NESO DER/CER Visibility and Access Roadmap

Strategy Report

July 2026

NESO
National Energy System Operator

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Foreword

Great Britain's energy system is transforming at pace as we move away from fossil fuels and towards low carbon sources of generation in our pursuit of a cleaner, more secure and affordable power system by 2030.

One of the biggest shifts we are seeing is in the increasing uptake of Distributed Energy Resources (DERs) and Consumer Energy Resources (CERs) connected to the distribution network. These distributed energy assets include everything from commercial batteries and small-scale wind to domestic energy sources, such as electric vehicles (EVs), rooftop solar panels, and home batteries.

Distributed Energy Integration presents an opportunity for the whole electricity system, as it can help reduce system costs and carbon emissions, improve resilience and flexibility, and give consumers the opportunity to play a more active role.

The DER and CER Visibility and Access Roadmap sets out a clear, system-wide direction for improving visibility, enabling participation, and translating system needs into the capabilities required to operate a safe, clean and flexible power system. This approach is aligned with the Energy Digitalisation Framework and is designed to build on, support and complement existing industry initiatives to deliver interoperable and scalable solutions across the system.

Since its publication for consultation in March, we have engaged a range of stakeholders, including flexibility service providers, suppliers, generators, network operators, technology providers, consumer groups and industry bodies.

We received support for the Roadmap, with industry agreeing that improved visibility and access were needed, and the Roadmap was welcomed as an initiative for structuring this work. Feedback was mainly about the approach to determining solutions and coordination of the Roadmap. We welcome this feedback and in response, have included new activities and updated our delivery approach as outlined in this report.

Looking ahead, the emphasis shifts from consultation and design to coordinated delivery. Our vision is that by 2030, we will have proportionate visibility and access to DERs and CERs across all necessary timescales, supporting delivery of consumer benefits as part of a clean power system.

The scale of change required and the benefits it will unlock cannot be delivered by NESO alone. Delivering this vision will require continued collaboration across industry, supported by scalable solutions that reflect the diversity of distributed assets and their roles within the system.

The consultation process has demonstrated a clear consensus; the direction set by the Roadmap is the right one. The focus is now on delivering it. By working together, we can deliver the visibility, coordination and confidence required to make DERs and CERs a cornerstone of a resilient and affordable power system for all.

Julian Leslie
Director of Strategic Energy Planning and Chief Engineer, NESO

Executive Summary

Great Britain's electricity system is decarbonising at pace and becoming more decentralised. Distributed Energy Resources (DERs) and Consumer Energy Resources (CERs) form a significant and growing share of system capacity and will be critical to delivering a secure, affordable and clean power system by 2030.

Today, NESO has limited visibility of these distributed energy assets to inform operational decision making and can access services from only a small subset of these assets to support with our system operations. This is already leading to operability challenges and higher balancing costs, undermining confidence that distributed flexibility can reliably support decarbonisation. Comprehensive delivery of DER/CER visibility and access would not only mitigate these impacts, but also offer a significant opportunity to enhance system resilience, reduce costs for consumers, and support the delivery of renewable energy solutions.

This report sets out NESO's vision for visibility of, and access to, DERs and CERs across all necessary timescales, to support the delivery of consumer benefits as part of a clean power system. In this vision, distributed energy assets are safely integrated into power system operations, including activities such as energy balancing, constraint management, restoration, resilience and planning. To deliver this vision, NESO, Distribution System Operators (DSOs) and market participants must coordinate through data sharing and standardisation, interoperable digital architecture, and aligned operational and market frameworks. Support from the Market Facilitator, Electricity Distribution Price Control 3 (ED3) arrangements, and emerging initiatives as primacy rules; as well as digital coordination initiatives including the Data Sharing Infrastructure (DSI), Flexibility Market Asset Register and Consumer Consent Solution (CCS) will be critical enablers. These digital coordination activities, underpinned by the Energy Digitalisation Framework and a future Digitalisation coordinator will drive visibility and access to DERs and CERs in a coordinated and scalable manner, supporting the transition to a more decentralised, flexible and consumer-led energy system.

Vision for Distributed Energy in GB

By 2030, NESO will have proportionate visibility and access to DERs and CERs across all necessary timescales, supporting the delivery of consumer benefits as part of a clean power system. Beyond 2030, NESO will continue scaling and optimising enduring solutions to meet the long-term requirements for DER and CER visibility and access in line with the evolution of the power system. Visibility and access to distributed energy will contribute to reductions in cost and carbon emissions of the wider GB electricity system, avoided network investment, and increased system resilience.

We have identified five core capability areas that NESO must develop to realise our vision:

Real-time operations: The ability to see the real-time status of distributed energy assets to improve situational awareness, to access services from these assets either directly or via an intermediary (aggregators, DSOs, suppliers, etc.) and to coordinate dispatch instructions with DSOs to operate the electricity system safely, cost-efficiently, and in line with clean power targets.

Forecasting and network planning: The ability to use distributed energy asset locations, capacity, planned availability, historic behaviour, and the drivers of that behaviour (such as weather conditions and price signals), as well as visibility of distribution network connections and constraints, to improve the accuracy of forecasting and network planning ahead of real-time.

Market facilitation and procurement: The ability to understand distributed energy asset behaviour, agree an approach to coordination with DSOs in market operation, design appropriate market services, and procure services from distributed energy assets either directly or via an intermediary (aggregators, DSOs, suppliers, etc.).

Restoration and resilience: The ability to understand the interaction of distributed energy assets with system restoration and resilience, to be able to identify, prepare for, and respond to risks, and the ability to access post-event data to investigate incidents.

Transparency and compliance monitoring: The ability to validate delivery and compliance of distributed energy assets against market and operational requirements, to provide transparent reporting that supports accurate settlement, and deliver regulatory assurance and confidence on DER/CER participation.

To develop these capabilities, NESO will require sharing of data across the following five categories:

1. **Static asset data:** Static information about distributed energy assets (e.g., location, installed capacity, asset type, electrical parameters).
2. **Real-time and historic metering:** Live telemetry from distributed energy assets (e.g., real-time MW and MVAr outputs) and logging of data for retrospective use.
3. **Distribution network model and flow data:** Network topology (e.g., network models), running arrangements, and network flow data (e.g., busbar voltages, and MW/MVAr flows and real-time running arrangements).
4. **Market and dispatch data:** Commercial and operational data for market participation (e.g., asset status, including: Physical Notifications, dispatch instructions, service commitments, planned availability).
5. **Settlement and post event data:** Data captured after market and operational events (e.g., settlement outcomes, imbalance charges, performance metrics for services and assets).

To ensure that wider benefits accrue from the sharing of data across these categories, two-way data sharing will be embedded within the delivery of roadmap activities as a standard consideration, where it provides broader system benefits. This approach will support more effective coordination, decision-making and use of data across the system.

We have defined a roadmap which sets out the activities NESO will undertake to build the above capabilities and data infrastructure for visibility and access. Most of these activities are already in-flight and have been prioritised as part of our recent NESO1 business plan.[1] There are a small number of new activities which will be scoped and planned in detail before we hold regulatory discussions on inclusion in our business plan and funding mechanisms. Where appropriate, we will develop Minimum Viable Products (MVPs) to stress-test and iterate capabilities ahead of scaling. We structured the delivery of activities on the Roadmap across three phases to help NESO sequence and set the direction of delivery whilst remaining flexible to wider uncertainties. For example, there are a spectrum of options for the chosen transmission distribution coordination model, from centralised to decentralised, and including 'hybrid' models where centralisation of system operations varies by function.

Although this roadmap focuses on NESO activities to improve NESO's DER/CER visibility and access, successful delivery will require strong and sustained collaboration with industry. A wider ecosystem of industry decisions and outcomes (such as primacy rules and Reformed National Pricing) will influence the end-state of NESO's visibility and access and require coordination of the Roadmap with future changes.

Through this process, we have considered feedback on the level of ambition, practicality and completeness of the actions, and how best to work together to deliver DER/CER visibility and access. This has informed refinements to the Roadmap to improve its clarity and strengthen our approach, and, overall, to better realise the opportunities to improve system efficiency, resilience, and use of renewable generation that this will provide.

