UK Government

Clean Power 2030 Action Plan: A new era of clean electricity

December 2024

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List of Abbreviations

AGR	Advanced Gas-cooled Reactor
BECCS	Bioenergy with Carbon Capture and Storage
CB	Carbon Budget
CCUS	Carbon Capture Usage and Storage
CfD	Contracts for Difference
CHP	Combined Heat and Power
CM	Capacity Market
DESNZ	Department for Energy Security and Net Zero
DPA	Dispatchable Power Agreement
DSR	Demand Side Response
DNOs	Distribution Network Operators
EEP	Energy and Emissions projections
H2P	Hydrogen to Power
H2PBM	Hydrogen to Power Business Model
gCO2e/kWh	Grams of carbon dioxide equivalent per kilowatt-hour of electricity
GBE	Great British Energy
GDP	Gross Domestic Product
GW	Gigawatt
LAES	Liquid Air Energy Storage
LDES	Long-duration Electricity Storage
MHHS	Market-wide Half Hourly Settlement
MoD	Ministry of Defence
MW	Megawatt
NESO	National Energy System Operator
NSIP	Nationally Significant Infrastructure Projects
NSTA	North Sea Transition Authority
OBR	Office for Budget Responsibility
Ofgem	Office of Gas and Electricity Markets
REMA	Review of Electricity Market Arrangements
SSEP	Strategic Spatial Energy Plan
TNUoS	Transmission Network Use of System

Foreword from the Secretary of State

We will usher in a new era of clean electricity for our country, with our plan to deliver the most ambitious reforms to our energy system in generations.

Since Russia's invasion of Ukraine, Britain has experienced a devastating cost of living crisis caused by our exposure to volatile fossil fuel markets. Every family and business in the country has paid the price and we remain exposed to future energy shocks. In an increasingly unstable world, our dependence on fossil fuels leaves us deeply vulnerable as a country – and that is true no matter where they come from.

But there is a solution: by sprinting to clean, homegrown energy, we can take back control from the dictators and the petrostates. That is why the Prime Minister has put delivering clean power by 2030 at the heart of one of his five missions and Plan for Change.

The age of clean electricity is about harnessing the power of Britain's natural resources so we can protect working people from the ravages of global energy markets. This plan will provide the foundation for the UK to build an energy system that can bring down bills for households and businesses for good. And it is also about creating the sort of country that we know people want to see - reindustrialising our heartlands with good jobs and tackling the climate crisis.

This plan sets out how the government will work with the clean power sector, including industry, trade unions, investors, policy makers and others to achieve our clean power goal. 2030 is just six years away, and we are under no illusions

about the scale of the task ahead, but mission-driven government is about acting with urgency and determination to rise to the challenges we face.

That is why, in my first week in office, I appointed Chris Stark as Head of Clean Power 2030 in my department, leading a new mission control to drive progress towards our target. As a first step we commissioned the National Energy System Operator (NESO) to provide independent, expert advice on delivering clean power by 2030. Their advice, published earlier this year, showed that we can achieve our goal, protecting consumers and delivering a more secure energy system.

This plan builds on that advice, setting out the government's view of the pathway to 2030 and the steps needed to get there.

Ultimately, we need to move fast and build things to deliver the once-in-a-generation upgrade of our energy infrastructure Britain needs. In our first five months, we've already lifted the onshore wind ban, established Great British Energy, consented almost 2 GW of solar, delivered a record-breaking renewables auction, and kickstarted our carbon capture and hydrogen industries. This is the speed at which we will continue to work.

As the Prime Minister has made clear, clean power is an urgent priority for our country. The clean power sprint is the national security, economic security, and climate justice fight of our time - and this plan gives us the tools we need to win this fight for the British people.

Foreword by the Rt Hon Ed Miliband MP

Secretary of State for Energy Security and Net Zero

Foreword from the Head of Clean Power 2030

Cleaning up our power system has long been understood as central to decarbonising the whole economy. With a clean electricity supply, the electrification of heat, transport and industry open up as routes to net zero. But the wider benefits of clean power have also become clearer. In Britain, we have pioneered policies to grow renewable industries, attract investment and deploy clean energy technologies at a scale that was once thought impossible. There is now a route to more stable energy bills for households and businesses, as they increasingly go electric. We have also experienced the harsh repercussions of Britain's over-reliance on fossil fuels, which left us badly exposed to the cost of globally traded oil and gas in the wake of recent global insecurity.

Achieving clean power is now a broader goal, key to a growing economy, our national security and improving our standards of living. We should be in a hurry to achieve it.

This year, Britain closed its final coal-fired power station, completing a successful transition from the most polluting energy source. Clean power by 2030 is our next milestone, but it requires us to act with much greater urgency. Britain has some of the world's greatest clean energy resources, but we have planning and consenting processes that are far too slow to build the infrastructure needed to exploit them. That must change.

NESO's recent analysis shows the pipeline of projects needed for clean power by 2030. Their pragmatic advice is that security of power supply can be provided if we maintain

Britain's fleet of gas power stations but reduce their use to no more than 5% of total generation. That clarifies the task: build the grid that Britain needs, overturning decades of delay; install clean sources of power at a pace never previously achieved; identify the energy mix needed for the 2030 power system and reorder the connection queue to achieve it; develop a flexible system that can accommodate and store Britain's renewable resources; deliver these benefits to consumers, people, households, and businesses as swiftly as possible.

This requires a mission-focus – industry and government working in partnership at pace. The steps in this Action Plan will reform planning and consenting processes, contract new renewable power generation at the scale required, encourage long-duration energy storage and first-of-a-kind flexible clean capacity and open the path to clean power and new opportunities for consumers to save.

For the first time, we will have eyes on a programme of clean power investment estimated to be around £40 billion per year for the next 6 years. That visibility allows a more active focus on removing the barriers to its achievement, supporting greater coordination of supply chains, with more UK-based production, and ensuring there are trained workers to meet the requirements across the country. This is the real prize, ensuring we are ready to meet the growth in electricity demand that we expect over the 2030s and 40s.

Britain's clean power mission is now underway.

Foreword by Chris Stark

Head of Clean Power 2030

Summary

Clean Power by 2030 will herald a new era of clean energy independence and tackle three major challenges: the need for a secure and affordable energy supply, the creation of essential new energy industries, supported by skilled workers in their thousands, the need to reduce greenhouse gas emissions and limit our contribution to the damaging effects of climate change. Clean power by 2030 is a sprint towards these essential goals.

We have accepted independent advice from the National Energy System Operator (NESO), on the energy infrastructure required to deliver Clean Power 2030. In a typical weather year, the 2030 power system will see clean sources produce at least as much power as Great Britain *consumes* in total over the whole year, and at least 95% of Great Britain's *generation*; reducing the carbon intensity of our generation from 171gCO_2e/kWh in 2023[1] to well below 50gCO_2e/kWh in 2030.

The path to 2030

Successful delivery will require rapid deployment of new clean energy capacity across the whole of the UK, reflecting the shared renewable ambitions of the UK, Scottish and Welsh Governments. In this plan, we are accepting government's central role in steering the creation of this new energy system, setting our expectations for the 2030 capacities of key technologies at national and regional level.

We have high ambition. That means 43-50 GW of offshore wind, 27-29 GW of onshore wind, and 45-47 GW of solar power, significantly reducing our fossil-fuel dependency. These will be complemented by flexible capacity, including 23-27 GW of

[1] Department for Energy Security and Net Zero (DESNZ) (2024), *'Digest of UK Energy Statistics (DUKES) 2024'* (viewed in December 2024).

battery capacity, 4-6 GW of long-duration energy storage, and development of flexibility technologies including gas carbon capture utilisation & storage, hydrogen, and substantial opportunity for consumer-led flexibility[2].

In line with the NESO advice, this new capacity must be underpinned by the rapid delivery of 80 network and enabling infrastructure projects, most of which are already at an advanced stage of planning and development.

Over the period to 2030, security of supply will be protected with the maintenance of an expected 35 GW of unabated gas reserve capacity.

Growing our clean energy system in this way will see once-in-a-generation levels of energy investment – an estimated £40 billion[3] on average per year between 2025-2030, spreading the economic benefits of clean energy investment throughout the UK with the collaboration of the Scottish and Welsh Governments. These investments will protect electricity consumers from volatile gas prices and be the foundation of a UK energy system that can bring down consumer bills for good. Every choice we make will be scrutinised to maximise the impact it can have in reducing consumer bills.

The new industries and employment opportunities created by the huge investment ahead will also ensure there are lasting economic benefits from clean power throughout the country.

Delivering Clean Power 2030 also paves the way to decarbonising the wider economy by 2050 as we pursue the electrification of heat in buildings, transport, and industry. By 2050, annual electricity demand is likely to at least double. Clean power by 2030 prepares us for the rapid growth in power demand expected over the 2030s and 40s.[4]

Actions we are taking to accelerate delivery

To hold to our path to 2030, we know that the government must take radical action, quickly. This document sets out our first major steps towards clean power, in partnership with the Scottish and Welsh Governments, industry and the public:

Electricity Networks and connections

We need to reform the grid connections process and reduce the queue to connect, working with NESO and Ofgem to provide a framework through which NESO can work with Transmission Owners (TOs) and Distribution Network Operators (DNOs) to prioritise projects needed for 2030, while maintain a robust pipeline beyond 2030. Around twice as much new transmission network infrastructure will be needed in the nation's grid by 2030 as has been built in the past decade[5].

[2] These voluntary offers of flexibility by energy consumers (whether households or industries) can also be referred to as demand side response (DSR) or demand flexibility.
[3] Undiscounted, 2024 prices. This includes £30bn investment in generation assets, and £10bn investment in transmission network assets. See the Technical Annex for more detail on how this was calculated.
[4] Department for Business, Energy & Industrial Strategy (BEIS) (2022), *'Electricity networks strategic framework, Appendix 1 – Electricity Networks Modelling'* (viewed in December 2024).
[5] National Energy System Operator (NESO) (2024), *'Clean Power 2030'* (viewed in December 2024).

Regulatory reform will ensure Clean Power 2030 is better integrated into planning and decision making, so investment can be made ahead of need and the time taken to build and deliver network projects can be reduced in line with 2030 requirements. This includes working with Ofgem to explore the appropriateness of tightening the incentives and penalties on electricity transmission owners and distribution network operators to drive the acceleration of network delivery. The Scottish and Welsh Governments are considering how their planning and consenting regimes will also integrate with Clean Power 2030.

An improved planning and consenting environment will accelerate the expansion and upgrade of transmission and distribution networks. We will consult on expanding planning consent exemptions to include low-voltage connections and upgrades in England, and engage with MHCLG on opportunities to provide further flexibilities for the consenting of electrical substations. It is essential that we engage effectively and thoroughly with communities that will host new transmission network infrastructure, so they can be a part of the change to our system and benefit from it.

The Scottish Government will shortly consult on the refresh of its Good Practice Principles for community benefits for onshore and offshore net zero energy infrastructure. The government's view is that communities that host clean energy infrastructure should benefit from it. As a first step, we will publish guidance to increase the quantum and consistency of Community Funds and support the launch of industry public communications campaigns to encourage public awareness on the importance of networks infrastructure in supporting net zero.

Planning and consenting

With a prioritised grid queue, we can signal key projects for clean power and speed up planning and consenting processes across Britain. We will ensure communities directly benefit from hosting new clean energy infrastructure. We know that the majority of 2030 clean power projects are already in the pipeline, and so there is therefore a major opportunity in rewiring the planning system and unblocking bottlenecks to ensure projects can receive timely decisions so they can get building.

We will do this first by upgrading the planning system itself, equipping organisations with the flexibility they need to manage the increased caseload it faces. This includes workforce reform and development as well as a commitment to reviewing resourcing within the system.

Next, we will ensure the system can prioritise 2030-critical projects. We will make 2030 a core priority in updated planning policy vehicles and guidance. We have brought onshore wind back in to the Nationally Significant Infrastructure Project (NSIP) regime. We will bring forward a Planning and Infrastructure Bill with measures to streamline the delivery of critical infrastructure in the planning process, and convene community, nature, and industry groups on complex projects to stress-test them prior to application. In line with Lord Banner's recommendations, we will also progress work exploring changes to the legal challenge process for major infrastructure projects.

We will ensure that a reformed planning system enhances the restoration of nature. We will do this by delivering the Marine Recovery Fund for Offshore Wind and are considering strategic mitigation approaches for onshore infrastructure in England. The UK government and the Scottish Government

are also working together to establish a similar Marine Recovery Fund for projects in Scotland.

Devolved administrations are taking positive steps towards speeding up energy infrastructure planning and consenting too. In Wales, the Infrastructure (Wales) Act 2024 sets out the new consenting process for significant infrastructure projects, replacing multiple consenting processes in Wales with a single process. In Scotland, work is underway to secure the pipeline of future planners and increase skills and capacity within planning authorities. We are working closely with the Scottish Government on reform to deliver a streamlined and efficient legislative framework for electricity infrastructure consenting.

Renewable and nuclear project delivery

Addressing blockages to networks, connections and planning progress will significantly help us deliver the renewable capacity we need for 2030. But there are specific issues to address.

The Contracts for Difference allocation process needs to meet our 2030 ambitions and put an end to the stop-start failures of recent years. We need high levels of renewables to protect consumers and they need to be secured at the best price. Offshore wind has a particularly important role as the backbone of the clean power system.

Following discussions with industry and subject to further assessment, we are minded to implement a package of targeted reforms. We will consider changes to the information the Secretary of State can use to inform the final budget for fixed-bottom offshore wind, an auction schedule to improve transparency and predictability, and review auction parameters, including our approach to the reference prices used to estimate the budgetary impact of bids. To maximise the competitive process, we are also minded to relax eligibility criteria for fixed-bottom offshore wind projects so projects that have yet to obtain full planning consents can participate. We will consult on these changes ahead of Allocation Round 7.

We will leverage Great British Energy, and wider policy measures to support local and community-led renewable capacity, including for homes, businesses, public buildings and land, and shared spaces. Great British Energy will provide support to deliver the Local Power Plan, putting local authorities and communities at the heart of restructuring our energy economy. It will also align with NESO's publications and the government's response to identify locations for new generation projects on private land and undertake development on public land, unlocking scope for generation on government estates.

Solar panels are already an eligible measure in existing programmes like the Warm Homes Local Grant and Warm Homes Social Housing Fund, and we will provide further details on how else solar could be supported in the Warm Homes Plan after the second phase of the Spending Review. We will also assess the potential to drive the construction of solar canopies on outdoor carparks through a call for evidence next year.

We are also committed to nuclear, including the lifetimes of existing nuclear projects where possible, and the development of emerging low carbon and renewable technologies that will play an important role beyond 2030, continuing to recognise that the policy of the Scottish Government is not to support new nuclear developments in Scotland.

Electricity market reform

Reforming the electricity markets will support clean power generation and networks. Reform is vital in ensuring our market arrangements are fit for the 2030s and beyond. We must ensure that the market

works in tandem with support schemes to deliver the right investment and operational signals and that any sector-specific barriers to deployment are addressed, to enable the huge volume of deployment that will underpin Clean Power 2030.

A significant increase in short-duration flexibility of 29-35 GW[6] across battery storage, consumer led flexibility and interconnection capacity from 2023 levels will reduce the amount of more costly generation and associated network infrastructure that needs to be built, whilst maintaining security of supply. Reforming the transmission network charging (Transmission Network Use of System (TNUoS) charges) is critical in order to enable the increased deployment of future generation.

The REMA Autumn Update outlines our ambition to conclude the policy development phase of the REMA programme by around mid-2025 and confirms that the timetable for REMA decisions will align with the timetable for the next allocation round (AR7) for the Contracts for Difference (CfD) scheme in order to reduce uncertainty.

Short-duration energy storage and flexibility

As we build an energy system reliant increasingly on variable renewables, improving the flexibility of the wider electricity system is key. A Low Carbon Flexibility Roadmap will be published next year, with new actions to drive clean power flexibility by 2030. We will introduce new market reforms to provide batteries and consumer-led flexibility with appropriate and fair access to, and utilisation within, relevant markets, and we will consult on how grid-scale batteries could be referenced in future planning reforms, and on including grid-scale batteries within the Environmental Permitting Regulations.

We will consider financing options for retrofit works, including batteries, in the Warm Homes Plan in England. We will consult to remove external display requirements for device meters from the Measuring Instrument regulations, and, in Summer 2025, we will publish a consultation on consumer engagement, including on how to help coordinate and amplify accurate messaging on consumer-led flexibility. We will also consider reform on the Maximum Resale Price and will introduce new Guaranteed Standards of Performance relating to smart metering in 2025.

We will respond to recent consultations on Energy Smart Appliance interoperability, a new licensing regime for service providers for consumer-led flexibility and load controllers, and tariff data accessibility. These will be followed up with detailed consultations on draft ‘first phase’ Energy Smart Appliance legislation, establishing minimum cyber security requirements for appliances in scope and a smart mandate for heat pumps; draft consumer-led flexibility service providers and load controller regulations and licence conditions, and measures to improve time of use tariff data accessibility. We will implement Capacity Market policy proposals, including permitted augmentation of storage, adjustments to Extended Performance Testing Requirements and making 3-year Capacity Markets agreements to low carbon technologies requiring no capital expenditure.

Long-duration flexibility

We are projected to need 40-50 GW[7] of dispatchable and long-duration flexible capacity in 2030 to support our power

[6] See Table 1. This is the difference between the current capacity of batteries, interconnectors, and consumer-led flexibility, and capacities in 2030 under the DESNZ *‘Clean Power Capacity Range’*. Differences in total figures are due to rounding.
[7] The sum of with low carbon dispatchable power, unabated gas, and LDES capacities in Table 1, rounded to the nearest 5GW. Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility.

system in extended periods of low renewable output. We are determined to drive the development of low carbon long-duration flexibility, which presents a substantial opportunity. We have announced Final Investment Decision for Net Zero Teesside, the world's first at scale gas power plant with carbon capture, and we are also developing a Hydrogen to Power business model which will de-risk investment and bring forward capacity. We also need to scale up deployment of pump storage hydropower and foster further innovation in more nascent long-duration storage technologies such as liquid air energy storage. The cap and floor scheme, which could open in Q2 2025, will support investment in the sector. Unabated gas will continue to play a back-up role throughout the transition to clean power, ensuring security of supply. This means that we will retain sufficient capacity until it can be safely replaced by low carbon technologies.

Supply chains and workforce

Clean power by 2030 is a signal to investors to locate in the UK and build strong domestic supply chains for key aspects of our clean power system. Actions to support and accelerate delivery will give developers greater route-to-market certainty, but we will go further, including with the forthcoming Industrial Strategy, which will include a sector plan for clean energy industries. We will convene a new supply chains and workforce industry forum for key Clean Power 2030 sectors, including trade unions, to develop a deep understanding of system-level supply chain and workforce planning needs for Clean Power 2030 delivery and devise targeted collective actions to ensure they are met. The Clean Industry Bonus will support manufacturing in coastal and energy communities and cleaner, more sustainable supply chains, while increased transparency and predictability in future Contracts for Difference allocation rounds will support investment. The National Wealth Fund will focus at least £5.8 billion of its capital on green hydrogen, carbon capture, ports, gigafactories, and green steel, while Great British Energy will support the growth of clean power supply chains around the UK.

The clean power transition also needs a skilled workforce, with thousands of new jobs throughout low carbon sectors. Details of the Clean Energy Skills Challenge have been published alongside this Plan. The Office for Clean Energy Jobs will work with the sector, trade unions and the devolved governments to support regions transitioning from carbon-intensive industries to clean energy sectors, to ensure jobs are high quality, with fair pay, favourable terms, and good working conditions. This work includes targeted interventions to reskill and upskill workers across the economy, supporting access to training schemes, and promoting the opportunities of clean energy jobs so that a lack of skilled workers does not become a bottleneck in the achievement of our Clean Power ambition.

How we will work, as government and with everyone involved, to deliver

The Clean Power 2030 Unit will look across delivery of the key 2030 projects, working to identify blockages and ensuring that the clean power programme stays on track.

To do this we will draw together a mix of skills and experience from government and the clean power sector, underpinned by an Advisory Commission of leading figures from across industry and academia. The Unit will work closely with those involved in practical delivery, including the devolved governments, to cut through issues quickly and to build a comprehensive view of the power infrastructure currently in development.

This insight, coupled with a strong underlying data capability that will bring together data and insight from across government and the clean energy sector, will help understand what is likely to be delivered, by when, and quickly identify emerging challenges. This will help the Unit take rapid action wherever it is needed to ensure delivery.

This Action Plan is our first major step towards Clean Power by 2030. The coming months and years will see a new programme of activity emerge, relying on the work of a wide range of businesses, many parts of government at central, regional and local level across England and the Devolved governments, the third sector, communities, and individuals.

Why Clean Power by 2030?

Our whole way of life relies on our energy supply. But the world is changing, and the way we have powered our nation for decades, built around oil, gas, and coal is no longer something we can take for granted. Millions of us have experienced hardship in recent years, as the dangers of relying too much on oil and gas, in an increasingly volatile world, have become all too clear.

The solution is clean homegrown power. The answer to some of the biggest challenges we face – building an energy system that is affordable for the long term, keeping our supply secure, and cutting our emissions before it's too late – now all point in one direction: towards the clean power sources that have become the core of modern energy systems.

A clean, affordable, and secure system is a realistic prospect – and we must seize this opportunity. The National Energy System Operator has produced independent advice which indicates what infrastructure we will require to deliver Clean Power 2030.

If we get this right, this is a huge opportunity for our country. We can protect households and businesses from price shocks, we can attract substantial amounts of investment and employment,

and we can set the stage for further growth as we decarbonise our heat and transport – while also building a path towards 2050 and beyond.

We start with some sizeable advantages. As a nation we pioneered several of the renewable technologies that have become the low-cost workhorses of a modern energy system. We have an abundance of natural resources, and so the gradual decline of our oil and gas reserves can be more than offset by our substantial wind and solar energy resource.

But to get this right we need to act – and act quickly – because 6 years is a short time in building energy infrastructure. We are not alone in wanting to rebuild our energy system and are competing with other countries for investment and to secure supply chains.

Many of the new investments that will be part of our 2030 power system have already started their journey and a core focus of our work will be ensuring that an ambitious pipeline of new projects with potential to be up and running by 2030 are successfully delivered.

This plan therefore sets out practical actions across every part of the power system, where we are determined to remove the blockages that have, for too long, added cost and delay to the development process. These actions will accelerate delivery in many of the core generation areas – removing barriers, untangling blockages, and accelerating support. Some of our priorities will not come as a surprise: we have to put an end to interminable delays in the system that mean it can take over a decade to develop and build renewables projects. We also need to reform the connections queue process, where the current queue adds up to 739 GW.[8]

However, we are also acting to raise the level of ambition right across the system, as well as taking action to deliver the industrial supply chains, and the skilled workforce, that we need to build a vast amount of new infrastructure.

The energy consumer is at the very heart of Clean Power 2030, because as a government our core aim is making sure everyone has a reliable and affordable energy supply, in a way that protects our environment and quality of life. We also want everyone to have the benefit from the new power sources and technology that can keep bills down for good.

This means a real change to how we deliver as a government. We will now be working with specific projects on the ground to understand their ongoing development in detail, and we'll be ready to do what it takes to keep key investments on track. This also means we'll be working across traditional department lines, and that we'll be ready to adapt and learn as we go, developing new actions wherever we need them to support delivery.

Clean Power 2030 supports the wider missions of this government, to make working people better off by delivering economic growth for every part of our country. Clean power also contributes to improving health outcomes for the British people, including through reducing air pollution.

Clean Power 2030 will set in motion an age of electricity. A time where we have an abundance of clean, homegrown energy, backed by a host of British companies in all four corners of the country. It's about fixing the foundations of our economy so we can protect businesses and families from increased energy bills resulting from volatile global gas markets, give ourselves

[8] Including Demand. Correct as of end-October 2024. Connections data is published monthly by the Connections Delivery Board.

a secure energy supply for the long term, and create stable and well-paid new jobs and growth in our manufacturing heartlands.

This is the real story of Clean Power 2030; transforming the way this country invests in and builds its future.

	Impact of Clean Power 2030
Consumers	CP2030 will protect and empower consumers by: • Helping to shield consumers from international energy price spikes by reducing our reliance on fossil fuels. • Providing the foundation to build an energy system that can bring down bills for households and businesses for good. • Ensuring communities benefit from hosting new clean energy infrastructure. • Developing more consumer-friendly digital products and services to increase consumer understanding and control over their electricity products, such as apps to manage smart appliances. By increasing the use of digital technologies, consumers can choose to save money on their bills by using appliances when electricity is cheaper or via automated systems managing this on their behalf – for example charging their car overnight and selling excess energy back to the grid, or programming their smart electronic appliances such as dishwashers to complete their cycle within cheaper timeslots. • Increasing consumers' ability to reduce their global footprint by making green spending and lifestyle choices easier/the default. • Increasing consumers' energy independence through the rollout of rooftop solar panels alongside domestic batteries, EV charging, heat pumps, and other green technologies to cut down on the cost of bills and to flatten the peak demand curve. • Reducing our reliance on fossil fuels, which contribute to air pollution - cleaner air will benefit both human health and wildlife.
Business	CP2030 will provide stability for businesses and confidence for investors by: • Accelerating the transition to clean energy sources to create a more stable environment that helps create growth, minimises energy-price-led inflation and also helps shield businesses from energy price spikes. • Giving developers greater route-to-market certainty through a clear national plan for our power system and reforming our planning and grid connections processes, enabling developers to plan and mobilise the supply chains and workforce they need to deliver new infrastructure, unleashing £40 billion of investment per year. • Maximising domestic opportunities for clean energy supply chains, including mobilising investment into the clean power sector and through the upcoming Industrial Strategy where clean energy industries are a priority growth sector. • Stimulating local economies through investment in innovative clean energy projects and accompanying employment opportunities.
Workers	CP2030 will help workers by: • Playing a key part in supporting hundreds of thousands of jobs, as part of the wider transition to net zero • Stimulating skilled new jobs and economic opportunities across the country, including our industrial heartlands. • Boosting awareness of well-paid, high quality jobs in clean energy sectors, in collaboration with the Office for Clean Energy Jobs

Protecting energy consumers for good

The UK's dependence on fossil fuels has left us vulnerable to unstable energy prices, a vulnerability that was exposed by Putin's invasion of Ukraine and saw the electricity price cap increase by over £1,300 in a year, peaking at £2,000[9]. Government spent over £44 billion supporting energy bills between October 2022 and March 2024, the most ever provided to subsidise household bills in UK history[10]. By producing the clean energy we need at home and being more efficient in how we use it, we can boost our energy independence. This transition is the only way to protect businesses and families for good from increased energy bills resulting from volatile global gas markets.

By accelerating the switch to domestic renewable electricity sources and accelerating the application of clean electricity to the wider energy system, we will be able to reduce our reliance on fossils fuels faster. This enhances energy security, making the UK less vulnerable to global market disruptions or geopolitical tensions that affect energy prices.

[9] Office of Gas and Electricity Markets (Ofgem) (2024), '*Energy price cap (default tariff) policy*' (viewed in December 2024).
[10] National Audit Office (NAO) (2024), '*Report – Value for Money – Energy bills support: an update*' (viewed in December 2024).

Central to delivering decarbonisation in the energy system is ensuring it benefits consumers and businesses.

By building a diverse energy system, we can make the most of our abundant natural resources to protect consumers from future price shocks. However, this mission will not be delivered from Westminster alone – local communities, the clean power sector (comprising industry, academia, and investors) and local government also have a key role to play, and we will empower them to participate in and benefit from decisions on local infrastructure.

We want to ensure that consumers are supported to make choices that benefit them, which will help us deliver on our net zero ambitions.

Market reform and the rollout of flexible technologies will give consumers greater control over their energy bills. For example, consumers might see the impact of Clean Power by installing solar panels which give them greater energy independence or having smart flexible technologies, such as electric vehicles or heat pumps, which enables consumers to take advantage of cheaper tariffs at different times of day.

The government's Warm Homes Plan will provide help for people, including those from fuel poor households, to live in better insulated homes with the ability to take advantage of these new flexible home heating technologies.

Ensuring energy security

When Putin cut off most gas supplies to Europe in 2022, energy prices for families and businesses in Great Britain increased dramatically, even though Russia provided only 4% of our gas imports[11]. Our dependence on globally traded gas for heating and electricity generation was the reason: so long as our energy supply can be weaponised by others, we will remain exposed to global supply shocks and price surges.

In an era of heightened geopolitical risk, switching fossil fuelled generation for homegrown clean energy from renewables and other clean technologies offers us security that fossil fuels simply cannot provide.

We understand that this is not always a like-for-like exchange. As we aim for clean power by 2030, it is crucial we complement renewables with flexible capacity to ensure we can deliver clean power no matter the weather. Historically, unabated fossil fuels have provided this flexibility, but that leaves us exposed to the rollercoaster of fossil fuel prices. This Action Plan sets out a pathway towards deploying low carbon flexible capacity technologies like long-duration electricity storage, power carbon capture, usage and storage (CCUS), and hydrogen to power, working alongside technologies such as nuclear generation, which provide round the clock reliable power.

[11] BEIS (2022), '*Energy Trends special article – Energy imports from Russia*' (viewed in December 2024).

Our 2030 mission will grow the UK's overall generation capacity and expand our network infrastructure so that we can safely and securely meet changing demand patterns in 2030 and beyond, driven by consumers' greener choices through the net zero transition. Taking account of this generational change in the UK's energy system, we are improving electricity market arrangements to ensure secure supply in a clean system transition, as outlined in further detail in the REMA Autumn Update.

As we rapidly deploy new infrastructure, we will maintain high levels of resilience and security – including to severe weather events which are expected to increase in intensity and frequency as a result of climate change, and in managing threats to our national security, such as cyber threats, as our energy system becomes increasingly interconnected. The government has empowered the independent National Energy System Operator with the responsibility to carry out resilience functions across the electricity and gas systems and we will continue to work with industry, regulators and other stakeholders to improve and maintain the resilience of old, new, and future energy infrastructure.

Our energy system must meet demand while protecting families and businesses from global supply shocks and volatile prices. That is what energy security means to this government, and that is what this Clean Power Action Plan delivers.

Our pathway to 2030

Defining the Clean Power target

Clean Power means that by 2030, Great Britain will generate enough clean power to meet our total annual electricity demand, backed up by unabated gas supply to be used only when essential.

In line with independent advice from the National Energy System Operator (NESO), our clean power target means transitioning to an electricity system with the following characteristics in a typical weather year:

- Clean sources produce at least as much power as Great Britain *consumes* in total, and;
- Clean sources produce at least 95%[12] of Great Britain's *generation*.

We expect delivering a clean power system with these characteristics will make Great Britain a net exporter of electricity and will reduce the carbon intensity of electricity generation from 171gCO_2e/kWh in 2023[13] to well below 50gCO_2e/kWh in 2030, well within the Climate Change Committee's Carbon Budget 6 advice[14]. The figures below visualise this target and set out the current generation mix.

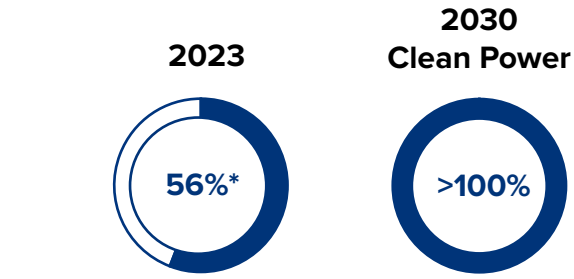
To achieve the mission, we will aim to deliver above this ambition where the system and consumer benefits align so that potential challenges in some areas of clean power delivery can be compensated by deployment elsewhere.

Delivering this target aligns with our ambitious 2030 Nationally Determined Contribution[15] and will help us meet Carbon Budget 6.

[12] See the technical annex for more detail on the definition of 2030 Clean Power.
[13] DESNZ (2024), '*DUKES*' (viewed in December 2024).
[14] Climate Change Committee (CCC) (2020), '*The Sixth Carbon Budget*' (viewed in December 2024).
[15] BEIS (2022), '*UK's Nationally Determined Contribution*' (viewed in December 2024).

Metric 1a:

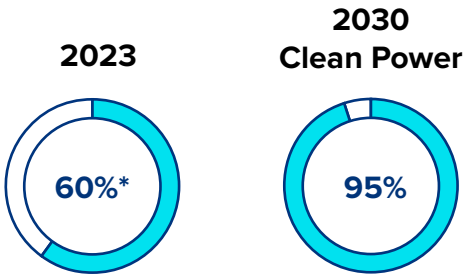
Clean sources produce at least as much power as Great Britain consumes in total.



▼ 44 points below target

Metric 1b:

Clean sources produce at least 95% of Great Britain's generation.



▼ 35 points below target

* This is the closest available official statistic to the clean power 2030 definition at the point of publication. This statistic is for the UK rather than Great Britain and includes gas CHP in the denominator and EfW in both the numerator (the proportion assumed to be from bioenergy) and denominator. Official statistics will be reviewed at a future date to allow us to accurately track delivery.

Metric 2:

Emissions intensity of well below 50gCO2e/kWh by 2030

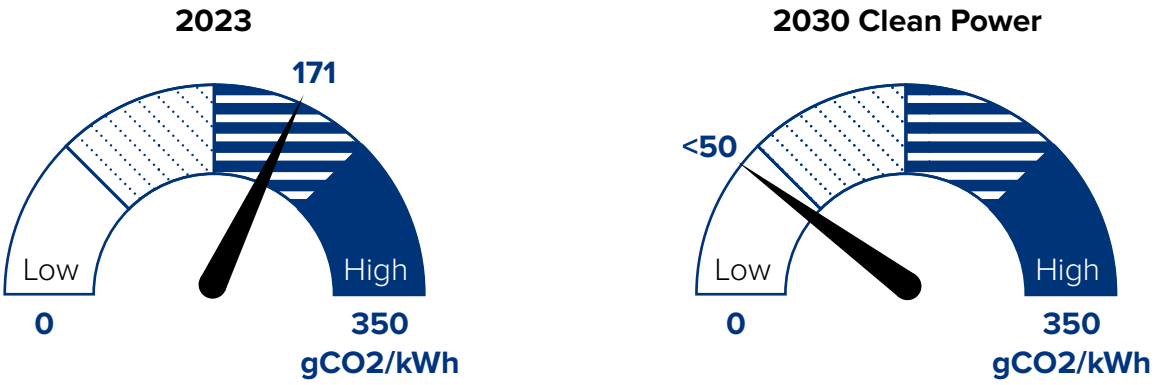
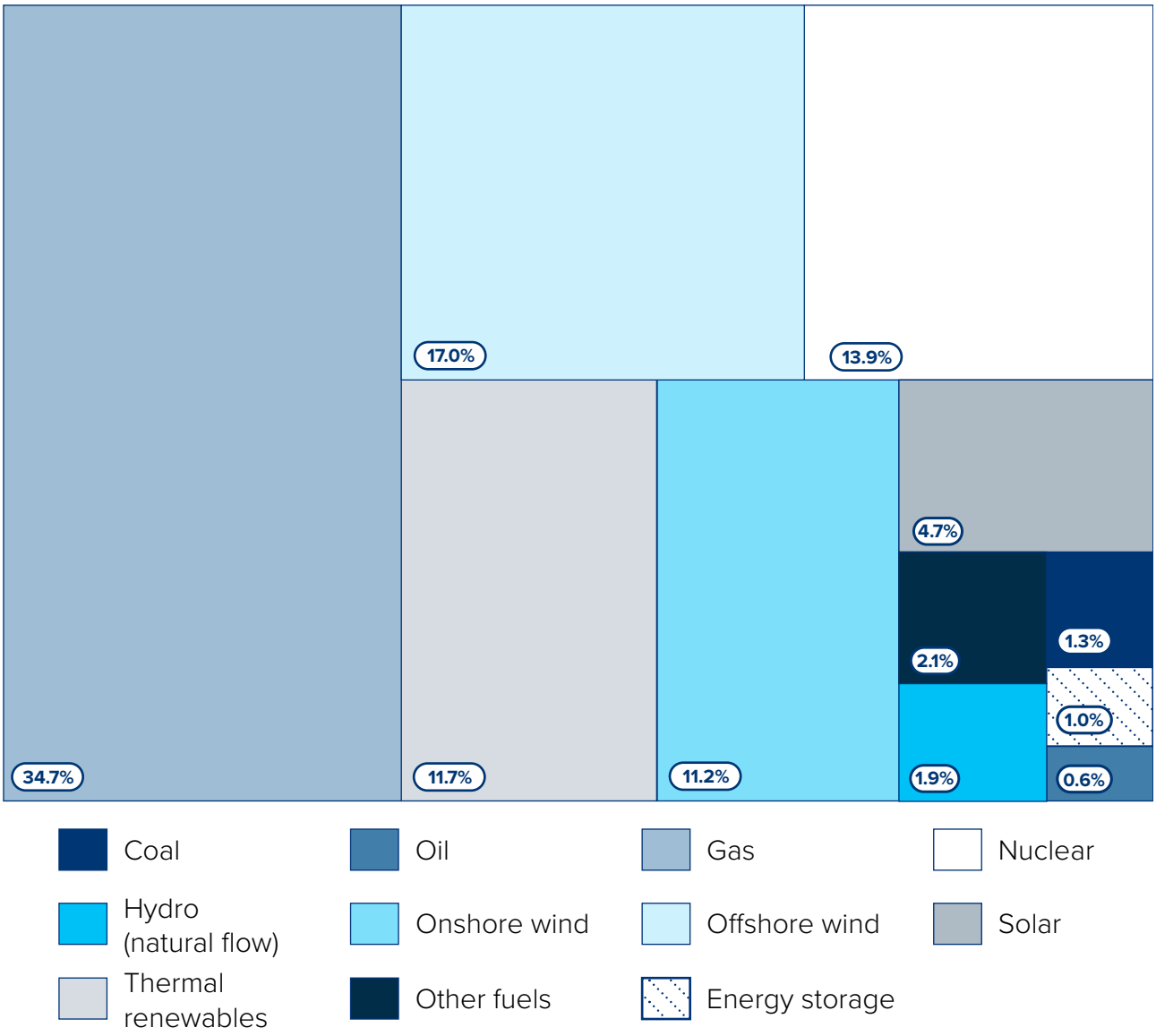


Figure 1: Shares of electricity generated (GWh), 2023



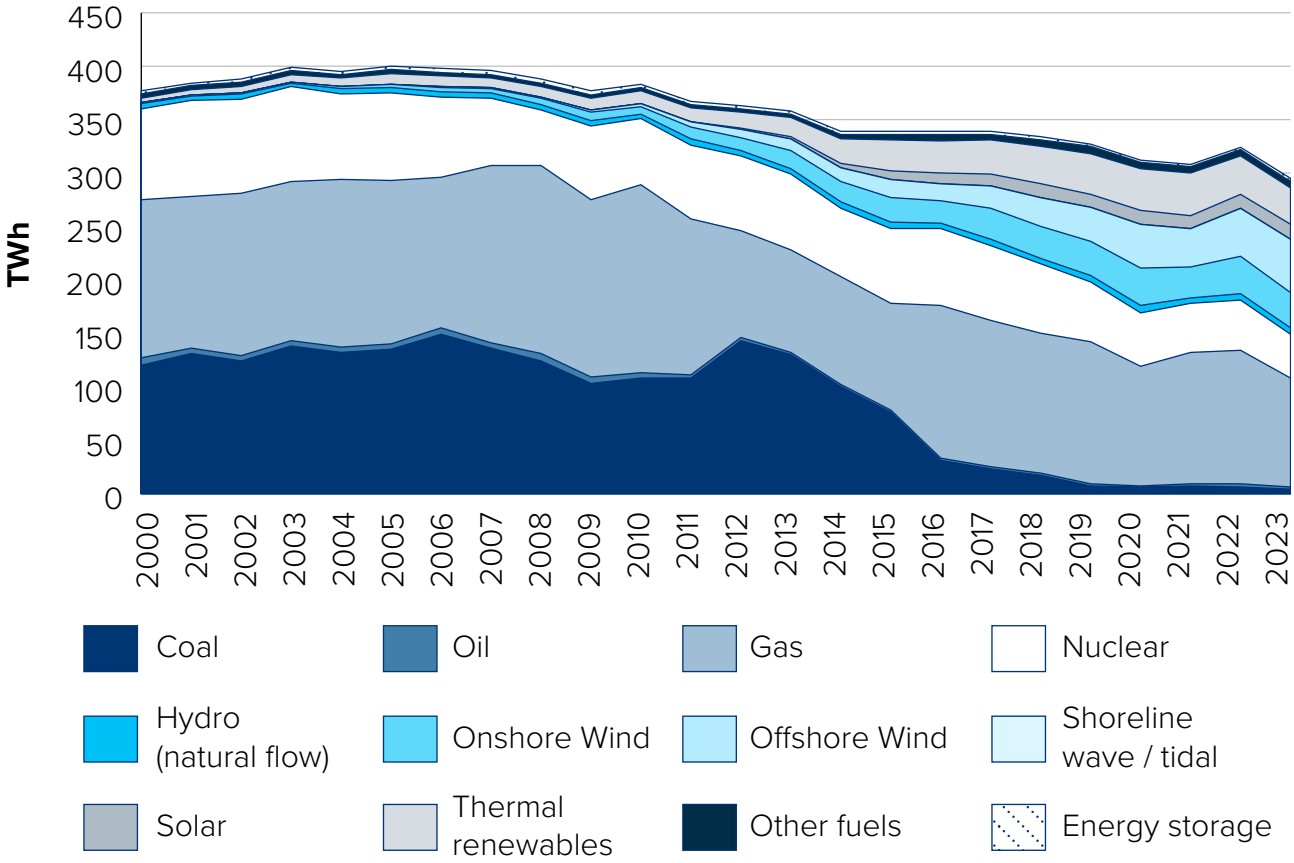
Source: DESNZ (2024), 'DUKES'

Note: The shares of electricity generated are on a UK basis.

