

First Feedback Request from Forum Participants – Clean Power 2030 Programme

1. Introduction to ESO and NESO

The Electricity System Operator (ESO) for Great Britain's role is to operate the electricity transmission system which spans across England, Scotland, and Wales. We do this by moving electricity around the system, procuring services to balance demand and supply second by second.

The ESO is currently transitioning into an independent public body called the "National Energy System Operator (NESO)", which comes into effect on 1 October 2024. This body will be independent of industry and UK Government and will be responsible for operating the electricity system, the grid connection process, and planning electricity and gas networks in GB, amongst other responsibilities.

The NESO will also have responsibility for providing expert, impartial advice to UK Government on energy-related policy, with its first task to provide advice on how Britain can achieve clean power by 2030.

2. Background and context to clean power 2030 programme

The Government has formally asked the Electricity System Operator (ESO) to develop advice on how to achieve clean power by 2030 for Great Britain. The formal commission letter from the Secretary of State¹ as well as ESO's open letter² to industry on formulating this advice have been published.

The advice the ESO will develop will be a practical plan of what is required to deliver a clean, secure, operable power system by 2030. The plan will consider possible clean energy generation mixes and their associated network, market, and operability requirements. The advice will also suggest areas where swift action is needed, by Government or others, to further accelerate GB decarbonisation of the power system in a fair way.

The programme for developing this advice will conclude within the Autumn, with an expected Government action plan being published by the end of the year.

3. Approach to analysis

The ESO have stood up a cross-directorate unit to undertake this advice, building on previous work and work already underway across ESO to ensure we can operate a decarbonised power system.

Our analysis so far focuses on six key elements of a clean power system for 2030. All of these must progress together to deliver a clean power system. The key elements included in our analysis are:

- Electricity Demand (electrification, efficiency, demand side flexibility)
- Electricity Supply (spatial clean power generation mix)
- Networks (planned pipeline of investment against need for 2030)
- Connections
- Operability (stability, voltage, restoration, flexibility for frequency, within-day and adequacy)
- Operations and system access

Underpinning all of these workstreams is the need for innovation and digitalisation. In developing our pathways and scenarios we consider a wide range of factors, including: deliverability, costs and impacts on

¹ Letter from Secretary of State for Energy Security and Net Zero, 27th August 2024, [link here](#).

² Letter from the Fintan Slye, Electricity System Operator, 27th August 2024, [link here](#).

ESO

consumers, community impacts, energy security, how the pathways support decarbonisation beyond the power sector and the wider journey to net zero beyond 2030, wider impacts on the economy and environment.

Our analysis will consider the actions that government, Ofgem, NESO and industry could take to deliver on the clean power mission across five critical enablers we have so far identified which are:

- Planning, consenting and communities
- Grid connections reform
- Markets, funding and financing
- Supply chains and workforce
- Institutions and governance

4. Stakeholder engagement

Building on the extensive stakeholder engagement already undertaken by our Future Energy Scenarios and Network planning teams, there are multiple ways in which the ESO's clean power team are engaging with stakeholders as we formulate this advice.

We are hosting regular bilaterals and group discussions with market participants and experts on specific issues to test credibility of scenarios and potential policy recommendations. In October, we will be hosting a set of open-access webinars to discuss the programme in more detail.

To discuss multiple key inputs and outputs of the clean power 2030 programme, ESO have established two stakeholder forums with invited industry representatives from trade bodies primarily and those with wider expertise in planning, environment, and land use. These are:

- **Networks and Technology Forum** – Forum to discuss ESO's emerging analysis, gathering views from stakeholders on opportunities and challenges for delivering clean power.
- **Societal stakeholder forum** – Forum to discuss ESO's emerging analysis, gathering views from stakeholders on opportunities and challenges for delivering clean power.

5. Summary of first forum

Chair and presenters: Julian Leslie, Chief Engineer and Director of Strategic Energy Planning and Ben Golding, Director of Clean Power at Mission Control presented. The topics below were discussed:

- ESO's working definition of clean power.
- Different potential energy generation and demand pathways that reach clean power by 2030.
- The large Transmission network requirements needed to reach clean power by 2030.
- Policy and enablers to reach clean power 2030.