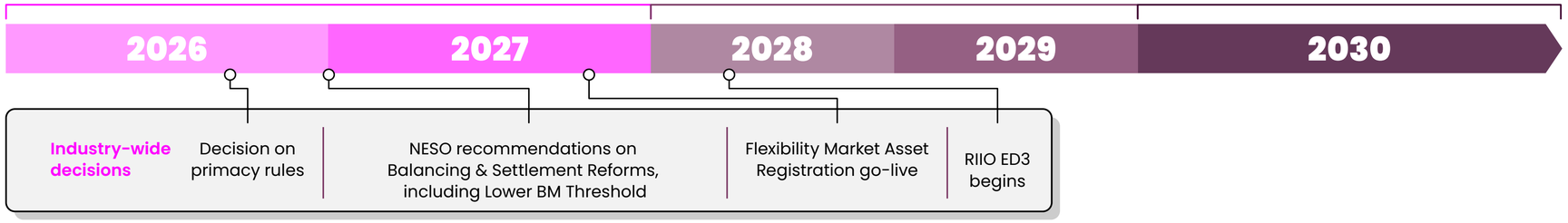
1 Our regulatory business plan for 2026-2028 | National Energy System Operator

High-level view of the NESO DER/CER Visibility and Access Roadmap

Phase 1
Foundation building for enduring solutions
Ongoing and planned activities will address urgent operability challenges and provide key insights to inform wider cross-industry decisions (e.g., RIIO ED3, Primacy Rules, Reform National Pricing), and guide future changes to business, technology, and policy.

Phase 2
Delivery of business, technology, and policy changes
Delivering policy, business and technology changes needed within NESO to stand up enduring solutions, utilising insights from Phase 1 and working closely with industry to ensure alignment.

Phase 3
Implementation of enduring solutions
We expect NESO to be ready to adopt enduring solutions, which will informed by Phase 1 and 2 outputs, and collaboration with industry. Activities will continue beyond 2030 to continue optimising these solutions.



Capability development
Near-term improvements in NESO's capabilities will be achieved through the delivery of Minimum Viable Products and widening market access. By the end of Phase 1, NESO will have the ability to...

The development of these capabilities will continue throughout Phase 2 and Phase 3 in light of insights from Phase 1, and industry-wide decisions

Progress is underpinned by cross-industry collaboration and alignment throughout all Phases

View NESO's interactive DER/CER Visibility and Access roadmap here

High-level view of the NESO DER/CER Visibility and Access Roadmap

Real-time operations

...monitor and access services from more DER/CERs in real time, enabled by data-sharing MVPs and the widening of Balancing Mechanism access

Forecasting and network planning

... create better forecasting and planning models using information about distribution network status and DER/CER behaviour that is provided through improved data sharing between DNOs, DSOs, and NESO

Market facilitation and procurement

... access more services from DERs/CERs through the development of new market services, and coordinate instructions between NESO and DSOs through risk of conflict reporting

Restoration and resilience

... view more information about DSO networks and access more DERs for system restoration, continue enabling compliance with the Electricity Restoration Standard (ESRS)

Transparency and compliance monitoring

... enable improved performance monitoring with more information about DER/CER assets provided through increased access to metering data

Introduction

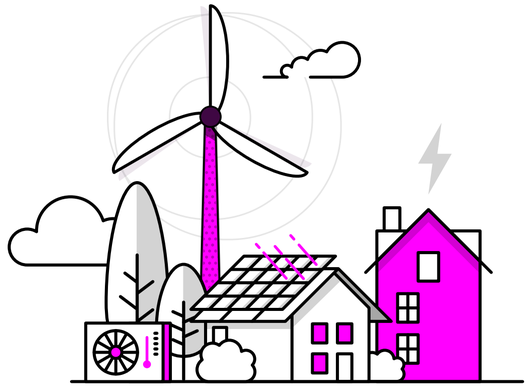
This roadmap presents a view of the activities NESO will undertake to deliver DER and CER visibility and access.[2] This includes both in-flight and planned activities. These activities are intended to both improve visibility and access in the near-term and gather evidence which will enable longer-term decision making.

The DER/CER Visibility and Access Roadmap complements other NESO publications, such as the *Markets Roadmap* and the *Operability Strategy Report*,[3] as shown in the Publication Map. We have included relevant activities captured in other documents where they may contribute to DER and CER visibility and access, even if that is not their primary goal. This consolidated view ensures that progress towards visibility and access across programmes can be tracked and sustained, enabling gaps to be identified while avoiding duplication.

Although this roadmap focuses on the NESO activities which will deliver DER and CER visibility and access, successful integration of DERs and CERs to the power system will require alignment and support across industry. The delivery of visibility and access will require increased data sharing and coordination across a wider set of national, regional and grid-edge actors, including Distribution System Operators (DSOs), Distribution Network Operators (DNOs), Independent Distribution Network Operators (IDNOs), suppliers, aggregators, flexibility service providers, technology providers and asset operators, depending on the requirements and coordination model adopted.

We gained valuable insights from responses to our report in 2022,[4] where we set out our initial case for change, benefits assessment and roadmap. Since then, we have engaged extensively with industry on this topic - through NESO events, Open Networks activities, other publications such as *Enabling Demand-side Flexibility in NESO Markets* (EDSF)[5] and *Clean Power 2030* (CP30),[6] and collaborative projects with industry that have informed this roadmap, such as Fractal Flow.[7]

Feedback received through consultation and wider engagement has informed the level of ambition outlined in this roadmap, as well as approaches to collaboration and delivery. This has enabled refinement of the scope, timelines and activities to ensure the Roadmap is robust, and aligned with stakeholder needs.



2 Delivering on the commitment from the *Clean Flexibility Roadmap* Clean flexibility roadmap - GOV.UK
3 Markets Roadmap and Operability Strategy Report 2026 | National Energy System Operator
4 Operational Visibility of DERs | National Energy System Operator
5 Enabling Demand-Side Flexibility in NESO Markets | National Energy System Operator
6 Clean Power 2030 | National Energy System Operator
7 SIF R3 Discovery - Fractal Flow (Partner) | National Energy System Operator

NESO Publication Map

The updated Publication Map can also be viewed here.

	Strategy	System Need	Policy & Procurement
Electricity	Holistic Network Design		
	DER/CER Visibility and Access Roadmap	Frequency Risk and Control Report	
		Summer Outlook	
		Winter Outlook	
	Beyond 2030	Resource Adequacy Study	
	Balancing Costs Report	Electricity Ten Year Statement	
		Transitional Centralised Strategic Network Plan	Electricity Markets Roadmap
	Operability Strategy Report		
Whole Energy	Clean Power 2030	Future Energy Scenarios	
	Strategic Spatial Energy Plan		
	Centralised Strategic Network Plan		
	Regional Energy System Plans		
	Innovation Strategy		
	Sector Digitalisation Plan		
Gas	Gas Options Advice Document	Gas Network Capability Needs Report	Gas Future Markets Plan

HND

Holistic Network Design

Cadence: Standalone

The HND and HNDFUE work is concluded apart from the environmental assessments we are completing on these. We have recently carried out a public consultation on the HND implementation plan, which is a retrospective environmental assessment. Offshore assessments will now be part of the CSNP.

For more information click here.

The updated Publication Map can also be viewed here.

DER/CER Visibility and Access Roadmap

Cadence: TBC

Distributed Energy Resources (DERs) and Consumer Energy Resources (CERs) are becoming an increasingly significant component of Great Britain's electricity mix. However, NESO currently has limited visibility of and access to these distributed energy assets. The DER/CER Visibility and Access Roadmap presents a view of the in-flight and planned activities which will deliver DER and CER visibility and access for NESO. This roadmap will evolve over time to reflect outputs of activities and the wider industry context.

For more information click here.

FRCR

Frequency Risk and Control Report

Cadence: Annual

The Frequency Risk and Control Report includes an assessment of the magnitude, duration and likelihood of transient frequency deviations, forecast impact and the cost of securing the system and confirms which risks will or will not be secured operationally.

For more information click here.

Summer Outlook

Cadence: Annual

The Summer Outlook report contains our view of the electricity system for the coming season and is designed to support the industry in its preparations. The report outlines our assessment of Great Britain's projected electricity needs covering security of supply, any potential operational challenges and an assessment of the wider energy market context.

For more information click here.

Winter Outlook

Cadence: Annual

The Winter Outlook Report presents our view of electricity security of supply for the winter ahead. This report builds on the Early View of Winter, providing our latest assessment of margins, operations and markets.

For more information click here.

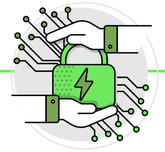
The updated Publication Map can also be viewed here.

Beyond 2030

Cadence: Standalone

Beyond 2030 is a ground breaking investment plan for the future of the GB electricity network, recommending upgrades and new infrastructure for electricity networks, both on and offshore. The document builds on the Holistic Network Design, and is a transitional plan, which is a stepping-stone before NESO develops the Centralised Strategic Network Plan.

For more information click here.



Resource Adequacy Study

Cadence: Yet to be published

This study will align with the CP30 publication of November 2024, but looks beyond this to consider security of supply in 2035 and 2040. The purpose is to identify long lead-time actions which need to be taken now to ensure a smooth and secure pathway towards a Net Zero energy future.

For more information click here.

ETYS

Electricity Ten Year Statement

Cadence: Annual

The Electricity Ten Year Statement is NESO's view of future transmission requirements and the capability of Great Britain's National Electricity Transmission System (NETS) over the next ten years. It is important in helping us to understand where investment and development are needed to help us achieve our zero-carbon ambition. Our key messages explain that the key system needs insights from our latest (FES) analysis.