What a Clean Power system will look like

Whilst the expansion of renewables in the power system has reduced the share of fossil fuel generation to date – see figure 2 – all routes to a Clean Power system will require mass deployment of offshore wind, onshore wind, and solar[16]. Securing affordable,[17] homegrown renewables means we will be able to run our power system for increasing periods on low carbon generation, with renewables providing the vast majority of generation, and nuclear continuing to deliver a backbone of vital firm low carbon power.

Figure 2: Electricity generation mix (TWh), 2000-2023



Source: DESNZ (2024), 'DUKES'

Note: The generation mix is on a UK basis.

[16] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

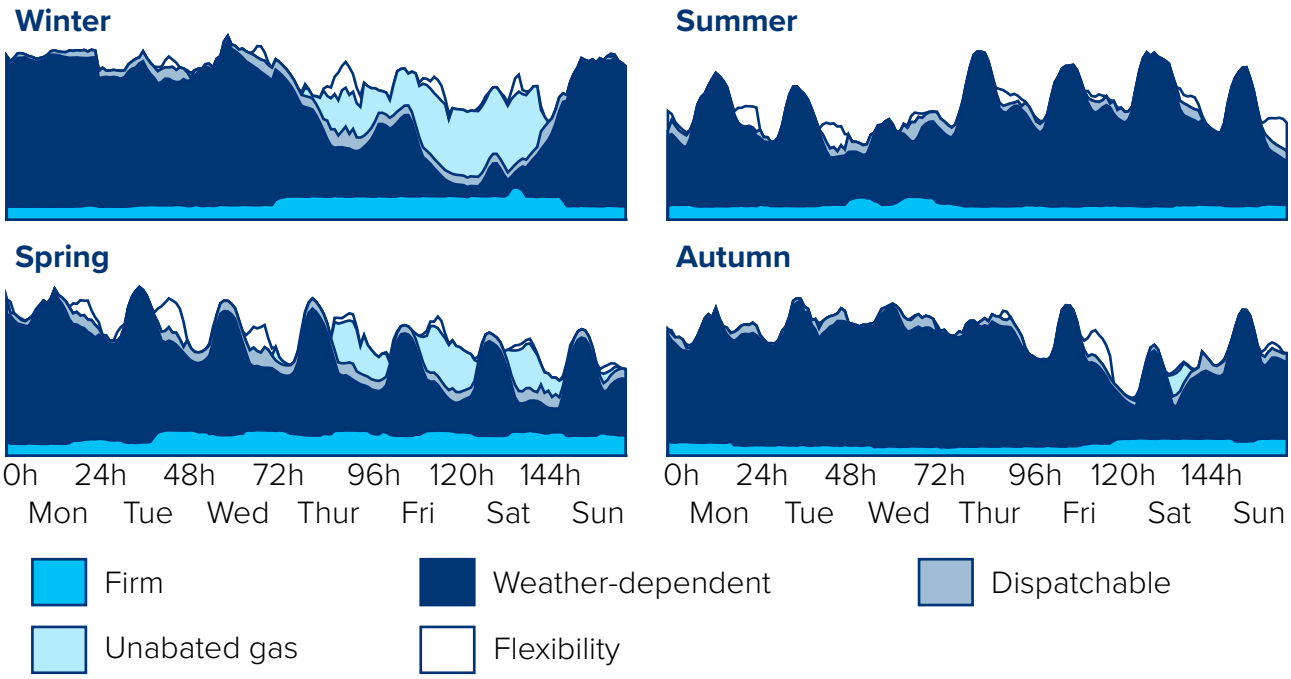
[17] BEIS (2023), *'Electricity Generation Costs 2023'* (viewed in December 2024). The published evidence demonstrates that intermittent renewable electricity sources like offshore wind, onshore wind and solar PV are the cheapest sources of new electricity generation to build and operate.

However, there will be periods over the year, mostly during winter and autumn, where weather conditions and higher electricity demand mean our fleet of renewables and firm generation alone are not able to meet electricity demand. Many of these periods will only be for a few hours. These short periods offer opportunities for flexible, low carbon solutions to meet our needs.

Where renewables alone are unable to meet demand for longer periods, we will enable a suite of technologies to be deployed and maintained to provide longer-duration power capacity. This could be a combination of pumped hydro storage, first-of-a-kind low carbon dispatchable technologies like gas CCUS or hydrogen to power (H2P), or innovative technologies like liquid air energy storage (LAES).

Whilst deploying of longer-duration technologies will help reduce unabated gas generation, we recognise the importance of gas capacity to maintain security of supply. We will see a fundamental shift in the role and frequency of unabated gas generation, moving from generating almost every day of the year, to an important backup to be used only when essential, with generation decreasing as we move towards 2030 – see figures 3-5. This is consistent with NESO's view[18] and aligns with the Climate Change Committee's advice[19] that maintaining gas capacity to use as backup is consistent with a fully decarbonised power system.

Figure 3: Modelled 7-day hourly generation profile in 2030 in the NESO 'Further Flex and Renewables' Scenario (MW)

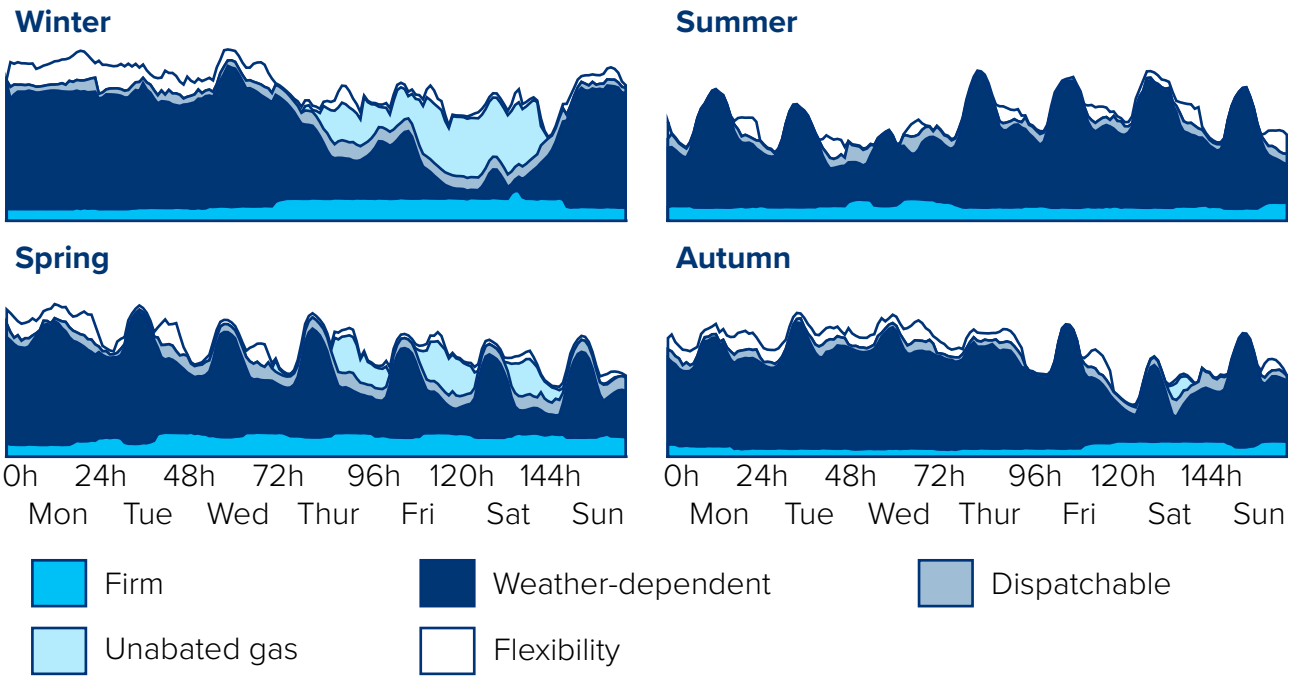


Notes: Firm includes nuclear, hydro, CHP and waste. **Weather-dependent** includes onshore wind, offshore wind and solar. **Dispatchable** includes biomass, pumped hydro, gas with CCS and hydrogen to power. **Flexibility** includes batteries and residential flexibility. Chart only shows when flexibility is discharging, not charging.

Source: NESO (2024), 'Clean Power 2030'

[18] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).
[19] CCC (2023), *'Delivering a reliable decarbonised power system'* (viewed in December 2024).

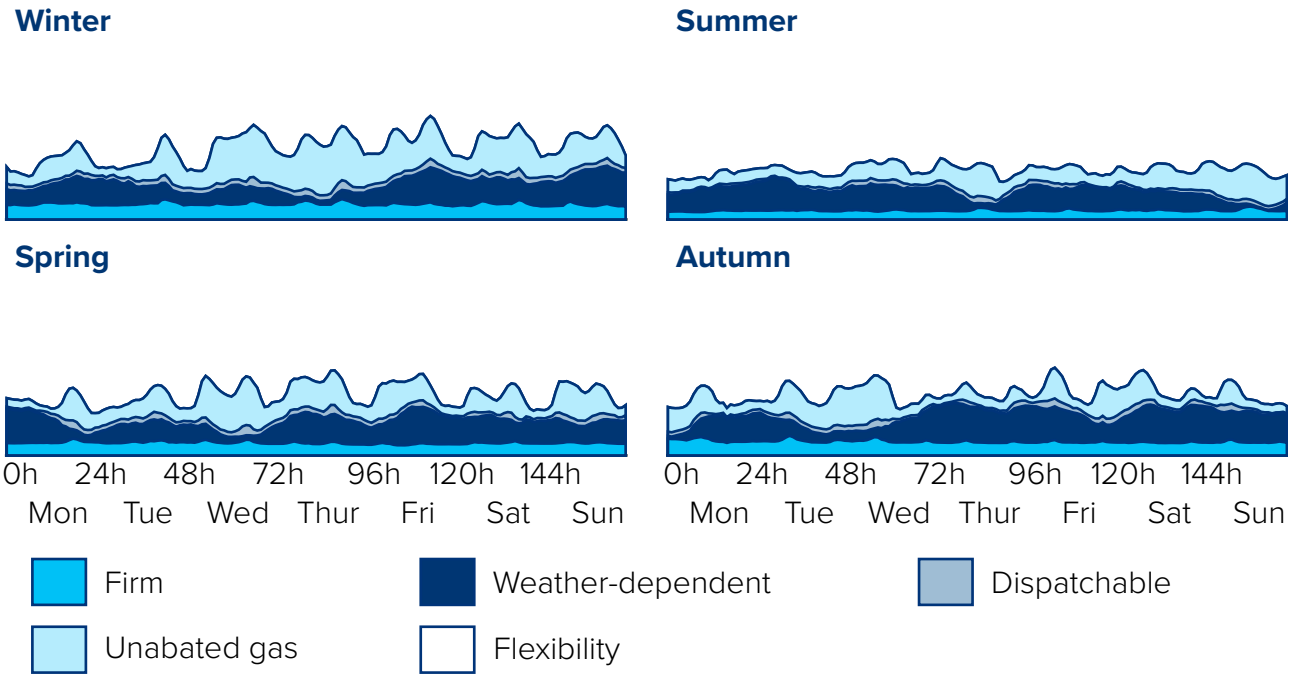
Figure 4: Modelled 7-day hourly generation profile in 2030 in the NESO 'New Dispatch' Scenario (MW)



Notes: Firm includes nuclear, hydro, CHP and waste. **Weather-dependent** includes onshore wind, offshore wind and solar. **Dispatchable** includes biomass, pumped hydro, gas with CCS and hydrogen to power. **Flexibility** includes batteries and residential flexibility. Chart only shows when flexibility is discharging, not charging.

Source: NESO (2024), 'Clean Power 2030'

Figure 5: Historical 7-day hourly generation profile in 2023 (MW)



Notes: Firm includes coal, nuclear, hydro, CHP and waste. **Weather-dependent** includes wind. **Dispatchable** includes biomass, pumped hydro. **Flexibility** is not identified in the historical data. Wind and solar generation are underestimated because they exclude embedded generation and wind farms which do not have operational meters.

Source: NESO (2024), 'Clean Power 2030'

Therefore, the clean power scenarios in Table 1 include technologies that play a range of key roles – variable generation that is renewable, firm generation to meet baseload demand, and dispatchable generation and flexibility for periods of low wind or sun, or higher electricity demand. For each technology, Table 1 shows current installed capacity, alongside, NESO's 'Further Flex and Renewables' scenario, and NESO's 'New Dispatch' scenario.

Using these scenarios, alongside an assessment of maximum feasible deployment based on current knowledge of the project pipeline, we have developed a DESNZ 'Clean Power Capacity Range', which is a range of possible installed capacities for each technology in 2030 – see Table 1. This reflects that there is no singular path to achieving clean power, but instead, that there are a range of scenarios that could get us there. Over time, there will be more clarity on which scenarios are most likely, depending on the outcomes of negotiations and other contract-award processes, and through monitoring delivery of assets with long lead-times, such as the transmission network, offshore wind, and nuclear. This new information will allow the pathway to 2030 to be refined over time, enabled where needed through prioritising connections offers, helping to determine the precise capacity mix required to deliver Clean Power 2030.

Therefore, whilst the 'Clean Power Capacity Range' provides a foundation to guide rapid policy development and focus delivery, the scenarios developed now cannot be exhaustive or definitive, and it is only right that some optionality is retained. In the first instance, this means:

- Government accepts the NESO advice on the infrastructure required for 2030 – decisions are required now to ensure the grid needed for the system in 2030 can be put in place.
- Government sets ranges for deployment of each technology by 2030 and will maintain some optionality until more clarity on which scenario is most likely is available. The 'Clean Power Capacity Range' is provided in Table 1.

There may be technologies not included in these scenarios that could have a role in providing clean power to the system and we will continue to refine our view on these. For example, biomethane is a domestically-produced low carbon gas currently primarily used to decarbonise heating. Biomethane can be used flexibly across many different end-uses – heat, power, industry, transport, agriculture, and hydrogen production – and it may also be able to contribute to low-carbon dispatchable power generation.

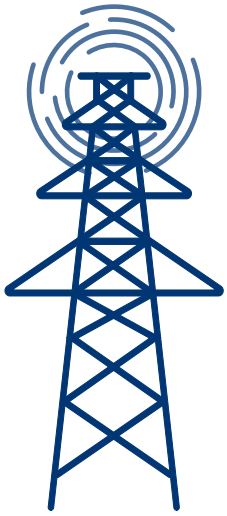


Table 1: Installed capacity in 2030 in the NESO 'Further Flex and Renewables' and 'New Dispatch' scenarios, and the DESNZ 'Clean Power Capacity Range', compared to current installed capacity (GW)

Technology	Current installed capacity[20]	NESO 'Further Flex and Renewables' Scenario	NESO 'New Dispatch' Scenario	DESNZ 'Clean Power Capacity Range'[21]
Variable				
Offshore wind	14.8	51	43	43 – 50
Onshore wind	14.2	27	27	27 – 29
Solar	16.6	47	47	45 – 47
Firm				
Nuclear	5.9	4	4	3 – 4
Dispatchable				
Low Carbon Dispatchable Power[22]	4.3	4	7	2[23] – 7
Unabated gas	35.6	35	35	35[24]
Flexible				
LDES	2.9	8	5	4 – 6
Batteries	4.5	27	23	23 – 27
Interconnectors	9.8	12	12	12 – 14
Consumer-led flexibility[25]	2.5	12	10	10 – 12

[20] Latest publicly available data for Great Britain at the point of publication. The data source for renewables is DESNZ (2024), *'Energy Trends 6.1'*, Q2 2024 data. The data source for nuclear, unabated gas, and LDES is DESNZ (2024), *'DUKES 5.12'*, 2023 data. The data source for consumer-led flexibility is NESO (2024), *'Clean Power 2030 Table 2'*, 2023 data. The data source for batteries is Modo Energy (2024), *'Indices & Benchmarks'*, Q4 2024 data. The data source for interconnectors is Ofgem (2024), *'Interconnectors'*, 2024 data. Low carbon dispatchable power includes biomass, power BECCS, gas CCUS and hydrogen to power. The data source for biomass/ power BECCS is NESO (2024), *'Clean Power 2030 Table 2'*, 2023 data. Gas CCUS & hydrogen are new technologies so there is no installed capacity at the point of publication.

[21] In addition to the two NESO scenarios, these ranges have been informed by internal modelling and an assessment of maximum feasible deployment based on current knowledge of the project pipeline. Therefore, the range differs from the range of the two NESO scenarios in some instances. However, for solar, there is scope to exceed the 47GW upper limit, subject to system need, noting for example the potential of rooftop solar to boost deployment – see Connections Annex for further details.

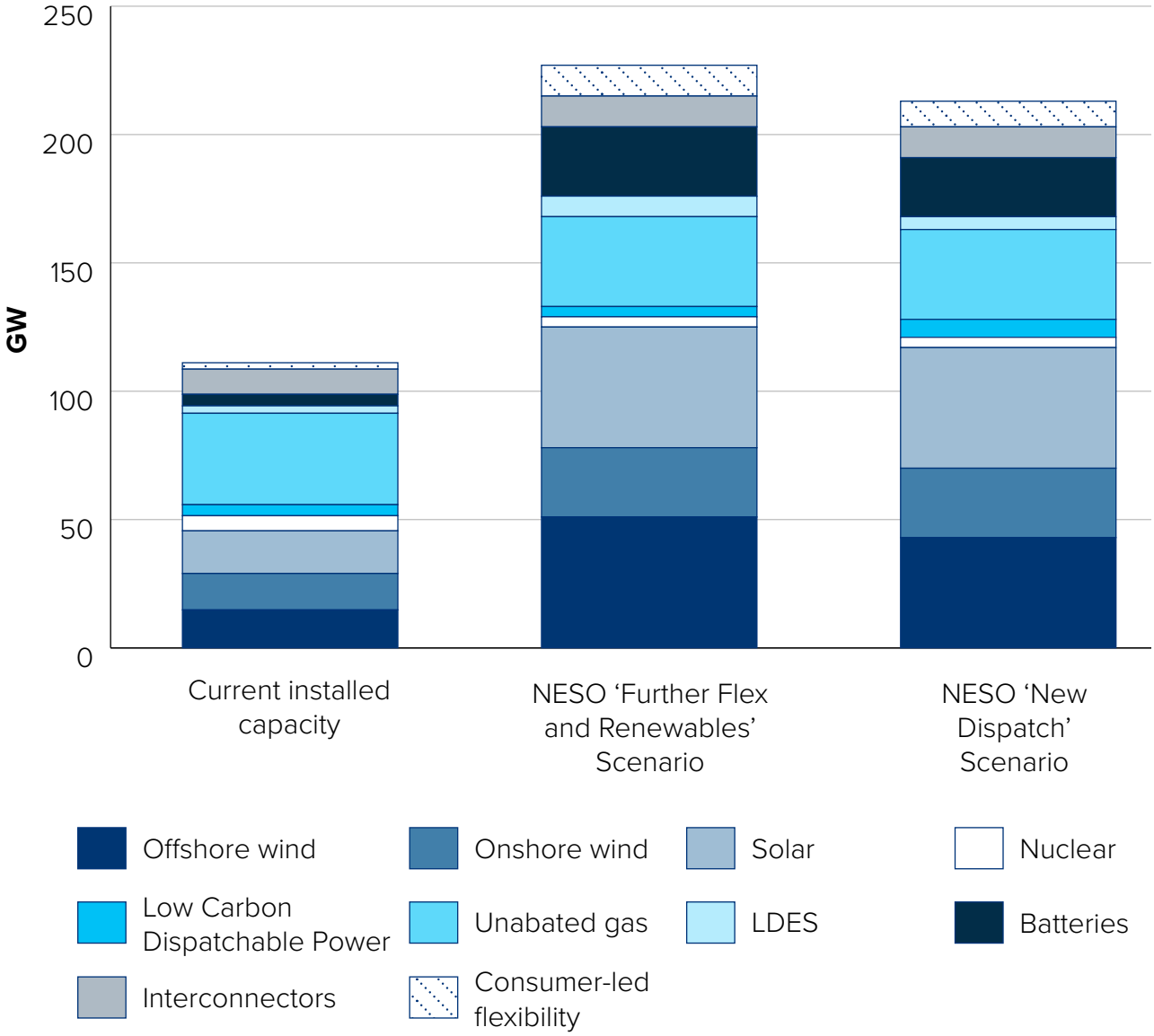
[22] Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility. This category includes biomass, power BECCS, gas CCUS and hydrogen.

[23] The low end of the range represents the minimum capacity we expect to have in 2030. There is uncertainty on the amount of biomass capacity that will be on the system in 2030 with some existing support arrangements ending from 2027 onwards. HMG is considering the position on potential future support arrangements, but no decisions have yet been taken.

[24] While delivering its Clean Power ambition for 2030, the government's aim is to ensure there will be sufficient flexible capacity on the system to meet security of supply. This includes retaining existing unabated gas capacity.

[25] Excluding storage heaters.

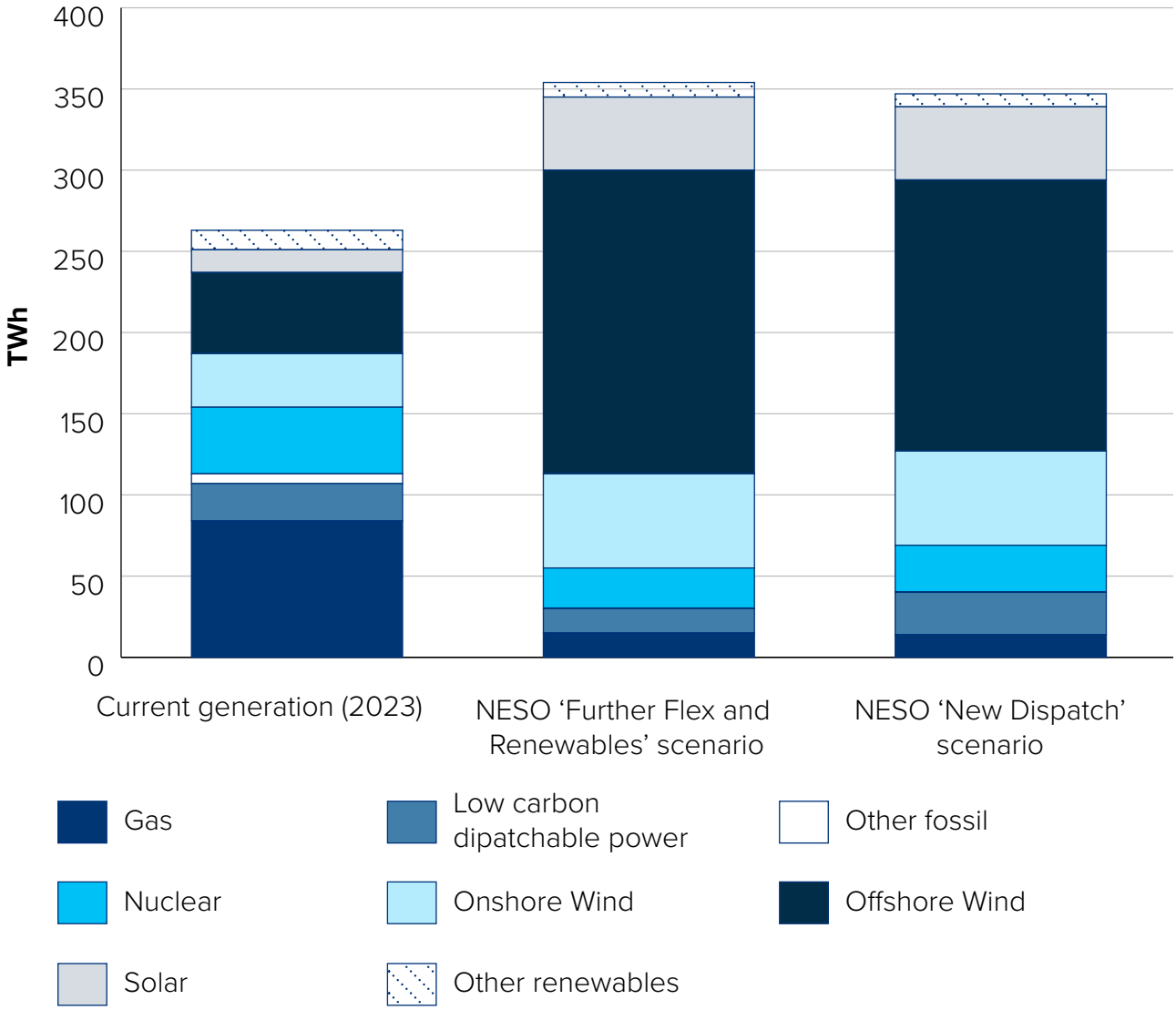
Figure 6: Installed capacity in 2030 in the NESO 'Further Flex and Renewables' and 'New Dispatch' scenarios, compared to current installed capacity (GW)



Note: Numbers for this visual can be found in Table 1

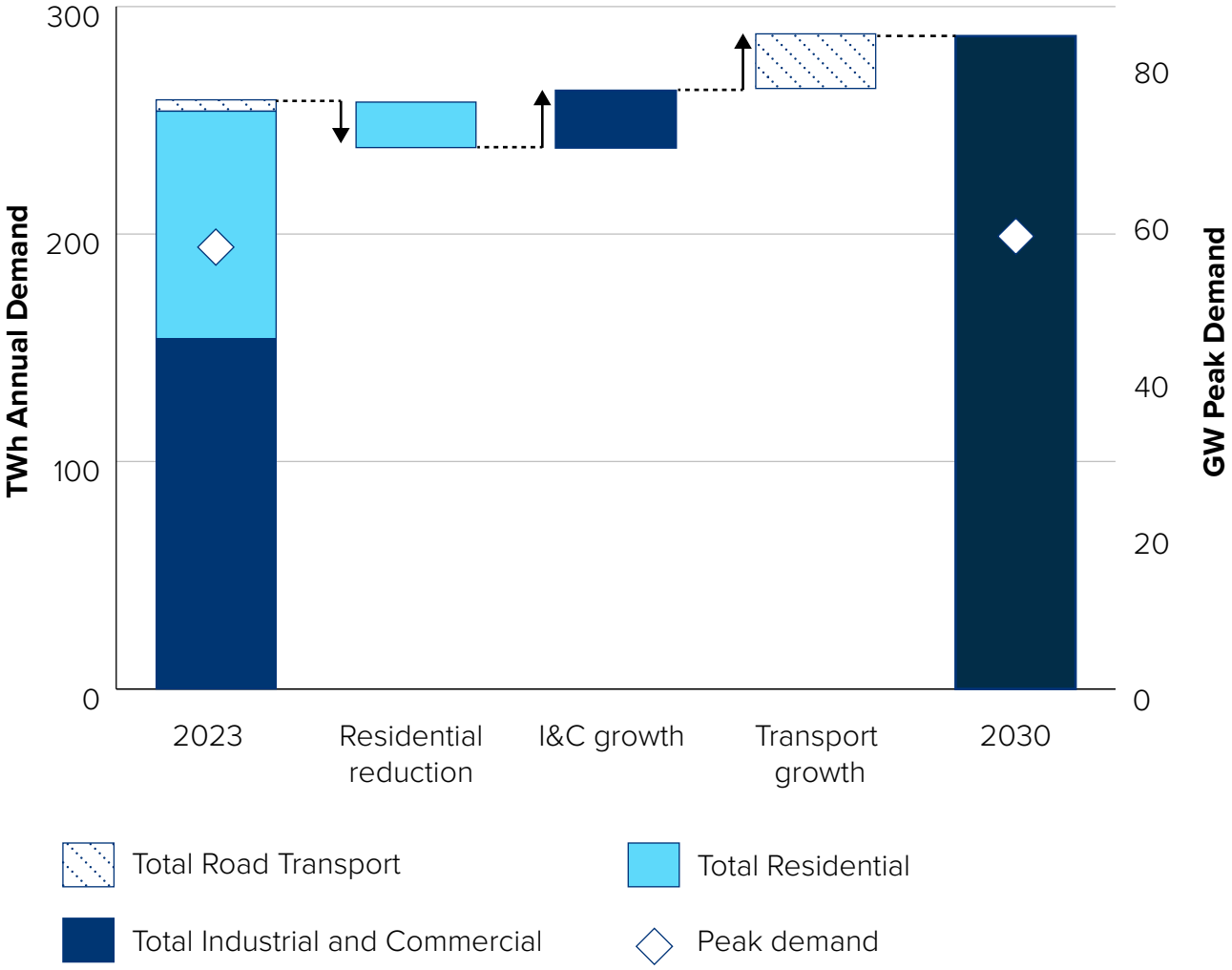
Source: Table 1 and NESO (2024), 'Clean Power 2030'

Figure 7: Generation in 2030 in the NESO 'Further Flex and Renewables' and 'New Dispatch' scenarios, compared to current generation (TWh)



Source: NESO (2024), 'Clean Power 2030'

Figure 8: Changes in consumer electricity demand (TWh annual demand, GW peak demand), 2023- 2030



Note: Peak demand is Average Cold Spell (ACS) peak demand. Peak demand is after smart charging and heat flexibility that occur daily, but does not include V2G and DSR that are less frequently used in the modelling.

Source: NESO (2024), 'Clean Power 2030'

Delivering Clean Power 2030

Delivering capacity that aligns with the 'Clean Power Capacity Range' in Table 1 requires deployment at a very significant scale and pace, which can only be delivered by taking rapid action to unblock delivery challenges. For most technologies, meeting the 'Clean Power Capacity Range' is achievable through delivering and accelerating projects already in the pipeline. Still, these technologies require significant policy action to unblock barriers to ensure timely delivery.

Delivering new capacity for 2030 could be more challenging for some technologies with longer lead-times. Clean Power 2030 capacities are most stretching for hydrogen to power and power bioenergy with carbon capture and storage (BECCS), due to limited availability of transport and storage infrastructure for hydrogen and CO_2 respectively. The amount of overall capacity required also depends heavily on peak demand, which is driven by consumer uptake of technologies such as electric vehicles and heat pumps, usage patterns, and levels of consumer-led flexibility.

To increase our chances of delivery, the 'Clean Power Capacity Range' provides a foundation to prioritise the most critical infrastructure to meet Clean Power 2030, which we know will be key to supporting further progress into the 2030s:

- **Connections:** Fundamental reform of the connections process is urgently needed to operationalise Clean Power 2030 and ensure the electricity system meets longer-term strategic needs. Our capacity range provides a framework for NESO to work with Transmission Owners and Distribution Network Operators to prioritise connection offers for strategically aligned projects that can demonstrate they have the means to deliver. To enable NESO to deliver efficient reform, we have set out regional breakdowns of our capacity range for onshore wind, solar, and batteries – providing clarity to developers, investors and network operators on what to connect, where. To continue progressing infrastructure required beyond 2030, our Connections Annex also sets out technology capacity ranges that NESO proposes to use as an indication of what is required on the system by 2035, to guide new connection offers until the Strategic Spatial Energy Plan is published in 2026. This will provide a 10-year horizon for connection agreements. These ranges are mostly derived from NESO's net zero-aligned Future Energy Scenarios (FES), with a bespoke approach[26] proposed for onshore wind and unabated gas. See the 'Networks and Connections' section for more detail.
- **Strategic Spatial Energy Plan:** Our 2030 capacity range is a key input to the development of this Plan, forming its baseline. The SSEP will build from the 2030 capacity range to offer a longer-term spatial plan for the energy system beyond 2030. This will help to ensure strategic coherence between short-term action to deliver 2030 Clean Power and longer-term spatial planning, to enable long-term decarbonisation and energy security.
- **Planning:** Accelerating clean infrastructure projects through the planning system is critical to achieving our goal and unleashing investment to support the Prime Minister's Growth Mission. Our capacity range will ensure that planners and statutory consultees at the national and local level have a clear sense of which projects to prioritise for consideration and, where appropriate, fast-track through the process to enable decisions on consent to be taken sooner[27]. See the 'Planning and consenting for new energy infrastructure' section for more detail.
- **Visibility to industry and investors:** As a challenging goal, delivery of Clean Power 2030 will only be possible if there is a clear understanding across the sector of what needs to be achieved, and if we offer to investors a clear prospectus of the opportunities.

