also exploring the potential of a Market Demand Guarantee to stimulate production of key electricity network equipment by providing certainty to the supply chain regarding the size of the future market opportunity.[94]

Path building actions	Hurdles	Short-term milestones
50. Government to mitigate supply chain challenges and support domestic manufacturing of electricity equipment	Supply chain capacity for electricity interconnectors, networks, and storage, especially transmission level, is constrained and requires long lead times for delivery of key equipment including High-Voltage Direct Current (HVDC) cables, converters and transformers	**a) Investing in domestic manufacturing to strengthen electricity equipment supply chains:** DESNZ to support a comprehensive Public Finance Institutions offer, including via Great British Energy (GBE) and the National Wealth Fund (NWF), to crowd private investment into sustainable supply chains in the UK. This includes a new £1bn GBE Clean Energy Supply Chain fund for key components for the clean power revolution like floating offshore platforms, electric cables, and cutting-edge hydrogen infrastructure; in addition, NWF investment in the development of low carbon power generation, flexibility and storage technologies and their supply chains. GBE will develop its supply chain fund through 2025
		b) CPAP Action: DESNZ is exploring a range of options to mitigate supply chain challenges including measures to develop the domestic supply chain for interconnection

[94] Industrial Strategy Clean Energy Industries Sector Plan, GOV.UK (2025)

Section 4: delivering the Clean Flexibility Roadmap

Roadmap governance framework

A robust, long-term governance framework is integral to the success of the Roadmap. While this document represents a significant step forward, it is not intended to be the last word on achieving clean flexibility. Key parallel developments, such as in markets, will require ongoing action and adaptation. The Roadmap governance framework will play a vital role in sustaining momentum beyond this publication, helping to keep the sector on track to deliver clean power by 2030 and, ultimately, net zero by 2050, in alignment with the government's Clean Energy Superpower Mission.

The governance framework is designed to deliver three core objectives:

- **Transparent tracking** of Roadmap actions delivery and their real-world impact
- **Continuous improvement** through a ratchet mechanism which proactively identifies the need for additional action and prevents backsliding
- **Celebrating success** by sharing case studies and learnings across the sector

This governance framework is designed as a dynamic system for learning, adaptation, and action. By combining strong leadership, continuous monitoring, and active stakeholder engagement, it will ensure the Roadmap is a living strategy, driving sustained progress toward clean flexibility goals.

Governance leadership and structure

The Roadmap's delivery is dependent on clear leadership and effective coordination across government, Ofgem, NESO and industry. To facilitate this, DESNZ will appoint a Flexibility Commissioner through the Clean Power 2030 Advisory Commissioner appointment process, with a particular focus on short duration flexibility, as well as the markets and smart appliances that it is dependent on.

DESNZ will also form an internal Electricity System Flexibility division to support cross-department coordination on clean flexibility.

Path building actions	Hurdles	Short-term milestones
51. DESNZ to establish stronger leadership structures for clean flexibility	Clean flexibility is a complex policy environment; greater internal and external government coordination is required	**a) Flexibility leadership:** DESNZ to appoint a Flexibility Commissioner, as part of the Clean Power 2030 Advisory Commission, in 2025. The Flexibility Commissioner will focus primarily on short duration flexibility and will be responsible for driving flexibility delivery across boundaries and acting as a voice representing the interests of maximising clean flexibility capacity in all relevant energy sector initiatives. The Flexibility Commissioner will also attend Roadmap governance meetings

Path building actions	Hurdles	Short-term milestones
		b) Central coordination: DESNZ to immediately form an internal Electricity System Flexibility division to aid coordination across the various teams contributing to the enhancement of flexibility capacity, including a new consumer-led flexibility (CLF) team within it to provide a strategic CLF portfolio management function across all relevant projects and programmes