For more information click here.

BCR

Balancing Costs Report

Cadence: Annual

The Annual Balancing Cost report provides a comprehensive review of balancing costs incurred, cost drivers, and our best outlook of costs in the future. The report also outlines work being undertaken by NESO and wider industry work required to reduce balancing costs.

For more information click here.

The updated Publication Map can also be viewed here.

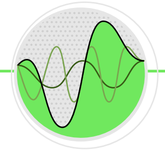
tCSNP

Transitional Centralised Strategic Network Plan

Cadence: Standalone

The tCSNP2 Refresh takes into consideration the recommended offshore network design that is set out in the HND and updated in the Beyond 2030 report. It identifies where the onshore electricity transmission network there is a need for wider network reinforcement, to enable additional electricity generation to flow from offshore wind farms to where it is required, onshore.

For more information click here.



MR

Electricity Markets Roadmap

Cadence: Annual

The electricity Markets Roadmap outlines what we are doing to reform the ancillary services and balancing markets and why we are doing it, giving participants the ability to build investment cases and stakeholders the confidence that we are making the right design decisions.

For more information click here.

OSR

Operability Strategy Report

Cadence: Annual

The OSR outlines the operability challenges we expect to face as we transition to a clean power system in 2030 and towards a net zero energy system by 2050. The report covers seven key areas of system operability: adequacy, flexibility, frequency, thermal, voltage, stability and restoration.

For more information click here.

CP2030

Clean Power 2030

Cadence: Standalone

Clean Power 2030 includes analysis of multiple pathways that enable a clean power system by 2030, with varying energy generation and demand mixes, transmission network requirements, implications for connections and any system operation considerations; including recommended actions for Government and Industry.

For more information click here.

The updated Publication Map can also be viewed here.

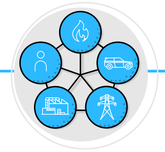
FES

Future Energy Scenarios

Cadence: Annual

Future Energy Scenarios (FES) outlines NESO pathways to net zero which represent different, credible ways to decarbonise our energy system as we strive towards the 2050 target.

For more information click here.



SSEP

Strategic Spatial Energy Plan

Cadence: Every 3 years

The Strategic Spatial Energy Plan (SSEP) will help accelerate and optimise the transition to clean, affordable and secure energy across Great Britain by providing greater clarity to industry, investors, consumers and the public on the shape of our future reformed energy system. The first SSEP will be a GB-wide plan that will map potential locations, quantities and types of electricity and hydrogen generation and storage infrastructure over time.

For more information click here.

CSNP

Centralised Strategic Network Plan

Cadence: Every 3 years

CSNP will deliver a whole-system view of electricity transmission, gas transmission, and hydrogen transportation and storage systems. It will provide a 25-year blueprint of where the network infrastructure will be needed to transport energy around GB. The CSNP will consider the anticipated changes of each network as the energy transition continues. It will be updated every three years, balancing the needs of consumers, investors, communities and the environment.

For more information click here.

RESP

Regional Energy System Plans

Cadence: Every 3 years

NESO's Regional Energy Strategic Plans (RESP) role will establish a new approach to strategic energy planning at the energy distribution level, with NESO producing RESPs for Scotland, Wales and nine English regions. The RESPs will provide key inputs both to the business plans developed by electricity and gas distribution networks, as well as to anyone involved in energy infrastructure planning and development. The RESPs will complement other GB-wide NESO strategic plans, such as the Strategic Spatial Energy Plan (SSEP) and the Centralised Strategic Network Plan (CSNP). To inform the next gas distribution price control, we will need to publish 11 full RESPs by December 2028.

For more information click here.

The updated Publication Map can also be viewed here.

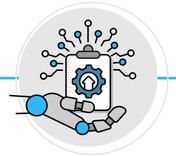
IS

Innovation Strategy

Cadence: Annual

The Innovation Strategy signals to the regulator and external innovators our innovation priorities for the year ahead, supporting NESO's secondary duty of facilitating innovation and our licence condition of developing an innovation strategy for gas and electricity. It sets out the focus of innovation resources and funding, such as Network Innovation Allowance, Strategic Innovation Fund and other mechanisms.

For more information click here.



SDP

Sector Digitalisation Plan

Cadence: Annual

The sector digitalisation plan brings together diverse perspectives and expertise from across the industry to review, consolidate and map current digitalisation efforts against future system needs. It identifies a clear set of deliverable, owner assigned actions, needed to deliver Clean Power 2030. Gaps, where intervention is needed but ownership is yet to be established are also identified.

For more information click here.

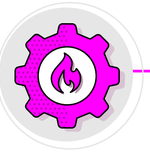
GOA

Gas Options Advice document

Cadence: Bi-annual

The Gas Options Advice document assesses the investment options put forward by National Gas, to provide high-level advice to Ofgem on the relative merits of those options.

For more information click here.



GNCR

Gas Network Capability and Needs Report

Cadence: Bi-annual

The Gas Network Capability and Needs Report sets out the needs for future needs for capability on the national gas transmission system, the 'National Transmission System' (NTS), owned and operated by National Gas.

For more information click here.

The updated Publication Map can also be viewed here.

Gas Future Markets Plan

Cadence: TBC

The Future Market Plan for gas, which is a NESO license condition c2.7, will be published as the Gas Markets Roadmap (GMR), as it more accurately reflects what the document is agreed with DESNZ. It will present a series of projects to support closing the evidence gap as we move forward in a decarbonized economy.

For more information click here.

Post-Consultation Update

Following the consultation, the Roadmap has been updated to address the views received from stakeholders across industry. There was clear agreement among respondents regarding the challenge posed by visibility and access of DERs and CERs and support for the Roadmap as an initiative to help structure activity. Constructive feedback was given across a range of topics, particularly relating to the approach to determining solutions and the approach to coordinating the Roadmap. This section sets out the main themes of feedback received during consultation and how these have been addressed across the documents.

There was a strong stakeholder consensus regarding the need for solutions to be proportionate. This included recognition of the roles that predictability of asset behaviour (e.g. based on price signals) and aggregation can have in reducing the need for asset-level metering, and suggestions to prioritise use of existing or low-cost data where appropriate. In response we have established a set of data principles, which will guide the development of trials, innovation projects and Minimum Viable Products (MVPs) on the Roadmap. These principles will ensure that, so far as possible, the proposed solutions are proportionate, standardised, transparent, and require the minimum data needed to achieve the target capability.

We also received questions regarding the relationship between this roadmap and wider industry digitalisation initiatives, including the Energy Digitalisation Framework (EDF). In response we have updated this document to better describe the alignment with ongoing initiatives and have included a new activity on the roadmap to develop the first industry-wide reference architectural framework.

There were concerns raised about how NESO will identify data requirements. These included the possibility of wide-ranging and non-specific requests for new data which could impose unnecessary costs on other organisations, as well as case-by-case requests for data which could lead to inefficiencies. We consider that, at this stage, activity-specific requests for data remains the right approach – this will enable us to progress the delivery of MVPs which are needed to inform enduring solutions to improve visibility and access. However, we have added three new activities to the Roadmap which are intended to increase clarity over NESO's requirements:

- **Minimum Visibility and Access Methodology** – Aims to develop a structured and repeatable method to assess how different levels of visibility and access affect NESO's ability to support safe, secure and efficient electricity system operation under future scenarios with high levels of distributed energy.
- **TIDE data catalogue** – To identify the data requirements initially associated with a subset of MVPs within the Roadmap. This will demonstrate that requirements are being harmonised and, over time, could be expanded to include more roadmap activities.
- **TIDE data and technology architecture** – To develop the target technology and data architecture, in line with the architecture reference framework set out in the EDF, for a subset of MVPs within the Roadmap. This will build clarity over the target end state and, over time, could be expanded to include more roadmap activities.

Consultation feedback highlighted a strong preference among respondents for more decentralised and hybrid coordination models, particularly where local actors such as DSOs and aggregators play a greater role. NESO recognises that these approaches could be appropriate for many markets, services and processes but we are not seeking to prescribe a single coordination model at this stage. Instead, the Roadmap is designed to retain flexibility and accommodate a range of viable approaches, with MVPs used to generate the evidence required to inform future decisions on the appropriate form of coordination for individual markets, services, processes, etc. We look forward to working with industry to further develop our thinking in this space.

There was a consensus on the need for activity on the Roadmap to be coordinated, for regular updates on progress, and for appropriate governance to be put in place, particularly given the potential stakeholder impacts associated with activities. We recognise the need, highlighted through consultation and engagement, to monitor the roadmap and propose to review the content annually alongside more regular (e.g. half-yearly) updates on progress. This is an area that we will continue to monitor over time to ensure that we are achieving the right balance of coordination, engagement and flexibility.