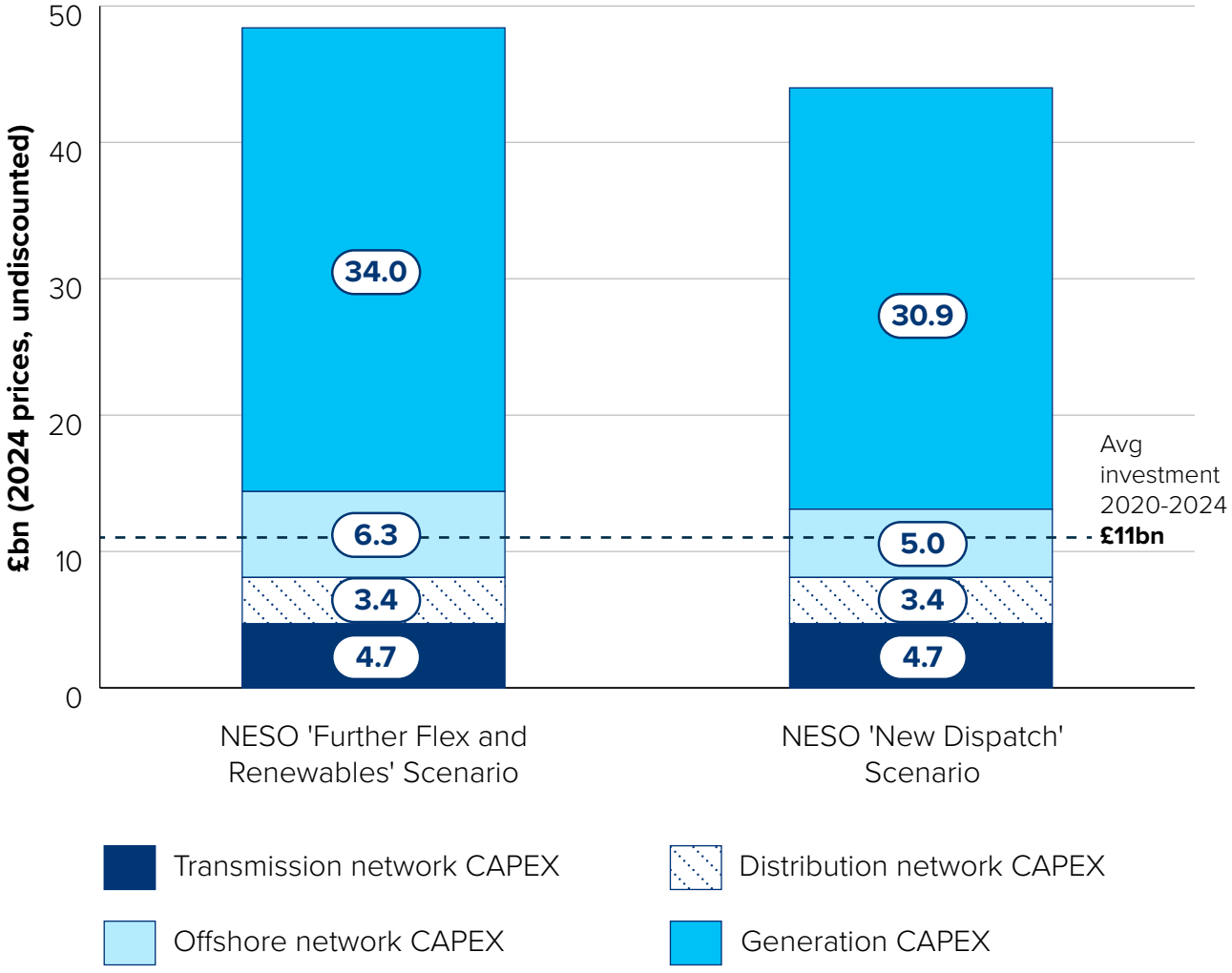
[26] We are proposing a bespoke approach for onshore wind because the FES projections are based on assumed ONW growth rates in England and Wales which pre-date the decision taken by Secretary of State in July to remove the de-facto onshore wind ban. As a result, we have increased the capacity range for onshore wind to 2035 – see Connections Annex for further detail.
[27] Final decisions on planning consent remain subject to meeting necessary planning and other regulatory approvals.

Cost and consumer impacts of Clean Power 2030

The level of deployment set out in Table 1 will require substantial investment across the country, an estimated **£40 billion**[28] on average per year between 2025-2030, much of which will be private investment.

This broadly aligns with NESO's investment estimate – see figure 9. In addition, by transforming the way we generate electricity, we will build a power system that is not just cleaner, but importantly less reliant on fossil fuels, thereby reducing our exposure to volatile gas prices.

Figure 9: Average annual investment in the NESO 'Further Flex and Renewables' and 'New Dispatch' scenarios, 2025-2030, £ billions, 2024 prices, undiscounted



Source: NESO (2024), 'Clean Power 2030'

[28] Undiscounted, 2024 prices. This includes £30bn investment in generation assets, and £10bn investment in transmission network assets. See the technical annex for more detail on how this was calculated.

In their advice, NESO set out their analysis of potential impacts of delivering Clean Power on electricity costs in 2030[29]. This indicated it could be delivered with similar costs to today, with scope for lower electricity costs and bills by 2030 as wider changes are taken into account.

This plan proceeds on the basis of the NESO analysis. The precise impact we will see on bills in coming years will depend on a range of factors, including the pathway chosen and other policy choices made going forward as well as the impacts of exogenous factors such as gas prices. As set out above, there are multiple capacity mixes that can achieve Clean Power in 2030. The government will scrutinise every policy choice for the impact it can have in reducing bills facing consumers, as well as value for money and affordability.

The new, more flexible consumer-led energy system will also offer many opportunities to lower the bills customers face. We already see individuals with solar panels and EVs taking advantage of these technologies. The government is determined to ensure it is not just those who are the best informed or better off who have access to these ways to save money. That is why rolling out half-hourly settlement, for example, is so important so that consumers have lower tariffs on offer for consumption at different times of day.

Importantly, Clean Power will protect electricity consumers from volatile gas prices. As the electricity system decarbonises, unabated gas generation is used less often. As a result, there will be an increase in the proportion of generation being paid a contracted price rather than the potentially volatile wholesale price, while the wholesale electricity price itself will also be increasingly decoupled from gas prices. As we rollout renewables, we will see a significant reduction in wholesale prices, the foundation for building an energy system that can bring bills down for good.

During the recent energy crisis, following the invasion of Ukraine, we saw the electricity price cap increase by over £1,300 in a year, peaking at £2,000. To protect businesses and consumers, government put in place energy support schemes at an estimated cost of £44 billion[30]. If a clean power system had been in place at the peak of the gas price crisis, it could have saved significant sums for households, businesses and taxpayers. This is the scale of the prize on offer in terms of stability and energy security.

The role of a clean power system in reaching net zero by 2050

Meeting the Clean Power 2030 goal is key to accelerating to net zero, not only in eliminating emissions that currently come from electricity generation but also via the application of clean power in the buildings, transport and industry sectors. A range of technologies, including electric vehicles and heat pumps, can help us switch away from the use of fossil fuels in these sectors, often improving the efficiency of the energy system in the process.

The shift to a clean power system by 2030 forms the backbone of the transition to net zero, as we move to an economy much more reliant on electricity. By 2050, annual electricity demand is likely to at least double as a result of electrification.[31] Over the period to 2030, most of the emissions reduction from clean power will come directly through displacing fossil fuel electricity generation. By contrast, in the period from 2030 to 2050, the further emissions reductions from

[29] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).
[30] NAO (2024), *'Report – Value for money: Energy bills support: an update'* (viewed in December 2024).
[31] BEIS (2022), *'Electricity networks strategic framework, Appendix 1 – Electricity Networks Modelling'* (viewed in December 2024).

clean power will come indirectly, through its application to displace fossil fuel use in other sectors, for example in boilers and vehicles.

The Climate Change Committee estimate in the Sixth Carbon Budget report that a clean power system will nearly eliminate the emissions relating to electricity generation by 2050 (currently 12% of total UK greenhouse gas emissions)[32]. In addition, a clean power system will enable transport, buildings and industry sectors to switch from fossil fuels to electricity and contribute 47% of the further emissions reductions required by 2050.[33]

However, although electrification provides the most potential for reaching net zero, it is not the solution for every use of energy across the economy, and will need to be supplemented by targeted deployment of CCUS and hydrogen, alongside action outside the energy system. Delivering Clean Power 2030 is the first part of a longer journey and the challenges for the clean power system will change over time, reflecting the greater long-term emphasis on electrification and the opportunity and necessity to deploy technologies with long lead-times:

- **At least a doubling of demand:** Electrification and other needs for clean power as part of net zero are likely to result in at least a doubling of electricity consumption compared to today, with even larger amounts required if there are significant roles for electricity-intensive decarbonisation routes such as green hydrogen and e-fuels for aviation and maritime. This will require strong growth in power generation from a diverse range of clean sources on a sustained basis through the 2030s and 2040s. There is an essential role for innovation on the path to 2030, to ensure the right technologies are supported to progress through technology readiness levels in the coming years, to enable mass deployment in the decades to come.
- **Nuclear:** Nuclear will play an important role in our future energy system, providing low-carbon, baseload power to the grid. Government will continue to seek to streamline regulatory processes, and foster innovation in nuclear technology, to ensure that nuclear continues to play an important role in the net zero transition after 2030. The budget set out that final decisions on Sizewell C and the Great British Nuclear-led Small Modular Reactor programme will be taken at the Spending Review.
- **An ever-smarter system:** As the extent of electrification of the wider energy system grows, so will the opportunity for a huge amount of short-duration consumer-led flexibility through flexible use of electric heating and smart charging of vehicles – promising wider access to smart tariffs for consumers aiming at lowering their bills, and lower system costs for the nation.
- **More seasonal and spikier demand:** While the within-day picture for electricity demand may be quite smooth in the longer term, electrification of space heating for buildings will lead to demand for electricity that is considerably more seasonal than today, and more changeable due to the requirements for heat on particularly cold days. This suggests a particularly important role for offshore wind in matching demand, as it tends to generate more strongly in the winter than other times of year, as well as low carbon dispatchable power to provide a very long-duration storage solution, including meeting demand during periods that are cold but less windy.

[32] DESNZ (2024), *'UK territorial greenhouse gas emissions national statistics'* (viewed in December 2024).
[33] CCC (2020), The Sixth Carbon Budget - The UK's path to Net Zero, Figure 2.6 (viewed in December 2024).

- **Reforming our market arrangements:** Our current electricity markets were largely designed for the fossil fuel-based power system of the past. The Review of Electricity Market Arrangements (REMA) Programme is considering the reforms needed to ensure that our market arrangements remain fit for the renewables-dominated power system of the future.

- **Further need to strengthen networks:** Higher, and spikier demand for electricity due to electrification will inevitably require strengthening of electricity networks, particularly at the distribution level. The timing and extent of this will, to some extent, depend on the precise mix of heat decarbonisation solutions deployed.

These are all challenges that we need to plan for now in order that the 2030 Clean Power system is fit for its pivotal role beyond 2030 in reaching net zero. Our actions sit alongside a wider framework being developed to lay the foundation for the longer-term plans for the GB energy system: the Strategic Spatial Energy Plan (SSEP), Centralised Strategic Network Plan (CSNP), and Regional Energy Strategic Plans (RESPs).

Integrating clean power and the natural environment

The world is facing twin climate and nature crises which threaten our global health, wealth and security. These are inextricably linked. The government is committed to accelerating to net zero, to delivering clean power by 2030, and also to restoring nature – for example through its commitment to delivering the Environment Act targets in England and honouring our international commitments under the UNCBD. This will mean halting the decline in species abundance by 2030, and effectively protecting our Marine Protected Areas as part of the global 30 by 30 commitment.

The UK is one of the most nature depleted countries in the world, so it is not enough for us to "protect" or "conserve" the nature we still have left. This is why this Government has committed to restoring nature through such targets, and our related international commitments.

Climate change is itself one of the greatest threats to nature in the years ahead, which is why one of the most important things we can do to protect nature is deliver clean power by 2030 - tackling the UK's dependence on fossil fuels and driving international climate action. Equally, nature is a key ally in helping us tackle the climate crisis, both through mitigation and adaptation.

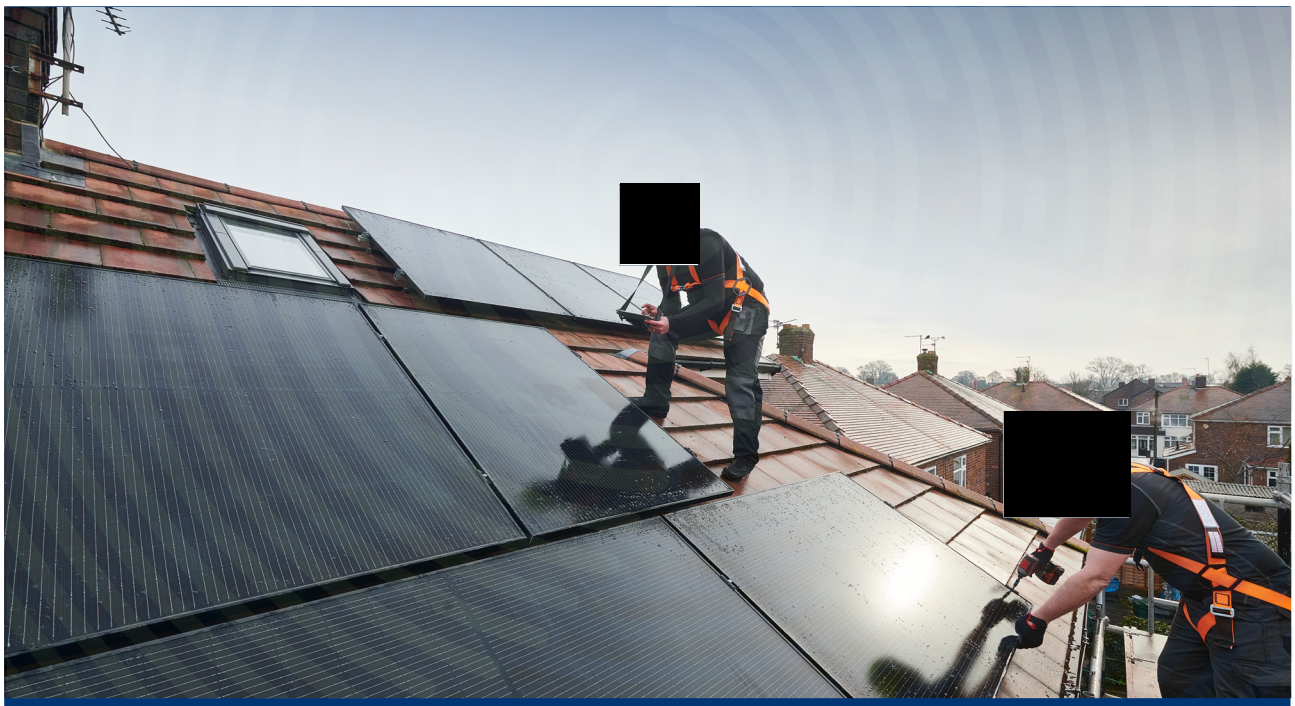
We should therefore ensure delivery of our climate and nature targets wherever possible, in an integrated and joined up way. This means ensuring habitats like peatlands store rather than emit greenhouse gas emissions; or restoring salt marshes and sea grasses so that they are sequestering carbon as well as protecting

our coastal communities from rising sea levels and extreme weather. This means that new energy infrastructure should be built in a way that protects the natural environment by following a “mitigation hierarchy” to do what is possible to avoid damage to nature, and then minimising, restoring and delivering compensation when damage is impossible to avoid.

The real opportunity available to the UK is to deliver clean power by 2030 in a nature positive way, such as rewetting lowland peat soils at the same time as constructing new solar farms or creating new wildlife corridors alongside or underneath linear energy infrastructure.

This approach is not so much about “balancing” energy and the environmental needs; it’s about *integrating* them. It’s about rebuilding our natural infrastructure at the same time as building the new energy infrastructure we need.

Government will launch an engagement exercise in early 2025 to invite communities, civil society and wider stakeholders to submit their ideas on how government can best encourage nature-positive best practice into energy infrastructure planning and development. Feedback from this exercise will allow government to better understand how we can integrate nature restoration through Clean Power 2030.



Supporting businesses and promoting growth

With 90% of global GDP covered by net zero targets[34], clean energy industries represent a significant potential growth area. These industries can generate new jobs through domestic manufacturing and services and preserve our Energy Intensive Industries in a decarbonised economy. Additionally, the only way to guarantee our energy security and protect billpayers permanently is to speed up the transition away from fossil fuels and towards homegrown clean energy.

By accelerating the transition to renewable energy sources, we are creating a more stable environment that is conducive to growth and minimises energy price led inflation. This stability is crucial for businesses, as it helps ensure that energy bills stay low, and allows them to plan and invest with confidence, knowing that they will not be subject to the volatility of fossil fuel prices. If gas price spikes occurred even once every decade, it could cost the UK between 2-3% of GDP annually, adding 13% of GDP to public debt by 2050[35].

Another of the key benefits of Clean Power 2030 and the scale up of clean energy sectors is the creation of new job opportunities in locations across the UK, particularly in coastal regions for offshore wind farms and in regions like the North West of England and North Wales for hydrogen production and carbon capture[36] whilst also supporting industrial jobs.

[34] Climate Action Tracker (CAT) (2023), *'CAT net zero target evaluations'* (viewed in December 2024).
[35] Office for Budget Responsibility (OBR) (2023), *'Fiscal Risks & Sustainability'* (viewed in December 2024).
[36] CCC (2023), *'A Net Zero Workforce'* (viewed in December 2024).

As we invest in the development of wind, solar, and other renewable energy projects, we will see a surge in demand for skilled workers in these industries and the industries and services that support their deployment. Reskilling our workforce will play a crucial role, with evidence suggesting a high degree of transferability between the UK's oil and gas workforce and the offshore renewables sector[37]. This will not only provide employment opportunities but could also stimulate local economies and drive innovation[38]. Studies have shown that green jobs tend to provide increased productivity and higher wages than non-green jobs, especially for middle and lower skilled workers[39]. A significant proportion of these jobs are expected to be in the energy efficiency and low carbon heating sector[40]. Increased jobs are also expected in low carbon energy, CCUS, hydrogen and electric vehicle manufacturing.

Decarbonising the UK economy could reduce regional inequalities, creating new jobs and supporting existing jobs in industrial heartlands and preventing decline in areas dependent on the oil and gas sector. For example, according to EDF[41], the Hinkley Point C project is helping young people stay and thrive in Somerset. The local area has seen a 25% growth in young people aged 25-39 – 3 times greater than the national average and local areas seeing a growth in the number of medium-sized companies that is ten times higher than anywhere else in the South West[42].

The Scottish Government has invested in a package of skills interventions in the North East of Scotland, supporting the transferability of the workforce across sectors to meet the needs of the net zero transition. This includes an Energy Skills Transition Hub and National Energy Skills Accelerator.

There are also opportunities for the UK to capture more of the value chain for key clean energy industries and the potential to drive inward investment in domestic supply chains. In Spring, the government will publish the new Industrial Strategy, with Clean Energy Industries as a priority growth sector.

[37] Robert Gordon University (2023) *'Powering up the workforce'* (viewed in December 2024).
[38] Zenghelis et al. (2024), *'Boosting growth and productivity in the United Kingdom through investments in the sustainable economy'* (viewed in December 2024) and CCC (2023), *'A Net Zero Workforce'* (viewed in December 2024).
[39] CCC (2023), *'A Net Zero Workforce'* (viewed in December 2024).
[40] CCC (2023), *'A Net Zero Workforce'* (viewed in December 2024).
[41] EDF (2024), *'Socio-economic Impact Report 2024'* (viewed in December 2024).
[42] EDF (2024), *'Helping Britain achieve net zero'* (viewed in December 2024).

How Clean Power 2030 will transform our energy system

Clean Power 2030 will be a major step towards realising an ambition of a clean, contemporary, digitalised energy system based largely on electricity, to be developed further in later years as part of decarbonising the whole economy. For energy consumers and citizens this will be a transformation in their relationships with energy.

Just as it has in so many other sectors before, such as banking, media, and retail, digitalisation will pave the way for a consumer-led transformation of the energy system, characterised by new business models, firms, and markets. While this will gain momentum in the period to 2030, it will continue to do so far beyond that date, as part of decarbonising the whole economy.

Lessons from other sectors are clear: digitalisation can increase consumer choice, bring down costs for everyone, and lead to the development of more consumer-friendly products and services.

Importantly for the energy system, this digitalisation will simultaneously unlock transformation of the demand side, a critical part of the energy system in the move to clean power and one which has been historically overlooked, failing to serve the best interests of consumers.

The system of the future will give consumers choice over how they engage, ranging from little change to today, through to being able to benefit from bill discounts thanks to smart tariffs. They will be able to engage physically by using appliances when electricity is cheaper or via automated systems managing this on their behalf. These would control how major appliances like car chargers, heat pumps, water heaters, washing machines/dryers, and fridge/freezers use their electricity to take advantage of low prices within the day and integrate the outputs of any residential generation such as rooftop PV, and household energy stores, potentially including the battery in your electric car.

The government is clear that engagement with these systems will be entirely voluntary, led by consumers. Under the previous government, consumers were offered the option to take advantage of different tariffs at different times. The evidence was that consumers were enthusiastic about the possibilities[43]. But this should not be a choice just given to the most informed consumers but to all. That is what the system of the future is about.

[43] NESO (2023) '*Household engagement with the Demand Flexibility Service 2022/23*'

What Clean Power means for local places

Boosting industry and transforming local economies with clean, homegrown energy

After the grid was first consolidated from 1926-33, energy became a lot cheaper, and this had a beneficial impact on industry, driving down costs[44].

In the same manner but on a much larger and more transformative scale, Clean Power 2030 will catalyse a new era of renewable energy, opening up the possibility for new ventures previously held back by the price of fossil fuels.

It will ensure that the benefits of clean power are spread throughout the country, driving new investment and industry into local places and communities. For example, enabling the development and growth of new energy intensive industries such as data centres across Scotland.

These changes will have a profound impact on people's livelihoods, as they bring with them new, higher value, future-proof jobs and employment.

[44] Butler (2001), '*The nature of UK electricity transmission and distribution networks in an intermittent renewable and embedded electricity generation future*' (viewed in December 2024).

Creating a fairer, more equitable energy system

Clean Power 2030 will create the conditions needed to drive investment in, and scale, locally led, owned and managed energy developments. Local leadership will be empowered to play a more active role in delivering the transition – for example, through partnering with and providing support to community energy groups and local and combined authorities, GBE's Local Power Plan will support the rollout of renewable energy projects using established technologies to contribute up to 8GW of clean, homegrown energy.

Communities and the people who live in them and the businesses that serve them, will see clearer links between local projects, and local benefits.

For example, the UK's first hospital-owned solar farm has not only contributed to the daily power needs of Morriston Hospital in Swansea, but also covered 100% of its demand for prolonged periods of time, helping save carbon and bills.

Through its Community and Renewable Energy Scheme, the Scottish Government supports the growth of community energy and helps communities engage in and benefit from the energy transition. To date, the Scheme has advised over 1200 organisations and provided over £67 million in funding to communities throughout Scotland, supporting over 960 projects and the installation of 63 MW of renewable energy.

Building trust, knowledge and confidence to support household technology adoption

Enabling truly local energy led by local citizens, businesses and local leaders will also play a vital role in citizen engagement, with local developments and business models in some cases representing the first real, 'tangible' occasion that local people can learn about and experience renewable energy.

These experiences will help to grow public trust and knowledge. Greater visibility and demystifying of renewable energy at the local level across Great Britain will support electrification right down to the level of the individual household, providing citizens with the confidence to adopt low carbon technologies, keeping us on track for our wider net zero targets beyond 2030.

Removing roadblocks: lowering barriers to investment, development and deployment

Delivering Clean Power 2030 will require reforms to the overarching structures that underpin delivery and operation of the energy system, to ensure they do not act as blockers to deployment of clean power projects.

We need to make sure that consenting regimes work to bring new projects through the system at pace, that the network expands rapidly so that our vast supply of clean electricity can be transported to centres of demand, and that the underpinning supply chain and workforce are available and capable to ensure this transformation is delivered.

We also need to ensure that the market works in tandem with support schemes to deliver the right investment signals, and that any sector-specific barriers to deployment are appropriately addressed, to enable the huge volume of deployment that will underpin Clean Power 2030.

This section of the Action Plan sets out how government will ensure this is delivered, with chapters covering:

- Planning and consenting for new energy infrastructure
- Networks and connections
- Renewable and nuclear project delivery
- Reforms to electricity markets
- Short-duration flexibility
- Long-duration flexibility
- Supply chains and workforce

Planning and consenting

Summary

Our current planning systems across Great Britain are not working at the pace required to meet our target for clean power by 2030. Planning systems are devolved and the regimes vary across Scotland, England and Wales, although similar problems are encountered in each. Lengthy paperwork and often-delayed processes for infrastructure projects hinder our energy security, our economic growth, and fails to deliver for the natural environment. The increased risks to projects associated with delays in planning decisions also increase costs across the system.

Our planning system needs to quickly change to enable government's missions to grow the economy and deliver clean power. Since July, the government has taken decisive steps towards making planning work better for clean power and economic growth. We've lifted the de facto ban on onshore wind in England and have committed to updating our National Policy Statements. We must go further. Processes are not suitable nor are examining authorities well-equipped to deal with the increase in new clean power projects and wider infrastructure that we expect in the coming years to achieve government's missions. There is particular urgency to accelerate the planning process across Great Britain for energy infrastructure since we do not have long for many clean power projects to begin construction if they are to be operational for 2030, especially networks and offshore wind developments.

The urgent need for change means we must undertake a wide-ranging reform programme, encompassing not only deep changes through primary legislation over the course of this Parliament, but to also get moving with operational and regulatory reforms across the system within the next year. Therefore, to enable clean power 2030:

1. **We will equip organisations across the planning system with the tools they need to help deliver Clean Power 2030 and government's wider missions**, including the Planning Inspectorate, statutory consultees, local planning authorities, and government consenting teams. We will enable them to better flex and prioritise their resource so that they can examine mission-critical projects faster. To complement these more immediate changes, we will deliver workforce reform, enhanced training, and reformed career development packages for certain organisations involved in the planning system. We will review resourcing in key organisations to determine whether they are suitable for handling an increased number of projects in the coming years, including the Planning Inspectorate and departmental consenting teams. The Clean Power 2030 Unit will assist planners by convening early engagement between stakeholders for complex applications.

2. **We will update the National Policy Statements for Energy and Planning Policy Guidance in 2025, and we have confirmed changes to our National Planning Policy Framework** to reflect the needs of Clean Power 2030, improving policy certainty for developers and examining authorities.

3. **We will undertake an ambitious programme of legislative reform, including through the Planning and Infrastructure Bill.** Building on the reforms in the Nationally Significant Infrastructure action plan[45], we will introduce legislative changes to update the NSIP planning system in the Planning Act 2008 in England and Wales for all infrastructure projects. We will also reform the legislative framework for electricity infrastructure consenting in Scotland, where there is executive devolution but where legislation under the Electricity Act is reserved for Westminster, to deliver a streamlined and efficient framework that is fit for purpose. We will explore reforming Judicial Review processes following recommendations from Lord Banner's review.

4. **We will ensure that the protection of nature is embedded into the delivery of Clean Power 2030,** including by delivering the Marine Recovery Funds for Offshore Wind, and using development to fund nature recovery where currently both are stalled. The UK government and Scottish Government are exploring a separate Marine Recovery Fund for projects in Scotland

[45] Department for Levelling Up and Housing Communities (DLUHC) (2023), *'Nationally Significant Infrastructure: action plan for reforms to the planning process'* (viewed in December 2024)

5. **We will ensure communities directly benefit from clean energy infrastructure they host** by building upon existing approaches and encourage consistency in community benefits across technologies.

6. **The Scottish and Welsh Governments have implemented programmes of planning reform which support the delivery of clean power.** We are working closely with both the Scottish and Welsh Governments to accelerate reform further to deliver for 2030.

The challenge

The projects we need for Clean Power 2030 need to begin construction soon. Advice from the NESO indicated that there are enough projects in the pipeline for most technologies, but delivery of the pipeline would require accelerated rates of planning and consenting decisions[46]. Increased pace in the planning system is essential to support effective delivery of the connections queue and wider actions enabling Clean Power 2030. Though construction timelines for clean power technologies vary, it is clear we must act urgently to get them through the planning system, while also delivering positive outcomes for nature and communities.

- Most new transmission network and offshore wind projects will need all permissions for construction by 2026[47] if they are to be operational by 2030 with current construction timelines
- New onshore renewable and battery projects typically have shorter construction timelines, but most large-scale projects would likely still need to receive consent by around 2028[48]
- For much of the firm generation, low carbon-flexibility and unabated gas that we need to underpin a clean power system we have identified the pathways for delivery for 2030 and are working towards accelerating them, but we need to ensure the judicial and wider permitting processes work to reflect the critical importance of these projects.

Our planning reform programme for larger scale energy infrastructure will need to be tightly coordinated. Terrestrial and Marine planning regimes are either fully or executively devolved. The delivery of energy infrastructure in Great Britain is split between interacting systems that differ between nations, with varying roles for central, local, and devolved governments. Some of the planning reforms referenced in this plan relate to consenting in England (and Wales for large NSIPs) while others will affect Scotland given that elements of the legislation governing parts of the Scottish planning and consenting regime are reserved to Westminster. In addition, there are a range of actions also underway in Scotland and Wales.

NESO will be delivering the Strategic Spatial Energy Plan in 2026 to enable long-term planning of the energy system out to delivering Net Zero by 2050. We also need a long-term, holistic approach to managing growing demand for use of the seabed. The Crown Estate's Marine Delivery Routemap will provide an opportunity to positively plan

[46] NESO (2024), *'Clean Power 2030'*, (viewed in December 2024).
[47] Internal DESNZ estimate informed by stakeholder engagement.
[48] Internal DESNZ estimate informed by stakeholder engagement.

for shared outcomes across different sectors with an agreed set of design parameters that incentivise best environmental practice across the project lifecycle. This will encourage development areas to be brought forward in the right locations that avoid the most vulnerable areas of biodiversity.

For the planning and environmental reform package to facilitate Clean Power 2030, changes will need to be made that cut across many different areas, involving multiple organisations, including developers, supply chains, and investors. The different systems with different requirements and obligations across the planning landscape are complex and were not designed to deliver at the speed and volumes now required of them.

Figure 10: Nationally Signficant Infrastructure Project (NSIP) planning process flowchart

Notes: This flow chart details the process for NSIP energy projects only. Projects which are considered using TCPA follow a slightly different process.

Source: Planning Inspectorate (2024), 'Decision Making Process Guide'

It takes a long time for Nationally Significant Infrastructure Projects (NSIPs) to receive a consenting decision, with ever increasing volumes of information being dealt with at each stage, leading to delays and pressure for all parties. The timespan for Development Consent Orders is intended to be less than two years but can go well beyond this, and the documentation underpinning consents has been getting longer and in too many instances now runs to tens of thousands of pages. Increased litigation has caused delays and introduced additional risk and costs for

developers. A large number of infrastructure projects are expected in the next 3 years[49], and change is needed to meet the urgent need set out in the NESO advice for significant numbers of projects to progress to construction in the next 6-24 months.

For locally-consented energy infrastructure, decisive reform is also urgently needed to deliver clean power by 2030. In England, planning applications with local authorities under the Town and Country Planning Act can sometimes take up to 12 months to receive a decision[50], despite a four-month limit on energy infrastructure projects which require an Environmental Impact Assessment. Currently, the National Planning Policy Framework (NPPF) does not make clear that local planning authorities should consider the benefits associated with renewable energy generation, and proposals' contribution to meeting a net zero future when determining applications for these developments. The Planning Practice Guidance for renewable energy, which adds further detail to the policy contained within the NPPF, contains outdated guidance which requires updating to reflect new policies.

There are also challenges in the planning process for low carbon electricity infrastructure in Scotland, which differs from the systems in England and Wales. These challenges are delaying investment in critical infrastructure and are costly to consumers. Government has run a consultation on proposals for reforming the consenting processes in Scotland under the Electricity Act 1989 and working with the Scottish Government, timely implementation of the results of the consultation process will be essential.

We need to accelerate transformation of the system, building on the work set out in the NSIP Action Plan. In February 2023, the then government published the NSIP Action Plan which outlined five key reform areas to help make the NSIP planning system better, faster, greener, fairer and more resilient. Following on from this, changes to the NSIP system were implemented in Spring 2024 with the introduction of legislative amendments to key infrastructure planning legislation and new infrastructure planning guidance. We recognise previous reforms to the system are yet to be in full effect and will make a positive difference, like the designation of low-carbon nationally significant energy infrastructure projects as 'Critical National Priorities' through the energy National Policy Statements. However, existing reforms still do not match our ambition for Clean Power 2030, and so we must go further – using all tools at our disposal.

Our planning reform programme for energy infrastructure will need to be tightly coordinated. The delivery of energy infrastructure in Great Britain is split between interacting systems that differ between nations, with varying roles for central, local, and devolved governments. For the planning and environmental reform package to facilitate Clean Power 2030, changes will need to be made that cut across many different areas, involving multiple organisations, including developers, supply chains, and investors. The different systems with different requirements and obligations across the planning landscape are complex and were not designed to deliver at the speed and volumes now required of them.

[49] Prime Minister's Office, 10 Downing Street (2024), *'Plan for Change: Milestones for mission-led government'* (viewed in December 2024).
[50] DESNZ analysis based on the Renewable Energy Planning Database (REPD).

Taking action

We will equip examining authorities with the tools they need to help deliver Clean Power 2030 and government's wider missions

We can unblock bottlenecks by improving resource, particularly shortages of critical specialisms, which are often noted as a main cause of statutory consultees' reasons for planning application deadline extensions[51]. In 2023-24, over 60% of delayed responses to planning applications from the Environment Agency were due to resourcing constraints[52], while Natural England have said the same for over 80% of the time they need to extend a deadline for a planning application[53]. Another statutory consultee, Historic England, have seen a 39% decrease in expenditure on heritage services in Local Planning Authorities in planning policy since 2009/10[54], impacting the delivery of developments. Reform of the planning system includes a need to better employ key skills and resource across a variety of bodies, which can be managed through targeted interventions and streamlining the system. We are expecting an increase in planning applications with the Clean Power 2030 target, providing further challenges than those the planning system is already experiencing. To manage this increase:

- **We will expand cost-recovery mechanisms** across relevant regimes to ensure that all organisations key to consenting have sustainable resourcing models which can match the demand of projects in the system into the future, to help deliver Clean Power 2030 and beyond.
- **We will continue to enhance the support that the Planning Inspectorate and statutory consultees give to developers through the planning process,** particularly at the pre-application stage.
- **We will review resourcing in key organisations to determine whether they are suitable for handling an increased number of projects in the coming years.** To ensure resource is making the most impact, we will drive operational efficiency in statutory consultees, to speed up consultation and examination timelines. Alongside a review of resourcing, we will establish new performance standards for all public-sector organisations, including central government teams, the Planning Inspectorate, statutory advisors, and local planning authorities; in addition to improving guidance and support for the private sector.
- **We plan to reform planning resourcing for the longer term**, including supporting existing strategies such as working with universities and skills providers to strengthen the intake of planners required for all infrastructure building. Additionally, we will look at options for attracting and retaining key specialists, such as through reviewing entry requirements for such roles.

[51] DESNZ (2023), *'Hydrogen projects: planning barriers and solutions – research findings'* (viewed in December 2024).
[52] Environment Agency (2024), *'Environment Agency's planning consultation response timelines: 2023 to 2024'* (viewed in December 2024).
[53] Natural England (2023), *'Natural England's response times to planning consultations in England'* (viewed in December 2024).
[54] Historic England (2024), *'Proposed reforms to the National Planning Policy Framework and other changes to the planning system: Consultation Response – September 2024'* (viewed in December 2024).

- **We will boost local planning capacity** including wider programmes of support, working with partners across the planning sector to ensure that local planning authorities have the skills they need both now and in the future. The government has announced a £46 million package of investment into the planning system to support capacity and capability including the recruitment and training of graduate and apprentice planners to support the planning system as a whole.
- **We will consider enhancing the quality standards energy NSIP applications must meet in order for their applications to be accepted into the regime and publish best practice** to help prevent resource being used unnecessarily in addressing issues with low quality or incomplete applications. Projects submitted to the Planning Inspectorate should be of a high quality, following best practice and guidance. Through constructive, early engagement with statutory consultees, and timely provision of information and evidence, developers will be able to better meet the high standards expected.
- **The Clean Power 2030 Unit will convene nature, communities and industry groups on complex projects**, in order to encourage and facilitate a high standard for projects, and stress-test them prior to application to identify any problems with input from across the planning system. This could enable an expedited pre-application process and help ease the burden on a system working at capacity.

We will update our national policy vehicles to reflect the needs of Clean Power 2030

Generally, where policy, legislation and guidance leaves room for doubt, examiners and decision-takers may adopt a more cautious approach to consenting and developers will lack clarity on what is required for their application to succeed. This results in added time, process and results in delays, and may open the door for more legal challenges post-decision. To address this, for NSIP policy:

- **We will update National Policy Statements** for energy in England. The Chancellor announced a 12-month review of National Policy Statements (NPSs) in July 2024. We will update our NPSs so that the Planning Inspectorate and other organisations involved in examining projects are given the clarity they need to provide robust advice on infrastructure critical in delivering Clean Power 2030;
- **We intend to take powers through primary legislation to ensure that NPSs are updated every five years through a quicker and easier process, giving increased certainty to developers and communities.**
- **We are reintroducing onshore wind into the NSIP regime at a new threshold of 100 MW and are altering the existing threshold for solar to 100 MW.** This will ensure the planning system is efficient with appropriate routes available that are proportionate to a project's scale, impact and complexity.

For local planning policy in England:

- **We have ended the de facto ban on onshore wind development**, and have now published our consultation response confirming changes to the National Planning Policy Framework (NPPF);
- **We will update the Planning Practice Guidance in 2025 to provide clarity on the application of planning policy** for renewable and low carbon development to support the updates to NPPF in practice. This will help local councils in developing policies for renewable and low carbon energy and identifies the

planning considerations associated with a proposal for development.

We will undertake legislative reform

We must reform the planning system, so it works better for energy projects and wider infrastructure for the long term beyond 2030 too. We will need to continue delivering new clean power infrastructure at pace after 2030 to keep up with increasing electricity demand. Government recognises the need to more strategically plan its long-term infrastructure needs and it needs the planning system to be responsive to this.

- **We will bring forward a Planning and Infrastructure Bill with measures to streamline the delivery of critical infrastructure in the planning process.**

The Bill will introduce new measures to prioritise and streamline the delivery process for critical infrastructure through the planning process, including accelerating upgrades to the electricity grid and boosting renewable energy which will benefit local communities. These proposed changes will move us away from a position where vital new infrastructure is being unnecessarily delayed whilst ensuring that it is sustainable, responsible and maintains high environmental and nature standards.