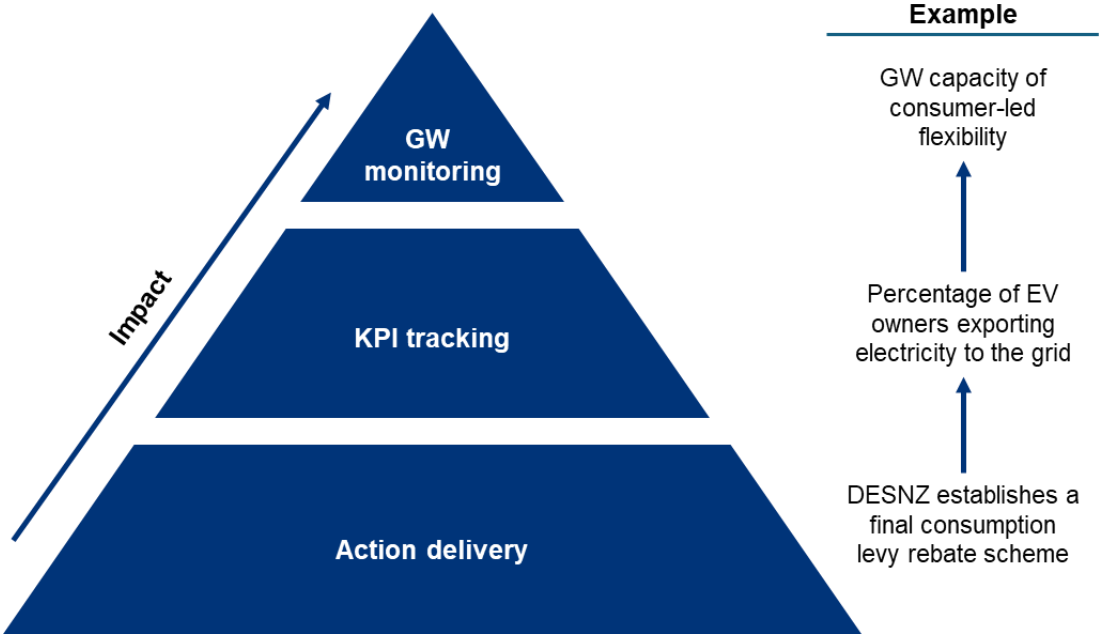
Monitoring progress

The governance framework's monitoring function is key to identifying areas requiring greater ambition as 2030 approaches. It tracks progress through **three interrelated layers**:

- **Action delivery tracking**
- **Key performance indicator (KPI) monitoring**
- **Flexibility GW capacity assessment**

Government will track the delivery of Roadmap actions. The actions will impact KPIs, which government will also develop and track. The KPIs will signal the impact of actions on flexibility GW capacities, enabling DESNZ to understand and track the causal mechanism between action delivery and GW capacities. For example, the delivery of Market-wide Half-Hourly Settlement (MHHS) actions should improve KPIs like the percentage of households using smart tariffs, which should increase the CLF GW capacity. The GW capacities will be monitored against Clean Power 2030 Action Plan ambitions by DESNZ's Clean Power Unit. By linking delivery to outcomes through KPIs and GW metrics, this approach enables early identification of shortfalls and where to target interventions.

Figure 14: the three layers of the Roadmap governance framework



Source: DESNZ visualisation

DESNZ will monitor action delivery, KPIs and flexibility GW capacity to track progress. We have a range of data sources, but the data held by wider organisations, such as Elexon, suppliers, aggregators, and DSOs, could provide a more comprehensive picture. We are therefore committing to clarify the KPI and GW monitoring data needed from industry to help us assess the need and form of additional actions via the Roadmap governance framework.

