



**United Kingdom**

# UNITED KINGDOM'S ACTION PLAN FOR POWER SECTOR DECARBONISATION

Department for Energy Security and Net Zero

Delivered for the 14<sup>th</sup> Clean Energy Ministerial (CEM14)

July 2023

## BACKGROUND

A collaborative report from the Clean Energy Ministerial (CEM) on [\*Lessons Learned for Rapid Decarbonization of Power Sectors\*](#) was delivered to energy ministers and presented at the 13<sup>th</sup> CEM (CEM13) in the United States in September 2022. In light of these lessons learned and discussed at CEM13, several jurisdictions signaled intent to develop Action Plans for power sector decarbonization, to be released at CEM14 in India in July 2023.

These Action Plans complement, but are differentiated from, other international power sector initiatives such as the Breakthrough Agenda (whose broad purpose is to raise collective ambition) and the Global Power System Transformation (G-PST) Consortium (whose goals are to convene power system operators to accelerate research innovations and foster peer learning). The Action Plans, supported by the [\*21st Century Power Partnership\*](#) and other CEM workstreams via direct technical assistance and capacity building, are intended to focus on select implementation actions given each country's existing power sector goals and activities, and are an opportunity for countries to display leadership in power sector decarbonization.

**These Action Plans are voluntary, developed by each country individually, not comprehensive of all activities within the jurisdiction, and are living documents that are subject to change.**

## BACKGROUND: KEY DRIVERS OF CHANGE OVER THE LAST DECADE

### Climate Change Act (2008)

- Establishes a legally binding target to reduce the UK's greenhouse gas emissions by at least 80% in 2050 from 1990 levels.
- Drives progress and sets the UK on a pathway towards meeting this target.
- Introduced a system of carbon budgets, including a target that the annual equivalent of the carbon budget for the period including 2020 is at least 34% lower than 1990.

### Electricity Market Reform (2013)

- Incentivises investments in secure low-carbon electricity, improves the security of Great Britain's electricity supply, and improve affordability for consumers.
- Part of [The Energy Act 2013](#) and introduced a number of mechanisms. In particular:
  - A Capacity Market, designed to help ensure security of electricity supply at the least cost to the consumer.
  - Contracts for Difference, designed to provide long-term revenue stabilisation for new low carbon initiatives.

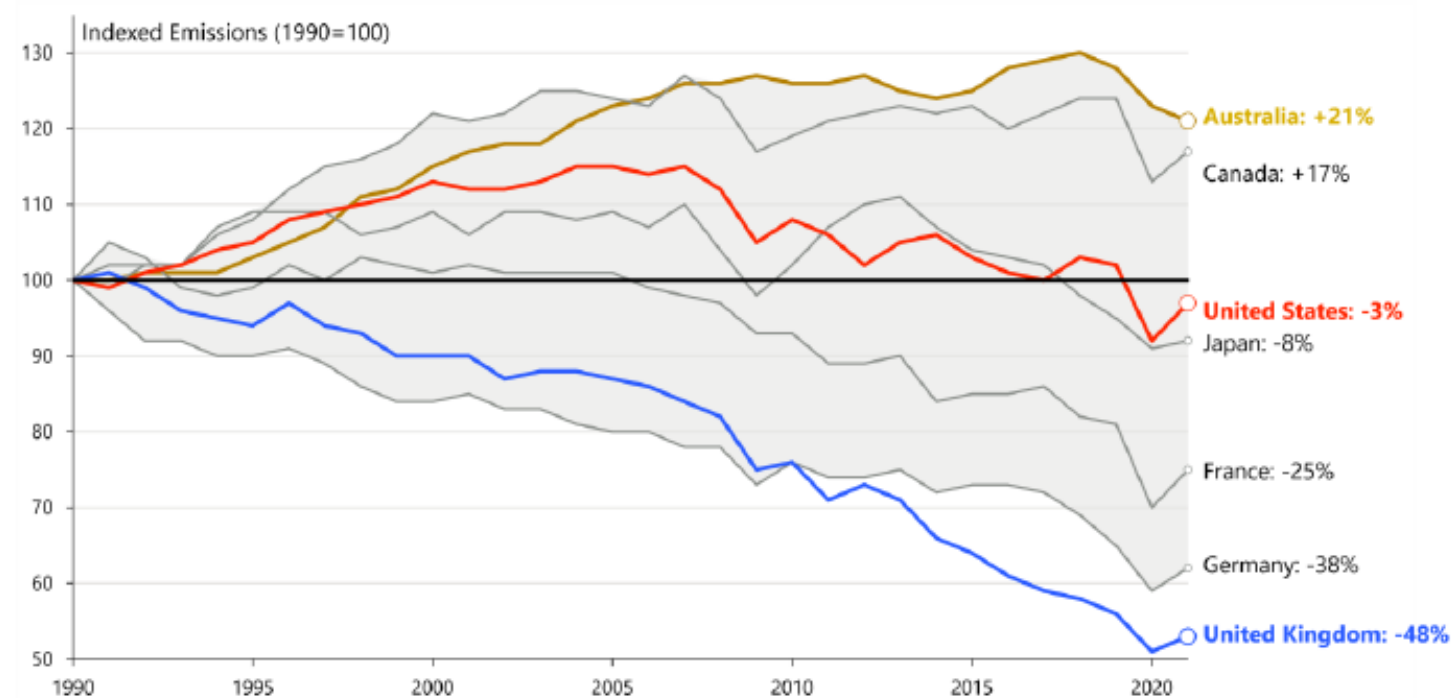
## DECOUPLING EMISSIONS AND ECONOMIC GROWTH

**The UK has made significant progress in decarbonising its economy and decoupling emissions from economic growth.**

Between 1990 and 2021, the UK has cut emissions by 48%, decarbonising faster than any other G7 country, whilst growing the economy by 65%.