Since our proposed primary legislation is not a quick-fix and will be too late for some projects that are critical for Clean Power 2030:

- **We will review secondary legislation and other legal requirements (like licences) regarding the planning process for energy infrastructure to establish relevant changes to speed up delivery of projects for Clean Power 2030.**

Legal challenges to DCOs can create significant delay to the delivery of NSIPs in England and Wales. Judicial review is a constitutionally important mechanism which allows an individual or organisation to challenge the lawfulness of a DCO decision in court. However, there is a case for reviewing the process to identify ways in which it can be streamlined to ensure it does not unduly slow down vital infrastructure development. Most legal challenges against DCO decisions are unsuccessful, but it can take many years for the courts to reach the decision, and hear further appeals in higher courts, leading to uncertainty and delays. Delays to new infrastructure can increase costs to consumers where constraint payments to operators are required.

- **We will explore reforming the judicial review process for NSIPs following Lord Banner's recent independent report**. We have published a call for evidence on judicial review reform following this report which is due to close at the end of this year. The call for evidence is seeking views on Lord Banner's recommendations and invites suggestions on other options for reform to reduce delays to infrastructure projects in England and Wales. We intend to legislate at the earliest convenience for any desired changes requiring primary legislation following the call for evidence. For example, this could include changing the rules so that claimants in each case only have one attempt to seek permission for judicial review. Any changes that we decide to make will strike the right balance between reducing delays to infrastructure projects and maintaining access to justice in line with our domestic and international legal obligations. In Scotland, the recent consultation on reforms to electricity infrastructure consenting sought views on creating a unified and streamlined system for challenging the decisions of Scottish Ministers, taken under the Electricity Act 1989, through the courts.

We will ensure that the protection of nature is embedded into the delivery of Clean Power 2030

Our existing planning system is built on solid foundational principles. Our policy and legal frameworks were originally developed to ensure the timely delivery of vital new infrastructure and other development, whilst ensuring communities hosting infrastructure are fairly treated and the natural world is protected.

We know that the status quo is not working when it comes to delivering the nature and infrastructure we need. The poor state of our natural environment means that there is often insufficient environmental headroom to allow developments to come forward without significant costly intervention. Applicants can struggle to navigate or satisfy environmental requirements and conditions on habitats, species and protected areas. A lack of clarity for industry from government and statutory consultees, a low-risk appetite from developers, and at times a reluctance from developers to engage with environmental requirements or deliver quality applications can slow down the delivery of much-needed energy infrastructure.

All this can lead to lengthy case-by-case negotiations of mitigation and compensation measures with statutory consultees, and extensions to decision deadlines. Once consent is granted, developers must often meet 'post-consent conditions' whereby construction cannot start until the conditions are met. To embed the protection of nature in energy developments, actions will include:

- **We are considering how to use development to fund nature recovery unlocking a win-win outcome for the economy and for nature** – as set out in the King's Speech, we are working with nature delivery organisations, stakeholders and the sector to consider how we can better support the delivery of housing and infrastructure whilst driving better environmental outcomes;
- **We will undertake measures to reduce pressures on protected sites including through expansion of the Protected Sites Strategies in priority areas in England.** Protected sites face several pressures inhibiting their recovery. This gives rise to development constraints when sites are in unfavourable condition, even if a new development is a small contributor to the overall problem. Reducing pressures on protected sites will help to ease some of the constraints energy developments face when addressing the environmental impacts of their projects;
- **We will publish our roadmap to bring forward Environmental Outcomes Reports** in consultation with devolved government, introducing an outcomes-based approach will provide the certainty developers need to embed environmental considerations into the earliest stages of the project. This will allow stakeholders to focus on delivering for the environment rather than guarding against the risk of legal challenge which will reduce costs and delays from unnecessary work. The roadmap will include our approach to implementation to ensure a smooth transition for stakeholders;
- **We will establish industry-funded Marine Recovery Funds** into which applicants can pay to discharge their compensation obligations, underpinned by libraries of approved strategic

compensation measures. The UK government are engaging with the Scottish Government with a view to reaching agreement on the establishment of, and the delegation of appropriate functions to operate and manage, a separate Marine Recovery Fund for projects in Scotland. The Offshore Wind Environmental Improvement Package (OWEIP) as a whole will accelerate and de-risk the consent of offshore wind projects whilst continuing to protect the marine environment;

- **We will consider options for harmonising the offshore wind environmental data and modelling used** for assessing impacts of offshore wind projects on species and habitats to provide consistency in assessments. Standardised methodologies and inputs to models and data standards could be developed allowing developers access to harmonised, coherent public data, reducing disagreements between developers and Statutory Nature Conservation Bodies (SNCBs), and helping to shorten the pre-application timelines for all future projects;
- **We will consult on reforms to the environmental permitting regime to better enable Clean Power 2030**, and ensure that environmental regulators have the powers and evidence to promptly develop the pollution standards required for the permitting of emerging clean power technologies;
- **We will explore strategic approaches to managing environmental pressures around industrial clusters which engages effectively with the planning and permitting systems. This will help to enable cluster decarbonisation within environmental constraints and address emerging issues prior to projects entering the planning system;**
- **We will launch a public engagement exercise in early 2025** to invite stakeholders to submit their ideas on **how government can best encourage nature-positive best practice into energy infrastructure planning and development**. Feedback from this exercise will allow government to better understand how we can integrate nature restoration within Clean Power 2030.

Our reform programme to deliver clean power infrastructure will keep nature at its heart. Whilst we want to accelerate infrastructure delivery, project developers must be clear that government expects them to continue delivering for communities and nature. We are not writing a blank cheque for low quality applications that fail to consider these outcomes.

We will work towards communities benefit from hosting new clean energy infrastructure

To realise our ambitions of becoming a clean energy superpower, some communities will see an increase in the amount of new energy infrastructure being built in their area. We must ensure that we bring all communities with us on this journey to Clean Power 2030. Maintaining public support is vital to the delivery of clean energy ambitions in Great Britain, and those asked to host energy infrastructure should feel tangible benefit from the role their areas play in building a low-cost electricity system[55]. Community benefits are already delivered on a voluntary basis in some sectors across Great Britain (e.g. solar and onshore wind), but this is not consistent across sectors and locations. Government wants to ensure that all communities hosting infrastructure receive high quality benefits in a consistent manner.

[55] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

We will ensure that communities directly benefit from clean energy infrastructure they host, and continue to explore how to do so. This will build on existing approaches to community benefits within the onshore wind sector, on which government intends to publish updated guidance for England in due course, and the work that Solar Energy UK have been taking forward to develop industry-led guidance for solar energy projects. In the interim, the government plans to publish new guidance on voluntary community funds so that communities benefit in a fairer, more ambitious and consistent way from new onshore electricity transmission infrastructure.

Planning reform in Scotland

Scotland is taking further action to improve the resourcing of the planning system. The Scottish Government's consultation on Investing in Planning set out of proposals aimed at increasing the capacity of the planning system in Scotland – the Scottish Government is now progressing a range of actions following the consultation. which set out a range of proposals aimed at increasing the capacity of the planning system in Scotland. Following the consultation we are now progressing a range of actions

The UK and the Scottish Government share the view that the consenting regime for larger scale electricity infrastructure in Scotland is not fit for purpose. Delays are caused by inefficient and outdated features of the existing legislative framework. The UK government, with the support of the Scottish Government, agree that the most pragmatic route to speeding up the deployment of low carbon electricity infrastructure is to reform the existing legislative framework. To address this:

We will seek powers to reform the current legislative framework for electricity infrastructure consenting in Scotland, with changes deployed by the Scottish Government. The Electricity Act 1989 could, for example, be amended to modernise and remove inefficiencies, whilst giving communities and statutory consultees meaningful opportunities to influence applications for consents.

The UK and Scottish Governments have worked together closely on reforms to electricity infrastructure consenting in Scotland referenced above. The recent consultation gathered evidence on a package of proposals which would help to streamline the existing outdated system in Scotland, which will encourage investment and acceleration towards our 2030 ambitions.

Additionally, with specific regard to consenting for offshore electricity infrastructure, the Scottish Government has been actively engaged with the UK government in the development and implementation of the reforms being delivered via the Offshore Wind Environmental Improvement Package under the Energy Act 2023, which will enable more efficient regulation of adverse environmental impacts arising from Scottish offshore wind developments. The Scottish Government also continues to pursue a continuous improvement approach to Scottish consenting processes through its Consenting Streamlining Unit, implementing more streamlined procedures where beneficial.

Planning reform in Wales

The Welsh Government has recently taken action to accelerate their infrastructure planning decisions. Immediate action has including enabling Planning and Environmental Decisions Wales (PEDW) to take decision on energy projects up to 50 MW, and prioritising applications for Developments of National Significance which have the greatest public benefits.

Longer term, the Infrastructure (Wales) Act sets out the new consenting process for significant infrastructure projects in Wales both on land and in the territorial sea[56]. This replaces multiple existing consenting processes with a single process. It will provide confidence and certainty in the decision-making process which is underpinned by clear policy that strikes the right balance between the need for infrastructure projects to help combat climate change whilst respecting our natural environment.

They have produced a consultation paper on development of a resilient and high performing planning service, including proposals for funding, performance monitoring, and increasing staffing skills and resilience[57].

[56] Welsh Government (2024), *'Implementing the Infrastructure (Wales) Act 2024'* (viewed in December 2024).
[57] Welsh Government (2024), *'Promoting a resilient and high performing planning service'* (viewed in December 2024).

Electricity Networks and connections

Summary

Our grid infrastructure needs strengthening. Failure to do so risks holding back our energy security, economic growth and other important infrastructure with lengthy delays. Across many walks of life, people see grid infrastructure as a massive impediment to their plans.

In truth, Great Britain's electricity network must undergo unprecedented expansion, as the economy electrifies, to deliver decarbonisation, energy affordability and energy security, and support economic growth. To connect new generation and meet future demand, around twice as much new transmission network infrastructure will be needed in Great Britain by 2030 as has been delivered in the past decade[58]. In addition to relevant cross-cutting actions on planning, supply chains, and skills we will take action to deliver the network we need at the right time:

Fundamentally reforming the connections process, working with NESO, Ofgem, TOs and DNOs to prioritise viable projects that align with the Clean Power 2030 Action Plan. Without these critical reforms, the queue will not align with our strategic needs and the projects we need will be delayed.

Regulatory reform to ensure that the Clean Power 2030 target is better integrated into planning and investment decision making, enabling investment in networks ahead of need. This includes working with Ofgem to explore the appropriateness of tightening the incentives and penalties to drive the acceleration of network build-out delivery.

Improving networks planning and consenting to provide the levers to accelerate the expansion and upgrades required across our transmission and distribution network to ensure energy infrastructure can support the delivery of the 2030 target.

Engaging with communities to enable them to benefit from living near new transmission network infrastructure.

[58] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

The challenge

Urgent action is required to ensure that the grid we need is in place for the connection of low-carbon generation and electrification of sectors such as transport, heating, and industry. Network build must be accelerated to address annual constraint costs, which are projected to increase without action from the already high level of around £2 billion per year in 2022[59] to around £8 billion per year[60] (or £80 per household per year) in the late 2020s[61], in a scenario where delays to network build persist. This cannot be allowed to happen.

Network constraints occur when the electricity system is unable to transmit power to electricity users because the maximum capacity of the circuit is reached. Constraint costs arise when NESO has to manage this problem by paying generators to reduce (turn-down) their electricity output in areas that are congested and switch on (turn-up) in locations closer to electricity users.

Work is required to significantly reduce the end-to-end delivery time for new transmission infrastructure. In the independent 2023 Report[62] by Nick Winser (Advisory Commissioner to the Clean Power 2030 Mission), he set out recommendations to halve timelines from 14 to 7 years, starting with strategic spatial planning of energy projects which would allow the network to be planned holistically ahead of need. Winser was clear that ambitious interventions were needed across every stage of the delivery process and government is working with delivery partners to drive the necessary change, including Ofgem, NESO and the network companies, who play a crucial role in delivery of new infrastructure on the ground.

To deliver a decarbonised power system by 2030, we will need to build on Winser's recommendations, going further and faster where necessary, to ensure the network we need is in place in time. NESO's Clean Power 2030 advice[63] confirms that all 80 transmission projects they identified as required to achieve clean power by 2030, including both upgrades to existing infrastructure and new transmission lines, are already in existing strategic network plans[64]. Of these, there are three with delivery dates post 2030, which we know need to be accelerated. Delivery of the full list of projects to such a short timeline is an unprecedented challenge. Government and the Clean Power Advisory Commission will work closely with partners to monitor delivery of individual projects and identify targeted interventions to accelerate delayed projects where necessary, including through prioritisation in the consenting process. Wherever renewables can connect to the distribution network, this should be encouraged for reasons of speed and efficiency.

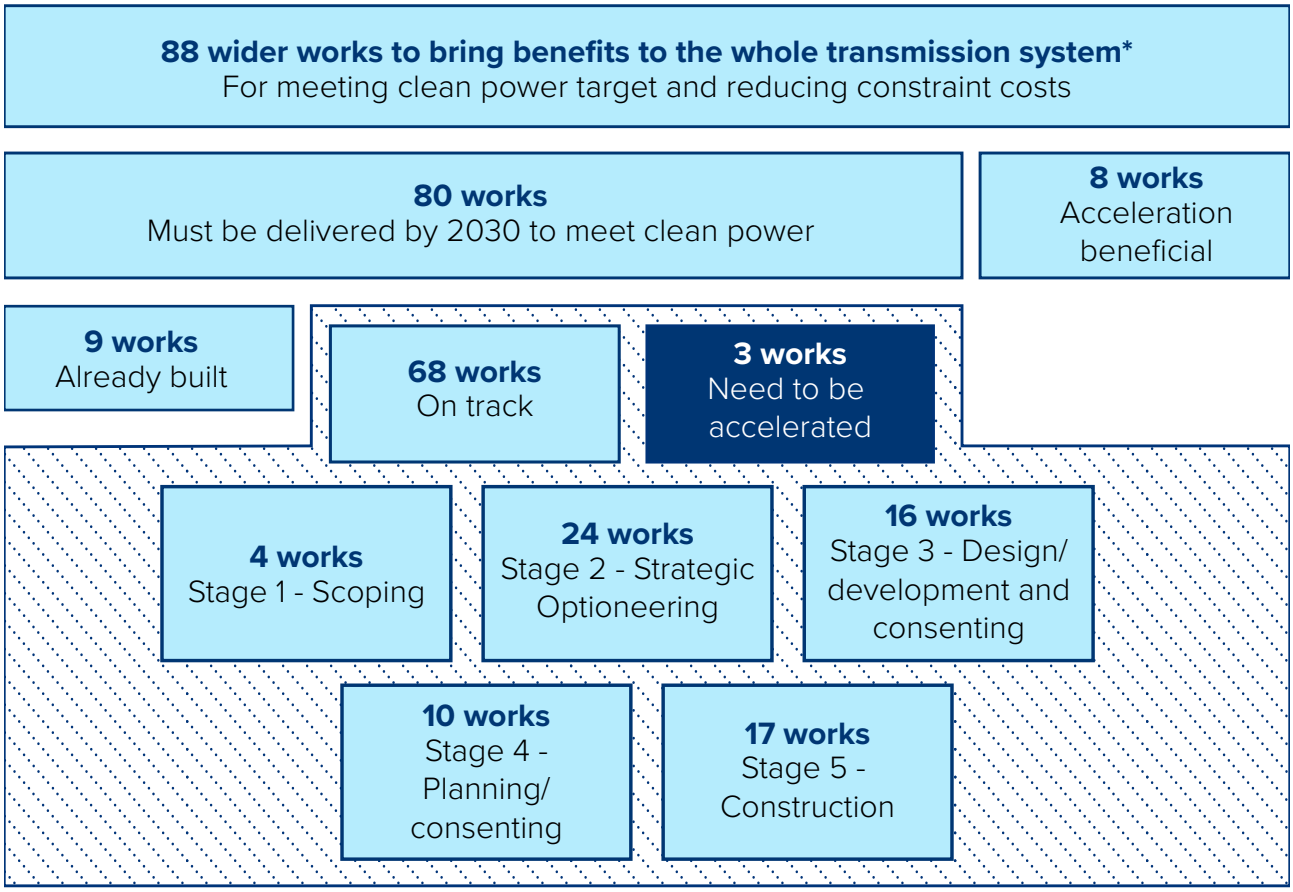
The distribution network is also in need of reform and, whilst it is less constrained than transmission level, large amounts of distribution-connected renewable

[59] National Grid ESO (2022), *'Monthly Balancing Services Summary'* (viewed in December 2024).
[60] Undiscounted, 2022/23 prices.
[61] DESNZ (2023), *'Community benefits for electricity transmission network infrastructure: government response'* (viewed in December 2024).
[62] DESNZ (2023), *'Independent report: Accelerating electricity transmission network deployment: Electricity Networks Commissioner's recommendations'* (viewed in December 2024).
[63] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).
[64] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

generation and storage will need to be accelerated to achieve the 2030 target. Significant reinforcement and build out of the distribution network will also be required to support the electrification of sectors projected for the decades ahead, as well as to accommodate new demand in some locations for growing infrastructure and industrial uses, such as data centres and transport hubs.

In addition to those actions set out in this chapter, delivery of network infrastructure will rely on actions outlined elsewhere in this Action Plan, notably the interventions being developed by the Office for Clean Energy Jobs to secure a workforce with the right skills to deliver Clean Power, resourcing and reforming planning and consenting for energy infrastructure, and supply chain interventions.

Figure 11: Transmission network project maturity and delivery timeline



Source: NESO (2024), 'Clean Power 2030'

* These are wider transmission network reinforcements – they may not include all works, for example, works driven by connection enabling works, operability etc.

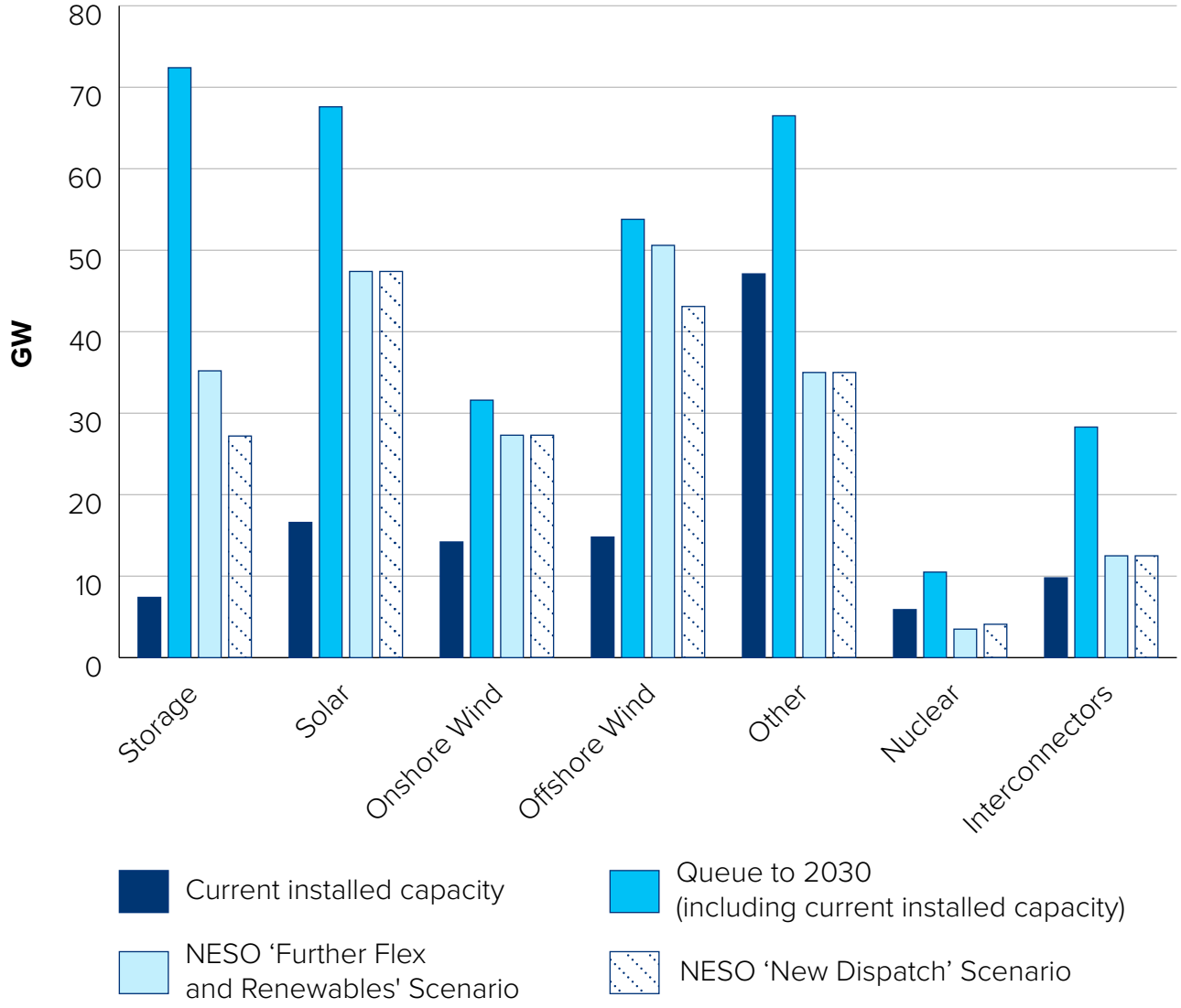
Taking action

Connections reform

Over the last five years, the grid connection queue has grown tenfold, and now contains an equivalent capacity of 739 GW[65]. Many of these projects are speculative or do not have the necessary funding or planning permission to progress, causing unacceptable connection delays for viable projects behind them. Fundamental reform of the connections process is critical and urgent – without it, the projects we need for Clean Power will not be able to connect on time.

We also need to accelerate towards net zero and ensure timely connections for demand including an increasing volume of low carbon technologies such as EV charge points and heat pumps, as we electrify the wider economy.

Figure 12: Current connections queue compared to current installed capacity and NESO 'Further Flex and Renewables' and 'New Dispatch' scenarios (GW)



Note: Other includes biomass, unabated gas, coal, oil and other fuels for current installed capacity. 2030 capacity figures refer to unabated gas only.

Source: Table 1 & DESNZ (2024), 'DUKES' & NESO (2024), 'Clean Power 2030'

[65] Including Demand. Correct as of end-October 2024. Connections data is published monthly by the Connections Delivery Board.

The queue is currently managed on a 'first come, first served' basis which does not consider the required 'mix' of energy projects (e.g. solar, wind) or where this mix is best located. As such, we do not have the levers to ensure an optimised future energy system across all regions of Britain that responds to local energy planning as well as national needs.

To meet our 2030 ambition, we must act now to rationalise the queue and accelerate the projects that are critical to our goal. This means going beyond previous plans to remove slow-moving or stalled projects from the queue and prioritise based on readiness alone. These actions are still needed but to achieve Clean Power 2030, technological and locational factors need to be considered in the connection process so the right projects can connect in the right place at the right time.[66] This Action Plan can now provide the basis to do this.

By removing unviable projects, re-ordering the queue, and accelerating connection timescales for the projects we need most, connection reform is expected to unlock £billions of much-needed investment in renewable generation[67] and electrification of the wider economy – investment that has been held back for too long.

A strategically aligned connections process will also bring inherent efficiencies in network design, planning, and build, and provide long-term confidence not only for investors in renewable energy, but also for all demand sectors that will depend on clean energy for electrification (from data centres – including those vital for supporting AI (Artificial Intelligence) – and gigafactories, to EVs and heat pumps), as well as related supply chains and the jobs these will create.

Government, Ofgem, NESO and network companies have been working at pace[68] to strengthen existing 'first ready, first connected' proposals and NESO has now consulted on[69] the detailed methodologies that will enable it to filter the queue and prioritise connections using strategic plans, starting with capacity ranges for generation technologies required for clean power by 2030 that are laid out in this Action Plan. Government will:

- Work with NESO and Ofgem to **change the grid connections process** to operationalise the Action Plan, by providing a framework through which NESO can work with Transmission and Distribution Operators to prioritise aligned projects, resulting in updated offers being issued before the end of 2025. Further detail on this is set out in the connections reform annex of this publication. We will introduce legislation, when parliamentary time allows, to ensure connection reform aligns with strategic energy and network plans and supports delivery of clean power by 2030.
- Subject to Ofgem's approval, additional flexibilities will be included in the reformed connection process to manage project attrition and over- or under-supply. For example, projects that go beyond the 2030 pathway for a technology but are aligned to the relevant 2035 pathway will still be eligible to connect before 2030 where there is spare capacity, after all 2030 pathway projects have been assessed. NESO will also be able to make substitutions of the same technology

[66] See the connections reform annex for further detail on regional breakdowns of technology capacities.
[67] DESNZ & Ofgem (2023), *'Connections action plan: speeding up connections to the electricity network across Great Britain'* (viewed in December 2024)
[68] DESNZ & Ofgem (2024), *'Open letter from DESNZ and Ofgem: Aligning grid connections with strategic plans'* (viewed in December 2024).
[69] NESO (2024), *'Connections reform consultation'* (viewed in December 2024).

between zones to manage over- and under-supply, where this does not cause material network constraints.

To avoid impacting projects whose development is already well advanced, NESO has proposed that any project that has been awarded a Contract for Difference or Capacity Market contract, an Interconnector or Offshore Hybrid Asset Cap and Floor agreement, Merchant Interconnector approval, or has secured planning permission as a Nationally Significant Infrastructure Project or via relevant Town and Country Planning Acts (including through devolved governments' planning regimes), will be included in the new reformed connections queue provided they have also met the Gate 2 Readiness Criteria.[70] Government will also use the publication of the SSEP in 2026 to examine the mix of technologies and consider whether capacity reserved for undersupplied technologies should be released for other technologies.

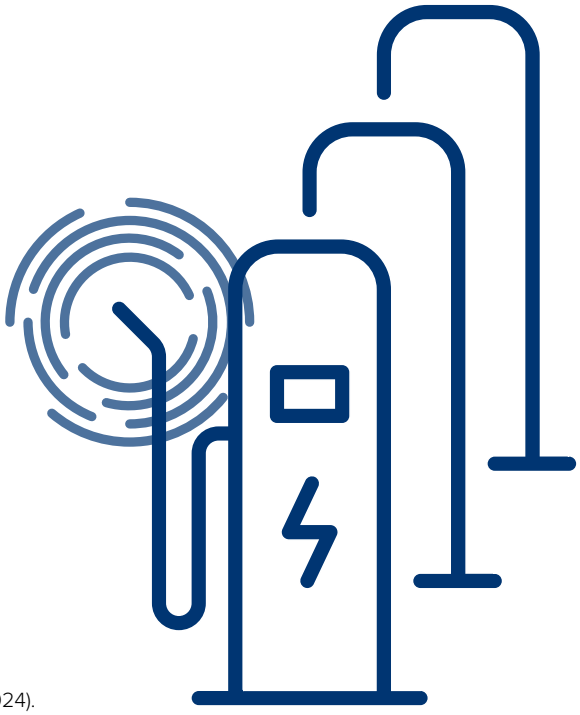
All parties involved must work at pace to secure swift and positive resolution of the reform process and explore all opportunities for faster implementation so that customers can received updated connection offers as soon as possible in 2025. In line with updating connection offers, the Transmission Owners will review and where necessary revise enabling and local works to comply with the requirements of the Security and Quality of Supply Standard. NESO also plays a role in ensuring overall compliance of the network with these standards.

Regulatory reform

Through its Accelerated Strategic Transmission Investment (ASTI) framework, Ofgem has prioritised the timely delivery of 26 large-scale strategically important transmission projects for delivery ahead of, or by, 2030. Of these, NESO have indicated that 21 need to be delivered by 2030 to deliver the Clean Power Plan. Delivery incentives apply to all 26 ASTI projects and Ofgem is building on this approach in future price controls for networks, which will be adaptive to efficiently fund additional build requirements. Timely delivery of these key projects remains very challenging and delivery incentives may need to be stronger to encourage ambition by the Transmission Owners.

To address these challenges, government will:

- Amend the Strategy and Policy Statement (which sets out government's strategic priorities that Ofgem must have regard to) to **ensure 2030 clean power and broader decarbonisation goals are sufficiently weighted in decision making** to approve strategic investments by network companies at an earlier stage.
- Work with Ofgem to explore the appropriateness of **tightening incentives and penalties for Transmission Owners and Distribution Network Operators** for delivery of strategically important network infrastructure. We will also work with Ofgem to ensure all incentives and penalties are robustly enforced.



[70] NESO (2024), *'Open letter on connections reform'* (viewed in December 2024).

Networks planning, land rights and consenting

Accelerating transmission and distribution network build required for 2030 is heavily dependent on the capacity of the planning system and wider reforms to planning and environmental requirements for all new energy infrastructure. This includes better resourcing of the planning system, reforms to consenting for energy projects in Scotland, and prioritisation of electricity networks projects in the consenting processes in England and Wales. Further details on these measures can be found in the Planning and Consenting for New Energy Infrastructure chapter.

At the distribution network level, current land rights processes in England and Wales can take between 2 to 4 years, which can lead to unnecessary delays[71]. A call for evidence undertaken by the previous government found that both network operators and landowners believe reform to these processes are necessary[72]. To address this, government will consult and engage in 2025 on proposals including:

- **Expanding planning consent exemptions** to include low voltage connections and upgrades, including upgrading single phase to three phase overhead lines (with voltage remaining the same) by amending the Section 37 regulations as they apply in England and Wales.
- **Opportunities to provide further flexibilities on the consenting of electricity substations.**

The National Policy Statement for Electricity Networks Infrastructure (NPS-EN5) sets out the government's position on undergrounding, which is that there is a starting presumption for overhead lines for large network projects. The exception to this is in nationally designated landscapes, where undergrounding is the starting presumption. This position takes into account factors including cost and environmental impacts, and the government's view is that this sets an appropriate balance between overhead lines and undergrounding.

Community engagement

To bring communities with us, we will need to better engage and provide assurance to communities and ensure they benefit from living near new onshore energy infrastructure. This government believes that it is a vital principle that communities that host clean energy infrastructure should benefit from it.

To recognise the vital role of communities living near new onshore transmission network infrastructure, government will deliver a strong package of community benefits. We will:

- **Publish voluntary guidance** to increase the quantum and consistency of Community Funds for transmission networks. This guidance will detail the recommended level of benefit, scope, eligibility, delivery costs, and the role of communities and developers.

To improve understanding of the need for new transmission infrastructure and better set the context for discussions with communities on new projects, the government will:

- Support the launch of a **public communications campaign** developed by industry with government support, to encourage public awareness on the importance of networks infrastructure in supporting net zero. This will be launched in early 2025.

[71] Energy Networks Association (ENA) (2023), '*Common sense plan for planning*' (viewed in December 2024).
[72] DESNZ (2024), '*Land rights and consents for electricity network infrastructure: summary of responses*' (viewed in December 2024).

These actions, alongside ongoing work of the government and our delivery partners, including Ofgem, NESO, and the Transmission Owners, will further accelerate networks projects that are critical to achieve 2030 Clean Power and reduce constraints on the network. They will ensure that communities benefit from hosting network infrastructure, reform the grid connections process to ensure timely connection for generation that is ready and is required for Clean Power 2030, and ensure that the network is ready for increasing electricity demand and continued development of low carbon generation post-2030.

Great British Energy

Setting up Great British Energy is one of government's first steps for change, putting the UK on the path to become a clean energy superpower. Great British Energy will be 100% owned by the British people, for the British people.

Our new publicly-owned energy company is designed to drive clean energy deployment to boost energy independence, create jobs, and ensure UK taxpayers, billpayers and communities reap the benefits of clean, home-grown energy. Great British Energy's project development and local power functions will help support the Clean Power 2030 mission, including through the development of up to 8 GW of local and community energy projects. We will continue to see its impact after 2030, ensuring we can meet future demand as we further decarbonise the economy out to 2050.

Great British Energy will benefit all four nations, and we are working hard to ensure its functions can complement the green energy initiatives across Scotland, Wales and Northern Ireland, creating jobs and building supply chains across the UK, while respecting the devolution settlements. Achieving our shared net zero targets, having greater control over our own energy resources, and increasing our energy independence are challenges for the whole of the UK, and this is an excellent opportunity to learn from each other's expertise and experience.

We are making rapid progress in establishing Great British Energy. In July, we published Great British Energy's Founding Statement, which set out its five functions: project investment and ownership; project development; supply chains; the Local Power Plan; and Great British Nuclear. We also announced Juergen Maier as the start-up Chair, alongside GBE's first major partnership with The Crown Estate. Since then, Great British Energy has announced its Aberdeen headquarters and made key policy decisions, including plans to collaborate with the National Wealth Fund to accelerate investments. And finally, we have secured £125 million in funding for 2025/26 so that GBE can start its important work to drive forward clean energy deployment.

This is just the start. Great British Energy will be capitalised with £8.3 billion over the current Parliament. Through its five functions, the publicly-owned company will help to create a better investment offer for privately-owned energy companies and international investors who will continue to play a significant role in our transition to an affordable, decarbonised power sector.

Renewable and nuclear project delivery

Summary

Electricity generated by renewables and nuclear power will be the backbone of a clean electricity system by 2030. Actions set out in other chapters, to lower barriers to planning and environmental consent, electricity network connection, and access to necessary supply chains and workforce will go a long way to increasing deployment of renewable technologies. However, even with success in these areas, there are outstanding and specific barriers that we face to deploy the renewables needed for a clean power system in 2030. There are also hurdles facing our nuclear fleet and the scaling up of emerging renewable technologies.

To lower and remove these, we will:

Improve the way Contracts for Difference are allocated, particularly for Allocation Round 7 (AR7), to support clean power delivery and ensure it can procure the capacities needed to hit the target.

Coordinate the interaction between wind turbines and civil aviation and defence infrastructure, working to find mitigation solutions and unlock deployment of planned offshore and onshore wind projects.

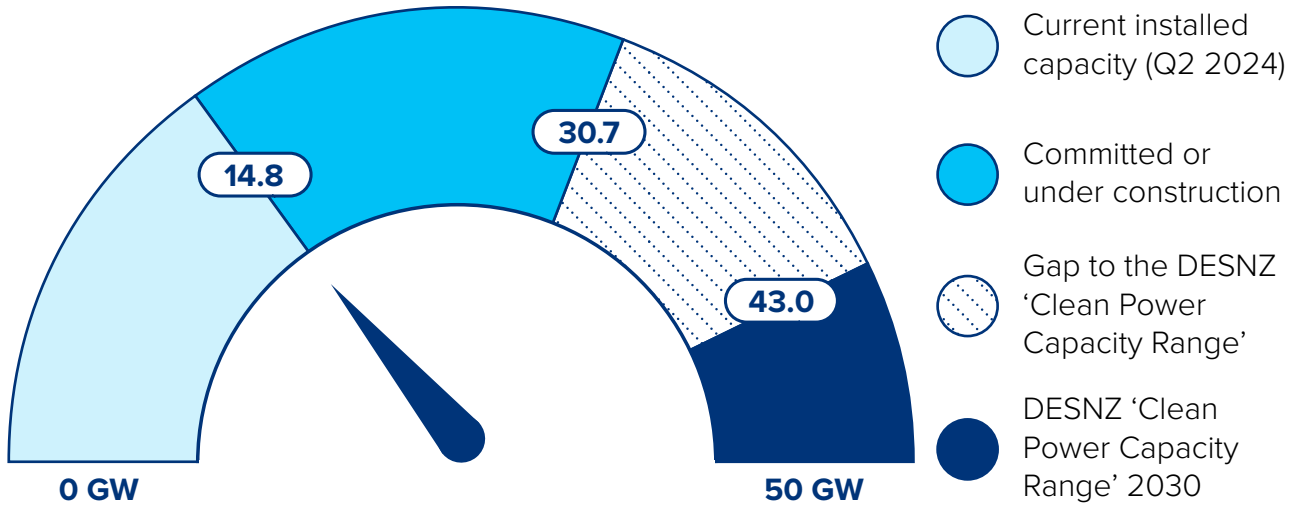
Leverage Great British Energy and deploy further policy measures to increase the rollout of local and community generation, including for homes, businesses, public buildings and land, and shared spaces.

Manage assets reaching the end of existing government support terms to minimise any capacity that may be lost before 2030, including through supporting repowering through the Contracts for Difference scheme.

Work with EDF to support the delivery of Hinkley Point C and support the development and technology readiness of emerging clean technologies that will play an important role beyond 2030.