Path building actions	Hurdles	Short-term milestones
52. DESNZ to track KPIs and flexibility GW capacity to assess the need for, and appropriate type of, additional actions	Insufficient data is making progress tracking difficult	**a) Data for progress tracking:** DESNZ to publish industry data requirements by the end of 2025 to enable the sharing of data by industry

Stakeholder engagement and accountability

External engagement will be central to maintaining transparency and momentum. The governance framework will use two formal engagement mechanisms:

- **Annual Roadmap Forum:** a ministerial event for reporting action delivery, KPI, and GW capacity progress and for announcing new commitments. It will serve as a vehicle to increase transparency and accountability of post-publication progress. We envisage ministers chairing the Roadmap Forums with attendance from the Flexibility Commissioner
- **Quarterly stakeholder workshops:** Open-invite workshops to enable discussion with external stakeholders to identify additional hurdles to reaching the government's clean flexibility vision and actions to overcome these hurdles. DESNZ will distribute summaries of these workshops to participants

The Roadmap governance framework will facilitate a ratchet mechanism via these forums. By regularly reporting on progress and publicly committing to new actions, our clean flexibility ambition will build annually to the level required for clean power by 2030 and subsequently net zero. This approach prevents backsliding and ensures ambition increases over time.

Roles of DESNZ, Ofgem, NESO and delivery partners

At a high level, government is responsible for setting the strategic policy direction and regulatory framework for the energy sector in Great Britain. DESNZ sets overarching decarbonisation goals and is the sponsor department for Ofgem.

Ofgem is the independent economic regulator of gas and electricity markets in England, Scotland and Wales, and makes decisions on business and investment plans. Ofgem is also the regulator of NESO and is responsible for approving NESO's business plan, ensuring cost-efficiency and driving high performance.

NESO, now a public corporation, is the whole system planner, operator of the electricity system and expert advisor to government and Ofgem as the key decision makers.[95]

[95] Strategy and policy statement for energy policy in Great Britain, GOV.UK (2024)

Within the field of flexibility, DESNZ, Ofgem and NESO are accountable for the actions outlined in the above chapters. Each of these organisations will also play an important role within the Roadmap's governance framework. Examples of both are highlighted below:

Organisation	Role in the field of flexibility	Role in Roadmap governance
Department for Energy Security & Net Zero	Sets overall policy on clean power and flexibility Sets electricity flexibility strategy and legislative direction (by publishing strategy documents like the Hydrogen Strategy and conducting research like the consumer engagement consultation) Develops high-level policy frameworks Supports flexibility innovation and funding Delivers programmes like SMIP and SSES	DESNZ's Electricity System Flexibility division and supporting analysts are responsible for tracking the delivery status of actions and KPIs, whilst the Clean Power Unit is responsible for tracking GW capacities. This will be closely monitored and evaluated within DESNZ internal governance structures and involving the Flexibility Commissioner. DESNZ will also convene both the quarterly external workshops and the annual Roadmap Forum, at which we will report on action delivery status, KPIs and GW capacities to further incentivise delivery
ofgem	Regulates the electricity market to protect the interests of current and future consumers Enables the delivery of a more flexible energy system, within the framework set by parliament Oversees programmes such as MHHS	Ofgem will report within the Roadmap governance framework, providing regular status updates on the delivery of its actions and providing KPI and GW monitoring data where appropriate
NESO National Energy System Operator	Operates the electricity system, procuring flexibility via various markets (e.g., ancillary services, DFS, balancing mechanism) Coordinates with DNOs Assesses and advises on the optimal locations, quantities and types of energy flexibility infrastructure required (e.g., via the SSEP)	Like Ofgem, NESO will report within Roadmap governance framework, providing regular status updates on the delivery of its actions. As an independent strategic adviser to government and Ofgem, NESO will also continue to feed independent insight into DESNZ's Roadmap governance framework, providing regular advice and providing KPI and GW monitoring data where appropriate

We will also work together with Elexon and Great British Energy to enhance the role of clean flexibility.