To keep the UK on a path to net zero by 2050, the government is required to set legally binding, five-year caps on emissions – carbon budgets – twelve years in advance and then publish a report setting out proposals and policies.

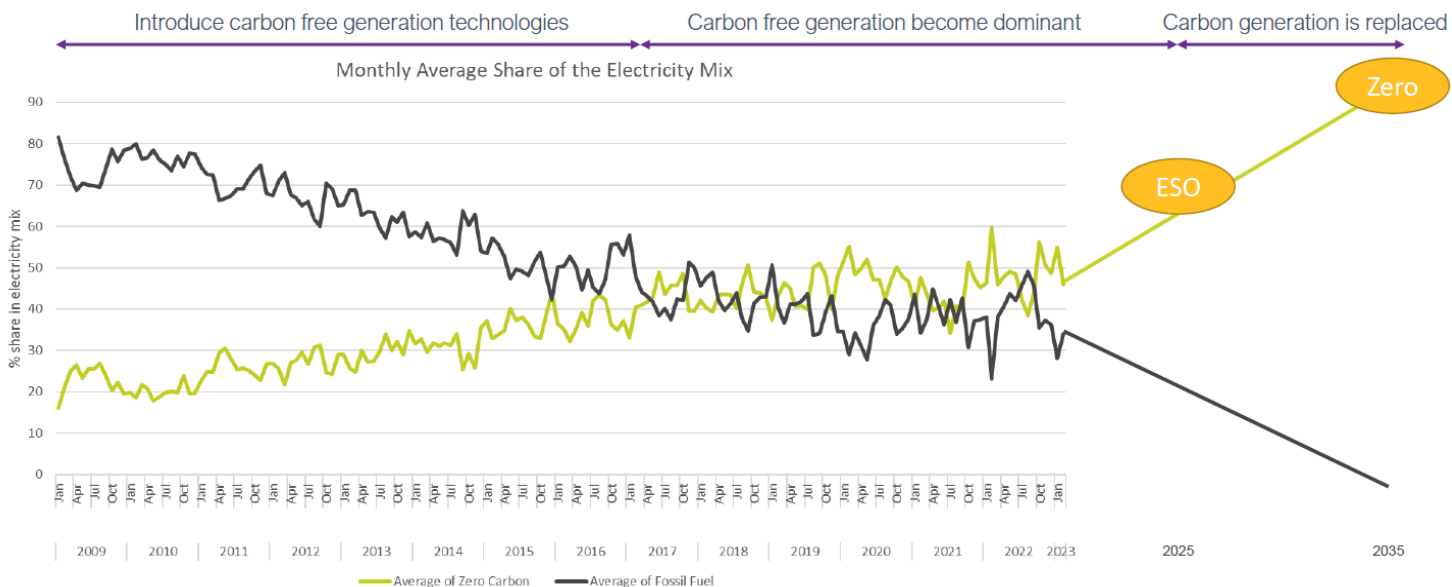
**Figure 1: Greenhouse Gas emissions for the UK and major economies, 1990 – 2021**



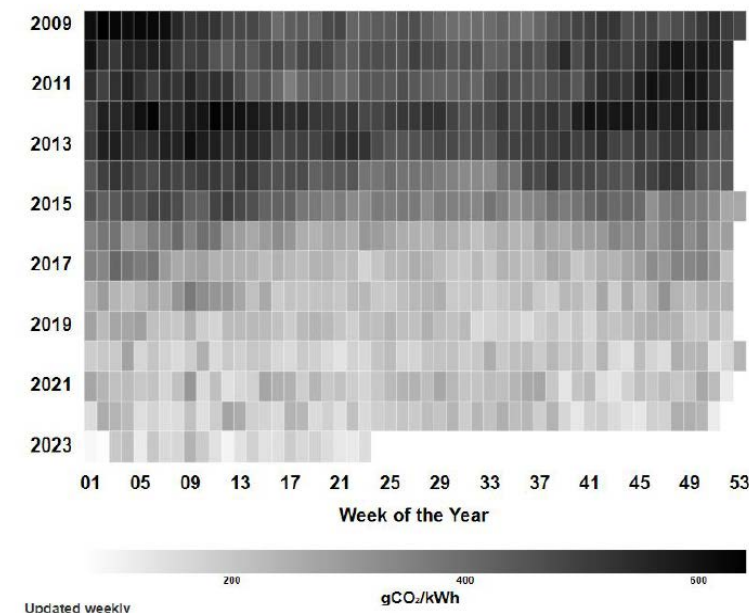
Note: GHG excluding LULUCF.  
Figures may differ slightly from official inventory submissions.

PRIMAP-hist national historical emissions time series, 2022.

## LOW CARBON ENERGY TRANSITION



### History of Carbon Intensity of Generation



### We have ambitious targets:

- The UK has the most ambitious 2030 emissions reduction target of any advanced country
- By 2025, the Energy Systems Operator has a target to operate the transmission network carbon free for short periods
- By 2035, the electricity network needs to operate carbon free all year round

### And we are making progress:

- In 2012, coal accounted for 40% of the UK's power generation, dropping to 1.8% in 2020



United Kingdom

# I. PLANNING

---

## Action Plan for Rapid Power Sector Decarbonisation

## POWERING UP BRITAIN: OVERVIEW

### Powering Up Britain

Plans setting out how the Government will enhance our country's energy security, seize the economic opportunities of the transition, and deliver on our net zero commitments.