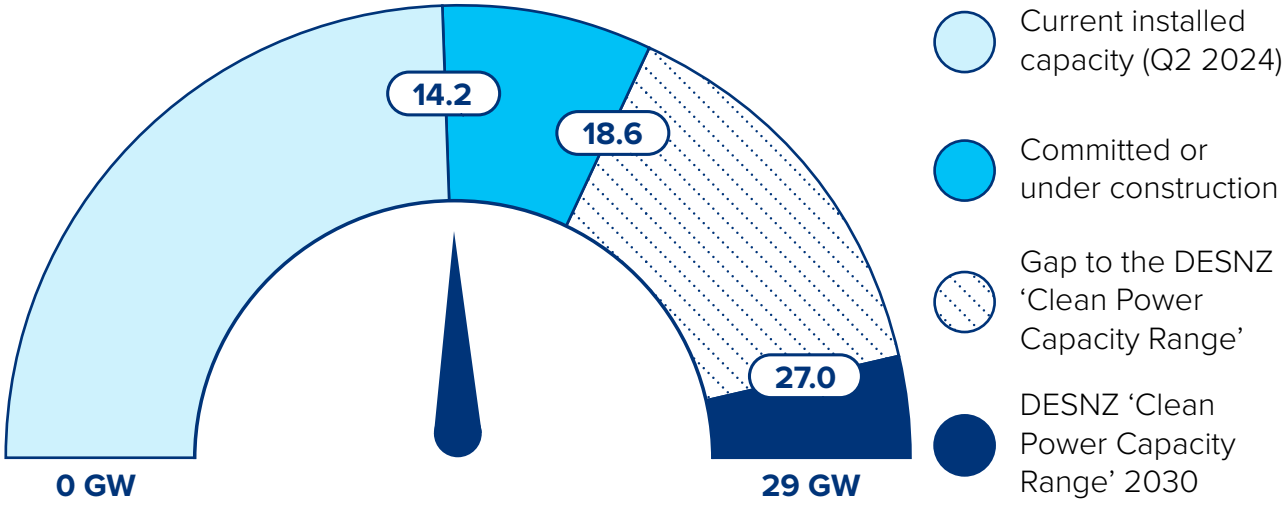
Offshore Wind

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



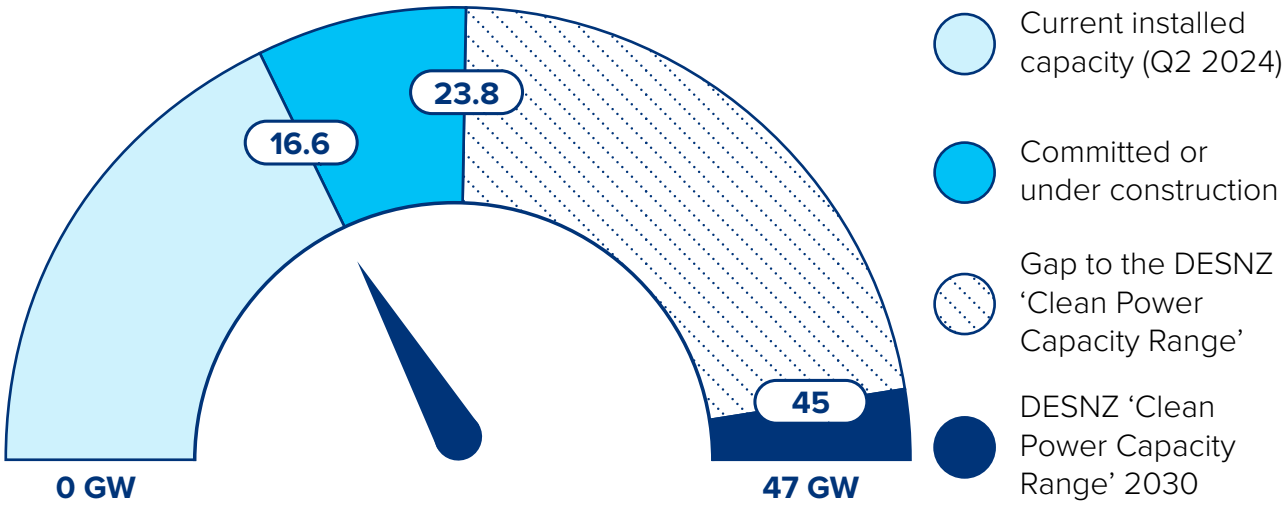
Onshore Wind

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Solar

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Source(s): Table 1, Low Carbon Contracts Company (LCCC) (2024), '*CfD register*' (viewed in November 2024).

Notes: Committed / under construction is defined as projects that have secured a Contract for Difference (CfD) but not yet become fully operational. For onshore wind and solar PV, 'merchant' (non-CfD) capacity that has not yet deployed has not been counted. Any pre-2030 asset retirements are not considered in these estimates.

The challenge

Renewable technologies will form the foundation of our clean power system, and we need to see very significant deployment to make this a reality. Meeting the renewable capacities set out in the DESNZ 'Clean Power Capacity Range' is achievable, but will require deployment at a sharply accelerated scale and pace. This can only be delivered by unblocking delivery challenges throughout the development lifecycle.

Accelerating delivery is exceptionally critical for **offshore wind**, where lead times for projects are often more than a decade[73]. This means that all that can be deployed by 2030 has either already been consented or is in the development and consenting process. Procurement and final investment decisions of these projects will need to be in place over the next 1-3 years.

There is greater potential to bring new **onshore wind** and **solar** projects forward and deliver additional capacity beyond what is already planned by 2030, due to shorter lead times[74]. But again, many 2030 projects are likely to already be in various stages of development, and final investment decisions on these projects will still need to be made well before our 2030 target.

Actions in this chapter, alongside cross-cutting enablers set out in other chapters, will support the delivery of renewable generation projects by de-risking the existing pipeline, accelerating new projects through the pipeline, and maximising the potential of existing capacity as assets approach end-of-life.

Nuclear power will also play a key role in achieving Clean Power 2030 and beyond by providing low-carbon, baseload generation on the system.

Taking action

Improving the way that Contracts for Difference are allocated to support 2030

The Contracts for Difference (CfD) scheme is the government's flagship policy for incentivising new low carbon electricity generating projects in Great Britain. The CfD and its predecessor investment contracts have seen around 9 GW of renewables start generating under them already, with a further 26 GW contracted to become operational by 2030[75].

Though the CfD has delivered substantial volumes of renewable capacity over the last decade, AR5 was a round that failed to deliver any offshore wind, which was a massive setback for industry and meant consumers were left more exposed to fossil fuel markets. We need consistency of success and scaling up to protect customers and meet Clean Power 2030. There is currently around 31 GW of either constructed or contracted offshore wind capacity. This will need to rise to 43-50 GW in 2030. The government will therefore seek to secure at least 12 GW across the next two to three allocation rounds – AR7, AR8 and, depending on the speed at which projects deploy, AR9.

This government has shown its ability to get the offshore wind sector back on its feet. While AR5 secured 0 GW of offshore wind, AR6 supported over 5 GW, at a price that was cheaper to build and operate than new fossil fuels. The government will ensure it secures the right volumes of offshore wind at a competitive price.

It is also the case that industry has long been calling for CfD reform to remove some of the uncertainty and give greater line of sight to support industrial strategy. That is why the government is developing

[73] DESNZ (2023), '*Seizing Our Opportunities: Independent Report of the Offshore Wind Champion*' (viewed in November 2024).
[74] DESNZ (2023), '*Electricity generation costs 2023*' (viewed in December 2024).
[75] LCCC (2024), '*CfD Register*' (viewed in December 2024).

targeted reforms to the CfD mechanism to ensure it is able to support the volume of new capacity – in particular, fixed-bottom offshore wind – needed to deliver the renewable contribution to the Clean Power 2030 target whilst continuing to minimise the costs of doing so to consumers. Subject to further assessment, including of the merits, feasibility and any further consultation where relevant, for AR7, the government is currently minded to implement:

- **A relaxation of CfD eligibility criteria for fixed-bottom offshore wind projects** to permit projects that have not yet obtained full planning consents to participate in near-term allocation rounds. This would award CfDs at an earlier stage in the offshore wind development cycle compared to the current model. Coupled with wider reforms, this could improve competition and enable earlier supply chain engagement.
- **Changes to what information the Secretary of State uses to inform the final budget for fixed-bottom offshore wind**, to avoid a repeat of AR5 and cost effectively maximise the volume of capacity that could be contracted from each round. This includes providing greater visibility over sealed bid information for the Secretary of State ahead of finalising the budget, so that there can be more certainty on how much capacity a given CfD budget will procure.
- **An auction schedule**, including capacity ambitions for upcoming allocation rounds, to improve transparency and predictability in the timing and scale of ambition for the CfD.
- **A review of auction parameters**, including our approach to Reference Prices (estimates of the average GB market price for electricity) used to estimate the budgetary impact of projects bidding into allocation rounds. The government recognises industry concerns and feedback about Reference Prices and the implications for CfD budgets and is seeking to ensure these concerns are balanced with our strong ambitions for the power sector for 2030 and beyond.

Alongside increased certainty around the auction and the potential capacity it can secure, **the government is also considering changes to CfD contract terms that would give longer market certainty once contracts are awarded,** including consideration of the merits of increasing the current 15-year CfD term to reduce overall project costs. The department intends to consult on this in early 2025, and to move ahead, would need evidence that this was in the interests of consumers.

Given the level of investment required, the government recognises the need to ensure that reforms provide stability and confidence to the sector, including the supply chain, and are delivered in a timely way. The government will consult on reforms in early 2025 ahead of the next allocation round, with a view to implementing any changes in time for Allocation Round 7 to open in summer 2025.

In addition to these proposals, there are wider measures that contribute further to ensuring the CfD mechanism is fit for purpose, including the Clean Industry Bonus (see the ‘Supply chains and workforce’ chapter) and reforms to the network charging regime in time for future CfD allocation rounds (see the ‘Reforms to electricity markets’ chapter).

Coordinating the interaction between wind turbines and civil aviation and defence infrastructure

Wind turbine generation must be done in a way that does not interfere with aviation and defence surveillance systems. At present, requirements are placed on proposed onshore and offshore wind projects that are impacting upwards of 20 GW[76] of capacity. The identification and implementation of interim and enduring solutions to this long-standing problem is therefore critical for Clean Power 2030.

The government has been working with the Offshore Wind Industry Council via a Joint Taskforce to drive collaborative agreements, seeking to find solution(s) so that offshore wind and military radar infrastructure can coexist now and in the future. The Onshore Wind Industry Taskforce has established its working group on aviation and defence to review the same issues.

Military radar

The Ministry of Defence (MoD) has launched Programme Njord, which will work with colleagues from DESNZ, The Crown Estate, Crown Estate Scotland, the devolved governments and the Offshore Wind Industry Council to identify, procure and implement a mitigation to resolve this problem for military radar.

The full costs of the long-term radar mitigation solutions identified by Programme Njord will be funded via an alternative route, delivered by government, and the funding requirement is therefore removed from **offshore wind** developers.

For **onshore wind** development which impacts military aviation, DESNZ and MoD are working at pace to seek an acceptable mitigation.

Civil radar

- DESNZ and the Department for Transport are working with the Civil Aviation Authority and the aviation industry to **agree a transparent and fair process to resolving objections**.
- The Onshore Wind Industry Taskforce is exploring the best specific approach, and will set out further detail to mitigate civil radar objections in the upcoming Taskforce Policy Statement.

Eskdalemuir

The Eskdalemuir Seismic Array is a facility in southern Scotland monitoring global nuclear activity. Wind turbines produce seismic ground vibrations which can compromise the Array. To safeguard the Array, MoD manages a finite seismic noise capacity to prevent compromising the detection capabilities of the Array. Scottish Government, MoD and DESNZ are collaborating to implement an updated approach to managing onshore developments around the Array.

- **MoD are consulting on their approach to safeguarding the Array, and following further work being undertaken by MoD the Scottish Government will consult on its development management guidance for new onshore wind projects in the Eskdalemuir consultation zone**. This will include a proposal on how onshore wind can be maximised within the array's consultation zone.
- The Onshore Wind Industry Taskforce will continue to examine these issues and will report by Spring 2025, covering a range of issues from supply chains and skills, to aviation and defence.

[76] Internal estimate based on stakeholder engagement.

Great British Energy Project Development

Developers are facing high risks, rising costs, and lengthy delays to energy projects developed in the UK, slowing down our rate of deployment. Alongside process change, the UK needs significant delivery acceleration in order to meet Clean Power 2030. GBE will accelerate the delivery of onshore and offshore clean energy projects by leading or co-leading (alongside public and private sector partners) projects through the pre-development phase and, in some cases, construction and operation – getting shovels into the ground quicker and improving UK energy security through publicly-owned energy projects.

- On private land, **GBE will align with NESO's publications and the government's response to identify locations for new generation projects** where additional capacity is needed to support the UK's spatial and wider energy system needs. GBE will work in partnership with the private sector to deliver these opportunities and provide a service that is additional to the market, maximising geographical opportunities and speeding up deployment of clean energy.
- **GBE will also undertake development on public land**, unlocking additional scope for generation capacity on government-owned estates to support decarbonisation, including in partnership with the private sector. GBE will seek to work with government to access the land and actively partner with government landowners who will host generation assets and provide power directly to public buildings, in addition to connecting into the grid.

Developing on both public and private land will support large-scale generation capacity in key strategic areas of the UK, improving system efficiency and accelerating the overall rate of deployment.

Unlocking local and community energy

Much of the generation capacity that will be deployed by 2030 is likely to come from large-scale, commercial energy infrastructure. However, local and community renewable energy will also play a vital role in delivering our ambitions, contributing to the capacity mix on an aggregate basis, delivering significant local benefits and reducing network system losses by bringing generation supply closer to electricity demand. Local and community power generation can contribute significantly to the prosperity of local places, driving down electricity bills, encouraging people to engage with the green economy, providing energy resilience, and promoting skilled jobs.

- That is why one of GBE's five functions will **provide support to deliver the Local Power Plan, putting local authorities and communities at the heart of restructuring our energy economy**. GBE will partner with, and provide funding and support to Local Authorities, Mayoral Combined Authorities, Community Energy Groups and others, as well as working with and through the devolved governments, to roll out local and community energy projects (mainly onshore wind and solar) to develop up to 8 GW of clean power in England, Scotland, Wales and Northern Ireland in support of the Clean Power 2030 Mission.

Alongside the work of GBE, government is also taking specific actions to remove barriers to, and further the deployment of, local energy. These will support deployment across local settings:

In homes and local businesses:

There is great potential for rooftop solar installation across the UK's warehouse and industrial sectors. Research commissioned by UK Warehousing Association (UKWA) indicates that the UK's 20% largest warehouses alone can provide 75 million square metres of roof space, and all warehousing roof space has the potential to support up to 15 GW of rooftop solar capacity[77].

- The Solar Taskforce has examined government and industry actions that can unlock this potential through its rooftop subgroup and will publish the Solar Roadmap in Spring 2025.

New standards will be introduced next year which will amend the energy efficiency standards in the Building Regulations in England. This will ensure all new homes and buildings in England are zero-carbon ready, meaning they will become zero-carbon when the electricity grid decarbonises without the need for any retrofit work. The Future Homes and Buildings Standards consultation was published in December 2023 and closed in March 2024. It set out detailed technical proposals for what future standards could entail, including proposals relating to solar panels.

- **We are reviewing proposals and feedback from the consultation and will publish the government response in due course.**

As part of the government's Warm Homes Plan, we are considering the role that finance may play in supporting homeowners with the upfront costs of energy efficiency improvements, solar panels, and installing low carbon heating.

[77] UK Warehousing Association (UKWA) / Delta Energy & Environment (2022), '*Investment case for rooftop solar power in warehousing*' (viewed in December 2024).

- Solar can be a cost-effective way to lower energy bills for fuel poor households, especially when paired with the adoption of a heat pumps, and **is an eligible measure in existing programmes like the Warm Homes Local Grant and Warm Homes Social Housing Fund. We will provide further details on how else solar could be supported in the Warm Homes Plan after the second phase of the Spending Review.**

In shared spaces:

Outdoor carparks provide potential to deploy solar canopies providing clean electricity, potential for electric vehicle charging and shelter for cars. Following the implementation of a new permitted development right to allow for the installation of solar canopies in non-domestic off-street carparks in England, it is now easier and quicker to deploy this technology.

- **The government will assess the potential to drive the construction of solar canopies on outdoor carparks over a certain size through a call for evidence next year.**

Finally, the National Wealth Fund's local authority advisory and lending function has a £4 billion capitalisation. It offers: commercial and financial advisory services to help local authorities undertake ambitious projects with confidence; and, lending on flexible terms at a market leading rate to local authorities who are developing projects, including in the clean energy sector.

Managing assets reaching the end of existing support

The UK-wide Renewables Obligation (RO) scheme was introduced in 2002 for GB (2005 for Northern Ireland) and it currently supports around 30% of the UK's electricity supply[78]. It is made up of three separate but complementary obligations covering England and Wales, and Scotland and Northern Ireland, and it closed to most new entrants in 2017. The Scottish Government runs the Renewables Obligation Scotland Scheme and we are working with them as we look forward to the next stages of the RO.

From 2027 onwards a large volume of renewable assets will stop receiving RO support. In total, across the GB RO schemes, around 1,000 active RO generators at approximately 9 GW of capacity will be reaching the end of subsidy by December 2030[79]. If these assets retire early, the renewable deployment required to achieve Clean Power 2030 targets and CB6 would have to increase to replace this lost renewable generation.

- We have surveyed existing RO generators to gather site-specific evidence on future plans and **are conducting further analysis to inform possible policy options to manage this risk**.
- We have already made a decision to **enable access to the CfD for repowered onshore wind from Allocation Round 7**[80] to ensure there is a route to continued generation for projects that require significant capital investment to continue operations.
- We are also implementing wider measures that will support the repowering and life extension of renewable assets, including through planning policy and through Ofgem's work on Offshore Transmission Owner (OFTO) asset life extensions.

[78] Ofgem (2024), '*Renewables Obligation (RO) Annual Report 2022-23 - (Scheme Year 21)*' (viewed in December 2024).
[79] Ofgem (2024), '*The Renewables and CHP Register*' (viewed in December 2024).
[80] DESNZ (2024), '*Consultation outcome: Proposed amendments to Contracts for Difference for Allocation Round 7 and future rounds*' (viewed in December 2024).

Biomass: existing low-carbon firm & flexible generation

Sustainably sourced biomass can be used as a low carbon fuel for renewable electricity generation[81] and so could play an important role in Clean Power 2030 by providing flexible or firm generation. Last year, biogenic sources of electricity, including conventional biomass, anaerobic digestion and biogenic energy from waste provided nearly 34TWh (equivalent to 25% of all UK renewable electricity and 12% of overall electricity generation)[82].

Support arrangements for a variety of large and small-scale biomass generators (including biogas technologies) conclude by 2030, or earlier. The previous government consulted on future support for large-scale biomass[83]. The current government is considering whether there is a strong value-for-money case to provide future support for these generators. Any future support would need to have greater protection for consumers and would be subject to robust sustainability criteria. No decisions have yet been taken; however, we plan to respond to the consultation shortly.

Large scale biomass plants also have the potential to transition to power BECCS. This carbon capture technology can combine the conversion of sustainable biomass, biogas and biogenic wastes into electricity while capturing a high percentage of the CO_2 emissions contained in that biomass in long-term storage in geological sequestration. Large scale power BECCS has the potential to support low carbon electricity and deliver negative emissions, helping to balance residual emissions from hard-to-abate sectors.

Nuclear and emerging technologies

Nuclear

Nuclear will play a key role in achieving Clean Power 2030 in the United Kingdom and our long-term net zero objectives by providing firm, low carbon baseload power at scale to generate alongside intermittent renewable generation – see Table 2.

[81] DESNZ (2023), '*Biomass Strategy*' (viewed in December 2024).
[82] DESNZ (2024), '*DUKES*' (viewed in December 2024).
[83] DESNZ (2024), '*Transitional support mechanism for large-scale biomass electricity generators*' (viewed in December 2024).

Table 2: Nuclear reactors that will impact installed capacity in 2030

Nuclear Power Station	Type of reactor(s)	Capacity	Status
Heysham 1	Advanced gas-cooled reactor	1.1 GW	Online – currently expected to come offline in 2027
Hartlepool	Advanced gas-cooled reactor	1.2 GW	Online – currently expected to come offline in 2027
Heysham 2	Advanced gas-cooled reactor	1.2 GW	Online – currently expected to come offline in 2030
Torness	Advanced gas-cooled reactor	1.2 GW	Online – currently expected to come offline in 2030
Sizewell B	Pressurised water reactor	1.2 GW	Online – currently expected to come offline in 2035
Hinkley Point C	European pressurised reactor	3.2 GW	Construction – expected to come online between 2029 and 2031

To help deliver Clean Power 2030, government will work with EDF to support the delivery of Hinkley Point C, with Unit 1 scheduled for completion between 2029 and 2031, enabling consumers to benefit from the project's generation as soon as possible. EDF have also confirmed they will be further extending the lives of the four generating Advanced Gas-cooled Reactor (AGR) stations, following inspections and regulatory approvals. This means that two of the AGR fleet, Heysham 2 and Torness, are expected to be generating and providing clean power until 2030.

The impact of these activities could be significant in helping ensure a reliable supply of low-carbon electricity, reducing greenhouse gas emissions, and supporting the overall decarbonisation of the power sector. However, there are uncertainties associated with having Hinkley Point C online by the end of the decade, given delays in the past few years.

As set out in the Budget, the government is also progressing the post-2030 generation interventions, with final decisions on Sizewell C and the Great British Nuclear-led Small Modular Reactor programme to be taken at the Spending Review. The government will continue to seek to streamline regulatory processes, and foster innovation in nuclear technology, to ensure that new nuclear continues to play an important role in the net zero transition after 2030. We also acknowledge the policy of the Scottish Government is not to support new nuclear developments in Scotland.

Emerging renewable technologies

Whilst emerging renewable technologies, like floating offshore wind and tidal stream, are expected to play a limited role in the 2030 energy mix, our ability to deploy them at scale could be important to the UK's achievement of longer-term decarbonisation objectives. For example, floating offshore wind could unlock the ability to take advantage of the strong winds at deeper water depths, providing additional capacity as our seabed becomes increasingly constrained. Emerging technologies could also provide broader system benefits,

including by enabling renewables deployment in a wide range of locations or power generation that is uncorrelated with other energy sources, such as tidal stream.

In addition, early investment in the deployment of emerging technologies like floating offshore wind could provide wider economic benefits and export opportunities for the UK.[84] The Supply Chains and Workforce chapter sets out further detail on how government is realising these benefits, such as through the Floating Offshore Wind Manufacturing Investment Scheme.

The UK already has the world's largest pipeline of floating offshore wind projects based on confirmed seabed exclusivity, including around 25 GW already in development in Scotland. The Crown Estate has made available seabed capable of supporting up to a further 4.5 GW in the Celtic Sea, and the partnership announced between GBE and The Crown Estate will bring forward new offshore wind developments.

The government will continue to work with the industry to identify ways to support the development of innovative new renewable generation technologies to ensure that they can play the necessary role in the UK's long term energy mix. The government response to the consultation on amendments to the Contracts for Difference scheme announced that floating offshore wind projects successful in future allocation rounds would be granted the ability to build out in up to three phases, providing developers more flexibility in the construction phase and reducing project risk[85]. The National Wealth Fund will also continue to explore opportunities to finance nascent renewable generation projects, seeking to mobilise private capital into them and enable final investment decisions to be reached.

Next steps

We expect the actions set out above, delivered alongside cross-cutting enabling actions in other chapters, will set the framework for the delivery of renewable and nuclear deployment needed to meet the 2030 clean power capacity range. But there will be further action required to get these projects over the line, and the Clean Power 2030 Unit will continue to work across government, the devolved administrations and industry to ensure the implementation of enabling actions.

This includes through the ongoing work of the Offshore Wind Industry Council, the Solar Taskforce and the Onshore Wind Industry Taskforce, and through addressing delivery risks for renewable projects as they emerge (see the below case study as an example).

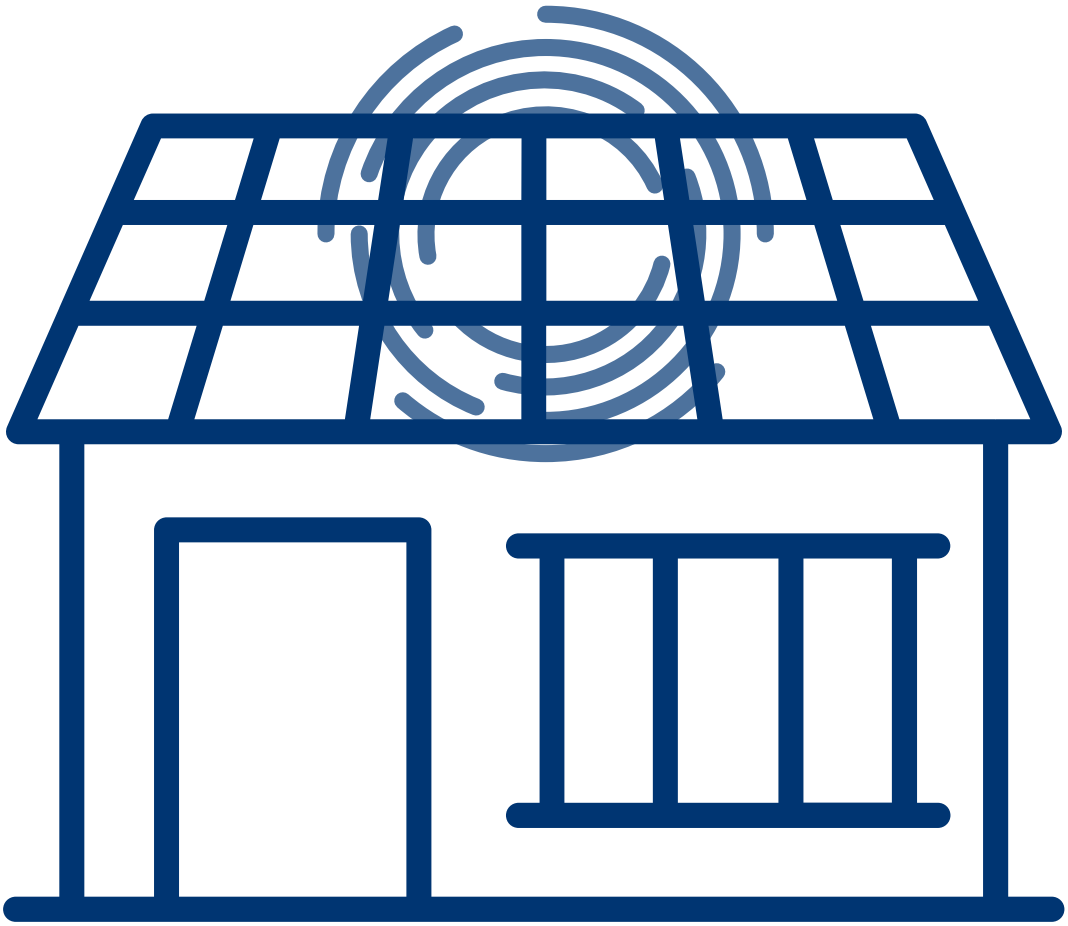
In the devolved nations, work is also underway to deliver this GB-wide target, with actions such as the Scottish Government's forthcoming Solar Vision, whose commitments will enable greater deployment of solar in Scotland.

Key upcoming milestones:

- The Solar Roadmap and the Onshore Wind Industry Taskforce report will both be published by Spring 2025.
- Consultation on relevant reforms to the Contracts for Difference scheme will be issued in early 2025.
- The consultation response on the Future Homes and Buildings Standards will be published in due course.

[84] The Crown Estate (TCE) (2024), '*Supply chain for Celtic Sea floating wind farms could power 5,000 new jobs and a £1.4bn boost for the economy*' (viewed in December 2024).
[85] DESNZ (2024), '*Contracts for Difference for Low Carbon Electricity Generation, Government response to the consultation on policy considerations for future rounds of the Contracts for Difference scheme*' (viewed in December 2024).

- Further details on the Warm Homes Plan will be announced after the second phase of the Spending Review.
- A call for evidence on the potential to drive solar canopies on carparks over a certain size will be issued next year.
- The consultation response on proposed transitional support for large-scale biomass will be published in due course.



Case Study: Management of emerging risks for project delivery – wake effects

Wake effects occur when wind turbines disrupt airflow to other turbines and reduce the energy production of those projects.

New projects with larger and/or a greater number of turbines have an even greater propensity to cause wake effects on existing downstream operational projects. Historically, this has been resolved outside the planning system, but a precedent was set with a wake condition in the 2023 Awel y Mor Development Consent Order, which said "No part of any wind turbine generator shall be erected as part of the authorised development until an assessment of any wake effects and subsequent design provisions to mitigate any such identified effects as far as possible has been submitted"[86].

As we radically accelerate the deployment of offshore wind in the UK to meet our 2030 target, we understand the uncertainty that this emerging issue has introduced both on operational windfarms and those in development, including the approximately 10 GW of pre-2030 offshore wind capacity currently in the planning system.

The Clean Power 2030 Unit would look to convene expert opinions from planners, engineers, academics, project delivery, data scientists and policy to understand the levers we can pull in this space, working with stakeholders like The Crown Estate, Crown Estate Scotland, the Planning Inspectorate, ORE Catapult and industry to gather the data and build an evidence base, looking for comparison mitigations with international partners and other industries.

[86] Statutory Instrument (2023), *'Infrastructure Planning: The Awel y Môr Offshore Wind Farm Order 2023'* (viewed in December 2024).

Reforming our electricity markets

Summary

Delivering Clean Power by 2030 requires an ambitious and actively planned approach from both government and business. Action is needed to shape and enable effective markets. This approach is central to the development and operation of the 2030 system and will only grow in importance as the system becomes more distributed and flexible in 2030 and beyond. To be successful in delivering clean power by 2030, we need to:

- **Support investor certainty** by ensuring wholesale market reforms, as being developed under the Review of Electricity Market Arrangements (REMA) programme, are delivered quickly and progress towards delivery is communicated clearly. We will do this by:
  - Publishing a REMA update alongside this 2030 Action Plan to provide further clarity on how our future electricity market might be designed;

  - Committing to a decision across the REMA programme by around mid-2025 and in time for the next CfD allocation round (AR7); and
  - Supporting interim measures from NESO and Ofgem, in the balancing market and on TNUoS respectively, whilst the REMA programme is completed.
- **Reform the Capacity Market** to provide clear and viable routes to decarbonisation for unabated gas, enable low-carbon flexible capacity, including consumer-led flexibility to increase its contribution to security of supply, and incentivise investment into existing capacity.
- **Accelerate reforms** to **balancing markets**, maintain **system operability** and reforms to **network charging** to ensure that the electricity system can be operated securely and cost effectively.
- **Unlock the full potential of consumer-led flexibility** through timely delivery of Market-wide Half Hourly Settlement in the retail market

The measures set out in this chapter seek to bring forward investment in low-carbon generation and flexibility while driving efficiencies in market operation. The proposals below address the more immediate challenges in our electricity system and will work alongside our ongoing efforts to drive the rollout of low-carbon generation and transition away from unabated gas generation while maintaining security of supply.

The challenge

While the state must play a role as system architect, markets are, and will, remain central to the development, delivery, and operation of the power system. It is widely accepted that the set-up of our electricity market with associated regulation and incentives needs to adapt to the future shape of our renewables-dominated power system. This need to adapt is recognised in the range of reform programmes and measures being undertaken by government, including REMA, which is considering the enduring market arrangements which are needed for the 2030s and beyond.

The delivery of clean power by 2030 needs to proceed at pace whilst we ensure that electricity markets are redesigned for the long term. Given the impact that market reforms will have on the long-term future of our energy system, it is crucial the potential reforms are properly and robustly considered. We recognise that in order to invest and build at the scale and speed necessary to deliver our 2030 target, the government must provide investors with greater clarity on short term risks, and long-term outcomes from policy and market changes. Therefore, this chapter sets out a clear way forward and timeline on this programme of work, together with the accompanying REMA update published alongside this plan.

Taking action

We have identified four key areas which require action and a clear direction of travel, to enable the delivery and maintenance of a clean power system by 2030. Some of these actions require additional policy development, while other areas require the acceleration of existing reforms to resolve existing challenges in the market. These actions are:

- Setting a clear direction of travel for wholesale market reform
- Reforming the Capacity Market
- Accelerating reforms to balancing markets, maintaining system operability and reforms to network charging
- Reforming the retail market to deliver better for consumers

Setting a clear direction of travel for wholesale market reform

Government seeks to reduce the uncertainties arising from policy and regulatory change as much as possible, to minimise the extent of policy and regulatory risks, which can be a significant barrier to investment. We have considered a wide range of options for wholesale market reform. Alongside this Action Plan, the government has published an Autumn Update on REMA providing greater clarity on the status of the different longer-term options for market reform. It is clear that "no change" is not an option in any scenario.

We have narrowed down policy development to improve locational and operational signals to two sets of options: zonal pricing (where the single electricity wholesale market is split into several zones) and retaining national pricing alongside a range of reforms to its existing arrangements. Whilst no decision has yet been taken between zonal pricing or reformed national pricing, and both options are under equal consideration, significant progress on narrowing down the options has been made, with policy development continuing at pace.

We are continuing to conduct further analysis and are aiming to conclude the policy development phase of the REMA programme across all policy areas by mid-2025. We will ensure that these REMA timelines align with the timetable for the next CfD allocation round (AR7). We plan, therefore, to announce the final decisions on REMA and the timetable for their implementation, particularly in relation to wholesale market reform and any transitional or legacy arrangements, before the AR7 auctions open, giving investors clarity for prospective bids. We will aim to provide ongoing clarity to industry, where possible, throughout the decision and transition periods.

We recognise that significant market reform creates uncertainty for investors and market participants. Government recognises the potential implication for cost of capital of transferring locational risk to generators. We will take these factors into account in our Cost-Benefit Analysis and in final decisions on whether to introduce zonal pricing or reformed national pricing. However, no change is not a viable option given the significant changes in the generation mix that will take place. In the REMA publication we provide an update on policy development for legacy and transitional arrangements. This includes:

- Confirming our commitment to **treat agreements under the next CfD allocation round in the same way as existing CfD agreements**, in relation to any legacy or transitional arrangements.
- Setting out our expectation that **if zonal pricing was to be introduced, existing and AR7 CfD contracts would be amended to use a local zonal reference price**, insulating these agreements from zonal price risk.

Reforming the Capacity Market: Short-term changes to ensure security of supply and support the transition to Clean Power 2030

As Great Britain's primary mechanism for ensuring security of supply, we are proposing a suite of near-term reforms to the Capacity Market that will contribute to both Clean Power 2030 and Great Britain's electricity security. These changes are critical to ensure continued investment in and the commercial viability of assets critical to security of supply.

The Capacity Market is a well-established, technology-neutral scheme in which existing and new-build electricity capacity (in the form of generation, interconnectors, consumer-led flexibility and other technologies) receive revenue (£/MW) based on capacity. Participants secure agreements through auctions which require them to make capacity available at times of system stress.

The nature of risks relating to electricity security faced by the system are changing. As the amount of renewable generation increases, reform is needed in order to meet peak demand in an increasingly electrified economy or demand over periods of low renewable output. Flexible technologies can, and will, play a critical role in enabling the safe transition away from gas to clean power and the Capacity Market will adapt to this new landscape. Government is taking steps now to reform the Capacity Market to provide clear and viable routes to decarbonisation for unabated gas, enable low-carbon flexible capacity to increase its contribution to security of supply, and incentivise investment into existing capacity to ensure security during the transition to Clean Power[87,88].

Measures aimed at supporting the decarbonisation of existing and new unabated gas assets include:

- Consulting on an exit pathway for unabated gas plants with multi-year agreements to leave the Capacity Market without penalty and transfer to a Dispatchable Power Agreement, facilitating conversion to power CCUS once the technology is available.
- Calling for evidence on *additional* pathways that could be implemented in the future to enable decarbonisation of unabated gas, such as conversion to Hydrogen to Power.
- Placing an obligation on power plants. This includes all substantially refurbishing power plants and new combustion power plants participating in the 2026 Capacity Market auction to declare that they will comply with new Decarbonisation Readiness legislation recently introduced alongside these proposed changes to the Capacity Market. This legislation will require new build and substantially refurbishing unabated gas and other combustion power plants in England to be built in such a way that they can readily convert to hydrogen-firing or by retrofitting carbon-capture technology within the plant's lifetime[89].

In parallel, the government is actively developing proposals to improve our understanding of the system's capacity and to ensure electricity security during the transition to Clean Power by:

[87] DESNZ (2024), '*Consultation: Capacity Market: proposals to maintain security of supply and enable flexible capacity to decarbonise*' (viewed in December 2024).
[88] DESNZ (2024), '*Call for Evidence: Capacity Market: call for evidence on proposals to maintain security of supply and enable flexible capacity to decarbonise*' (viewed in December 2024).
[89] Draft Statutory Instrument (2024), '*The Environmental Permitting (Electricity Generating Stations) (Amendment) Regulations 2024*' - provisionally expected to come into force from 28 February 2026 (viewed in December 2024).

- Exploring future options for developing NESO's modelling of longer-term capacity needs, including indicative future capacity targets eight years ahead depending on responses to the call of evidence published in October. As the grid decarbonises, it is particularly important to ensure we have as much clarity regarding future capacity needs as possible.

- Making it easier for refurbishing plants to access multi-year Capacity Market agreements, providing greater revenue certainty and encouraging the type of investment that ageing plants need to extend their operating life.

The government recently published a policy update on the Capacity Market Phase 2 policies.[90] The government intends to introduce these proposals ahead of next year's Capacity Market prequalification window. This includes:

- Enabling low-carbon technologies to access 3- year agreements with no capex thresholds, facilitating CM access and supporting investment in low carbon, low capex technologies, and

- Introducing a new 9-year capex threshold for low carbon projects, so that new and refurbished projects with costs which fall between the existing 3-year and 15-year threshold are not prevented from coming forward in the Capacity Market.

Consumer-led flexibility involves voluntary actions taken freely and directly by energy consumers to shift their electricity use. This enables consumers to be rewarded with cheaper electricity by flexibly adjusting their usage to times of lower demand on the grid. The government is reducing administrative barriers to consumer-driven flexibility. Building on feedback already received from industry the government will publish a package of proposed changes to the Capacity Market shortly, that aims to improve the contribution that consumer-driven flexibility can make to our electricity security. This will seek views on how to better value, integrate and incorporate consumer-led flexibility within the Capacity Market.

Maintaining operability and managing constraints

Rapid progress will need to be made to ensure that the electricity system can be operated securely and cost effectively using zero carbon ancillary services. In the nearer term, this will include overcoming barriers to more advanced IT and digitalisation, including integrating new technology into NESO's control room. Additional changes to the wider market are needed to help ensure decarbonised system operability, including constraint management. These changes will help to ensure continued investment in renewables and reduce costs.

NESO will continue developing short and medium-term balancing service markets, in order to help deliver a cost-efficient system: NESO's Roadmap[91] outlines measures to enhance utilisation of batteries in providing flexibility services and introduce new stability and voltage markets to increase accessibility to low-carbon technologies. Further detail on measures to enhance the efficiency of batteries are outlined in the Short-duration Flexibility chapter.