Elexon, as market facilitator, is responsible for delivering standardised, open and transparent flexibility markets and aligning Distribution System Operators (DSOs) and NESO flexibility market arrangements, as well as delivering the Flexibility Market Asset Registration (FMAR). One of its core market facilitator functions is strategic leadership for flexibility markets by reducing barriers to flexibility market entry and enabling digital infrastructure.

Elexon, more broadly, also administers the Balancing and Settlement Code and is the delivery body for the MHHS programme and aspects of the Smart Secure Electricity Systems Programme (SSES) Programme, which combined with the role of market facilitator, supports the government's Clean Energy Superpower Mission.

Great British Energy (GBE) is an operationally independent clean power developer, operator and owner of clean energy assets. It exists to develop assets from conception to operation.

The Secretary of State is GBE's sole shareholder but has no authority to determine which projects GBE deploys its capital to. GBE is also independent from Ofgem and NESO and so will receive no preferential treatment (e.g., for grid connections). GBE can support the government's clean flexibility vision by investing in various technologies, as described at a high level in the Local Power Plan and Statement of Strategic Priorities.

Glossary of terms

Acronym	Term
APM	Advanced Procurement Mechanism
BMU	Balancing Mechanism Unit
BSC	Balancing and Settlement Code
CER	Consumer Energy Resources
CfD	Contracts for Difference
CLF	Consumer-led flexibility
CM	Capacity Market
CPAP	Clean Power 2030 Action Plan
CPU	Clean Power Unit
CSNP	Centralised Strategic Network Plan
DER	Distributed Energy Resources
DFS	Demand Flexibility Service
DNO	Distribution Network Operator
DPN	Data Preparation Node
DSI	Data Sharing Infrastructure
DSM	Data Sharing Mechanism
DUoS	Distribution Use of System
EPC	Energy Performance Certificates
EV	Electric Vehicle
FES	Future Energy Scenarios
FMAR	Flexibility Market Asset Registration
GB	Great Britain (England, Scotland, Wales)
GBE	Great British Energy
HAR2	Hydrogen Allocation Round 2
H2P	Hydrogen to Power
H2PBM	Hydrogen to Power Business Model
HPBM	Hydrogen Production Business Model
HSBM	Hydrogen Storage Business Model
HSE	Health and Safety Executive
HTBM	Hydrogen Transport Business Model

Acronym	Term
HVDC	High-Voltage Direct Current
I&C	Industrial and Commercial
LAES	Liquid Air Energy Storage
LCM	Local Constraint Market
LDES	Long Duration Electricity Storage
MCS	Microgeneration Certification Scheme
MHHS	Market-wide Half-Hourly Settlement
MPI	Multi-Purpose Interconnector
MVP	Minimum Viable Product
NCSC	National Cyber Security Centre
NESO	National Energy System Operator
NPSA	National Protective Security Authority
NSI	Non-Standard Interconnectors
NWF	National Wealth Fund
NZIP	The Net Zero Innovation Portfolio
OBP	Open Balancing Platform
OHA	Offshore Hybrid Asset
PBA	Path Building Actions
Power CCUS	Power Carbon Capture Usage and Storage
PSH	Pumped Storage Hydropower
REGO	Renewable Energy Guarantees of Origin
REMA	Review of Electricity Market Arrangements
RESP	Regional Energy Strategic Plans
RIIO2	Revenue = Incentives + Innovation + Outputs. RIIO2 is the second iteration of Ofgem's price control framework
RIIO-ED3	Revenue = Incentives + Innovation + Outputs, third iteration.
SDS	Strategic Direction Statement
Smart tariffs	Energy pricing plans that vary the cost of electricity based on the time of day
SSEP	Strategic Spatial Energy Plan
SSES	Smart Secure Electricity Systems Programme
T&S	Transport and Storage
TO	Transmission Operator
TPI	Third Party Intermediaries

Acronym	Term
TSO	Transmission System Operators
VLP	Virtual Lead Party
V2X	Vehicle-to-Everything
ZEV	Zero Emission Vehicle