### The Energy Security Plan

Sets out the key steps to deliver the ambitions of the British Energy Security Strategy and the Net Zero Strategy to ensure the UK is more energy independent, secure, and resilient.

### The Net Zero Growth Plan

Sets out the steps that the Government is taking to ensure the UK is more energy independent, secure, and resilient.

## “Energy security and net zero are two sides of the same coin”

After decades of reliance on imported fossil fuels, the new Department for Energy Security and Net Zero's mission is to replace them with cheaper, cleaner, and domestic sources of energy.

Energy security necessarily entails the smooth transition to abundant, low-carbon energy. If we do not decarbonise, we will be less energy secure.



## ENERGY SECURITY PLAN: KEY ELEMENTS

**Energy security, in-keeping with climate commitments and existing targets, requires increased energy efficiency and the move away from imported fossil fuels and toward abundant, low-carbon energy.**

The Government has committed to achieving fully decarbonised electricity by 2035, subject to security of supply.



- Demand may grow by up to 60% by the mid-2030s as we electrify transport and heat.
- By 2035, Britain aims to have among the cheapest wholesale electricity prices in Europe.
- By 2050, secure, low-cost, and clean electricity will be the predominant form of energy consumption, and a key means of decarbonising other sectors.



- Though future demand for gas will drop, Britain is still hugely dependent on it in our energy system.
- We need to maintain a resilient and affordable supply of gas.
- This means maximising production of UK oil and gas as the North Sea basin declines and building strong international partnerships for both supply and export opportunities.



## NET ZERO GROWTH PLAN: KEY ELEMENTS

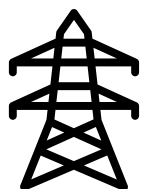
**The Net Zero Growth Plan focusses on how the UK is bolstering our delivery of Net Zero Growth. This plan:**

- Explores how we can achieve net zero in the most pro-growth, pro-business way.
- Demonstrates the actions we will take to ensure the UK remains a leader in the net zero transition.
- Strengthens delivery with a focus on the actions we can take today to keep us on track to meet our carbon budgets, both on a national and local level.
- Meets our statutory obligations under the Climate Change Act (2008).

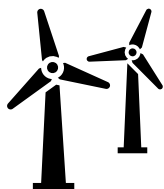


## DECARBONISING THE POWER SECTOR: AMBITIONS

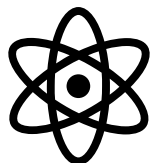
**The ambition is to fully decarbonise the power system by 2035, subject to security of supply, and to grow and develop energy sources beyond the power sector.** This will allow for cheaper and cleaner domestic energy, and address our underlying vulnerability to international fossil fuel prices.



Fully decarbonise the power system by 2035, whilst maintaining security of supply.



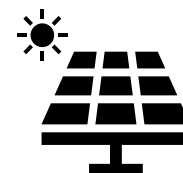
Up to 50 GW of offshore wind by 2030, including 5 GW of floating offshore wind.



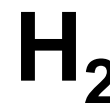
Up to 24 GW of nuclear by 2035; a final investment decision on a large-scale plant by the next Parliament.



At least one power CCUS project by the mid 2020s.



Up to 70 GW of solar by 2035, made up of rooftop and ground-mounted PV.



Double our ambition to up to 10 GW of hydrogen production capacity, with at least 50% from electrolytic projects.



**United Kingdom**

## II. BUILDING

---

Action Plan for Rapid Power Sector Decarbonisation

# DECARBONISING THE POWER SECTOR: ACHIEVEMENTS SO FAR

<p><b><u>Overarching</u></b></p> <ul style="list-style-type: none"> <li>• In 2021, the share of generation from renewables reached 40% (including from bioenergy, wind, and solar), with an additional 15% from nuclear.</li> <li>• In 2012, coal accounted for 40% of the UK's power generation, dropping to 1.8% in 2020.</li> <li>• Offshore wind price reductions – prices in 2022 were 5.8% lower than 2019.</li> </ul>	<p><b><u>Carbon Capture, Utilisation, and Storage (CCUS)</u></b></p> <ul style="list-style-type: none"> <li>• Commitment of <b>£1 billion</b> in public investment to decarbonise our industrial clusters.</li> <li>• Publication of the shortlist of power CCUS, industrial carbon capture (ICC), waste and CCUS-enabled hydrogen projects in August 2022.</li> </ul>
<p><b><u>Renewables</u></b></p> <ul style="list-style-type: none"> <li>• Reached 13.9 GW of offshore wind installed. AR4 will deliver 7 GW more by 2027.</li> <li>• Committed up to <b>£320 million</b> for fixed and floating wind ports and infrastructure.</li> <li>• 14.8 GW of onshore wind installed.</li> <li>• 14.7 GW of solar PV installed.</li> </ul>	<p><b><u>Nuclear</u></b></p> <ul style="list-style-type: none"> <li>• Launched the Great British Nuclear organisation.</li> <li>• Invested ~<b>£700 million</b> for a 50% stake in the Sizewell C nuclear power station.</li> <li>• Established a <b>£120 million</b> Future Nuclear Enabling Fund to progress new nuclear technologies.</li> <li>• Committed up to <b>£385 million</b> to support the Advanced Modular Reactor innovation programme.</li> </ul>