Overall, the insights we received from industry and the subsequent updates have helped to improve both the Roadmap and our approach to delivering it. We appreciate the valuable input provided by stakeholders throughout the consultation process and welcome continued engagement as delivery of the Roadmap progresses.

01

Background

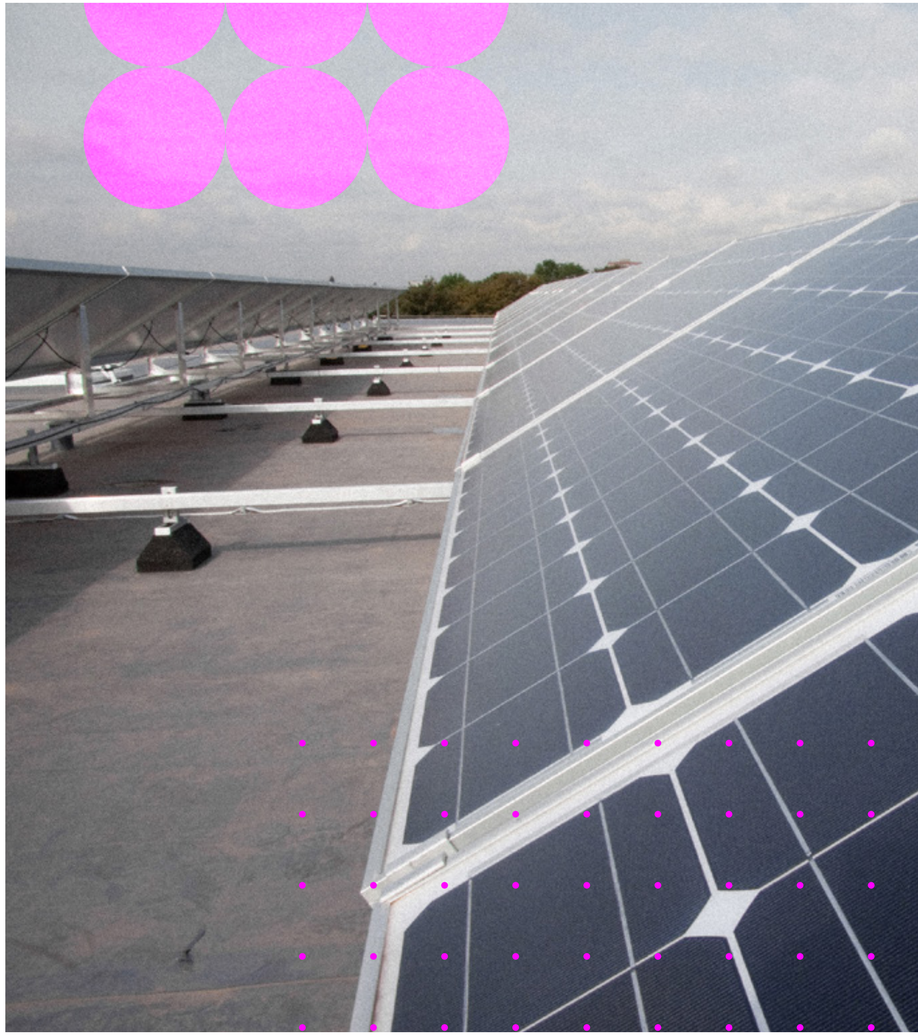
The Increasing Importance of DERs and CERs

Great Britain's electricity system is undergoing a rapid transformation as we progress towards Clean Power 2030 and Net Zero. Increasing decentralisation, significant growth in renewables, and a shift towards asynchronous generation (such as wind, solar and batteries) is resulting in an increasingly complex supply mix, connected at all levels of the network and comprising a diverse set of technologies and intermittency. Demand patterns are changing as heat and transport become increasingly electrified, with demand also becoming more flexible as consumers and smart devices respond to price signals and participate in flexibility markets.

Volumes of DERs and CERs are rapidly increasing

As part of this transformation, DERs (Distributed Energy Resources) and CERs (Consumer Energy Resources) have become a significant and rapidly growing component of Great Britain's electricity mix.

- DERs are business-owned small-scale power generation, storage, and demand devices connected to the distribution grid and located close to where electricity is consumed – for example, wind, solar, and battery energy storage systems (BESS).
- CERs are consumer-owned assets that are connected to the distribution grid at consumer premises. Common examples include rooftop solar, batteries, and EV chargers.[8] These are typically <1 MW in size, and can include behind-the-meter (BtM) assets.[9]



8 Transformation to Integrate Distributed Energy | National Energy System Operator

9 Behind-the-meter assets sit on the consumer side of the electricity meter and are not directly visible or controllable by system operators. As a result, interaction with these assets is typically achieved indirectly, for example through aggregators, suppliers or market signals. Where assets are behind the meter, approaches to visibility and access will need to reflect these participation routes and the degree of direct or indirect controllability available.

As of February 2026, 44.1 GW of distributed energy capacity (≥50 kW assets) was registered on the distribution network.[10] Distributed capacity figures from 2024 indicate that approximately 80% of this capacity is provided by DERs, and around 20% by CERs.[11]

The *2025 Future Energy Scenarios* (FES) report indicates that, under a Holistic Transition pathway, distributed energy capacity could scale to approximately 65 GW by 2030 to support a clean power system – an additional c.20 GW of capacity.[12] The latest Connections Reform data goes further, identifying 30.8 GW of embedded generation as part of Phase 1 projects required for 2030.[13] This includes 16.3 GW of solar photovoltaic (PV), 10.2 GW of battery storage, and 4.3 GW of onshore wind.

These figures, alongside wider global trends of increased integration of DERs and CERs into power systems,[14] suggest that the rapid growth of DERs and CERs connecting to the GB power system will continue.

Distributed flexibility from DERs and CERs will be critical to achieving a clean and affordable electricity system

The distribution network is expected to play an increasingly important role in the deployment of renewable generation and flexibility assets, which will support the decarbonisation of the GB power system. For example, around 90% of future solar capacity is expected to be connected to the distribution network.[15]

DERs and CERs can provide an important source of distributed flexibility as part of this transition.[16] Distributed flexibility can help manage intermittency and enable more efficient use of renewable energy sources, reducing reliance on expensive and fossil-intensive back-up plants.[17]

Consumer-led flexibility enabled by DERs and CERs can reduce system costs. Shifting demand in response to system needs reduces balancing interventions and wholesale market pressures. This also results in lower costs of energy use for the consumer.[18]

Greater DER and CER visibility and access will improve GB electricity system operability

Improved DER and CER visibility will enable optimised system operation. For example, enhanced visibility should improve forecasting by allowing models to be trained on richer DER and CER data. This helps the models learn generation and consumption patterns, as well as underlying human behaviours. Improved forecasts are essential to optimal utilisation of infrastructure and efficient scheduling of resources. During real-time operations, improved visibility enhances situational awareness of the underlying network's generation and demand, which supports optimised dispatch decisions.

While improved market access for DERs and CERs is an important outcome of this roadmap, it is not the sole driver of visibility and access requirements. These requirements also support NESO's core operational roles, including real-time system operation, forecasting and network planning, restoration and resilience, and compliance monitoring, which together underpin improvements in system operability.

10 National Embedded Capacity Register | Northern Powergrid
11 Future Energy Scenarios 2025: Pathways to Net Zero | NESO - FES 2025 showed 41.1 GW total distribution-connected energy in 2024. Of this, 33.1 GW was categorised as 'distributed' connection (non-transmission sites greater than 1 MW and typically connected to one of the 14 distribution networks), and 8.1 GW as 'micro-distributed' connection (less than 1 MW, the smallest of which may be connected directly to properties behind the meter').
12 Future Energy Scenarios 2025: Pathways to Net Zero This includes distributed' and 'micro-distributed' connection. Note that this figure is for embedded onshore wind, batteries, and solar only. This does not include other technologies (such as offshore wind).
13 Connections Reform Detailed Results Data | National Energy System Operator
14 DER Integration | ISON
15 Clean Power 2030 | National Energy System Operator
16 The Future of Distributed Flexibility | Ofgem
17 Clean Power 2030 | National Energy System Operator
18 Demand Flexibility Service Winter Review, July 2025 | National Energy System Operator

Greater access to services from DERs and CERs should also improve operability of the GB electricity system. DERs and CERs can be used to reduce peak electricity demand, help manage power flows and absorb excess renewable generation, which improves thermal operability and within day flexibility.[19]

DER and CER Visibility and Access should deliver significant benefits

An assessment of the quantitative benefits of comprehensive delivery of DER and CER visibility and access found that consumer costs could be reduced by up to £292 million per annum, up to a cumulative £3 billion by 2035.[20] This aligns with other benefits assessments relevant to DER and CER visibility and access. The government and Ofgem's *Smart Systems and Flexibility Plan* estimates that data-enabled flexibility can cut system costs by up to £10 billion per year by 2050,[21] and the National Infrastructure Committee found that higher flexibility driven by asset visibility could reduce distribution reinforcement needs by up to 15%.[22]

In terms of cost assessment, we recognise that delivery of activities on the Roadmap will lead to costs for stakeholders across industry, including NESO, DER and CER Operators, Flexibility Service Providers and Aggregators, DNOs and DSOs, and TOs. Generally, these stakeholders are best placed to assess the costs of changes within their own organisations, as these will vary by institution and solution.