NESO are also leading on a **Constraints Collaboration Project** with industry, to develop options for improved constraint management. The project aims to reduce these costs to consumers by implementing market-based constraint management measures. Initial assessments indicate potential savings of up to 6% of thermal

[90] DESNZ (2024), *'Capacity Market: Policy Update – 2023 Phase 2 Consultation'* (viewed in December 2024).
[91] NESO (2024), *'NESO Roadmap'* (viewed in December 2024).

constraint costs per annum compared to the current balancing mechanism[92].

This includes the potential for constraint management markets and the use of technical solutions such as the use of storage to increase the flow of electricity over constraints. The outcomes of this project should be available by early 2025. We will consider the outcomes of this project as part of the ongoing REMA programme.

There are several policy initiatives planned to maintain system operability through low-carbon flexible assets as the proportion of variable renewable generation grows:

- **An electricity system operability strategy for 2030.** This will provide clarity on how NESO will maintain system operability in a way that is consistent with Clean Power 2030, at best value to the consumer. The strategy will be published by NESO and we will work with NESO, Ofgem and stakeholders to develop a coherent and robust strategy, to be published in Spring 2025.
- **NESO have agreed to improve forecasting of medium to long-term operability needs**, including by location where relevant. This will help give investors and developers the level of certainty that they need for the future demand of these services to invest in low-carbon ancillary service capability.
- **Improved greenhouse gas emissions reporting on NESO operability activity across all electricity markets**. This will provide transparency on the greenhouse gas intensity of each ancillary service that is used to maintain operability, enabling the tracking of progress in the decarbonisation of these crucial services on which operability depends. These measures will help to reach Clean Power 2030 and will work in conjunction with a longer-term strategy to resolve operability challenges.

Ensuring the continued investment in renewables:

The system is experiencing rising Transmission Network Use of System (TNUoS) Charges, creating a need for reforms to the network charging regime. TNUoS charges recover the cost of building and maintaining the transmission network in England, Wales, Scotland, both onshore and offshore. They feature a price signal designed to reflect the costs that demand consumers and generators impose on the transmission system by connecting in different locations. The NESO's 10-year projection shows a trend of significant increases to TNUoS charges for Scottish generators, and a significant decrease to those in England and Wales. We also recognise that some of the highest charges are at the very end of the network resulting in some of the most productive wind assets facing the highest charges. We understand from some stakeholders that there is a need to address the volatility and long-term uncertainty arising from TNUoS charges. In particular, the increasing size of charges and the relationship with CfD marginal clearing strike prices can have an impact on investment.

Ofgem have proposed a temporary cap and floor to alleviate these concerns. In an open letter[93] Ofgem encouraged NESO to develop a temporary cap-and-floor solution in response to projected increasing costs and volatility of TNUoS to drive investment in renewables. We expect that this update will provide generators with greater certainty ahead of future allocation rounds including providing certainty on direction

[92] NESO (2024), *'Constraints Collaboration Project – Final Report'* (viewed in December 2024).
[93] Ofgem published an open letter to industry on 30th September 2024 proposing a cap-and-floor solution to the increasing cost and volatility of Transmission Network Use of System charges.

of travel ahead of AR7. We will continue to work with Ofgem and NESO as this modification progresses.

All the above proposals are at different stages of development; subject to the outcome of recent consultations and calls for evidence. The Clean Power 2030 Unit will work closely with NESO and Ofgem to ensure the timely delivery of these reforms. The earliest implementation for changes to network charges would be for the 2026 auction prequalification window.

Following this shorter-term reform, under the lead REMA design options, Ofgem would introduce enduring reforms to network charges to ensure that they send a stable, cost-reflective, and effective locational signal. These options are being developed and assessed through Ofgem's strategic review of transmission charging. We continue to work with Ofgem in this space and they seek to conclude policy thinking in line with REMA timeframes.

Unlocking the potential of the retail energy market

The future retail market will play a vital role in enabling consumer-led flexibility, outlined in greater detail in the short-duration flex chapter. The market needs the right price signals which accurately reflect the value of actions to the wider system, and which incentivise suppliers and consumers to engage in such consumer-led flexibility. Additionally, smart technologies will be needed to enable consumers to engage with new products and services, allowing them to benefit.

Market-wide Half-Hourly Settlement is a key enabler for the retail market, making its timely delivery critical for the 2030 target. This industry-led transformation programme, overseen by Ofgem, will change the landscape of the retail market. Consumers will be able to take advantage of this system to get lower bills.

In addition, the smart meter rollout is critical for unlocking innovative approaches to managing consumer demand and will enable the successful delivery of Market-wide Half-Hourly Settlement. Improved price signals will align retail market incentives with a decarbonised energy system and demonstrate the value of consumer-led flexibility. The short-duration flexibility chapter contains actions to remove barriers to smart meter adoption.

Consumer protections must enable trust in the market. In the future, smarter technologies, tariffs, and services should empower consumers to take advantage of lower price periods. We will progress work in this area so that all consumers can benefit, regardless of their level of engagement, energy needs, or income.

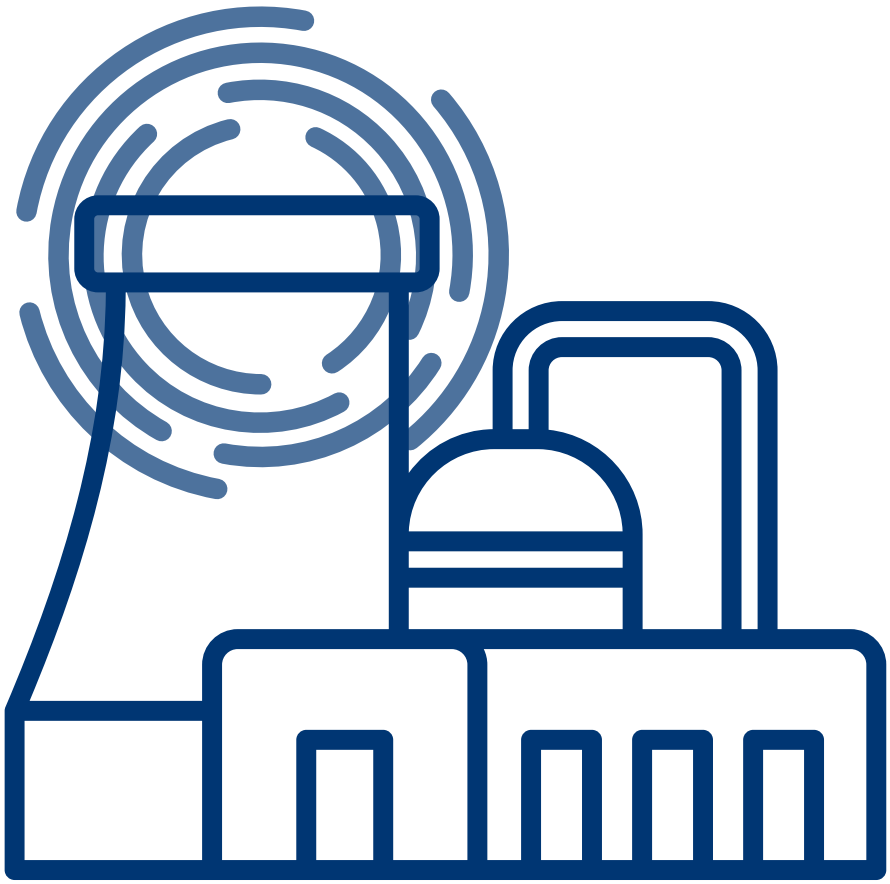
In coordination with Ofgem, we will ensure that consumer protections are designed in such a way that they protect consumers, whilst still enabling consumers to access the benefits that innovation can bring. This includes strengthening the regulator to ensure it can hold companies to account for wrongdoing, a consultation on regulation of Third Party Intermediaries, and a commitment to improving compensation as showcased in Ofgem's consumer confidence programme.

Government is committed to retaining the default tariff cap, and will work closely with Ofgem to ensure that the future price protection framework enables consumers to get the most out of a smarter and more flexible market, whilst also ensuring that those who are unable to use energy more flexibly are not unfairly penalised.

Next steps

We expect these actions, delivered alongside cross-cutting enabling actions in other chapters, to drive decarbonisation by enhancing investor confidence, spurring investment in clean technologies, and fostering a more adaptable and efficient energy system essential for meeting the 2030 target. The Clean Power 2030 Unit will work across government and industry to ensure we advance policy development on wholesale market reform. This includes the ongoing work of the REMA and Retail teams.

- **The REMA Autumn Update** provides further clarity for stakeholders – particularly investors – on REMA's progress, timelines, and the policy options still being considered.
- We will seek to conclude the policy development phase of the REMA programme by mid-2025. We will ensure that REMA timelines will align with the timetable for AR7 in order to provide investors the maximum clarity for prospective bids.
- On **CfD reform** and **Capacity Market reform**, we will ensure the timely delivery of reforms needed to enable 2030 Clean Power, whilst continuing to progress the longer-term reforms being considered under REMA.



Short-duration flexibility

Summary

Since Winter 2022, under the previous government, the National Energy System Operator has offered to consumers the option for them to take advantage of different tariffs at different times. This was a departure from a monolithic system where most consumers have received a single price, whatever time they used various appliances. There was a positive response from consumers to this voluntary offer.

A significant increase in short-duration flexibility of 29-35 GW across battery storage, consumer-led flexibility and interconnection capacity from 2023 levels is possible and can play a role in achieving clean power in 2030.

The opportunity is huge, as battery storage and consumer-led flexibility are scalable and could be relatively quick to deploy. Their deployment could not only cut bills for consumers but minimise the amount of more costly generation and associated network infrastructure that needs to be built, whilst maintaining security of supply.

Key actions set out in this Chapter to address some of the biggest challenges include:

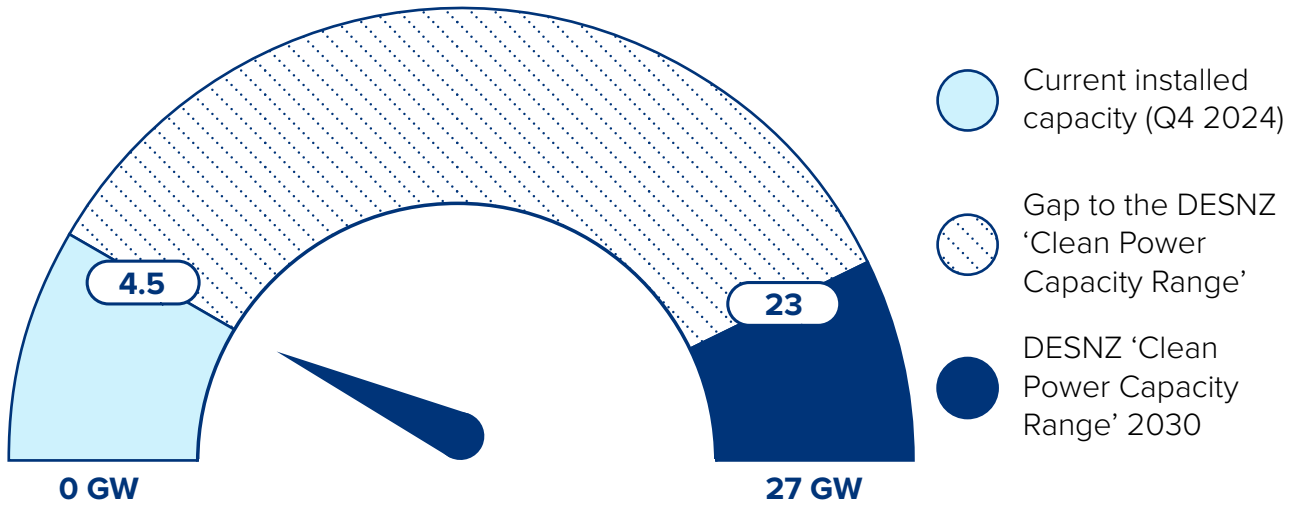
- **Publication of a Low Carbon Flexibility Roadmap in 2025** to consolidate existing and further new actions to drive both short and long-duration flexibility for clean power in 2030 and net zero by 2050;
- Incremental **market reforms to provide batteries and consumer-led flexibility** with appropriate and fair access to, and utilisation within, relevant markets, to assist investment decisions;
- **Enhanced management** of the portfolio of disparate programmes, projects and activities that contribute to the delivery of consumer-led flexibility, including review of the Market-wide Half-hourly Settlement (MHHS) Programme's delivery model to ensure implementation.

Challenges and Actions

We have divided these challenges and actions into four subsections: battery storage; consumer-led flexibility; common enablers for both technologies; and electricity interconnection.

Battery Storage

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Source: Table 1

Grid scale[94] and small-scale[95] batteries can offer short-duration flexibility (currently typically a maximum of two hours' continuous supply of electricity without recharge). Long-duration electricity storage (currently defined as at least 6 hours of continuous supply of electricity), is considered in the long-duration flexibility chapter of this Action Plan.

Batteries can be used to store electricity when it is plentiful and low cost, such as during low demand periods when wind and solar output is high, for use when electricity generation is less plentiful or during times of peak electricity demand. Batteries can reduce the amount of generation and associated network that needs to be built to meet peak demand, helping Britain reach clean power in a cost-effective way and reducing delivery risk associated with other types of energy infrastructure.

[94] Utility-grade batteries providing services to a region or the whole of GB.
[95] Those providing services to a household or business and sitting behind the meter for the premises.

Currently, there is 4.5 GW of battery storage capacity in Great Britain[96], the majority of which is grid-scale. Based on NESO and DESNZ battery storage growth scenarios for 2030, we expect 23-27 GW of battery storage to be needed by 2030 to support clean power, a very significant level of increase. The government expects the majority of this increase to come from grid-scale batteries, with small-scale batteries also making a contribution.

While there are many common enablers for both consumer-led flexibility and battery storage which are addressed later in this chapter, there are also specific actions necessary for battery storage to deliver on its potential for supporting clean power. In addition, DESNZ is considering the role heat batteries can play in decarbonising homes and hopes to be in a position to feed this work into the low carbon flexibility roadmap in summer 2025. Among the specific actions required for batteries, improving the time it takes for mature grid-scale batteries to obtain grid connections and planning decisions are the most significant actions in order to deliver the huge increase in grid-scale battery capacity. The table below sets out these hurdles and corresponding actions needed to address them, as well as specific hurdles and actions applying to small-scale batteries.

Table 3: Battery-specific hurdles and actions

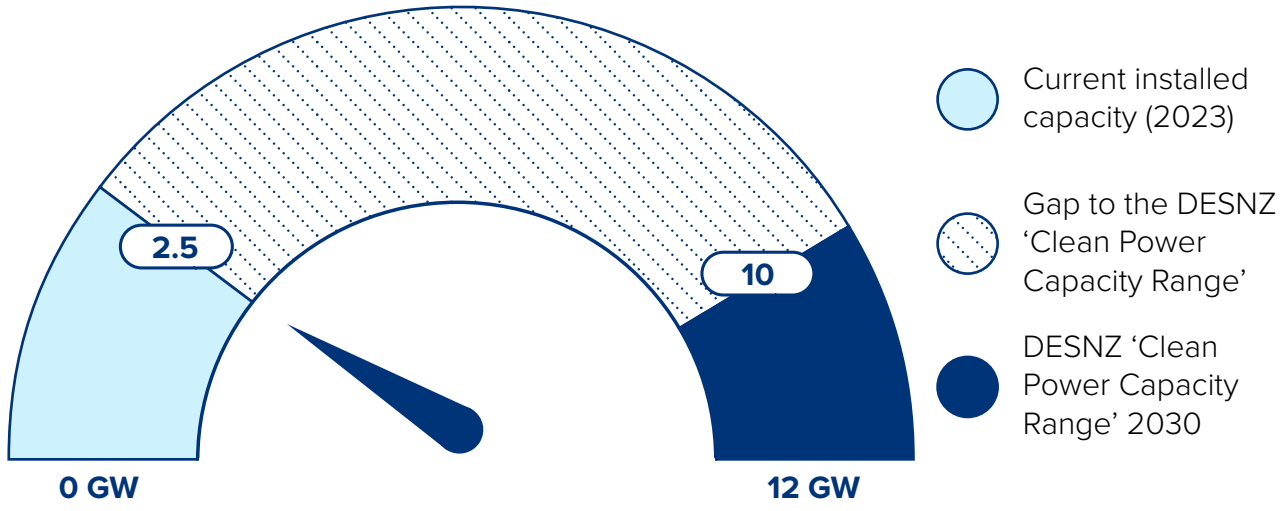
Area	Hurdle	Action
Grid scale batteries	**(a) Grid connections** While there are many projects with grid agreements, these and other grid connection agreements are not ordered by project maturity or strategic need leading to long waits for a grid connection.	**NESO** have agreed to work with **Ofgem** and **network companies** to ensure that grid connection reforms and acceleration of grid infrastructure development timelines result in a sufficient capacity (in line with the 2030 clean power capacity range) of mature, grid-scale battery projects to connect and operate by 2030.
	(b) Planning Grid-scale batteries take a long time to gain planning approval and are not currently referenced in the national planning policy framework.	**DESNZ** will work with **MHCLG** to consider how grid-scale batteries, and their importance for clean power in 2030 and net zero, could be referenced in future planning reforms.
	(c) Health and safety Grid scale batteries are currently covered by a robust health and safety framework. This needs to be maintained as batteries deploy.	**Defra** will consult on including grid-scale batteries within the Environmental Permitting Regulations by June 2025.
Small scale batteries	**(a) Affordability** The upfront costs of home batteries can be high for consumers, particularly those on low incomes.	**DESNZ** will consider the financing options for retrofit works, including batteries, in the Warm Homes Plan.

[96] Modo Energy (2024), *'Indices & Benchmarks'* (viewed in December 2024).

Area	Hurdle	Action
	(b) Final consumption levies Home batteries and EV batteries providing vehicle-to-grid services are asymmetrically charged with respect to final consumption levies. This means that levies are charged on import but not refunded on export, creating a disincentive to providing flexibility.	**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 a 2025 Clean Power Flexibility Roadmap.

Consumer-led flexibility

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Source: Table 1

Consumer-led flexibility involves voluntary actions taken freely by energy consumers – or on their behalf by Demand Side Response Service Providers (DSRSPs) with consumers' consent – to shift some of their electricity use when they choose to be rewarded for this flexibility while still having their energy needs met[97]. The financial benefits of flexibility on offer to consumers reflect the benefits to the wider electricity system (which in turn benefits all consumers).

A consumer could choose, for example, to receive cheaper electricity bills or other benefits in return for enabling a service provider to vary the electricity use of an

[97] These voluntary offers of flexibility by energy consumers (whether households or industries) can also be referred to as demand side response (DSR) or demand flexibility.

Energy Smart Appliance (ESA) such as their electric vehicle (EV) smart charge point or their smart heat pump while still meeting the consumer's needs (e.g. a charged EV by the morning or household temperature remaining within defined bounds).

All consumers will enjoy benefits from nation-wide consumer-led flexibility, as it will lower prices for peak hours by flattening the price curve.

Consumer-led flexibility also reduces Britain's aggregate electricity use at peak demand periods, thereby minimising the amount of generation and associated network that needs to be built to meet peak demand. It can therefore help Britain to reach clean power in a cost-effective way with reduced large infrastructure delivery risk. Ofgem monitors consumers' approach to flexibility and its role includes ensuring that sufficient consumer protection is in place for this growing sector.

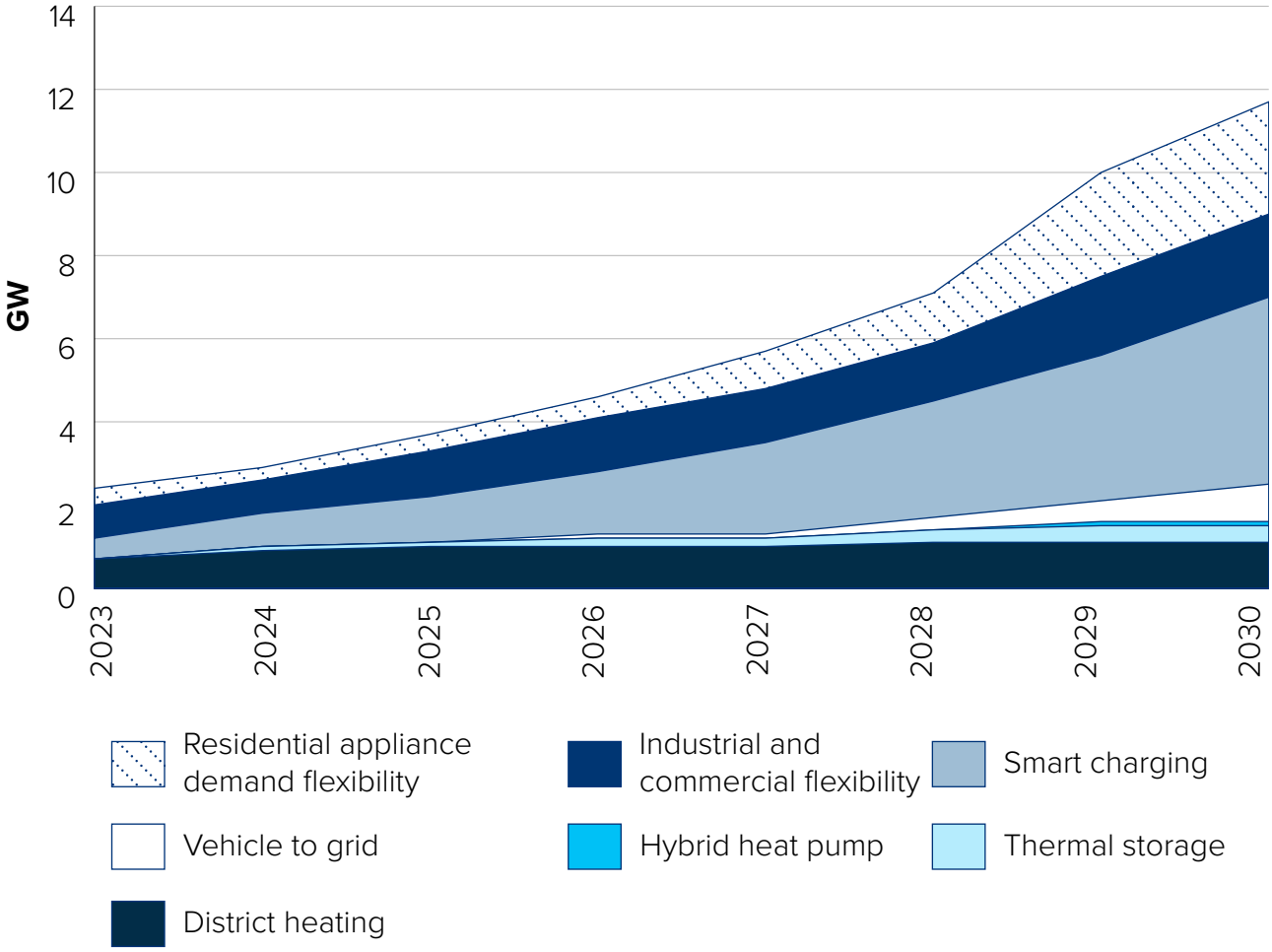
In 2023, following a scheme put in place by the National Energy System Operator, there was 2.5 GW of consumer-led flexibility utilised in Great Britain (not including electric storage heater flexibility), with 0.8 GW from smart heat pumps and flexible district heating, 0.5 GW from EV smart charging, 0.4 GW from other smart appliances and 0.8 GW from non-domestic consumer-led flexibility. Non-domestic consumer-led flexibility has fallen over time, reducing from 1.7 GW in 2021 to 1.2 GW in 2022 and then to 0.8 GW in 2023[98,99].

Up to now, only those consumers who were the best informed took up the flexibility on offer. With market-wide half-hourly settlement there is considerable potential for growth led by consumers.

Based on NESO and DESNZ scenarios for 2030, excluding electric storage heaters, we expect 10-12 GW of consumer-led flexibility capacity is possible by 2030 to support clean power. Government expects EV smart charging to be a key driver of consumer-led flexibility capacity growth.

[98] NESO (2024), *'Future Energy Scenarios 2024'* (viewed in December 2024).
[99] 4.8 GW is also assumed flexibility from storage heaters in 2023. The electric storage heaters providing current flexibility have in most cases been in place for a long time, and this capacity is expected to fall over time. It will be important that when consumers replace storage heaters that they adopt new and efficient forms of low carbon heating such as heat pumps.

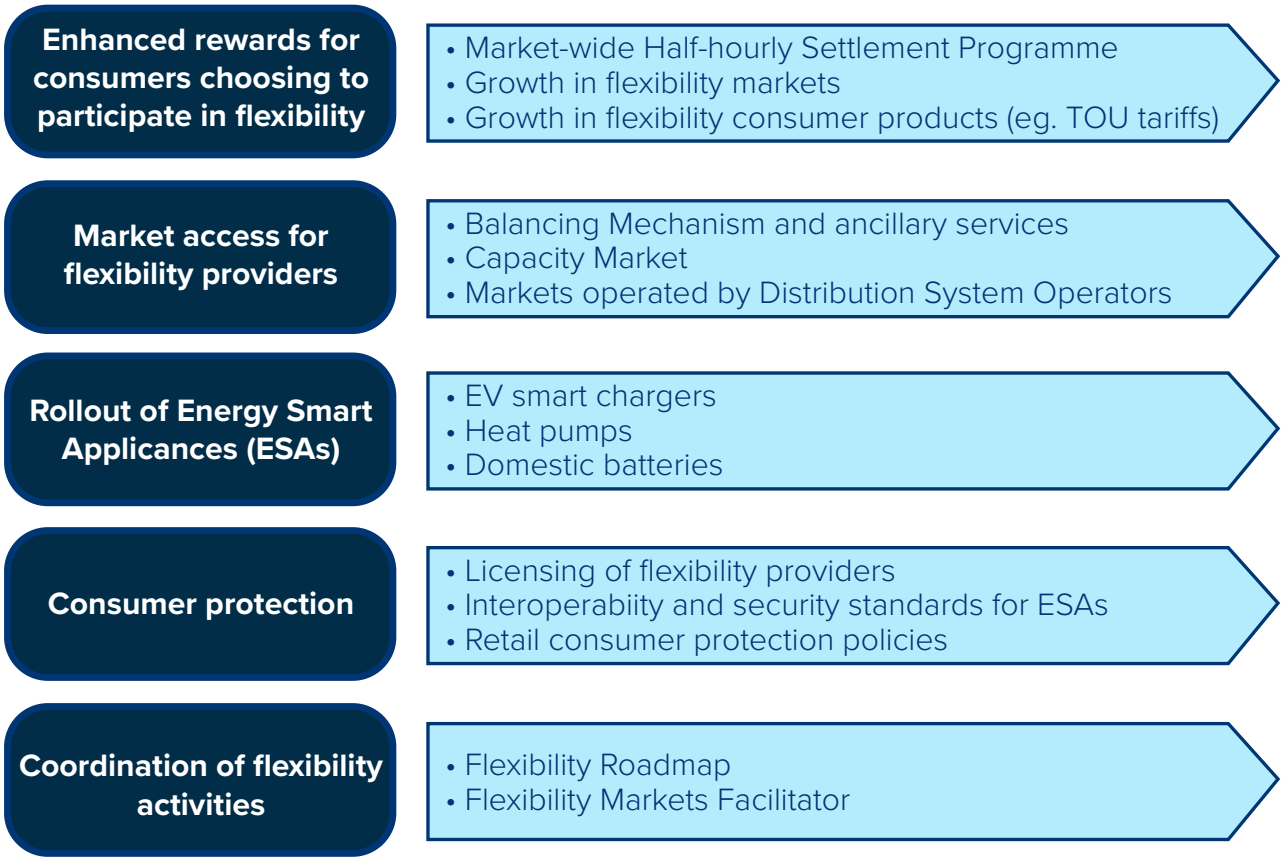
Figure 13: Consumer-led flexibility at peak (GW), 2023-2030



Note: Data excludes storage heaters that shift around 4 GW. NESO refers to consumer-led flexibility as demand flexibility.

Source: NESO (2024), 'Clean Power 2030'

Ensuring that all consumers have the potential benefit of this flexibility requires the delivery of a large number of different policies, projects and programmes across many different organisations, summarised at a high level in the diagram below.



While there are many common enablers for both consumer-led flexibility and battery storage, there are also specific actions necessary to further increase the scale of choice and opportunity for consumer-led flexibility and enhanced energy bill savings. Some areas requiring a step change are presented in the table overleaf, where the hurdle they present to consumer-led flexibility capacity is set out. For context, the wider government net zero programmes supporting the electrification of transport and heating will also be fundamental to the amount of consumer-led flexibility that becomes available by 2030.

Table 4: Consumer-led flexibility-specific hurdles and enablers

Area	Hurdle	Action
Market-wide half-hourly settlement	Swift introduction of market-wide half-hourly settlement is vital for incentivising all energy suppliers to reward consumers for being flexible, but the programme has faced delays.	**Ofgem** as programme sponsor will review the market-wide half-hourly settlement programme delivery model by the end of FY24/25, including to ensure that industry parties have credible plans to complete market-wide half-hourly settlement in a timely way and maximise the amount of half-hourly consumption data available.
Smart Secure Electricity Systems	Trust in consumer-led flexibility is essential to uptake, requiring interoperability of ESAs (e.g. to support choice and competition in service provision for consumer-led flexibility), effective regulation of DSRSP engagement with consumers, and safeguards against cyber-security and grid stability risks.	**DESNZ** will publish in Spring 2025 a government response to the 2024 package of Smart Secure Electricity Systems Programme consultations on ESAs interoperability, a new licensing regime for service providers for consumer-led flexibility and load controllers, and tariff data accessibility. This will be followed up with detailed consultations on draft "first phase" ESA legislation establishing minimum cyber-security requirements for appliances in scope and a smart mandate for heat pumps; draft DSRSP and load controller regulation and licence conditions; and measures to improve time of use tariff data accessibility.
Delivery Coordination for consumer-led flexibility	Successful delivery of consumer-led flexibility requires coordination across a large number of policies, projects and programmes spanning government departments, Ofgem, NESO and industry. More strategic coordination and portfolio management is required.	The Clean Power 2030 Unit will work with policy teams to review necessary organisational requirements to effectively plan and track delivery data for consumer-led flexibility across all relevant organisations, and address obstacles, on an ongoing basis.

Area	Hurdle	Action
Metering	**Smart meters** Consumers looking to participate in consumer-led flexibility need to be able to quickly obtain a smart meter.	**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.
	Device meters Current device metering regulation requires meters to have external displays, which adds to manufacturing costs of smart appliances.	**DBT** will continue stakeholder engagement on allowing for remote display options in the Measuring Instruments Regulations, for meters used for trade, and plan to consult on options to amend the existing requirements during the first quarter of 2025.
Consumer engagement	Consumer-led flexibility is a voluntary activity, and it is crucial that consumers are well informed of what it involves and how to participate, which evidence shows is not always currently the case.	**DESNZ** will, in Summer 2025, publish a consultation on consumer engagement, including on the potential to better coordinate and amplify accurate messaging on consumer-led flexibility.
Large non-domestic consumer-led flexibility DSR	Consumer-led flexibility capacity from large non-domestic energy consumers has fallen from 1.7 GW in 2021, to 1.2 GW in 2022 and then to 0.8 GW in 2023[100].	**DESNZ, NESO** and **Ofgem** will set out specific actions for supporting an increase in large non-domestic consumer-led flexibility in a Low Carbon Flexibility Roadmap in 2025, following industry engagement.
EV smart charging	**Increasing access to EV private charging** Landlords can increase the costs of charging EVs for tenants who need to access a communal smart charger, making EV smart charging unduly expensive for some.	**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.

[100] Figures illustrate the loss of incentive, including the Triad changes during this period, not the decline in actual DSR capacity.

Area	Hurdle	Action
	Increasing access to smart public charging. Charging of electric vehicles in public on-street locations has the potential to deliver short-duration flexibility. However, charge point operators are only just beginning to provide flexible tariffs to their customers.	**DESNZ** together with **DfT** will explore with industry options to accelerate deployment of smart charging at public charge points and set out progress and next steps in the 2025 Flexibility Roadmap.

Common enablers for consumer-led flexibility and battery storage

Some of the greatest hurdles faced by consumer-led flexibility and batteries are common to both, in particular around market access. Unlike low carbon generation and other forms of low carbon energy storage, battery and consumer-led flexibility projects are wholly dependent on forecast market revenues for investment decisions. Therefore, confidence that there will be appropriate access to, and utilisation within, relevant markets is crucial for scaling up battery storage and consumer-led flexibility for Clean Power 2030.

The table below sets out more detail on this and other common hurdles, and corresponding actions for addressing them and turning them into enablers for battery storage and consumer-led flexibility. Additional work that has the potential to improve market opportunities for consumer-led flexibility and batteries, including wider change to GB market arrangements that could send sharper price signals, is discussed in the 'Reforming our electricity markets' chapter of this action plan.

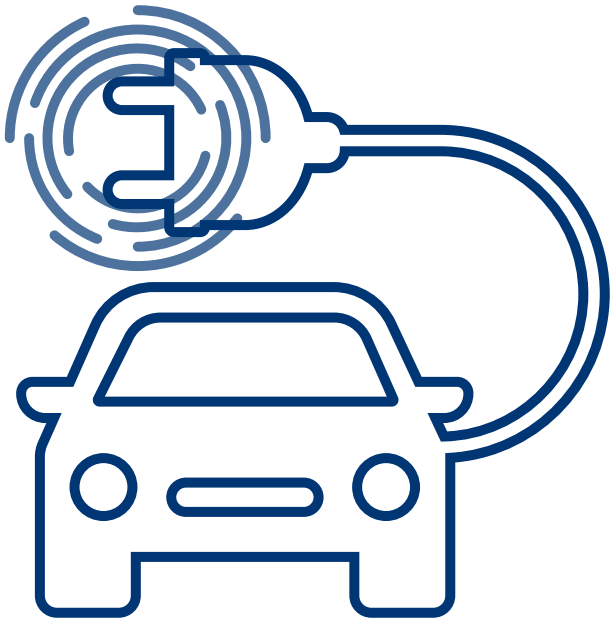


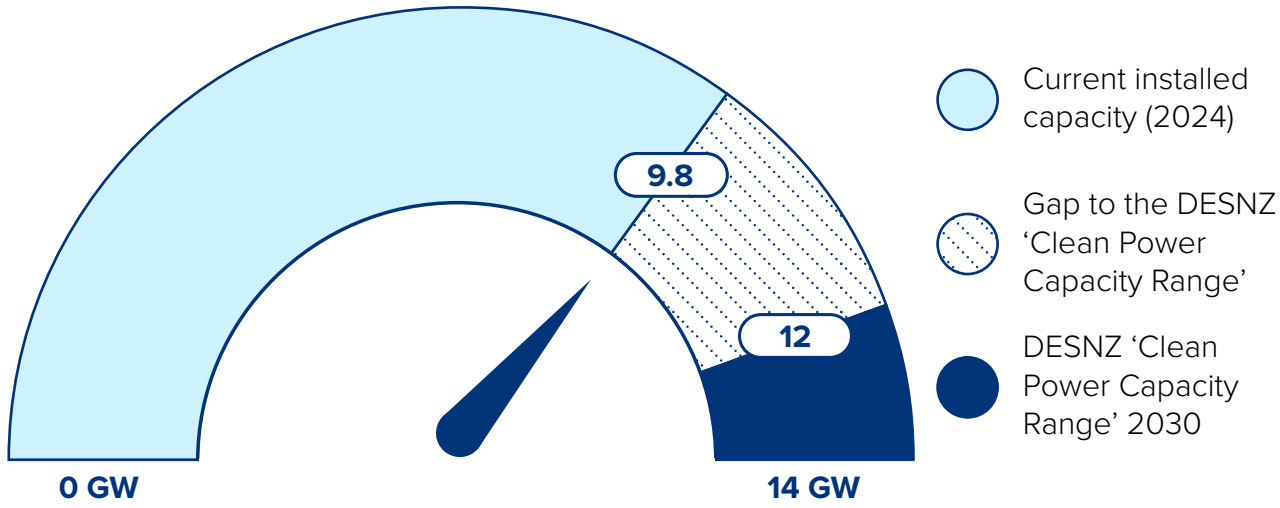
Table 5: Consumer-led flexibility and battery storage common enabler hurdles and actions

Area	Hurdle	Action
Market Access	Access to some energy markets (e.g. the Balancing Mechanism, other NESO/DSO markets and the Capacity Market) is currently challenging for some kinds of short-duration flexibility. Issues include: • Overly stringent market entry requirements for flexibility; • The System Operator's ability to use all low carbon flexible assets (such as batteries and consumer-led flexibility) effectively and incorporate them fully into the economic dispatch process has been hindered due to legacy systems, manifesting in "skip rates"; and • Barriers to the stacking of revenues by flexibility assets across different markets.	**NESO** have agreed to set out, for inclusion in the Low Carbon Flexibility Roadmap, progress on and further actions to support providing flexibility assets with appropriate and fair access to the markets it manages, including: • removing unnecessary or overly restrictive rules or participation requirements to the greatest extent possible, allowing access to more types of flexibility assets; • 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; and • an assessment of the potential to create additional measures to enable a wide range of flexibility providers to offer services to meet system needs (including constraint management). **DESNZ** will, ahead of the 2025 Capacity Market prequalification period in summer 2025, implement the Capacity Market policy proposals as outlined in its July 2024 and October 2024 responses to the 2023 Phase 2 Capacity Market consultation. These include permitted augmentation of storage, adjustments to Extended Performance Testing Requirements and making available 3-year Capacity Market agreements for low carbon technologies whose CAPEX is £0/kW. In addition, DESNZ plans to publish shortly a Consultation and Call for Evidence to invite stakeholder views on how to better reflect the diversity of consumer-led flexibility technologies and their treatment and handling within the Capacity Market.