## NEXT STEPS: RENEWABLES

### Offshore Wind:

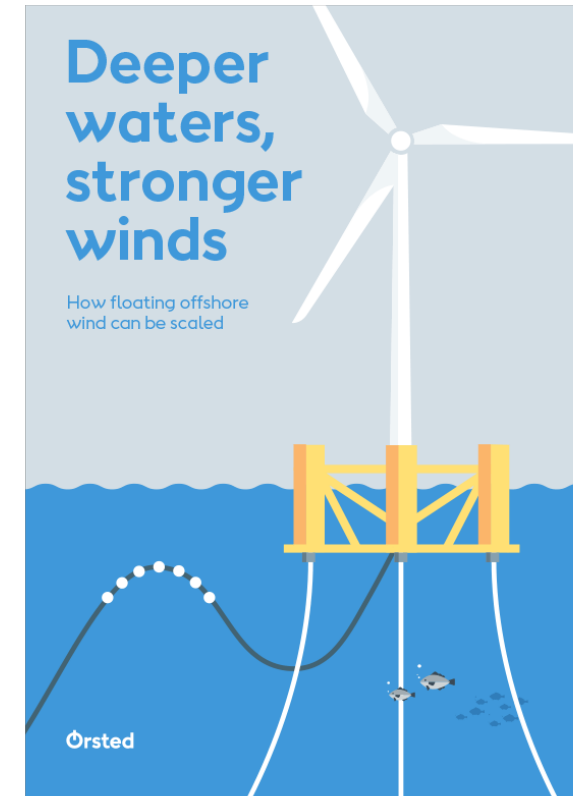
**Aim: Up to 50 GW of offshore wind by 2030, including 5 GW of floating offshore wind.**

- Launching the Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS), which will provide up to £160 million to kick start investment in port infrastructure projects needed to deliver our floating offshore wind ambitions.

### Solar:

**Aim: Up to 70 GW of solar by 2035, made up of rooftop and ground-mounted PV.**

- Establish a solar government-industry taskforce and publish a solar roadmap setting out a clear deployment trajectory.
- Seeking large scale solar deployment across the UK, mainly on brownfield, industrial, and low/medium grade agricultural land.
- Simplifying the planning processes for larger commercial and industrial rooftop installations, while also working to facilitate low-cost finance from retail lenders for homes and small business.



Source: Orsted  
(<https://orsted.com/en/insights/white-papers/floating-wind>)

See Annex for more detailed timelines

## NEXT STEPS: CARBON CAPTURE, UTILISATION, AND STORAGE (CCUS)

### Aim: At least one power CCUS project by the mid 2020s.

Government is making an ambitious series of announcements on CCUS, following up to £20 billion of funding:

1. Eight initial Track-1 capture projects with which we are entering into negotiations.
2. A process to bring in further projects within the Track-1 clusters by 2030.
3. Work to identify if any of these additional projects could be potential alternatives to any of the initial Track-1 projects, if any are unable to agree on contracts within the criteria and timelines required.
4. Remain committed to our ambition of 20-30 mtpa of carbon storage and four operational CCUS clusters by 2030, by launching the Track-2 cluster process.
5. Further development of Industrial Carbon Capture, Waste, CCUS-enabled Hydrogen, Power CCUS, and engineered GGRs.



Source: Carbon Capture and Storage Association  
(<https://www.ccsassociation.org/discover-ccus/ccus-in-action/>)

See Annex for more detailed timelines



## NEXT STEPS: NUCLEAR

**Aim: Up to 24 GW of nuclear by 2035; a final investment decision on a large-scale plant by the next Parliament.**

### Launch of Great British Nuclear (GBN)

- Government is committed to a programme of new nuclear projects.
- Funded to lead delivery of a programme of new nuclear projects at speed.
- Operates through British Nuclear Fuels Limited.

### Small Modular Reactor (SMR) Selection Process

- The priority of GBN is to launch a competitive process to select the best SMR technologies (commenced April 2023).
- Second phase (down selection) launched in Summer 2023 with decisions made Autumn 2023.
- Launched Nuclear Enabling Fund of up to £120 million to provide targeted support for new nuclear to address barriers to entry.

### Sizewell C

- Progressing the Sizewell C project to the point of a final investment decision in this Parliament, subject to value for money and all relevant approvals.