For NESO, a 2024 assessment estimated that the delivery of NESO technology changes required to achieve DER and CER visibility and access would require around £100 million of investment. This figure is indicative and would need to be refined based on specific solutions once agreed. Additionally, in 2022, the Energy Networks Association estimated that £25 - 42 million of investment would be needed to deliver enhanced visibility for DERs (>1 MW).[23]

Although these benefit and cost assessments were conducted on a range of use cases without clarity on exact solutions to meet them, and implementation of enduring solutions would require a specific Cost Benefit Analysis to be conducted, these previous analyses clearly indicate that the benefits of DER and CER visibility and access outweigh the expected costs.

Integration of DERs and CERs through visibility and access is therefore critically important to delivering NESO's statutory duties of enabling Net Zero, ensuring security of supply, and promoting an efficient and economic power system.[24]

19 Markets Roadmap and Operability Strategy Report 2026 | National Energy System Operator
20 DER & CER visibility benefits | LCP Delta
21 Upgrading our Energy System – smart systems and flexibility plan | Ofgem The *Smart Systems and Flexibility Plan* estimated £30 billion to £70 billion of cumulative savings to 2050, contingent on digitalisation and open market access to flexible resources.
22 Electricity distribution networks: Creating capacity for the future | National Infrastructure Committee National Infrastructure Committee modelling estimated a reduction in required distribution investment from £45 billion to £38 billion.
23 Operational DER Visibility and Monitoring | Energy Networks Association
24 RIIO-2 Business Plan 3 | National Energy System Operator

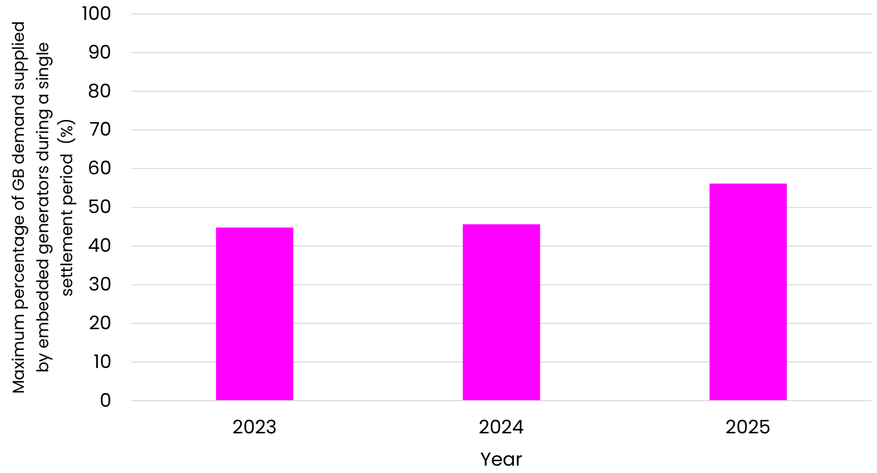
Operational Challenges of Limited Visibility and Access

System resilience is already being impacted by limited DER and CER visibility and access

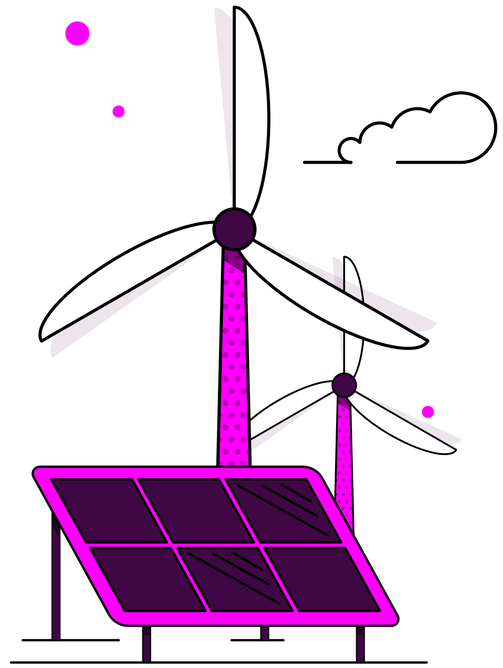
The generation from DER and CER is highly variable, and challenges for system operation tend to occur at the extremes. These extremes are becoming more pronounced; the maximum share of national demand that is provided by DERs and CERs has been growing rapidly in recent years and exceeded 50% for the first time in 2025 (see Figure 1).

However, around three quarters of these assets don't share operational data with NESO or participate in NESO's markets, and so aren't visible or accessible to NESO. This poses significant challenges to the operability of the GB electricity system. Without action to increase NESO's visibility of and access to DERs and CERs, these challenges will continue to grow and impact system resilience (see Table 1).

Figure 1: **The highest percentage of non-BMU intermittent generation for one settlement period**



Source: NESO analysis of DUKES.[25]



25 Digest of UK Energy Statistics (DUKES) | GOV.UK On Sunday 25 May 2025, non-BMU intermittent generation reached 56% of total GB demand.

Table 1: DER and CER operability challenges and their impacts

Examples of operability challenges associated with DERs and CERs	Impacts on system resilience
Large frequency swings caused by step demand changes	Large step changes in demand have occurred when many assets respond simultaneously to external signals, such as tariffs or prices. These swings are not reflected in conventional consumption or production patterns and forecasts, and have caused significant frequency deviations. They can also include changes in usage patterns triggered several days ahead of delivery.
Declining accuracy of demand and generation forecasts due to increasing penetration and variability of DERs and CERs, particularly where visibility of asset behaviour is limited or uncertain	As distributed assets (e.g. rooftop solar, batteries, EVs) scale, so do the challenges of forecasting. The behaviour of these assets can be less predictable and is often driven by price signals. They are also less visible to the system operator, particularly where behind the meter. This reduces the accuracy of demand and generation forecasts, especially in real time and near real time, and increases uncertainty in system balancing.
Challenges to system security during times of low demand and high DER and CER generation	During low demand and high DER and CER generation hours (for example, windy nights or sunny bank holidays) NESO must operate the system with sufficient downward margins. Some generators, often synchronous, also need to be run to meet stability, voltage and inertia requirements. DER and CER visibility and access (mainly downward regulation) is needed to safely operate the system during these conditions, and complements the range of operational actions already taken by NESO, including demand-side flexibility such as the Demand Flexibility Service (DFS) and other downward balancing measures. Demand, especially low demand during weekends, summer nights, and increasingly daytime periods with high embedded renewable output, doesn't grow at the same rate as DER/CER generation. This exacerbates the frequency and size of associated challenges, requiring increased actions to be taken by NESO at a higher cost to consumers.
Reactive power spill from distribution networks caused by uncompensated cable networks, high embedded generation, or low demand	Cable networks are increasingly being deployed to connect demand and generation customers, but these cable networks are often not reactively compensated. As a result, periods of high distributed generation or low demand can result in localised high voltage challenges. Regions such as the Southwest of England are particularly susceptible to reactive power flowing from distribution to transmission. This spill requires additional reactive power capabilities to ensure voltage remains within safe operating limits. Addressing these challenges is expected to be supported by developments under the ED3 price control, including investment in enhanced DNO system capabilities for managing voltage and reactive power at the distribution level.
Limited accuracy and efficacy of post-event analysis due to lack of data	Post-event analysis of system incidents is important to ensure that we learn from these events and improve system resilience. The lack of visibility of DERs and CERs provides challenges for accurate and comprehensive post-event analysis. Recent incidents, where DERs tripped unexpectedly, highlighted the importance of investigating and learning from these incidents especially with the growth in system complexity.
Challenges to effective system restoration following a National Power Outage	NESO remains confident in its ability to manage system restoration under current conditions. However, as the penetration of DERs and CERs increases, and system characteristics continue to evolve, maintaining restoration performance will become more complex without improved visibility and access. In particular, without increased visibility of DERs and CERs, NESO's ability to restore 60% of the demand per region within 24 hours of a national power outage, and full restoration within 5 days, may become increasingly challenging over time. A sufficient understanding of demand of DER and CER output levels in the early phases of restoration is critical for the speed and stability of restoration activities. Deeper visibility of DERs and CERs and better coordination with DSOs will therefore help to enhance the effectiveness of existing tools such as the Distributed ReStart service in overall system restoration plans.