Area	Hurdle	Action
Flexibility Roadmap	Great Britain lacks an up-to-date framework for prioritising and managing the delivery of ongoing actions across government, NESO, Ofgem and industry. This will be crucial for maximising the potential of flexibility for Clean Power 2030 and net zero by 2050.	**DESNZ** will publish with **Ofgem** and **NESO** a joint Low Carbon Flexibility Roadmap in 2025. The Flexibility Roadmap will set out clear short and long-duration flexibility milestones and measures required for both clean power in 2030 and net zero by 2050, building on those within this Action Plan. The Roadmap will also provide a framework for planning and tracking the delivery of these key flexibility measures. As part of this, DESNZ, working with Ofgem and NESO where appropriate, will review current measures to assess where further changes or new policies are needed to support Clean Power 2030 and net zero by 2050.
Digital-isation	There is insufficient visibility of – or sharing of data on – distributed energy including local generation and flexible assets on the grid, hampering the integration of these assets and potential for their utilisation within flexibility markets.	**DESNZ** and **Ofgem** will work with **NESO** to set out measures in the Low Carbon Flexibility Roadmap in 2025 to enable greater visibility of distributed energy assets to unlock further flexibility and assist with network planning.
Innovation support	Further innovation is needed to accelerate the deployment of short-duration flexibility for 2030, for example to reduce the costs of bidirectional chargers for vehicle-to-grid and develop consumer-led flexibility interoperability standards.	Further innovation across **DESNZ** will ensure the flexibility innovation needed to facilitate clean power 2030 and net zero.

Electricity interconnection

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Source: Table 1

Electricity interconnectors connect the transmission systems of two countries, enabling us to import and export electricity. At the end of 2023, Great Britain had 9.8 GW of interconnector capacity across 9 interconnectors, with a further 2 interconnectors (1.9 GW of capacity) in construction[101]. Based on both government and NESO modelling of clean power trajectories, we expect 12-14 GW of interconnector capacity by 2030 to deliver clean power. Interconnectors can bring a wide range of system and consumer benefits. Electricity interconnectors support security of supply by enabling access to more diverse generation over a wider geographic area. They also provide system flexibility by helping the system rapidly respond to changes in supply and demand. This means that, when we generate more electricity than we need, a strong interconnector system will allow us to export the excess electricity, thus contributing towards the clean energy superpower role of the United Kingdom.

Finally, interconnectors contribute to European-wide decarbonisation, as they can allow for more efficient use of intermittent renewables between connected countries.

The table overleaf sets out the key hurdles to maximising the growth of electricity interconnection by 2030. There may be additional, project specific hurdles that DESNZ will work with developers to action, as appropriate. Additionally, the Supply Chain and Workforce section of this document details how the UK will use our established manufacturing capacity to support the delivery of Clean Power 2030.

[101] Ofgem (2024), *'Interconnectors'* (viewed in December 2024).

Table 6: Electricity interconnection hurdles and actions

Area	Hurdle	Action
Grid connections and planning	The grid connection and planning processes mean that interconnectors awarded cap and floor agreements by Ofgem in the third cap and floor window / Offshore Hybrid Asset pilot a) might have been awarded a connection agreement for later than 2030, or b) might not be operational by 2030.	**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.
HVDC supply chains	The supply chains for HVDC cables are tight and present risks to interconnector projects with cap and floor agreements from the third cap and floor window / Offshore Hybrid Asset pilot not being operational by 2030.	**DESNZ** is exploring a range of options to mitigate supply chain challenges including measures to develop the domestic supply chain.

Next steps

The implementation of the actions in this chapter should make a strong impact in helping to achieve the benefits for consumers made possible by clean power in 2030, particularly by rapidly improving market access and utilisation for battery storage, increasing opportunities for consumer-led flexibility, implementing market-wide half-hourly settlement, and significantly reducing grid connection and planning timelines for grid-scale batteries and interconnectors.

The government will continue to work with Ofgem, NESO and industry to review the need for further actions and we will include these new actions within the Low Carbon Flexibility Roadmap that we will publish in 2025. Success will involve evidence that investments and operational assets are ramping up short-duration flexibility capacity in line with the capacity ranges for Clean Power 2030 that are set out in this Action Plan. The Clean Power 2030 Unit will be closely monitoring this.

Delivery of this short-duration capacity for clean power in 2030 will also significantly help with meeting carbon budget and net zero requirements[102], enabling the power sector to accommodate the significant increase in future electricity demand that will result from the electrification of other sectors such as transport, heat and some parts of industry.

[102] BEIS (2021), '*Smart Systems and Flexibility Plan*' (viewed in December 2024).

Long-duration flexibility

Summary

Long-duration flexible technologies can add significant value to the system and can provide a secure supply of electricity during extended periods of low renewables output. There are a number of innovative low carbon technologies such as power carbon capture, usage and storage (CCUS), hydrogen to power (H2P) and forms of long-duration electricity storage (LDES), capable of replicating the role of unabated gas. We estimate between 40-50 GW[103] of dispatchable and long-duration flexible capacity could be needed by 2030. Whilst we will continue to rely on unabated gas to ensure security of supply, we will drive the deployment of these low carbon technologies, cementing our position as a world leader at the cutting edge of the clean energy revolution.

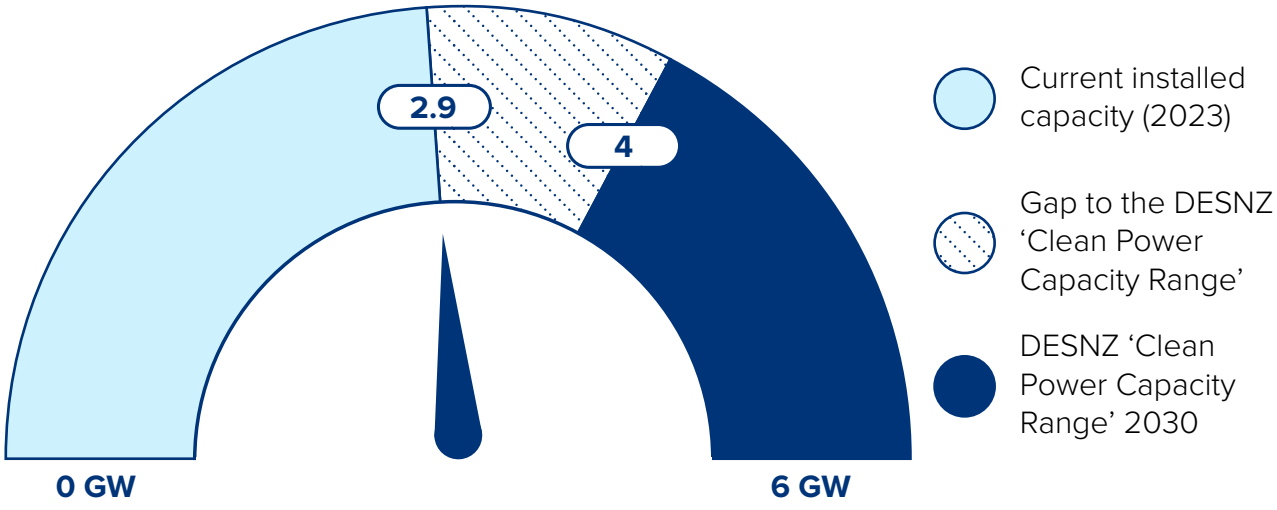
The following interventions will support the deployment of long-duration flexible technologies in driving towards Clean Power 2030:

[103] The sum of low carbon dispatchable power, unabated gas, and LDES capacities in Table 1, rounded to the nearest 5 GW. Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility.

- **We have announced a groundbreaking deal with Net Zero Teesside**, our first power CCUS project – delivering secure, low carbon power from 2028.
- **We are developing a hydrogen to power business model**[104] to de-risk investment and bring forward hydrogen to power capacity at an accelerated rate. We intend to provide further market engagement on the design of the business model in Spring 2025.
- **Ofgem will introduce the cap and floor scheme** to support investment in long-duration electricity storage, aiming to open the scheme to applications in Q2 2025.

Long-duration electricity storage

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)

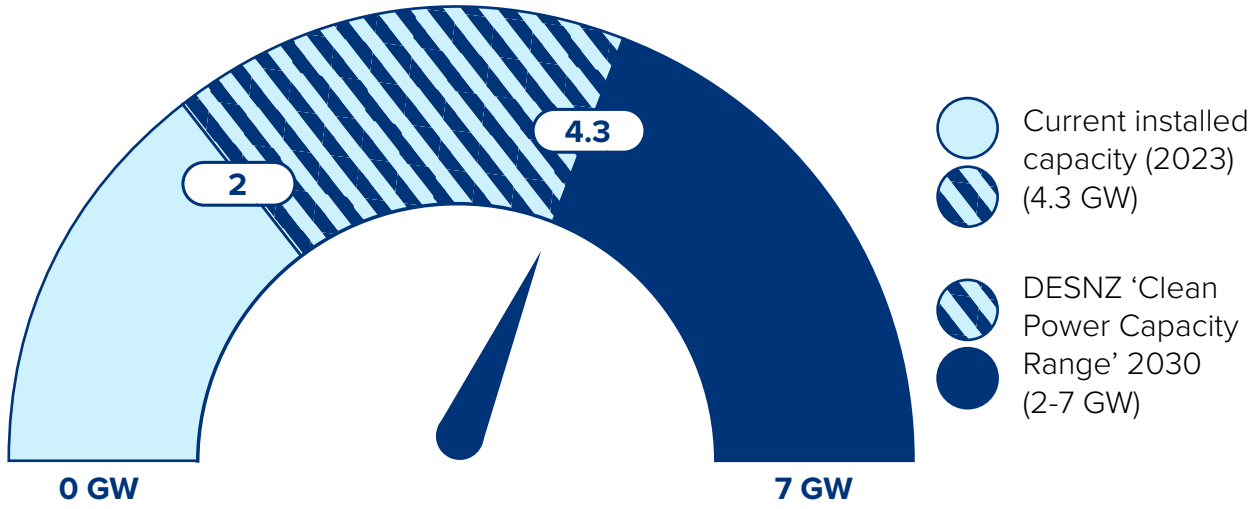


Source: Table 1

[104] DESNZ (2024), '*Hydrogen to power: market intervention need and design*' (viewed in December 2024).

Low Carbon Dispatchable Power

Current installed capacity compared to the DESNZ 'Clean Power Capacity Range' in 2030 (GW)



Source: Table 1

Note: Low carbon dispatchable power includes biomass, power BECCS, gas CCUS and hydrogen to power. Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility.

The challenge

Long-duration flexible technologies can adjust their output quickly to match supply with demand and can provide a reliable source of electricity for managing daily and seasonal demand peaks and longer periods of low renewable output (such as 'Dunkelflaute' conditions). Today, most of that flexibility is provided by around 35 GW of unabated gas and around 3 GW of pumped storage hydro[105], currently the only mature technologies capable of providing this flexibility.

Between 40-50 GW[106] of dispatchable long-duration flexible capacity could be needed by 2030. Whilst we expect the majority of this capacity will come from unabated gas, it will be running less frequently as we support the deployment of low carbon alternatives and approach 2030. In this chapter we focus on driving forward the delivery of the low carbon long-duration technologies, such as power CCUS, H2P and LDES, that are closest to maturity and could play a key role in a 2030 system. Biomass and BECCS are covered in more detail in the Renewable and nuclear project delivery chapter.

Deploying new low carbon long-duration flexible technologies can add significant value to the system as they can replicate the role of unabated gas currently plays, minimise system costs and reduce delivery pressures on other technologies, such as offshore wind. NESO have noted in their report that even relatively small levels of operational capacity materially reduce the overall challenge of the rest of the programme.

[105] DESNZ (2024), *'DUKES'* (viewed in December 2024).
[106] The sum of low carbon dispatchable power, unabated gas, and LDES capacities in Table 1, rounded to the nearest 5 GW. Dispatchable technologies are ones which combust fuel to produce electricity and, by varying the rate at which fuel is burned, can respond to meet the needs of the grid with varying levels of flexibility.

Power CCUS and hydrogen to power plants in Great Britain present a great opportunity for low carbon long-duration flexibility. We will also need to scale up the deployment of pumped hydro storage and drive forward innovation in more nascent LDES technologies.

Government is committed to the transition away from unabated gas whilst maintaining security of supply.

Taking action

Power carbon capture, usage and storage

Power CCUS, which is natural gas fuelled generation equipped with carbon capture technology, can provide non-weather-dependent, dispatchable low carbon generation that will support a renewables-based 2030 system. The Power CCUS business model, known as the Dispatchable Power Agreement (DPA), has been designed to ensure that Power CCUS plays a valuable mid-merit role, dispatching behind renewables, but ahead of unabated gas generation. The DPA will enable both new build projects and the retrofit of existing plants which will be key to enabling the transition away from unabated gas.

NESO have suggested that we could need to deploy up to 2.7GW of power CCUS and H2P by 2030 – see Table 1[107]. The importance of power CCUS beyond 2030 is also highlighted by the Climate Change Committee in their Carbon Budget 6 report where they model that power CCUS would provide 30TWh of generation a year by 2035 as part of the balanced pathway scenario[108].

As well as supporting the clean power mission, CCUS more broadly is vital to decarbonising a range of industrial sectors and the deployment of negative emission projects. It will enable a just transition for industrial regions by decarbonising in a way that drives growth in the UK, with CCUS projected to support up to 50,000 jobs as the sector matures in the 2030s and adds £5 billion of value annually by 2050[109]. Carbon capture is a safe technology, and geological CO_2 storage is a proven technology that has been in operation globally for decades. In the UK we have the technical expertise and a geographical and geological advantage with a shallow seabed and 78 billion tonnes of theoretical CO_2 storage capacity distributed across the UK continental shelf[110].

Additionally, the proximity of emission centres to the geological storage sites provides the right opportunity for these industrial clusters to decarbonise through the CCUS cluster approach that we have established. This approach involves the strategic selection of industrial clusters to maximise the number of capture projects and is designed to fairly distribute cost and enhance the cost efficiency of transport and storage infrastructure, benefiting a larger number of capture projects. The deployment of CCUS in the UK will pioneer technical advancements and a world-leading regulatory framework to help Britain benefit from the opportunities of first mover advantage.

[107] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).
[108] CCC (2020), *'The Sixth Carbon Budget'* (viewed in December 2024).
[109] DESNZ (2019), *'Energy Innovation Needs Assessments'* (viewed in December 2024).
[110] Energy Technologies Institute (ETI) (2016), *'Strategic UK CCS Storage Appraisal'* (viewed in December 2024).

Net Zero Teesside

The world's first at scale gas power plant with carbon capture.

Groundbreaking deals announced on 10th December 2024 mean construction of the UK's new carbon capture industry will start in 2025.

Contracts were signed with Net Zero Teesside, the world's first at scale gas power plant with carbon capture, supplying up to one million homes with low carbon, secure power from 2028.

Combined with Northern Endurance Partnership (NEP), the supporting CO_2 Transport and Storage project, the East Coast Cluster will capture and store carbon emissions from the region. This investment will directly support an average of 2,000 jobs in the North-East, marking the latest milestone in the government's mission to reignite its industrial heartlands, tackle the climate crisis and turbocharge growth for decades to come. It follows the government's £21.7 billion funding commitment to ensuring the UK's vision for CCUS becomes a reality in the UK.

By signing the first Dispatchable Power Agreement (DPA) with industry, the government is proving that this world-leading CCUS business model – developed over years in collaboration with stakeholders – is delivering real results by attracting investment and getting this game-changing technology off the ground. The DPA has been specifically designed to support projects like Net Zero Teesside to dispatch low carbon power ahead of unabated gas but not displace renewables.

The DPA showcases the UK's ability to create innovative solutions to address the challenges of achieving net zero and this milestone is a testament to the collaborative efforts of industry and government, reflecting our shared vision of a decarbonised power sector. This is a landmark step forward in our plan for Clean Power 2030.

HyNet and beyond

In addition to Net Zero Teesside in the East Coast Cluster, there is a strong pipeline of potential Power CCUS projects in development across the UK which can deploy and play a key role in a decarbonised power system[111]. In north-west England and north Wales, government is working with industry to deliver the HyNet Cluster, which aims to store up to 4.5 million tonnes of CO_2 per year by 2030[112]. The HyNet CO_2 Transport and Storage (T&S) network will enable the safe onward transport of CO_2 from CCUS projects to permanent undersea storage. There is a power CCUS project which, among other CCUS projects, is aiming to connect to HyNet by 2030.

In addition to the East Coast Cluster and HyNet Cluster, the UK has an exciting pipeline of further CCUS clusters at a mature stage of development. These include Acorn in north east Scotland and Viking in the Humber which contain power CCUS projects at the heart of their plans.

Upstream emissions

We are clear that future emissions from the production of natural gas will need to reduce in the UK and across the world. Domestically, DESNZ is working with industry to decarbonise upstream emissions of natural gas production. The North Sea Transition Authority (NSTA) estimates that between 2018 and 2023, operators have reduced flaring by 49% and overall emissions from domestic upstream oil and gas production have decreased by approximately 28%. Through the North Sea Transition Deal, industry is committed to extend the overall emissions reduction to 50% from 2018 to 2030[113].

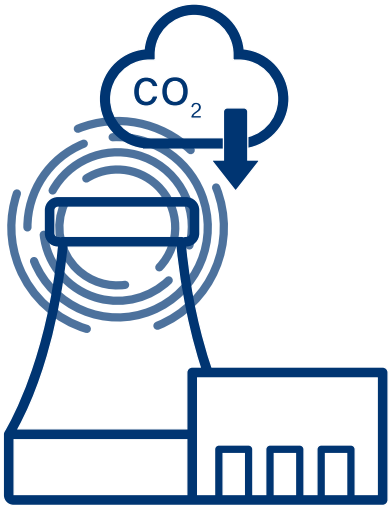
Internationally, we are also committed to the World Bank's zero routine flaring initiative which aims to eliminate the practice by 2030 for oil producing platforms. The UK is also a member of the Global Methane Pledge, to collectively reduce global methane emissions by at least 30% by 2030 compared to 2020 levels[114]. In addition, we are working with the US, EU and others to develop a framework to better measure, monitor, and report methane emissions from imported gas. We also share technical expertise and best practice internationally on reducing emissions in the energy sector.

Financing

CCUS was one of the five sectors which will benefit from the additional £5.8 billion allocated to the National Wealth Fund. This capital will be deployed by the National Wealth Fund to finance projects which are facing barriers to investment, helping to mobilise private finance into them.

CCUS for net zero

In the 2030s and as we accelerate to net zero, it is important industry and government enable the development of a self-sustaining UK CCUS sector that supports delivery of our Missions, jobs and reduces emissions, putting the UK at the forefront of global CCUS.



[111] Subject to meeting necessary planning and other regulatory approvals.
[112] Eni (2024), '*HyNet North West Project*' (viewed in December 2024).
[113] North Sea Transition Authority (2024), '*Emissions Monitoring Report 2024*' (viewed in December 2024).
[114] Global Methane Pledge (2024), '*Global Methane Pledge*' (viewed in November 2024).

Hydrogen to Power

Hydrogen to Power can play a key role in our electricity system at a range of scales and is the primary low carbon technology capable of providing low carbon inter-seasonal storage, whilst providing a decarbonisation pathway for unabated gas. Our analysis indicates H2P is economic at lower load factors (below 30%), enabling it to be cost effective in a clean power system where flexible load factors are expected to fall as renewable generation increases[115]. H2P faces two primary deployment barriers – increased investment risk and cost from being a first of a kind technology, and exposure to cross-chain risks from reliance on a nascent hydrogen value chain. There is a critical dependence on access to enabling grid-scale hydrogen infrastructure, such as new build transport and storage facilities, which typically have long lead-in times. Ensuring the deployment of hydrogen transport and storage infrastructure, alongside supporting H2P plants, will be critical in enabling delivery of H2P to deploy whilst also providing the infrastructure to support industrial decarbonisation through hydrogen.

Hydrogen to power business model

To accelerate deployment of H2P, government is implementing a H2P business model (H2PBM) to de-risk investment and mitigate our identified deployment barriers, as committed in the government's December 2024 response to the consultation on 'H2P need for and design of a market intervention'. We will deliver a H2PBM based on a Dispatchable Power Agreement style mechanism. To progress development of the H2PBM, we intend to publish a market engagement document in Spring 2025 outlining further detail on the proposed design of the H2PBM. We are establishing an H2P expert working group to support our policy development.

Hydrogen storage

Hydrogen storage will play a vital role in the hydrogen economy and the wider energy system. Storage is key for managing within day network balancing and providing security of supply to hydrogen off takers. Large-scale deployment of H2P will require access to geological hydrogen storage via hydrogen pipelines, to enable delivery of H2P plants.

Developers face barriers to investment including high costs, long lead-times, and uncertainty around how quickly demand for transport and storage will increase. This is why we are committed to designing, in 2025, new business models for hydrogen transport and storage infrastructure to address these barriers and unlock private investment. Public and private investment in transport and storage infrastructure will in turn unlock further private investment in the wider hydrogen economy, by helping to increase the geographical availability, reliability and cost-effectiveness of hydrogen supply.

The Energy Act 2023 provides the legislative framework that will underpin the delivery of the hydrogen transport and storage business models. We are currently progressing the design of the commercial models and the process for awarding them at pace.

Hydrogen production

Hydrogen production capacity is vital to increase the supply of the fuel for H2P plants and support is being provided through the Hydrogen Production Business Model. This provides hydrogen production projects with a route to market and we are already making progress, with the October announcement of £21.7 billion of available funding to

[115] DESNZ (2023), '*The Need for Government Intervention to Support Hydrogen to Power*' (viewed in December 2024).

launch the first CCUS projects including CCUS-enabled hydrogen[116].

Eleven electrolytic hydrogen production projects were selected for contract award in the first Hydrogen Allocation Round (HAR1), and we expect these projects to be operational by 2026. We intend to publish a shortlist of HAR2 projects in due course and we are currently developing our approach to future HARs, including HAR3, and we will invite feedback through a market engagement exercise in due course.

We intend to publish the next edition of the Hydrogen Strategy Update to the Market shortly.

Financing

Hydrogen was one of the five sectors which will benefit from the additional £5.8 billion allocated to the National Wealth Fund. This capital will be deployed by the National Wealth Fund to finance projects which are facing barriers to investment, helping to mobilise private finance into them.

Long-duration electricity storage

Long-duration electricity storage (LDES) is a key enabler to a secure, cost-effective and low carbon energy system. LDES can help to decarbonise the system by supplying electricity continuously from several hours to up to several days without recharge, replacing flexibility from unabated gas and helping to alleviate constraints on the grid. It includes pumped storage hydro, a long-established and mature technology, and other more recently developed technologies such as liquid air energy storage. As well as providing electricity during protracted periods of low wind/sun, LDES technologies also provide a range of essential grid services such as inertia, voltage support, short circuit and demand response.

There is currently 3 GW of pumped storage hydro capacity connected to the grid[117], but long build times combined with revenue uncertainty have inhibited investment in LDES development over the last 40 years[118]. This has been the greatest challenge to LDES development, which this government has now addressed through announcing our decision to introduce a cap and floor investment support scheme with Ofgem acting as regulator and investment support scheme delivery body[119].

The Clean Power Capacity Range in Table 1 suggests that we could need 4-6 GW of LDES in total by 2030[120]. The actions below will help bring forward more LDES onto the system.

[116] DESNZ (2024), *'Government reignites industrial heartlands 10 days out from the International Investment Summit'* (viewed in November 2024).
[117] LDES in Table 1.
[118] DESNZ (2024), *'Long-duration Electricity Storage Policy Framework Consultation'* (viewed in November 2024).
[119] DESNZ (2024), *'Consultation outcome: Long-duration electricity storage: proposals to enable investment'* (viewed in December 2024).
[120] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

Cap and floor scheme

Following government's decision in October 2024 to introduce a cap and floor investment support scheme for LDES:

- Ofgem will publish an open letter on specific aspects of the scheme where it would like further stakeholder input and will provide further information around cap and floor scheme implementation timings.
- In Q1 2025, DESNZ and Ofgem will publish a Technical Decision Document to provide clarity on outstanding areas of the cap and floor scheme design
- Ofgem expects to open the first cap and floor allocation round in Q2 2025 following publication of the Technical Decision Document
- NESO have agreed to provide advice on the range of LDES capacity that Ofgem should seek to provide cap and floor schemes for in the first allocation round, and support Ofgem in assessing projects that apply

Financing

Building on the two investments the National Wealth Fund has already made in LDES companies, it will continue to engage 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.

Capacity Market

The Capacity Market is the primary mechanism to secure capacity and ensure security of electricity supply in Great Britain. The scheme provides participants with revenue (£/MW), allocated through competitive auctions. This revenue is provided in exchange for the capacity being available at times of system stress. LDES projects, where meeting qualifying criteria, are eligible to and currently participate in the Capacity Market.

DESNZ will, ahead of the 2025 Capacity Market pre-qualification period in summer 2025, implement the Capacity Market policy proposals as outlined in its July 2024 and October 2024 responses to the 2023 Phase 2 Capacity Market consultation. Changes include increasing the build period extension available to support projects qualifying for the Capacity Market long stop mechanism. This will allow generators requesting an extension (at the point of application), to have up to 6 years in a T-4 Capacity Market agreement to come online (via a 24-month extension). We expect this specific change to be in place ahead of the auctions in early 2026. This will be an addition to the existing 12-month extension option.

Innovation

Innovation can make an important contribution to the deployment of LDES. More nascent technologies, such as liquid air energy storage, offering greater locational flexibility than pumped storage hydro, have quicker build times, and help to diversify the LDES technology portfolio. Approximately £100m of innovation funding has been provided over the last decade to support the advancement of many novel LDES technologies[121]. The current Net Zero Innovation Portfolio has funded novel technologies such as liquid air and flow battery energy storage, advancing them to demonstrator stage and catalysing investment in them, which has enabled these innovations to be viable options for low carbon flexible capacity by 2030 and beyond. Further innovation will ensure that

[121] Approximate cumulative innovation funding for LDES provided by the Department since 2014 from innovation funding programmes, including the Energy Innovation Programme and the Net Zero Innovation Portfolio.

a range of novel technologies develop and deploy at pace and scale.

Planning and grid connections

Government, Ofgem, NESO, and network companies can ensure grid connection reforms and acceleration of grid infrastructure delivery timelines that result in sufficient capacity (in line with 2030 clean power capacity ranges) of LDES projects connecting by 2030, including those that co-locate with renewables projects. We will work with the Ministry of Housing Communities and Local Government to consider how LDES, and its importance to clean power in 2030 and net zero, could be referenced in future planning reform.

In Scotland, responsibility for planning and consenting is devolved to the Scottish Government. Through their Fourth National Planning Framework (NPF4), the Scottish Government has placed climate and nature at the centre of their planning system and made clear their support for all forms of renewable, low-carbon and zero emission technologies, including transmission and distribution infrastructure. Potential impacts on communities and nature, including cumulative impacts, are important considerations in the decision-making process.

Unabated gas

As clean power substantially reduces the amount of electricity generated by gas-fired plants, unabated gas will change its role in the system. Under a clean power system, it will play a back-up role at specific times throughout the transition to clean power. This means retaining sufficient unabated gas capacity until well beyond 2030, when it can be safely replaced by low carbon technologies that can provide the amount of long-duration flexibility necessary to keep the system balanced at all times. We currently rely on ~35 GW of unabated gas on the system to provide long-duration flexible capacity[122]. This firm capacity is crucial for electricity security, and will be required as strategic back-up to respond to certain periods of high demand, even as we aim to reduce fossil generation (i.e. gas running hours) overall.

Existing assets

Retaining the existing gas fleet where possible is likely to be the most cost-effective means of meeting the capacity we need for gas to fulfil its strategic function in 2030. Current fleet intelligence suggests most existing gas assets will remain online until 2030, but we are also consulting on measures to make it easier for gas assets to stay in the Capacity Market and for plants to access multi-year Capacity Market agreements, encouraging investment in life extension of older plants.

Decarbonisation readiness

To provide the clarity investors need to make long-term decisions, we are introducing decarbonisation readiness requirements. This will ensure that new or substantially refurbishing combustion power plants in England, which submit their environmental permit application from 28th February 2026, must have a credible plan to decarbonise either through converting to hydrogen firing or through retrofitting carbon capture. Requiring developers to demonstrate the viability of their decarbonisation plan will ensure that the developers of new or substantially refurbishing combustion power plants have considered how they will access low carbon hydrogen or CO_2 storage in the future, and that land necessary to enable that decarbonisation has been set aside. This will support providing visibility to investors over which sites are well placed to decarbonise in future.

[122] NESO (2024), *'Clean Power 2030'* (viewed in December 2024).

Moreover, to help ensure that capacity coming forward before the implementation date consider their decarbonisation plans, we are placing an obligation on substantially refurbishing or new combustion power plants in England, participating in the 2026 Capacity Market auction to declare that they will comply with the Decarbonisation Readiness requirements.

We are complementing this with measures intended to enable gas assets tied into long term Capacity Market agreements to exit without penalty and transfer to the power CCUS Dispatchable Power Agreement, enabling conversion to low carbon through retrofitting carbon capture equipment. We are exploring additional routes for gas assets in the Capacity Market to decarbonise including the feasibility of gas assets exiting long term agreements to enable conversion to H2P through H2PBM support.

As low carbon flexible technologies become more established, unabated gas will increasingly move to a reserve role on the system, essentially called upon as a last resort to meet peak demand, and demand during long periods of low supply from variable sources. Maintaining this reserve generating capacity is important for reaching clean power by 2030. As set out in the market reform chapter, we are taking steps to reform the Capacity Market to ensure there is sufficient unabated gas capacity on the system to maintain security of electricity supply as it moves into this reserve role.

The reforms we are announcing to existing market frameworks are the best way to ensure that the necessary strategic reserve capacity of unabated gas generation remains on the system. The government's view is that a novel out-of-the-market mechanism to manage that reserve may have a role in the long-term phase-out of unabated gas capacity once its volume in the system has significantly reduced and long-duration low carbon flexible technologies have been deployed at scale.

Next steps

The actions outlined in this section will be critical to delivering a strong pipeline of low carbon long-duration flexible technologies and driving forward innovative and nascent technologies that can play an important role in delivering clean power. It also makes clear the important role that unabated gas will continue to play in a new back-up role to provide security of supply into the 2030s and beyond, whilst giving clarity for investors on the future routes to decarbonisation for these assets.

Supply chains and workforce

Summary

Lowering barriers to investment into resilient supply chains and workforce development is vital to ensuring we meet the demand for Clean Power 2030 and to capturing the benefits of this change for our economy. This is an opportunity to support UK growth by building domestic supply chains, growing the skilled workforce and spreading good jobs across the country. Government will support industry to secure the supply chains and skilled workforce they need by:

Giving developers greater route-to-market certainty so that they can plan and secure necessary supply chains and workforce, sooner.

Rapidly convening a new supply chains and workforce industry forum for key Clean Power 2030 sectors, including trade unions, to develop a deep understanding of system-level supply chain and workforce planning needs for Clean Power 2030 delivery, exploring bold solutions and devising targeted collective actions to ensure they are met.

Maximising domestic opportunities for clean energy supply chains through cross-economy work such as the UK's Industrial Strategy in Spring 2025, and clean power specific policy actions.

Exploring where international collaboration can support supply chains, including via trade agreements and international co-operation. The government is determined to work with other countries to diversify international supply chains.

Driving an increase in capacity of our domestic clean energy workforce to match the scale of the deployment challenge through our investment into clean energy sectors, and accelerating wider reforms led by the Office for Clean Energy Jobs, the Department for Education, and Skills England alongside targeted clean power offers, working closely with the devolved governments, industry, and trade unions.

Boosting awareness of clean energy job opportunities by publishing data on future clean energy workforce and skills needs, to ensure a common understanding of trends and challenges to inform action.

The challenge

Supply Chains

To deliver Clean Power 2030 we need secure, sustainable, competitive and reliable supply chains to provide the components and materials it requires. The UK will need to source more components by both powering up our domestic manufacturing and ensuring access and competitiveness in international markets. As we achieve this, we are committed to unlocking the growth benefits that come with scaling up deployment and manufacturing of clean energy technologies. Our ambition is to see a sustained increase in supply chain activity both up to 2030 and continuing out to 2050.

Domestically, the UK has established manufacturing capacity in some of the key technologies needed to deliver Clean Power 2030. We have strengths in offshore wind engineering services, cables, electrolysers and electrical equipment, as well as parts of the wind turbine generator and monopiles. We also have suppliers with expertise in both high-voltage alternating current and high-voltage direct current (HVDC) electrical systems and are aiming to build capacity in HVDC cables. The upcoming Industrial Strategy will look to attract investment in growth-driving sectors including clean energy industries, and work is being carried out to determine the key subsectors on which it will focus. More broadly, we are a world-leading investment location, with a strong pipeline of potential projects that could strengthen our base further, although we will always need to also buy inputs and finished components from the international market.

We have been working with industry to make an initial assessment of the industry procurement challenges that may be faced for Clean Power 2030, building on previous evidence produced in collaboration with Baringa and the Industrial Growth Plan[123,124]. This work has identified constraints across several key sectors, with supply chains close to full manufacturing capacity, long lead times for key components, and reliance on single international sources in places. Alongside these constraints, there are several cross-sectoral challenges associated with procuring components and delivering the resilient supply chains we need for Clean Power 2030:

- **Investment confidence for buying components and investing in domestic manufacturing.** Developers need greater certainty in the clean power deployment pathways and associated order books to secure supply chain components as early as possible, especially those with long lead times. In turn, this will give greater confidence to the supply chain to make investment decisions committing to basing or increasing future manufacturing capacity in the UK. We also know that UK supply chain companies need early, strategic engagement from developers to help develop and refine their product and service offerings to market needs.
- **International buying power.** There is growing global competition for clean energy supply chains, with competition for key components across different countries and sectors, which can result in prices being driven up. The UK will always be reliant on international supply chains to some extent: alongside stronger domestic supply chains, it is essential that UK developers have reliable access to and are able to compete in international markets for materials or components.
- **Logistical constraints.** On a sector-by-sector basis, there are specific issues that prevent or delay transport and deployment of supply chain components – most prominently in transmission networks, offshore and onshore wind, where ports, vessels, and abnormal load issues are acute.

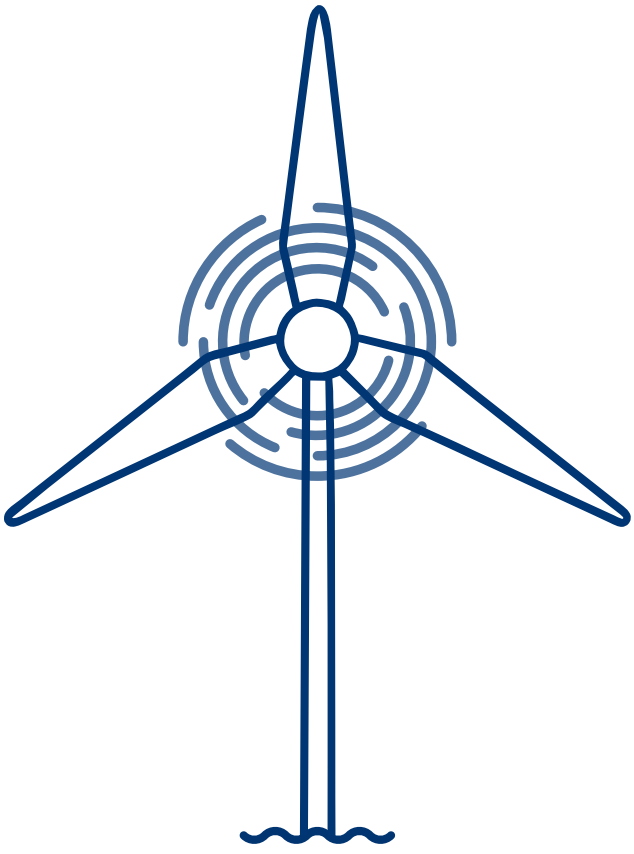
Workforce

The wider transition to net zero is expected to support hundreds of thousands of jobs, with Clean Power 2030 playing a key part in stimulating a wealth of new jobs and economic opportunities across the country[125]. These jobs will cross a range of skill levels and occupations, including technical engineers at levels 4–7 (and particularly 6+ including roles in civil, mechanical, electrical and design), along with electrical, welding, and mechanical trades at levels 2–7, and managerial roles including project and delivery managers at levels 4–7[126]. Many of these occupations are already in high demand across other sectors such as house building, construction, and wider manufacturing, and there also is a relatively high degree of transferable skills and knowledge between many carbon-intensive sectors and clean energy sectors, so wider coordination will be vital[127]. The 'Assessment of the Clean Energy Skills Challenge' evidence annex sets out further evidence on key clean energy occupations, gathered through a range of sources.

[123] Baringa (2024), *'UK renewables deployment supply chain readiness study'* (viewed in December 2024).
[124] RenewableUK, Offshore Wind Industry Council, TCE, & The Crown Estate Scotland (2024), *'Offshore Wind Industrial Growth Plan'* (viewed in December 2024).
[125] CCC (2023), *'A Net Zero Workforce'* (viewed in November 2024).
[126] UK Government, *'What qualification levels mean'* (viewed in December 2024).
[127] Experimental job advert analysis shown in figure 14 suggests there is relatively high transferability of skills from many carbon-intensive sectors to clean energy sectors, suggesting workers in carbon-intensive sectors are likely to have many of the skills needed across the Clean Power workforce. The challenge will be in enabling the reskilling of these workers, quickly.