See Annex for more detailed timelines

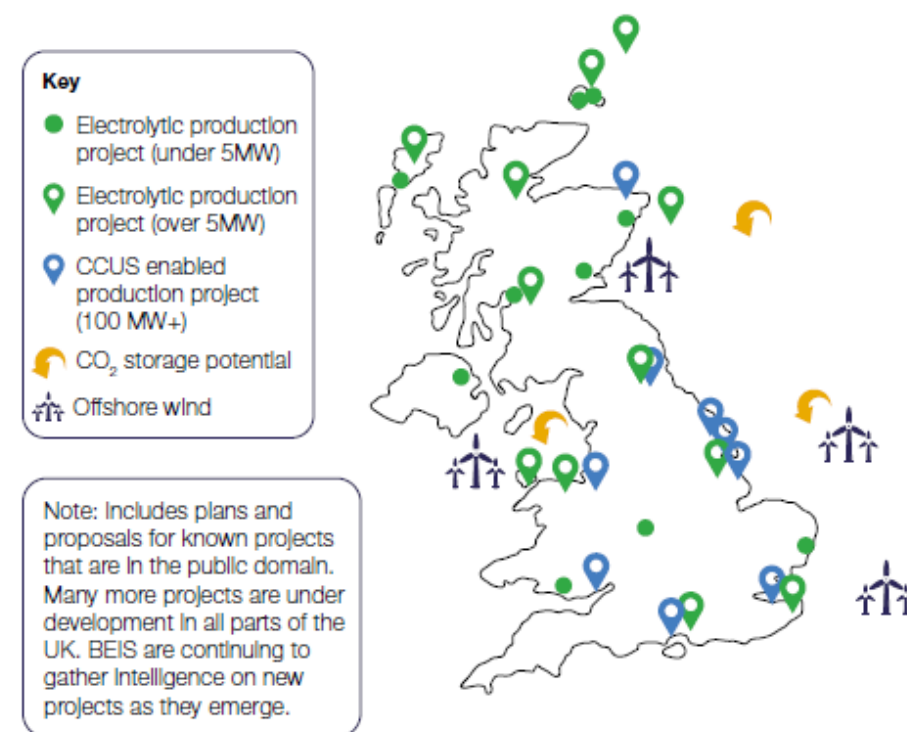


## NEXT STEPS: HYDROGEN

**Aim: Double our ambition to up to 10 GW of hydrogen production capacity, with at least 50% from electrolytic projects**

- Confirming the first winning projects from the £240 million Net Zero Hydrogen Fund.
- Support up to 250 MW of new electrolytic hydrogen production capacity, subject to affordability and value for money with successful projects funded by the government until the hydrogen levy is in place.
- Announcing intention to launch a second electrolytic allocation round later this year intended to support up to 750 MW capacity, and to publish a hydrogen production delivery roadmap by the end of the year.
- Aiming to introduce legislative powers crucial to designing new business models by 2025. These actions are key to potentially unlocking up to £11 billion in private investment by 2030, accelerating the UK hydrogen economy, and potentially supporting over 12,000 jobs by 2030.

Figure 1.3: Proposed UK electrolytic and CCUS-enabled hydrogen production projects



See Annex for more detailed timelines



United Kingdom

### III. OPERATING

Action Plan for Rapid Power Sector Decarbonisation

## POWER NETWORKS, INTERCONNECTION, AND SYSTEM GOVERNANCE

### Background:

From July-October 2022, the government held a public consultation on the review of electricity market arrangements, to identify reforms needed to transition to a decarbonised, cost effective, and secure electricity system.

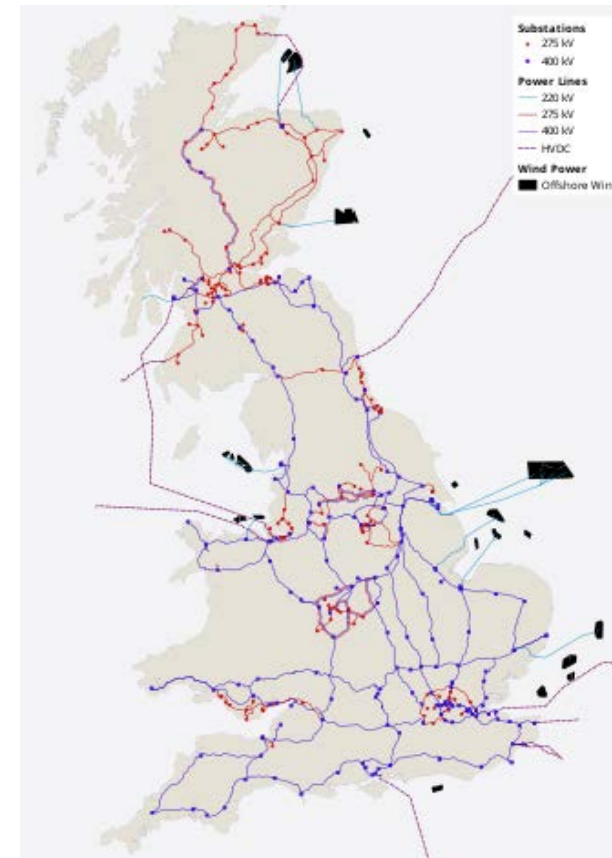
### Key Commitments

Publish an action plan in summer 2023 to accelerate electricity network connections, including reform of the connections process.

Introduce guidance on community benefits for network infrastructure later this year, subject to responses to consultation.

The Government and Ofgem will consult this summer on the details of the Future System Operator's new roles in resilience and security and provide an update on implementation plans.

Work with partners to realise an increase in interconnection capacity – aiming for at least 18 GW by 2030, over double the current capacity of 8.4 GW.