Protecting system security against these operability challenges increases system operation costs

Operability challenges related to a lack of DER/CER visibility and access contribute to higher costs of running the GB electricity system. For example, reactive power spill from distribution networks drives up purchases of additional reactive power from conventional plants, frequently at a high cost.[26] Similarly, poor near-real time visibility of distributed energy assets reduces the accuracy of forecasted behaviour and therefore national demand forecasts. This creates significant power requirement accuracy errors and hard-to-predict demand swings, particularly at settlement period boundaries.[27] As a result, NESO must procure and activate more reserve (e.g., Balancing Reserve) and hold more operating reserve in the BM, increasing balancing costs.

Ultimately, insufficient visibility of DERs and CERs increases the likelihood of inefficient dispatch decisions being made and that there will be poor coordination between wholesale and balancing markets, at further consumer cost.[28]

26 Clean Power 2030 | National Energy System Operator
Continued use of unabated gas to address reactive power spill also risks not meeting Clean Power 2030 ambitions.

27 Energy Forecasting Strategy & Delivery Plan | National Energy System Operator

28 Reformed National Pricing Call For Input | National Energy System Operator
This Call For Input closed on 14th April 2026.

Coordinated changes are required across the full system operations value chain

The operability challenges arising from a lack of DER and CER visibility and access are extensive, and manifest across NESO's full system operations value chain. Addressing these issues will require coordinated enhancements of core power system capabilities to ensure that NESO can continue to operate a secure electricity system (in line with license obligations and statutory duties) as DER and CER penetration grows.

Long-term planning

Enhanced transmission-distribution coordination will be essential to support long-term operational planning. Infrastructure must be co-developed to connect both demand and generation customers and ensure optimised and secure operation across all timescales. Sharing of static data for new connections will be critical for this, so that NESO's network modelling tools are updated with high quality models of connected equipment. These network modelling tools are vital to ensuring that NESO's planning and operational studies (e.g., voltage and stability studies) provide accurate results. Visibility of transmission and distribution constraints, Active Network Management schemes (ANMs), and Load Management Schemes (LMSs) will be important for operating the future electricity system.

Resilience and emergency management

For resilience and emergency management, distribution networks connect critical national infrastructure loads and a significant amount of future generation. With a high percentage of DERs and CERs supplying GB electricity demand, enhanced real-time visibility of distribution networks is needed to ensure security and quality of supply for these critical loads.

Short-term planning and forecasting

NESO must also enhance short-term operational planning and forecasting capabilities. DERs and CERs are often weather-dependent or driven by external optimisation signals (such as market prices, tariffs, or self-consumption of renewable energy), resulting in increased variability and uncertainty in system behaviour. This is particularly relevant for consumer-owned and Behind-the-Meter assets, where behaviour is influenced by consumer preference and market signals, and where direct real-time visibility at an individual asset level is not typically appropriate. Understanding how weather conditions and price signals influence demand and generation patterns will be essential to mitigating operability risks. In many cases, visibility of these assets is expected to be achieved through aggregated or portfolio-level information, rather than individual asset telemetry, reflecting the scale and nature of CER participation. Increased visibility of DER and CER data, delivered through these approaches, will be a critical enabler.

Improving the predictability of DER and CER behaviour, particularly for smaller and BtM assets, can also support system operation. Clearer and more consistent market signals and price incentives can reduce uncertainty, improving forecasting accuracy and complementing the role of enhanced visibility.

Additionally, most DERs and CERs utilise Inverter-Based Technologies (IBTs) which behave differently compared to synchronous generators and don't provide stability services (such as inertia). These different characteristics, behaviours, and weather dependencies require continuous refinement of the frequency response and reserve products to reduce frequency variability. Advanced modelling capabilities and expanded studies will be required to maintain converter-driven stability and validate fault ride through characteristics of DERs and CERs. Next generation IBTs with grid forming capabilities will also be required to provide system services to enhance system stability (for example, inertia and fault current injection).

Real-time operations

NESO will need to improve real-time operational processes and systems to integrate and utilise greater visibility and access to DERs and CERs. NESO will increasingly draw on DERs and CERs for distributed flexibility, to meet system demand requirements, manage power flows, absorb excess renewable generation, and for restoration. Transmission-distribution coordination will be critical to managing reactive power spill and meeting Clean Power 2030 ambitions. Our modelling suggests that, under certain system conditions, voltage regulation could be maintained using clean power sources alone.[29] This coordination must begin during planning timescales and continue into real-time operations, consistent with the ED3 framework's emphasis on proactive, long-term, and integrated network planning for the 2028–2033 period.[30]

Post-event analysis

Improved sharing of post-event analysis data regarding system incidents and events is also critical to ensure learnings are captured and incorporated into future processes and tools.

Resolving these operability challenges will be vital to mitigate risks to system resilience, and to ensure that NESO and GB can achieve a cost-effective clean power system by 2030.

29 Clean Power 2030 | National Energy System Operator
30 ED3 Framework Decision | Ofgem

Where We Are Today

We have improved DER and CER visibility and access since our last report in 2022,[31] primarily through widening market access to non-BM units, and expanding access to the BM for DERs and CERs.

Multiple new markets have been launched, and existing markets have been expanded to create new routes to market and lower barriers to entry for distributed flexibility:

- The Demand Flexibility Service (DFS) was initially developed in winter 22/23 to lower demand during evening peak periods. It now makes it simpler for homes and businesses to join the electricity flexibility market. Through DFS, we have increased visibility of participating DERs and CERs and can increasingly access services to reduce or shift demand and support national system balancing during periods of peak demand.[32]
- Participation in Quick Reserve (NESO's bi-directional reserve service that rapidly restores system balance) was opened to DERs through a non-BM dispatch route via the Open Balancing Platform (OBP) in late 2025, expanding access to aggregated non-BM flexible assets.[33]
- A Local Constraint Market (LCM) is being trialled on one of GB's most constrained boundaries to boost access to new sources of embedded flexibility and manage constraints.[34] The trial has been extended to January 2027.
- The MW Dispatch constraint management service has provided greater real-time operational access to DERs (down to 1 MW) by enabling NESO to issue curtailment (including turn-down to zero output) instructions via DSOs to manage transmission constraints.

31 Operational Visibility of DERs | National Energy System Operator
32 Demand Flexibility Service (DFS) | National Energy System Operator
33 Quick Reserve | National Energy System Operator
34 Local Constraint Market | National Energy System Operator
The B6 boundary separates the transmission network at the SP Transmission and National Grid Transmission interface, running roughly along the border between Scotland and England.

Early in 2026, we introduced changes to operational metering requirements for the BM, fulfilling our commitment to make participation in the BM more accessible to aggregated small scale assets, such as EVs.[35] In parallel, we will launch an innovation project to investigate the feasibility and relative performance of synthetic meter feeds being created by NESO and aggregators as an enduring solution.[36]