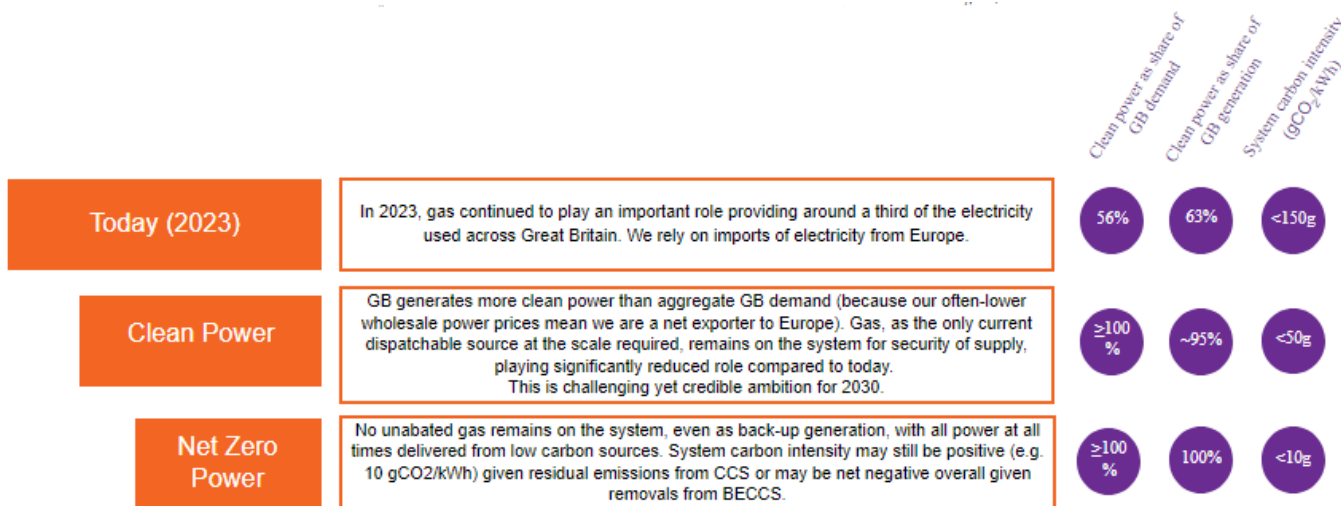
To note: The first forum focused on some of the key workstreams for developing the clean power 2030 advice, analysis is still ongoing on other workstreams and therefore the next forum and feedback window will have a different focus.

1. ESO working definition of clean power.

It is important to set out a challenging yet credible definition of clean power for 2030 in the context of where we are now and what is needed to achieve future emissions reductions targets.

We have considered how GB generation of clean power compares to GB power demand, how it compares to total generation (noting our modelling also shows GB is likely to become a net exporter of electricity by 2030), the carbon intensity of generation, and the role of unabated gas in 2030.

ESO are defining clean power as power from those sources considered to be low-carbon under UK carbon accounting, including renewables, nuclear, carbon capture and storage along with power produced as a by-product from heat or waste processes and from interconnectors. ESO's working definition for a clean power system would see GB generate more clean power than we consume, with unabated gas only used in a strategic role to provide security of supply.



To note: Above is the ESO’s working definition, it is subject to review and challenge and has not yet been agreed with UK Government.

2. Potential energy supply and demand mixes that reach clean power by 2030

Every year, the ESO undertakes an extensive stakeholder engagement exercise with ~3000 participants to understand future energy needs. This results in our annual Future Energy Scenarios (FES).

Our new pathways for clean power by 2030 are based on the Holistic Transition pathway published in FES in July 2024. The key associated assumptions made for this pathway are found here.

Using FES as our base, we have developed three pathways that could provide clean power by 2030. The pathways explore key uncertainties in supply and demand across the transmission and distribution networks, including delivery of bulk energy by renewables, deployment of new technologies and flexibility.

Below is description of the three pathways:

Pathway	CP1 [High Flex]	CP2 [High dispatch]	CP3 [High Renewables]
Pathway description	Fast development of renewables alongside the highest level of energy storage capacity and consumer engagement in demand flexibility. Minimal new dispatchable low carbon power.	Growth in renewables but the lowest of all pathways. Highest deployment of low carbon dispatchable power alongside highest nuclear capacity.	Highest level of renewables capacity across all pathways. Growth in flexibility in line with CP2 (High Dispatch) and minimal dispatchable low carbon power in line with CP1 (High Flex).
Demand assumptions	Transport, heat and industry electrification is driven by the requirement to meet overall emission reduction targets in 2030s. Energy efficiency improvements grow. Highest engagement with residential and industrial DSR, other demand flexibility sectors aligned to other pathways.	Transport, heat and industry electrification is driven by the requirement to meet emissions targets in the 2030s. Energy efficiency improvements grow. Growing levels of smart charging and DSR.	Fastest pace of electrification of demand, with sectors decarbonising at a faster pace than in other pathways, to align with highest renewables level. Demand flexibility growth in-line with CP2 (High Dispatch).
Clean Power	96%	95%	96%

Across Britain, the below table shows the likely impact of implementing these pathways on generation build.