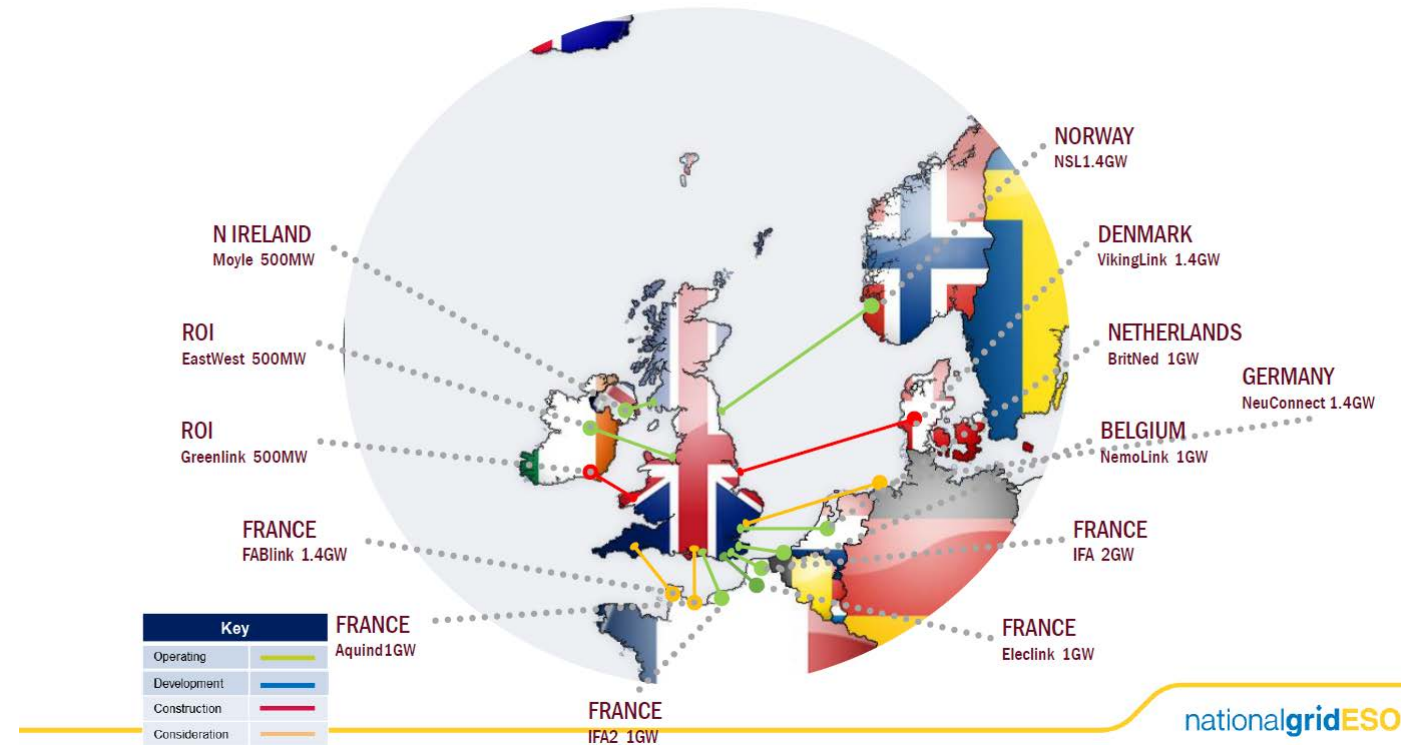
## INTERCONNECTORS

In 2022, Britain exported more power than we imported for the first time, and this is set to increase.

The Government is working closely with Ofgem, developers, and our European partners to:

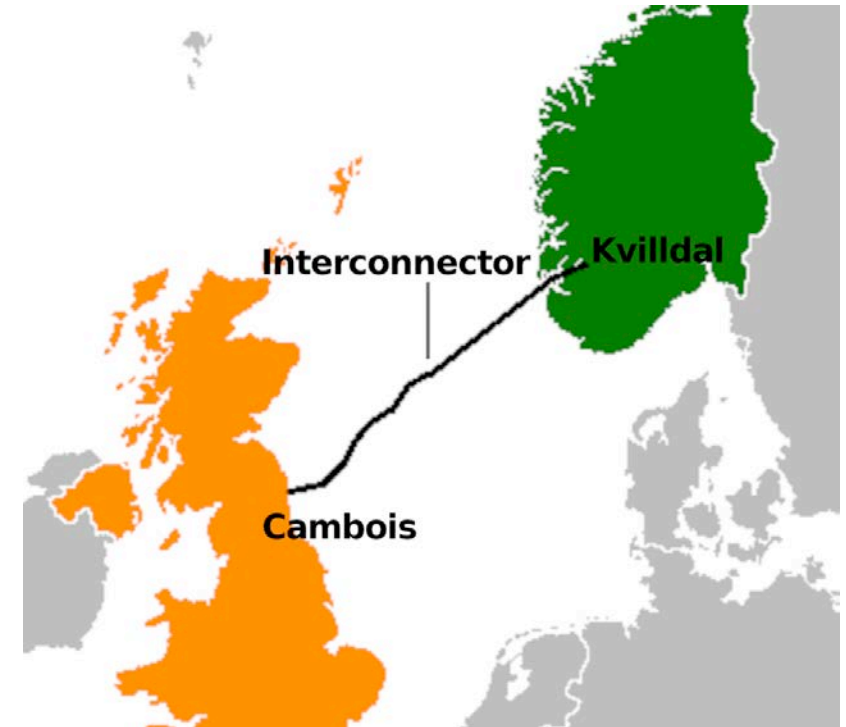
- Increase the interconnection capacity, with an ambition of realising at least 18 GW by 2030, over double the current capacity of 8.4 GW.
- Build our first multi-purpose interconnectors.
- Set out an ambition for interconnection beyond 2030 before spring 2024.