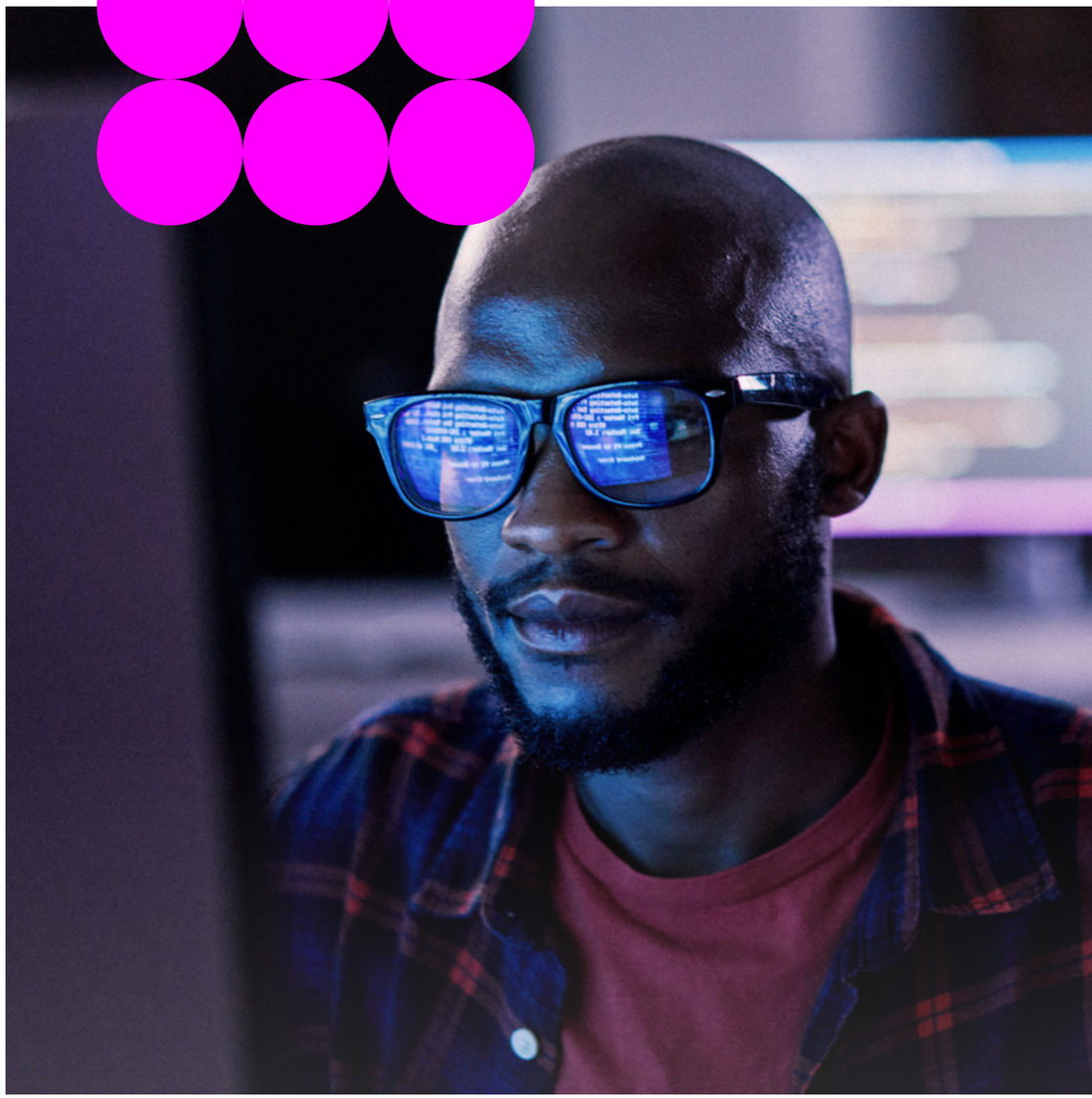
To support the expanding suite of DERs and CERs participating in market services and the BM, NESO has been working with DNOs/DSOs to refine primacy rules. Primacy rules (now governed and maintained by the Market Facilitator as part of the Flexibility Market Rules) are arrangements for coordinating access to distributed flexibility in a way that accounts for distribution network capacity. This prevents conflicts and ensures that flexibility from DERs and CERs can be used safely and efficiently across transmission and distribution systems.[37] We have collaborated with DNOs/DSOs to develop integrated processes for DSOs to actively reflect their network needs into the procurement process. The implementation of DFS v.4 will see the introduction of primacy rules with DSOs as a demonstration of primacy before rollout to wider services. This will implement 'risk of conflict' reporting, which involves the exchange of market and network data to identify and mitigate potential conflicts in NESO and DSO requirements.

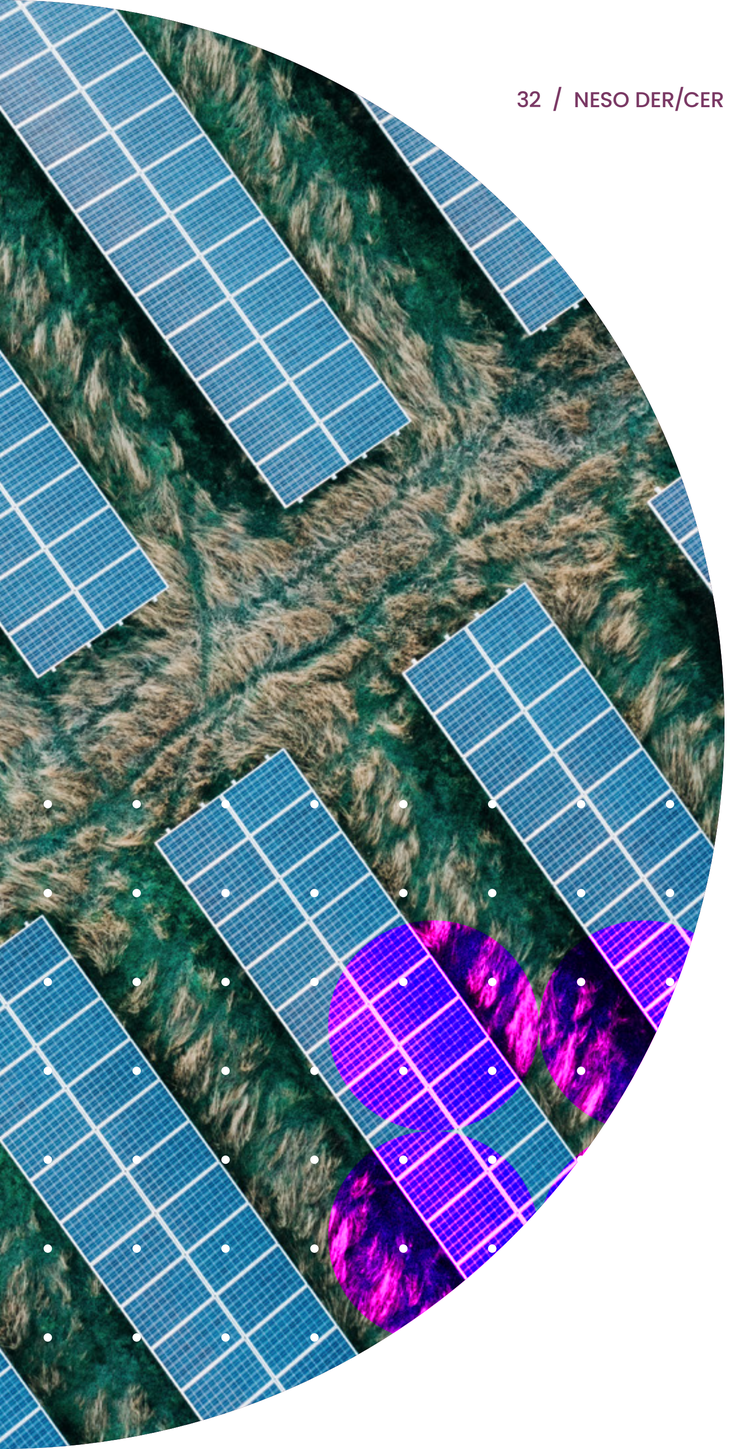
However, further action is needed to unlock the full opportunities of DERs and CERs for GB, and to address the risks created by limited visibility and access. NESO has some real-time visibility of an estimated 13.8 GW of distributed energy assets, through assets registered in the BM and ancillary services.[38,39,40] This means that more than half of distributed energy asset capacity is not visible to NESO. This is even more stark when considering CERs specifically, as these currently have relatively few opportunities to participate in the BM or ancillary services. By contrast, DSOs have relatively good visibility of DERs within their networks, with ENA analysis conducted in 2022 indicating that approximately 80% of distribution-connected capacity was monitored at the time.[41] This indicates that improved visibility could be obtained through data sharing with DSOs, or greater direct participation of DERs and CERs in NESO's market services.

35 Briefing Note: BM Operational Metering Changes
36 Power Responsive Autumn Event 2025 | National Energy System Operator
37 Primacy Rules | Elexon
38 Elexon Portal | Registered BM Units
Around 8.3 GW of embedded assets are registered with Elexon in the Balancing Mechanism. It should be noted that not all these assets are necessarily also registered with NESO, so the actual visibility to NESO may be lower.
39 Single Markets Platform (SMP) data indicates visibility of up to 13.8 GW of embedded assets registered across NESO services. However, not all fields in SMP are mandatory so this number should be considered indicative.
40 Ancillary services vary in the visibility requirements, i.e., what signals are shared. Visibility also might only be provided when the unit is under the service provision.
41 Operational DER Visibility and Monitoring | ENA
2022 analysis showed that across all DNO networks, 28.4 GW of DER capacity out of 35.8 GW total capacity had some form of monitoring.

02

Future of Distributed Energy in GB





Vision for Distributed Energy in GB

In line with NESO's central role in the energy system, we have developed a high-level vision for the end-state of distributed energy in GB for consultation. This vision largely reflects the existing strategic analysis and plans produced by NESO, including in the Clean Power 2030 Action Plan and the Future Energy Scenarios (FES), but is framed through a distributed-energy-focused lens to identify the most relevant enablers. Our ambition for the end state of distributed energy will guide our work in the coming years by providing a long-term direction while near-term details develop. The estimated £3 billion in consumer benefits from delivering comprehensive DER and CER visibility by 2035 (as outlined in the Background) underscores the case for action. We expect details to evolve as we incorporate emerging insights, and we actively encourage feedback through this consultation to refine our approach.

By 2030, NESO will have proportionate visibility and access to DERs and CERs across all necessary timescales, supporting the delivery of consumer benefits as part of a clean power system. Visibility and access to distributed energy will contribute to reductions in cost and carbon intensity of the wider GB electricity system, avoided network investment, and increased system resilience.

Beyond 2030, NESO will continue scaling and optimising enduring solutions to meet the long-term requirements for DER and CER visibility and access in line with evolution of the power system.