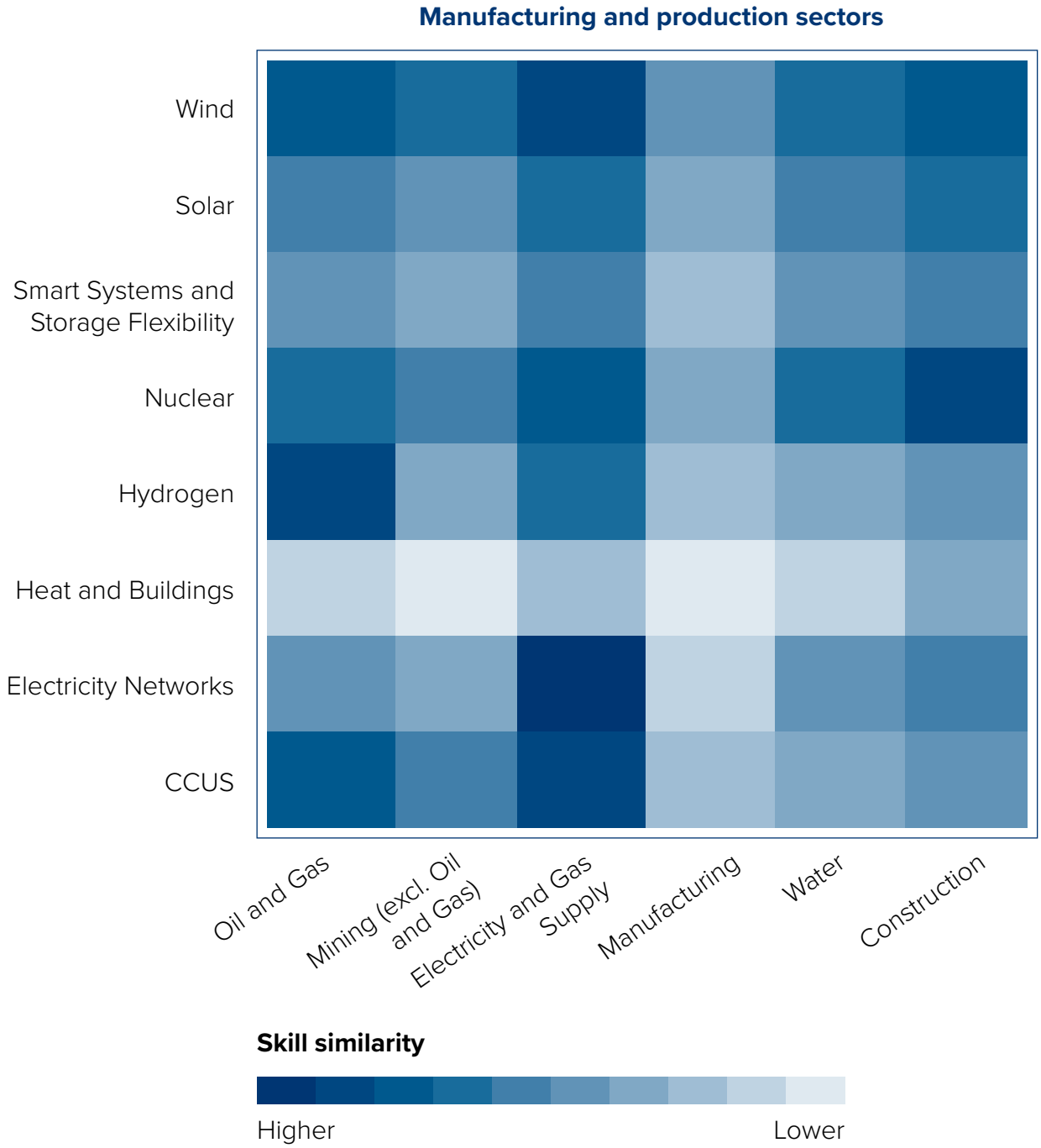
The challenge of finding employees with the right skills to take on these roles is already significant and expected to remain so. Through industry engagement, we have identified several key barriers to securing the Clean Power 2030 workforce:

- **Delivering future skills needs:** There are a number of gaps and key occupations that need to be better targeted in the post-16 skills system. Exacerbating the challenge is the high proportion of small and medium sized enterprises in clean energy sectors, some of whom have struggled to engage with the existing skills system. The UK also has an ageing workforce, and many individuals with the skills we need have left the workforce or are retiring soon.
- **Reskilling and transferability:** Most of the workforce we need for 2030 is already employed, so retraining, upskilling, and increasing the transferability of workers between sectors is essential.
- **Awareness, perceptions and accessibility of clean power jobs:** Lack of awareness of green sector jobs is exacerbating role shortages and putting future skills supply at risk. The Learning and Work Institute reported that 87% of 16–24-year-olds did not know what 'green skills' were when asked[128], reducing uptake of skills and training provision. In addition, we are not fully utilising the talent and ambitions of our workforce, for example, only 16.5% of the engineering workforce is female[129] and only 7% of the offshore wind workforce are from non-white backgrounds[130].
- **Regional pressures:** Several clean energy sectors, like offshore wind and carbon capture, are heavily clustered in specific regions of the UK. With limited data on skills needs, local skills providers are struggling to identify and tailor skills requirements around the rapidly evolving needs of their local areas. They can also find it challenging to respond to these needs given constraints on the teaching workforce and on the availability of facilities and equipment that support clean energy skills development.



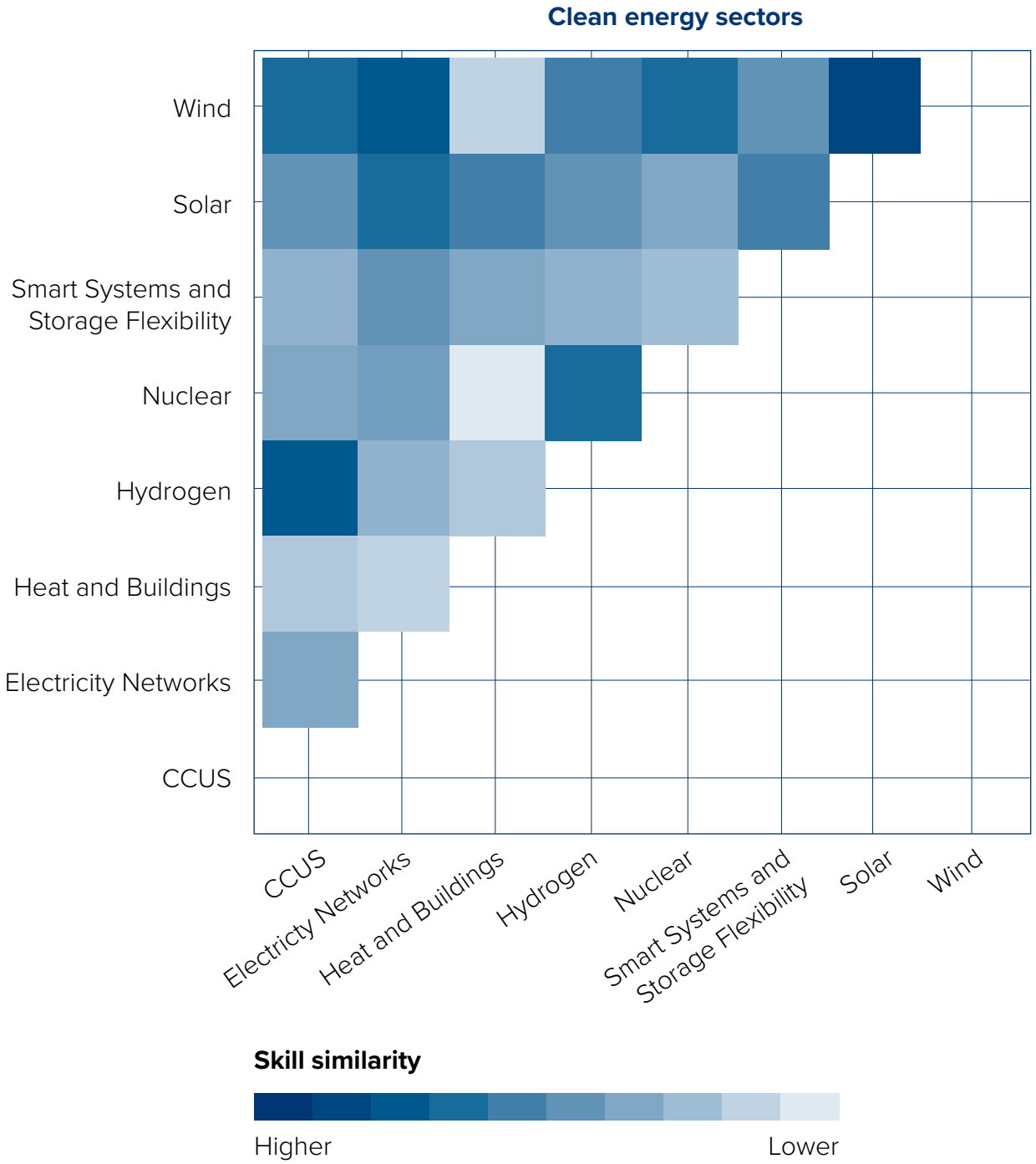
[128] Learning and Work Institute (2023), *'Skills for a net-zero economy: Insights from employers and young people'* (viewed in November 2024).
[129] EngineeringUK (2022), *'Women in Engineering: Trends in women in the engineering workforce between 2010 and 2021'* - Based on ONS Labour Force Survey data (viewed in December 2024).
[130] Offshore Wind Industry Council (2023), *'Offshore Wind Skills Intelligence Report'* – Based on job record data provided by employers (viewed in December 2024).

Figure 14: Similarity of skills demanded by online job adverts across several carbon-intensive and clean energy sectors



Note: 'Similarity' refers to cosine similarity, calculated using skills and their prominence across SIC groupings and clean energy sectors. The following traditional sectors are considered: Construction (Section F), Water (Section E), Electricity and Gas Supply (Section D), Manufacturing (Section C), Mining excl. Oil and Gas (SIC 05, 07, 08, 099), Oil and Gas (SIC 06, 091). There may be a small proportion of job adverts which fall into both groups being compared.

Source: DESNZ experimental analysis of Lightcast online job advertisement data (2024). The Clean Energy Job Adverts Analysis: Charts and Methodology document provides more detail on this analysis.



Note: 'Similarity' refers to cosine similarity, calculated using skills and their prominence across SIC groupings and clean energy sectors. The following traditional sectors are considered: Construction (Section F), Water (Section E), Electricity and Gas Supply (Section D), Manufacturing (Section C), Mining excl. Oil and Gas (SIC 05, 07, 08, 099), Oil and Gas (SIC 06, 091). There may be a small proportion of job adverts which fall into both groups being compared.

Source: DESNZ experimental analysis of Lightcast online job advertisement data (2024). The Clean Energy Job Adverts Analysis: Charts and Methodology document provides more detail on this analysis.

Taking action

We will take action to address these barriers, through broad UK government industrial policy, English skills reforms and through targeted Clean Power 2030 initiatives. Similar approaches are being taken across the devolved governments, such as those outlined in the Scottish Green Industrial Strategy,[131] the Welsh Economic Mission[132] and the Northern Ireland Executive's Path to Net Zero Energy[133]. We want to give developers of clean power infrastructure the best chance of securing the supply chains and workforce they need to deliver Clean Power 2030, and we are committed to delivering Clean Power by 2030 in such a way that retains value for money and balances cost considerations with delivery.

This starts with giving developers greater clarity and certainty over their routes to market, to enable them to plan and mobilise the supply chains and workforce they need to deliver new generation. This will help give forward sight to supply chain companies to prepare and have capacity to supply clean power infrastructure projects. We have aimed to do this elsewhere in this plan, particularly in sections covering market reform, Contracts for Difference reform for upcoming allocation rounds, proposed changes to planning and consenting, and connections queue changes. For network companies, greater flexibility to secure supplier capacity earlier and for the longer term will be given primarily through the launch of Ofgem's Advanced Procurement Mechanism[134].

The Clean Power 2030 Unit, in collaboration with the Office for Clean Energy Jobs, will convene key stakeholders from Clean Power 2030 sectors in a new industry forum in early 2025. This will be a collaborative vehicle for proactive supply chain and workforce planning. Further information on this forum is included in the government's approach to delivering Clean Power 2030 chapter as a case study for how we will drive delivery through a new, mission-focused approach.

Alongside the work of the forum to develop collective actions for Clean Power 2030 delivery, UK government has a further role in:

- **Maximising domestic opportunities for clean energy supply chains** through cross-economy work such as the UK's Industrial Strategy in Spring 2025, and clean power specific policy actions.
- **Exploring where international collaboration can support supply chains,** including via trade agreements and international co-operation. The government is determined to work with other countries to diversify international supply chains.
- **Driving an increase in capacity of our domestic clean energy workforce to match the scale of the deployment challenge** through our investment into clean energy sectors, such as the Clean Industry Bonus and Great British Energy, and accelerating wider reforms led by the Office for Clean Energy Jobs, the Department for Education, and Skills England alongside targeted clean power offers, working closely with the devolved governments, industry and trade unions.

[131] Scottish Government (2024), *'Green Industrial Strategy'* (viewed in December 2024).
[132] Welsh Government (2023), *'Economic mission: priorities for a stronger economy'* (viewed in December 2024).
[133] Northern Irish Executive (2021) *'Path to Net Zero Energy'* (viewed in December 2024)
[134] Ofgem (2024), *'Electricity Transmission Advanced Procurement Mechanism Consultation'* (viewed in December 2024).

- **Boosting awareness of clean energy job opportunities by publishing data on future clean energy workforce and skills needs**, to ensure a common understanding of trends and challenges to inform action.

Maximising domestic opportunities for clean energy supply chains

A range of work is already underway in government to support cross-economy development of domestic supply chains. **In spring 2025, we will publish an Industrial Strategy including a clean energy sector plan**. Government's approach to stimulating investment and activity in growth-driving sectors will be set out in this upcoming Industrial Strategy, which we will continue to actively shape to maximise its benefits for clean power industries. The strategy will outline government's next steps to securing growth opportunities in these industries, and a clear approach to enabling sectors to overcome barriers to growth and investment, including in supply chains. A new **supply chains taskforce** will assess where supply chains critical to the UK's economic security and resilience are vulnerable – focussing in the first instance on supporting the development and delivery of the Industrial Strategy.

In addition, we are taking action to focus investment into boosting our supply chain capacity and create pathways for efficient procurement processes:

- **Delivering the new Contracts for Difference (CfD) Clean Industry Bonus**. This initiative allows clean energy developers in fixed and floating offshore wind to access additional CfD revenue for investments in manufacturing in our coastal and energy communities and cleaner, more sustainable supply chains.
- **Consulting on targeted reforms to the CfD mechanism for upcoming allocation rounds**, including improving transparency and predictability in the timing and scale of future CfD allocation rounds, which in turn can support increased investment in clean power supply chains. Further detail on these reforms is included in the Renewable and Nuclear Project Delivery chapter.
- **Delivering the Floating Offshore Wind Manufacturing Investment Scheme** (FLOWMIS) which was set up to provide grant funding to support the development of port facilities for large-scale floating offshore wind deployment. The Port of Cromarty Firth and Port Talbot have been placed on the FLOWMIS primary list, meaning they have been taken forward for detailed due diligence, subsidy control assessment and negotiation of grant terms. Further detail on the role of floating offshore wind is included in the Renewable and Nuclear Project Delivery chapter.
- **Mobilising government investment into the clean power sector** via the National Wealth Fund and Great British Energy. At least £5.8 billion of the National Wealth Fund's capital will focus on five other sectors relevant to clean power: green hydrogen, carbon capture, ports, gigafactories and green steel. £8.3 billion over the course of this Parliament has also been committed to the newly created Great British Energy, which will work in lockstep with the National Wealth Fund. It will work to support the growth of clean power supply chains across the UK, ensuring the benefits of these are widely distributed.
- **Supporting Ofgem's development of the Electricity Networks Advanced Procurement Mechanism** to be launched in early 2025 with the aims of providing greater flexibility for Transmission Owners to secure supplier capacity and to bulk procure multiple factory slots across a portfolio of projects ahead of need.

Exploring where international collaboration can support supply chains

We recognise that, though it is crucial to build domestic capacity, some of our supply chain needs will be met by the global rather than the domestic market. Where this is necessary, we want to give developers the best possible opportunity to secure what they need. We will do this through:

- **Collaborating with international partners** through international initiatives such as the Global Clean Power Alliance and other bilateral and multilateral initiatives, to diversify and strengthen supply chains. This has the potential to support new sources for critical clean power components, address bottlenecks and reduce costs.
- **Exploring international solutions to ensure the UK is able to secure the critical goods it needs** for the energy transition and explore international trade frameworks and institutions that can support the transition to net zero.

Driving the increase in capacity of our domestic clean energy workforce

Wider reform of the skills and employment system are underway across government to shape the domestic workforce and support the delivery of Clean Power by 2030. The skills and expertise of workers from the oil and gas will be central to the success of our Clean Energy Mission. There is a huge opportunity for re-skilling and transferability of skills of the oil and gas workforce across the economy. As skills policy is devolved, we will commit to continue our ongoing dialogue and collaboration with our counterparts in the devolved governments to ensure a coordinated and joined-up approach.

The Scottish Government published the Green Industrial Strategy in September 2024[135]. This outlines that the availability of high quality, appropriately skilled and ambitious people is critical to the willingness of a business to start, scale and invest. Significant work is progressing to reform the Scottish education and skills system so that it is more responsive to economic needs and ambitions. The Scottish Government will continue to invest in that system and the infrastructure that supports it, including for example, schools, colleges, universities, apprenticeships and our Innovation Centres, to enable the transition to net zero as well as broader ambitions.

The Welsh Government has published the Stronger, Fairer, Greener Wales: Net Zero Skill Action Plan[136], to provide practical steps towards understanding where and how skills needs will change over time and indicate how the Welsh Government will support this transition. Other planned Welsh initiatives include the publication of Clean Energy Sectors Skills Roadmaps, an Energy Sector Deal, supporting the Heat Strategy for Wales to advance decarbonisation, developing a new renewable energy apprenticeship framework and fostering industry collaboration to enhance supply chain opportunities.

The Northern Ireland Executive is also looking to influence and shape developments in green skills and has facilitated an industry-led Green Skills Action Plan. The Green Skills Action Plan initially focusses on the following three areas: large-scale energy production; infrastructure; and domestic low carbon technologies and energy efficiency to ensure that courses and apprenticeships are in place to provide the skills needed for the energy transition.

[135] Scottish Government (2024), *'Green Industrial Strategy'* (viewed in December 2024).
[136] Welsh Government (2023), *'Stronger, Fairer, Greener Wales: Net Zero Skill Action Plan'* (viewed in December 2024).

Ongoing UK government work includes:

- **Setting up The Office for Clean Energy Jobs,** which has been created to focus on ensuring we have the skilled workforce in core energy and net zero sectors critical to meeting Clean Power 2030. It will focus on supporting regions transitioning from carbon-intensive industries to clean energy sectors, ensuring clean energy jobs are high quality, with fair pay, favourable terms and good working conditions, and increasing diversity in the clean energy workforce. It will engage across the energy sector, trade unions and industry to deliver on this.

- **Designing a pilot scheme to support regional skills interventions** that will help transition the UK workforce from carbon-intensive sectors to clean energy sectors. This will be achieved by identifying and addressing skills gaps and challenges through targeted interventions trials on a regional basis. Interventions could include local skills and workforce mapping, career transition advisors, funding for direct training provisions.

- **Setting up Skills England to provide an authoritative assessment of national and regional skills needs**; work with Combined Authorities to ensure these are met; align a comprehensive suite of apprenticeships, training and technical qualifications with skills gaps; and advise on a new growth and skills offer. DESNZ will work with DfE and Skills England, together with the devolved governments, on early reform priorities to ensure that policy implementation begins as soon as possible to have the greatest impact on Clean Power 2030. The government will also evolve the apprenticeships offer into a more flexible growth and skills offer, delivering greater flexibility for learners and employers, aligned to the Industrial Strategy, creating routes into good, skilled jobs in growing industries such as clean energy. DESNZ will work with DfE, Skills England, and the sector to inform the offer. DESNZ will also work with DfE on transforming further education colleges into specialist Technical Excellence Colleges and on ways to enhance the further education workforce in clean energy and related sectors. The Curriculum and Assessment Review closed its call for evidence recently, and many clean energy industry bodies provided information.

- **Taking forward the 'Get Britain Working' White Paper.** This sets out plans for reforms to employment support to tackle economic inactivity, such as the Youth Guarantee, a new jobs and careers service to support more people into work and help them get on in work, and locally led Get Britain Working Plans for areas across England. DESNZ, DWP and DfE will work together to develop proposals for how the specific reforms mentioned within the White Paper will be implemented to support delivery of the workforce needed for Clean Power 2030.

In addition to this cross-economy work, we are taking the following clean power specific action to secure the 2030 workforce demand:

- **Exploring targeted skill interventions to reskill and upskill workers across the economy**, including identifying the regions that will be most impacted by the transition to clean energy. As of October 2024, DESNZ has come onboard as a strategic partner of the Skills Passport project. The passport is an industry led initiative overseen by Renewable UK and Offshore Energy UK and supported by the UK and Scottish Governments which will align standards, recognise transferable skills and qualifications and map out career pathways for suitable roles. This new digital tool for workers is set to be piloted by January 2025.

- **Developing ways to support access to training schemes in key clean power sectors needed for 2030**. Government is developing several new economic and investment policies which will crowd investment into the sector and create future potential opportunities to channel funding into skills provisions and training.

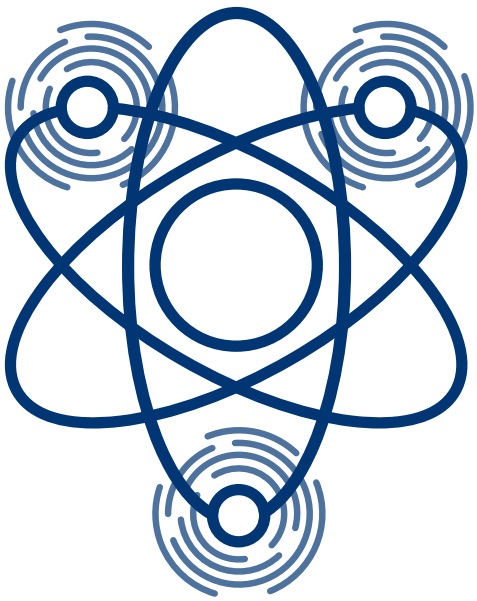
Boosting awareness of clean energy job opportunities

Ensuring an improved uptake of clean energy upskilling and reskilling offers will be essential, we will do this by establishing a common understanding of the barriers and collaborating with industry to overcome them. We will do this by:

- **Publishing the 'Assessment of the Clean Energy Skills Challenge' evidence annex alongside this Action Plan**, comprising data gathered across government, industry and company leaders, academics and further education representatives. This evidence is based on previous 2035 targets. However, the key near-term occupation shortages and workforce challenges sectors are expecting to face are anticipated to be largely similar. This evidence will be used as a basis for government, industry, and other key partners to better understand the 2030 workforce requirements and support targeted skills planning with confidence.
- **Exploring public awareness campaign options**, working between government and industry to see how we can coordinate messaging promoting the opportunities from clean energy jobs, help employees and employers navigate the skills landscape, and improve diversity in the clean energy workforce.

Next steps

- The first meeting of the new collaborative forum will take place in early 2025, convening key partners across private and public sectors to work collaboratively on supply chain and workforce planning.
- Our new, modern, Industrial Strategy 'Invest 2035', including a sector plan for clean energy industries, will be published in Spring 2025, setting out the government's approach to growth opportunities in clean energy industries across both supply chains and skills.
- We will deliver an updated carbon budget delivery plan in due course to the end of Carbon Budget 6 in 2037 with full detail of policy packages for all the sectors. This will provide a long-term line of sight, outlining the policies and proposals needed to deliver carbon budgets 4-6 and the Nationally Determined Contributions in 2030 and 2035 on a pathway to net zero.
- Government is developing a new Trade Strategy which will support the energy transition in alignment with Clean Power 2030, and ensure resilient global supply chains.



Taking us to 2030: Our approach to delivery

Delivery of large-scale transitions is nothing new for the energy sector, but the challenge of achieving clean power by 2030 is substantial. The Clean Power 2030 Action Plan defines the UK government's role in the clean energy transition. Government will work with industry to unlock barriers and will take an innovative approach. Additionally, it is important that government looks at a clean power system beyond 2030, where demand is expected to increase.

Leveraging the UK's industrial expertise

Clean Power 2030 needs a large amount of infrastructure to be delivered in just a few years, almost all of which will be delvered by private companies – including making key components, designing and developing projects, installing infrastructure, operating power generation plants, and financing new ventures.

All these companies are key to successful delivery of Clean Power 2030, and the UK is fortunate in having many people with a great deal of practical experience and knowledge in all these areas. The Clean Power 2030 Unit draws together a mix of skills from within the Civil Service and industry expertise, ensuring the right insight and expertise is available to support delivery.

The Clean Power 2030 Unit itself is underpinned by an advisory commission made up of 8 leading figures from across industry and academia who provide insight and advice on all aspects of its work.

The Clean Power 2030 Unit is also committed to working closely with those involved in practical delivery. The engineering, commercial, market, regulatory and policy landscape is complex, and we will need deep skills in all these areas combined with an ability to engage all parties to cut through issues quickly, together with creating and sustaining a mindset of collaborative endeavour across the industry.

To create the Action Plan, experts from government and the clean power sector explored policy approaches and assessed their deliverability. We believe the actions in this plan define the necessary policy landscape for successful delivery of Clean Power 2030, with a clear statement of intent and potential route to Clean Power 2030. However, we recognise that this is just the start, and the coming years will see a complex programme of activity, relying on the work of a wide range of businesses, many parts of government at central, regional and local level, the third sector, and individuals. We are committed to working hand-in-hand with industry, to provide both direction and support to deliver our common goal. The work of the Vaccines Task Force during the pandemic demonstrated what can be achieved when tight focus, strong direction, and full collaboration come together.

Tracking and supporting delivery of the system as a whole

A key role of the Clean Power 2030 Unit is to build and maintain a comprehensive view of the power infrastructure that is currently in various stages of development and delivery, and of the wider enablers across the electricity system, to understand what is likely to be delivered by when, where challenges may be emerging, and early warning signs for these, and what actions can be taken to keep key investments on track.

The Unit will take a whole-system approach, tracking power generation, transmission and distribution infrastructure, and with a particularly close focus on the development of flexible power production and consumption and smart demand, as well as the parallel evolution of the heat and transport sectors, and how the system contributes to our overall emissions. The Unit will also track vital wider enablers across the length and breadth of this Action Plan, to effectively identify whether the mission is on track.

Where emerging problems are identified, the Unit will work with government sector experts to investigate what can be done in more detail, develop actions that can be taken, and drive their implementation. The Advisory Commission will have a key role in advising both on emerging issues, and on the priorities for action.

Taking a data driven approach

We commissioned NESO to provide advice on the potential pathways to achieve clean power by 2030. This suggested Clean Power 2030 is achievable, with insights on the pathways to delivery.

The Unit will bring together data and insights from across government and the clean energy sector, to track the delivery of clean power infrastructure and metrics for vital wider enablers, with analytical and data science expertise embedded within the Unit. This capability will provide decision-makers with up-to-date insight on progress across the infrastructure projects critical to 2030 and will inform actions taken to promote effective delivery and address emerging issues. The Unit will work to promote collaboration on collecting and using these data across government and our delivery partners where appropriate.

This work will also involve managing dependencies and ensuring that our future power system works as a coherent whole.

The Clean Power 2030 Unit will continue to develop this data capability in the New Year. We currently envisage an expert team across all necessary fields, supported by strong data flows and backed by the Mission Board, the Secretary of State, and ultimately the Prime Minister, all within a structured engineering program delivery environment.

This is a once-in-a-generation opportunity to deliver clean power – and we are committed to operating a robust system of evaluation and innovation to drive continuous improvement throughout the system.

An industry forum for system-level supply chain and workforce planning

With global competition for resources for clean energy technologies we know that developers face challenges in securing both the materials and skills they need. Our approach to delivering Clean Power 2030 presents a unique opportunity for government and industry to come together to more proactively plan and coordinate supply chain and workforce delivery. We will have clearer line-of-sight of what needs to be built and by when, so are uniquely placed to work in lockstep with industry to help them manage and navigate supply chain and workforce constraints.

In addition to the policies and actions discussed in the Supply Chains and Workforce chapter, we see a core role for the Clean Power 2030 Unit in bringing together key industry players to think radically about the challenges facing our supply chains and workforce. This group will meet for the first time in early 2025 and will look to quickly move to agreeing specific policy actions that can be taken to address shared risks in this area.

To do this we will establish a new forum, convened by the Clean Power 2030 Unit in close collaboration with the Office of Clean Energy Jobs, which brings together key partners, across private and public sectors, including trade unions, in infrastructure delivery. Drawing on past government experience of working innovatively with industry, this forum will quickly form a view of the Clean Power 2030 system-level supply chain and workforce needs and then devise targeted collective actions to ensure these needs are met.

We will engage with industry in the development of this forum, exploring what role it should take to be most impactful. This could be a more active role for government in supporting workforce planning across key sectors for 2030 or enabling greater collaboration and sharing of insight across industry. The new forum will join up work already being done across the Offshore Wind Industry Council, the Onshore Wind Taskforce and the Solar Taskforce. The new collaborative forum will look to complement the work of these groups to drive forward bespoke actions for 2030. This group will meet for the first time in early 2025 and will look to quickly move to agreeing specific actions that can be taken to address shared risks in this area.

The key role of the Devolved Governments

The Devolved Governments will play an important part in meeting the targets for Clean Power 2030. The governments have significant devolved powers in areas around energy and will need to be a part of the UK wide initiatives to ensure effective implementation of Clean Power 2030 policies. Not least, we will need their support in streamlining the planning and consenting processes to facilitate faster development of clean power projects.

The development of clean power infrastructure will create jobs for local areas, and we will need support to ensure that the skills development is in place to fill these roles. The UK government has been working closely with the devolved governments to ensure there is a consensus and understanding with what will be needed to achieve Clean Power by 2030.

Wales

The Welsh Senedd was the first government to declare a climate emergency. Welsh Government has set a target for Wales to host sufficient renewable capacity to meet its own needs from 2035 and to keep pace as we move away from fossil fuels and demand for clean electricity increases.

Welsh Government welcomes the Clean Power Plan, which is necessary if Wales is to achieve its ambitions for a prosperous low carbon future. This plan will be important in accelerating the start of what must be a long term pathway for the next thirty years. We need future certainty to secure long term investment in the nation's energy infrastructure, and in the skilled workforce we need to build it.

Whilst we recognise the importance of large scale generation and transmission networks, our Future Energy Networks for Wales work also recognises the role of smarter and more local energy use. Wales is taking a proactive approach to planning for the new energy system, supporting local authorities to develop plans that show how transport, heating and industry will change as we use cleaner fuels and more efficient processes. Our Ynni Cymru programme is supporting a range of projects that look to meet energy needs locally, keeping value local and reducing the need for large scale change. We look forward to contributing evidence from this innovative programme, to how we collectively achieve the future energy system at least cost and least impact for people.

Scotland

The Scottish Government is committed to working closely with the UK government on shared ambitions to decarbonise energy generation and drive progress towards net zero. Close collaboration is vital to ensuring coherent delivery of the Action Plan across Great Britain, and devolved areas – such as Scotland's terrestrial and offshore planning and consenting systems – will play a key role.

Scotland's significant renewable energy potential, strong pipeline of projects, and growing supply chain will be essential to achieving a secure, affordable and clean power system across Great Britain. The Scottish Government's objective is to ensure this brings significant wider benefits – such as boosting economic growth, supply chains and green jobs; delivering renewable energy with tangible benefits to communities; and reducing costs for consumers.

Scotland has already made significant progress towards a clean, fair and secure energy system. Scotland is a net exporter of electricity to the rest of Great Britain, and in 2022, more than 70% of electricity generated in Scotland was from renewable sources. Scotland's renewable energy capacity continues to grow, with a strong pipeline of future projects that will play a

key role in decarbonising the power system across the UK.

The Scottish Government is already taking action to build on this progress and accelerate deployment of clean energy – this includes measures to improve the planning and consenting regime for energy infrastructure; delivering the Green Industrial Strategy; investing in the offshore wind supply chain in Scotland; and actions to achieve the Scottish Government's existing 2030 ambitions for onshore and offshore wind.

The Scottish Government will continue to work with the UK government to maintain investor confidence and boost renewables deployment, whilst also securing clear benefits for consumers and communities throughout the transition.

Northern Ireland

The Clean Energy Superpower Mission will benefit UK taxpayers, which includes Northern Ireland. Energy policy is largely devolved to the Northern Ireland Executive, and they are producing their own plan to decarbonise the power sector. Taking a holistic four nations approach will increase the benefit for the entire UK. Clean Power 2030, whilst a target for Great Britain, is on the pathway to reach net zero by 2050, which as enshrined in law, includes Northern Ireland.

Role of power sector actors

The delivery of Clean Power 2030 will rely heavily on the collaboration and input from a huge range of public and private sector organisations. Government will work in close collaboration with these groups to deliver Clean Power 2030. Whilst the list of organisations essential to our successful delivery is long, particularly key groups include:

The role of industry

Private sector input is essential, bringing the expertise and investment required to achieve the ambitious Clean Power 2030 target. This plan outlines the policy actions being taken by the government, but the industry will play the core role in the delivery of the Clean Power 2030 target, from securing the initial investment and undertaking early project design, through to building and operating Clean Power 2030 assets. The government has engaged with the industry while developing the action plan and will continue to do so as progress is made towards the 2030 target.

The role of Ofgem

Ofgem is Great Britain's independent energy regulator, whose primary responsibility is to protect energy consumers, especially the most vulnerable, while at the same time working with government, industry and consumer groups to deliver a net zero economy at the lowest cost to consumers and drive economic growth. Ofgem works closely with the Clean Power 2030 Unit, the National Energy System Operator, consumer groups and across government, to support its aim of delivering a clean power energy system by 2030 and a net zero economy by 2050. Its governing body is the Gas and Electricity Markets Authority, which comprises non-executive and executive members, and a non-executive chair. Members are appointed by the Secretary of State of the Department for Energy Security and Net Zero. Ofgem's Senior Executive Committee is chaired by Ofgem's Chief Executive Officer and is responsible for our overall performance; it is made up of the CEO and seven Director Generals and Directors from across Ofgem.

Ofgem works on behalf of energy consumers to ensure that households and businesses across Britain can rely on a safe, affordable and environmentally sustainable energy supply. The UK has one of the most ambitious climate change goals in the world

and at the heart of this is our transition from a high carbon traditional energy system to one that is fully decarbonised. Ofgem has a key role in this transition, making sure that customers' interests are looked after along the way. As a Non-Ministerial Department and independent regulator, Ofgem uses the duties and powers set out for it by Parliament to:

- Ensure fair prices so consumers pay a reasonable price for their energy and are protected from unfair costs.
- Drive up standards by ensuring energy suppliers abide by the rules and treat customers properly.
- Keep down costs by fostering innovation and attracting investment so consumers can make greener choices through new products and services.
- Grow our energy resilience by helping to deliver a future energy system that is not reliant on global energy imports so consumers have access to stable, affordable, and secure supplies of energy.
- Deliver government schemes for renewable energy, energy efficiency and to protect the poorest energy customers.

The role of the National Energy System Operator (NESO)

NESO was established in October 2024 as a publicly owned system operator, with new responsibilities in strategically planning the whole energy system and giving advice to government and Ofgem. NESO's advice to government on achieving clean power by 2030 has been a key input in shaping this plan. NESO will be a key partner in delivering clean power, working closely with government Ofgem and industry.

As a first step, NESO is consulting on the reform of connections processes, which includes aligning those processes with government's clean power plan and with future iterations of the Strategic Spatial Energy Plan. This will enable the generation capacity required to meet clean power to efficiently connect to the system and provide longer term clarity for industry.

As the System Operator, NESO will be working to ensure that its own operations, processes and systems are prepared for the drive to clean power. This will include developing an implementation and putting in place its ongoing industry engagement plan.

NESO will work with Ofgem to continue to push forward energy code reform and help to identify the direction of future code changes for clean power provided through the Strategic Direction Statement and assess how code change can be more effective and responsive to changing system or market needs. In November, NESO launched a consultation on its business plan which sets out how NESO will work to implement clean power by 2030[137].

The role of DNOs

DNOs are responsible for the infrastructure that delivers electricity from the national transmission network to consumers. This includes the maintenance and operation of towers, transformers, cables, and meters. They are key players in the energy transition, given their intrinsic responsibilities to enable the distribution of renewable energy.

[137] NESO (2024), *'Have your say on our first business plan as NESO'* (viewed in December 2024).

The role of Transmission Operators

The three Transmission Operators are responsible for owning and maintaining the high voltage electricity network ensuring high voltage electricity can reach one of the fourteen Distribution Networks Operators across GB. They are key players in ensuring the energy system is suitably maintained and equipped to transport renewable energy across the country.

The role of public finance institutions

The UK's public finance institutions are empowered to deliver a range of financing tools to support government policy goals in line with their government set mandates.

They play a key role in providing finance to clean power sectors and technologies, supporting them to commercial maturity and scale. This includes support for earlier stage innovation (UK Research and Innovation), smaller businesses vital to commercialisation of green technologies (British Business Bank), and first-of-a-kind commercial deployment, or later stage scaling-up and growth stages for businesses and technologies (National Wealth Fund and UK Export Finance).

The National Wealth Fund will build on the UK Infrastructure Bank's (UKIB) leadership and investment expertise with an expanded suite of financial instruments (such as performance guarantees), additional capital, a broader mandate, additional resource to conduct more proactive development, a commitment to trialling new blended finance solutions with government departments, and a greater regional focus. It will continue to invest in UKIB's previous priority sector of clean energy (including renewable generation, nuclear, flexibility, storage, grid, retrofit, heat networks and clean energy supply chains) for projects which have a financing gap, helping to mobilise private capital into them. At least £5.8 billion of the Fund's capital will focus on five other sectors relevant to clean power: green hydrogen, carbon capture, ports, gigafactories and green steel.

The public finance institutions are actively involved in financing clean power 2030, including battery storage facilities, renewable energy generation, and electricity network infrastructure and supply chains.