Total Volumes GB-wide – interim analysis, subject to review and challenge		
Generation and demand assumptions	2023 (GWs)	2030 (GWs)
Nuclear	6.1	Reduced output, building again in 2030s
Offshore Wind	14.7	~ 3 – 4x current levels
Onshore Wind	14.0	~ 2x current levels
Solar	15.0	~ 3x current levels
Storage (Batteries, pumped hydro, LAES and CAES) .	7.4	~ 4 – 5x current levels
Interconnection	8.4	~ 1.5x current levels

Demand side flexibility	7.4	~ 2x current levels
New low carbon dispatchable generation (gas CCS, hydrogen, BECCS ³)	0.0	~ 0 – 3 GW
Biomass	4.3	Reduced output, due to conversion to BECCS
Unabated gas	ESO currently investigating the amount of unabated gas required taking into consideration adequacy requirements, starting with an assumption in line with the capacity we expect to be available in the market this winter.	

To note: The above generation and demand assumptions are all going through sensitivity analysis and refinement and may well change as analysis progresses. Drawing on the storage figures in particular, ESO are still considering the requirements for response and reserve and sensitivities around higher and lower storage capacity coming online for 2030.

3. Major transmission network requirements that could be needed to reach clean power by 2030.

In 2022, ESO published recommendations for future major transmission network requirements needed for 2030⁴. Following this, Ofgem provided funding for some of these projects under the new Accelerated Strategic Transmission Investment (ASTI) framework⁵ to Britain’s Transmission Owners.

Given the average time it takes to build major linear infrastructure, ESO have focused on analysing network projects already under development, and whether they can support the delivery of clean power.

ESO have been working with the Transmission Owners to understand how projects recommended in 2022 are progressing. Based on the latest data from the Transmission Owners, ESO have analysed major ‘wider’ transmission network requirements already in the pipeline and identified several large projects that are already in development and would support delivery of clean power.

If built, early analysis shows the expected CCS network could support clean power across the generation and demand pathways mapped out above. However, our early analysis shows that delays to network delivery will significantly undermine the delivery of clean power by 2030.

ESO have also analysed if accelerating any infrastructure due to connect beyond 2030 could reduce constraint costs borne on the consumer. ESO early analysis shows three major projects that could reduce constraints, these vary from an offshore subsea cable to new shorter onshore circuits.

To note: Both the ESO and the network companies are still undertaking connections analysis, and there will be some ‘local enabling’ transmission works required to connect future generation and demand into the system.

To note: this interim analysis is transmission only and does not include any associated infrastructure build required at distribution level.

4. Policy and enablers to reach clean power by 2030.

As well as the system requirements needed to reach clean power, the Secretary of State asked ESO to consider the actions that government, Ofgem, NESO and industry should take to deliver on the clean power mission.

Whilst ESO’s interim analysis indicates that the pathways are technically possible to achieve, they will require immediate action from government, Ofgem, ESO/NESO and industry to deliver them.

We have identified five cross-cutting enablers where action will be needed (see figure below). In these forums we focused on Planning, Consenting and Communities and Supply Chains and Workforce, drawing on work

³ ESO recognises that biomass with carbon capture and storage have different impacts (produce negative emissions) on the system than the other generators in this group.

⁴ ESO’s Pathway to 2030: Holistic Network Design, 2022, [link here](#).

⁵ Ofgem’s ASTI decision, 2022, [link here](#).

ESO

done by industry and other stakeholders to date to highlight what actions should be prioritised to support CP30.



6. Participant input and feedback

As discussed at the forums, we are seeking feedback on the four main topics discussed at the first forum (and set out above). We'd like organisations to provide evidence and advice from their expertise and experience, or that of your members (where applicable), on:

- ESO's proposed overall approach
- The four topics covered at the first forum:
 - ESO's working definition of clean power.
 - The demand and supply mixes that can achieve clean power.
 - Transmission network reinforcements, including trade-offs between the needs of the consumer, the environment and communities, and the clean power system.
 - Policy and enablers.
- Any other evidence that you consider it important for ESO to consider.

To note: this is forum one of two, and we will be covering other policy enablers and deep dives on other analysis workstreams as part of this programme with attendees of the Societal Delivery Forum and Networks and Technology forum.