### UK Existing Interconnectors and up coming



## EXAMPLE INTERCONNECTOR: NORTH SEA LINK

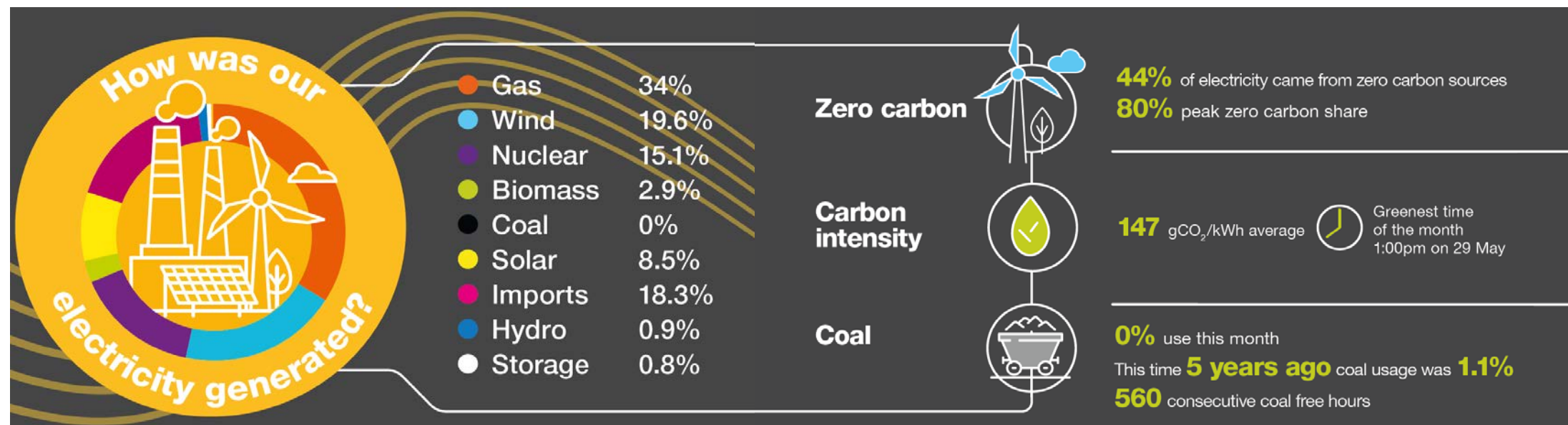
- 5 High Voltage Subsea Electric Cables
- 720 km of cable – the world's longest subsea interconnector
- 1400 MW of energy carried
- 1.6M Tonnes of CO<sub>2</sub> saved last year
- 100M Tonnes of CO<sub>2</sub> saved by 2030
- 8M Households powered through interconnected energy by 2024



*The interconnector will allow for excess wind energy to be exported to Norway, and for excess hydropower to be imported to the UK.*



## EXAMPLE OF PROGRESS: ELECTRICITY MIX – AVERAGES ACROSS MAY 2022



- ✓ In May, 44% of electricity came from zero carbon sources, peaking at 80% on 4 May at 11am.
- ✓ For the first time this year, 0% of generation came from coal in May, allowing us to achieve 560 consecutive hours without coal.

\*NB: FIGURES DO NOT INCLUDE SOURCES OF ELECTRICITY FOR NORTHERN IRELAND

<https://www.nationalgrideso.com/electricity-explained/electricity-and-me/great-britains-monthly-electricity-stats>; LIVE API OF UK'S CARBON INTENSITY: <https://carbonintensity.org.uk/>

# NEXT STEPS FOR ACTION PLAN IMPLEMENTATION

The Powering Up Britain Energy Security Plan sets out detailed delivery timelines for each component of the decarbonisation plan. These look out over 2023, 2024, 2025-30, and 2031-35 timelines.

Extracts of these for the examples discussed can be found in the [Annex](#).

## Delivery Timelines

### Enhancing Security of Gas Supply

	2023	2024	2025-30	2031-35
Maximising supply of UK gas				
33rd Licensing Round	From Q2 - NSTA awards first licences			
North Sea Transition Deal			The Deal targets a reduction in upstream production emissions, against a 2018 baseline, by 10% in 2025, 25% in 2027 and 50% in 2030, while reducing carbon emissions to zero by 2050.	
Accelerating production	New projects will benefit from an accelerated regulatory process			
Updates to Gas Safety Management Regulations	HSE has laid SI that amends, amongst other things, the <i>Wobbe Number</i>		Q2 - Change to the <i>Wobbe Number</i> take effect	
Maintaining and securing our gas import and export capacity				
Memorandum of Understanding with Ireland	Government agreeing a Memorandum of Understanding on gas security of supply with Ireland			
LNG terminals	Operators of the <i>Grain</i> and <i>South Hook</i> LNG terminals investing in upgrades to their facilities to increase capacity			
UK-US <i>Energy Security and Affordability Partnership</i>	US will strive to export at least 9-10 billion cubic metres of LNG in 2023 via UK terminals.			
Increasing system resilience				
<i>Gas Supply Security of Assessment</i>	Government to publish methodology and implementation plan	Delivery by FSO when established		



## BIBLIOGRAPHY

- [Powering Up Britain](#)
- [Powering Up Britain – Energy Security Plan](#)
- [Powering Up Britain – Net Zero Growth Plan](#)
- [Powering Up Britain – Supporting Documents](#)
- [Great Britain's monthly electricity stats](#)
- [National Grid – North Sea Link](#)
- [UK Hydrogen Strategy \(2022\)](#)
- [Carbon Budget Delivery Plan](#)
- [Climate Change Act 2008](#)
- [Review of electricity market arrangements](#)
- [Live API of UK's carbon intensity](#)

## DISCLAIMER

This report was authored by the United Kingdom Department for Energy Security and Net Zero in collaboration with Clean Energy Ministerial (CEM) workstreams such as the 21<sup>st</sup> Century Power Partnership. The content herein does not necessarily represent the views of the Clean Energy Ministerial workstreams or other contributors, including any of the participating governments and organizations, the CEM Secretariat, or the U.S. Department of Energy. No warranty is expressed or implied, no legal liability or responsibility assumed for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, and no representation made that its use would not infringe on privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring.



United Kingdom

## ANNEX — EXAMPLE GANTT CHARTS OF NEXT STEPS

---

# GANTT CHART: RENEWABLES SNAPSHOT

Objectives	2023	2024	2025-30
<b>Introduce legislation to streamline consenting process for Nationally Significant Infrastructure Projects, including offshore wind and other renewable projects that meet quality standards.</b>	Levelling Up and Regeneration Bill Royal Assent expected early summer. Pilots for Fast Track consenting process, from late autumn.		
<b>Publish a solar roadmap setting out a clear step by step deployment trajectory.</b>		Roadmap published 2024.	
<b>Assess how low-cost finance options can be provided to households and small businesses for solar technology.</b>	Look at facilitating low-cost finance from retail lenders for homes and small business premises.	Implement policy interventions required, Q1-2.	Monitor impact and assess if further intervention required. Removal of VAT on solar panels in residential accommodations until March 2027.
<b>Consult on permitted development rights to support solar deployment.</b>	Published consultation on changes to Permitted Development rights in Q1. Regulations amended and guidance strengthened Q4.	Implement, Q1.	Monitor impact and assess if further intervention required.
<b>Floating Offshore Wind Manufacturing Investment Scheme supporting floating wind infrastructure investment.</b>	Scheme launched March 30 <sup>th</sup> .		End of scheme in March 2025.
<b>Develop local partnership model for onshore wind in England.</b>	Launch local partnership consultation. Government Response to consultation.		

## GANTT CHART: CCUS SNAPSHOT

Objectives	2023	2024	2025-30
<b>Deploy 2 industrial clusters by the mid 2020s</b> <ul style="list-style-type: none"> <li>◆ Deploy at least one power CCUS plant by the mid 2020s</li> <li>◆ Deploy 4 industrial clusters by 2030</li> <li>◆ Capture 20-30 mtCO<sub>2</sub> pa by 2030, including 6 mtCO<sub>2</sub> pa from Industrial CCS by 2030</li> <li>◆ Deploy at least 5 mtCO<sub>2</sub> pa of engineered GHG removals (GGRs) by 2030</li> <li>◆ 50,000 jobs enabled by CCUS by 2030</li> </ul>			
<b>CCUS – Programme Track-1</b>	Project shortlist announced. Negotiations with projects start. FEED work continues.	Negotiations with projects end. Publication of CCUS Network Codes. Construction starts.	Track-1 projects operational.
<b>Track-1 expansion</b>	Launch Track-1 expansion process.		Track-1 projects remain operational.
<b>CCUS Programme Track-2</b>	Launch Track-2 process. Complete expressions of interest. Announce next steps.		Track-2 projects operational.

## GANTT CHART: NUCLEAR SNAPSHOT

Objectives	2023	2024	2025-30
<ul style="list-style-type: none"> <li>◆ One Final Investment Decision this parliament, progressing two in the next parliament</li> <li>◆ Ambition to increase deployment of civil nuclear to up to 24 GW by 2050 (up to 25% of projected demand)</li> </ul>			
<b>Sizewell C - Final Investment Decision.</b>		By end of this Parliament.	
<b>Launch consultation on new Siting Strategy to inform National Policy Statement.</b>	By end of 2023.		
<b>Launch of Great British Nuclear (GBN) with aim to launch market engagement in April.</b>	April.		
<b>Ambition to select the leading small modular reactor (SMR) technologies and co-fund this exciting new technology for the UK.</b>	By autumn.		
<b>Launch Nuclear Fuel Fund, including funding to Westinghouse for Springfields fuel facilities.</b>	January-February.		
<b>Advance Modular Reactors R&amp;D Programme.</b>	Summer: commence work on Reactors and Fuels.		March 2025: Phase B concludes. Phase C Construction (2025-35) is subject to Strategic Review Decisions.

## GANTT CHART: HYDROGEN SNAPSHOT

Objectives	2023	2024	2025-30
<b>First funding round for Strands 1 and 2 - providing development and capital support to low-carbon hydrogen production projects (launched in 2022).</b>	Grant offer letters issued for successful applicants in Q1 2023.	Complete Strand 1 funded activities by March 2024. Strand 2 projects operational from March 2025.	Strand 2 projects operational from March 2025.
<b>Hydrogen allocation rounds (hydrogen production business model and possible NZHF support for electrolytic and other non-CCUS hydrogen production) - Round 1.</b>	Aiming for contracts to be awarded in Q4.		First projects operational in 2025, delivering up to 250 MW of capacity.
<b>Hydrogen economy – certification.</b>	Government response to consultation on a <i>Low Carbon Hydrogen Certification Scheme</i> .		Launch certification scheme by 2025.
<b>Hydrogen economy – transport and storage.</b>	Government response to consultation on Hydrogen Transport & Storage Business Models in Q2.		Design business models by 2025.
<b>Hydrogen economy – hydrogen use.</b>	<b>Blending:</b> Policy decision on the role of blending by the end of 2023. <b>Power:</b> Consult on the need and potential design options for a market intervention.		<b>Heating:</b> Decisions on the role of hydrogen for heat in 2026.





United Kingdom

# UNITED KINGDOM'S ACTION PLAN FOR POWER SECTOR DECARBONISATION

Department for Energy Security and Net Zero

Delivered for the 14<sup>th</sup> Clean Energy Ministerial (CEM14)

July 2023

NREL/PR-5R00-86714