This vision is made up of these key components:

The electricity system

By 2030, clean sources will produce at least 95% of Great Britain's electricity generation.[42] As part of this transition, DER and CER capacity has scaled, and enables optimised use of renewable energy sources, including through distributed flexibility. NESO will have visibility of and access to DERs and CERs, and operational challenges associated with limited visibility and access will be avoided. The increasing volumes of DERs and CERs on the distribution network will play an active role in managing increasing volatility with greater agility. System resilience will have increased, supported by improved confidence in DER and CER behaviour during faults, and improved integration of distributed assets within restoration plans.

Proportionate visibility and access refers to tailoring data requirements to the specific operational need, ensuring that the level, granularity and timeliness of data are appropriate to the relevant capability, service, asset class and timescale. This includes prioritising delivery toward areas of highest system value, recognising that some requirements will be more pressing, while for others, more detailed visibility may be appropriate over time but not an immediate priority.

These requirements will be defined on an activity basis, driven by NESO's operational needs and developed through the delivery of individual activities. This may include asset-level, aggregated, real-time, near-real-time or retrospective data.

Consumer benefits

By 2030, DERs and CERs will actively support balancing, alleviate system constraints, and provide flexibility that lowers the costs of running the system. Consumers will see direct financial benefits as a result, with hundreds of millions per year in reduced consumer costs and Great Britain on track to realise £3 billion in cumulative consumer savings by 2035.[43] These savings will be realised through multiple routes, from reduced balancing and system management costs to improved constraint management and competition from distributed flexibility. Households and businesses will gain opportunities to participate actively in energy markets, increasing competition and liquidity in the market, and industry innovations will increase consumer choice in how energy is consumed.

Market access and design

By 2030, reformed market mechanisms will have increased the participation of distributed energy assets in NESO's markets, including the BM, enabling more efficient balancing actions.[44] The Market Facilitator's Flexibility Market Rules will support aligned operation of NESO and DSO markets, allowing participants to operate seamlessly between local and national opportunities through coordinated service design and ways of working.[45] NESO will have visibility and access to all assets above 10 MW through mandatory participation in the BM (consistent with GC0117,[46] which is currently at workgroup) and a phased and proportionate approach will be in the process of being delivered to lower the threshold to 1 MW (subject to the outcome of the *Reformed National Pricing Call For Input*).[47]

42 Clean Power 2030 | National Energy System Operator
43 DER & CER visibility benefits | LCP Delta
44 Reformed National Pricing Call For Input | National Energy System Operator
45 Market Facilitator Delivery Plan 2026-2028 | Elexon
46 GC0117: Improving transparency and consistency of access arrangements across GB by the creation of a pan-GB commonality of Power Station requirements | National Energy System Operator

The aim of GC0117 is to standardise access arrangements for Power Station connections across GB by creating a common threshold for requirements, addressing current regional inconsistencies. The outcome of this harmonisation would be mandatory participation in the BM for all assets above 10 MW, which would increase NESO's visibility of and access to DERs and CERs.

47 Reformed National Pricing Call For Input | National Energy System Operator

Once complete, most active energy participants will be fully integrated into NESO system operation. Participation of smaller assets in the BM will also be supported by relaxed Operational Metering standards for CERs.[48] Many CERs are located behind the meter and will therefore participate indirectly, for example via aggregators or suppliers, with implications for visibility, access and controllability. Proportionate metering solutions will be required to support this, including ongoing work to assess synthetic and aggregated metering approaches as part of the Operational Metering programme.

NESO/DSO Coordination

By 2030, the ED3 distribution price control will encourage whole-system planning, ensuring that NESO and DSO system plans are aligned and reducing the likelihood of operational and planning conflicts.[49] Within this, transmission-distribution coordination will be actively supported by the Market Facilitator through the specification of primacy rules. NESO's visibility of DERs and CERs will include distribution network models, so that NESO instructions respect local constraints and are not counteracted by ANMs or other conflicting instructions.

We also recognise that many DERs and CERs will be connected to IDNO networks and that, as such, coordination between NESO, DSOs and IDNOs will also be an important consideration.

Data sharing and future system architecture

By 2030, data sharing and digital infrastructure will have enabled scaled integration of DERs and CERs to support a reliable and resilient power system.[50] Future system architecture will be supported by Data Sharing Infrastructure (DSI)[51], to improve visibility of DERs and CERs across all timescales, coordinating asset, operational, and market data. Delivering this will depend not only on increasing access to data, but also on ensuring that data is consistently validated, standardised and interpreted across organisations. Standardisation will be critical to enabling interoperability, reducing complexity, and ensuring that data can be effectively used to support operational decision-making.

Several industry initiatives are supporting this progress. ED3 distribution price control mechanisms will drive investment in smarter, digitalised networks and system operation coordination processes. The DSI will provide a scalable and secure framework for sharing data across the sector, while the Flexibility Market Asset Register (FMAR) is expected to establish a more consistent and comprehensive view of assets participating in flexibility markets. Additionally, the Consumer Consent Solution[52] and Smart Data Repository[53] will be key enablers in the emergent new digital ecosystem. The Energy Digitalisation Framework[54] sets the broader strategic direction for improving data accessibility, interoperability and governance across the energy system, and the Market Facilitator will play a key role in supporting aligned market design, coordination and data exchange standards.

48 Briefing Note: BM Operational Metering Changes
49 ED3 Framework Decision | Ofgem
50 DER Integration | ISON
51 Data Sharing Infrastructure (DSI) | National Energy System Operator
52 retailenergycode.co.uk/our-programmes/consumer-consent-solution/
53 elexon.co.uk/what-we-do/smart-data-repository/
54 Energy Digitalisation Framework | Department for Energy Security and Net Zero Including alignment with the wider Energy Digitalisation Framework.

New and uplifted NESO technology platforms will enable secure and scalable interoperable data exchange. As a Domain Coordinator within the Energy Digitalisation Framework, NESO will play a key role in enabling these outcomes by developing and operating systems that support secure data exchange, interoperability across platforms, and alignment of data requirements with operational and market needs. This includes working closely with DSOs and other stakeholders to support consistent approaches to data definition, validation and usage across the transmission and distribution boundary. As a result of these activities, NESO and DSOs will be able to procure, store, analyse, and make decisions using data relevant to DERs and CERs and improve the operation of the whole-energy system through enhanced real-time operations, forecasting, modelling, and planning processes. Flexibility Service Providers will be able to seamlessly participate in NESO and DSO markets with confidence that consumer data is protected.

As data sharing expands, it will be essential to ensure that consumer data is appropriately protected and used in line with established governance and consent arrangements. In particular, solutions such as the RECCo consumer consent framework[55] will support consumer participation while maintaining trust and ensuring that data is shared in a secure manner.

NESO is developing a first draft of the architectural reference framework. This will establish the baseline target architecture for the sector. This will provide a common baseline architecture from which new and developing digital infrastructure can be built. We envisage that this architectural reference framework will be iterated and broadened over time, in line with the progress with respect to digitalisation across the sector.

To deliver this vision, NESO will need to engage actively in key industry decisions and build several core capability areas, supported by access to, and the effective use of, distributed energy data.

55 Consumer Consent decision | Ofgem

Key Decisions and Uncertainties

Achieving NESO's vision for distributed energy in GB will occur as part of a wider ecosystem of decisions and changes, each of which will have a major impact on how visibility and access to DERs and CERs is achieved. These decisions will be driven by multiple actors: some are closer to NESO's own scope to design and operationalise, while others lie primarily with external bodies, where NESO will seek to inform and shape the design through evidence and analysis.

- **Primacy –** A model will be chosen to coordinate access to flexibility from distributed energy assets by NESO and DSO, led by the Market Facilitator.[56] This model will become increasingly important as the number of distributed energy assets within NESO's markets increases and will have significant implications for the approach taken by NESO to access distributed energy assets.
- **New licence conditions for DSOs on embedded asset registers –** Ofgem have recently consulted on the potential introduction of a licence condition placing new requirements on DSOs with respect to maintaining embedded asset registers.[57] If introduced, this would increase the scope of static asset data that NESO is able to access beyond current Embedded Capacity Registers.
- **Electricity Distribution Price Control (ED3) –** The ED3 price control will determine the requirements and incentives placed on DSOs with respect to facilitating asset visibility and access, as well as the resources provided to enable this.[58] Ofgem's Sector Specific Methodology Decision established the overall direction for ED3, highlighting the importance of digitalisation, coordination and data sharing in enabling efficient system operation.[59] Further detail will be developed through subsequent stages of the price control process but, given the critical role that DSOs have in supporting our vision, this will be a significant enabler.
- **Flexibility Market Asset Register (FMAR) –** The FMAR is intended to represent a 'single source of the truth' for assets registered in either DSO or NESO flexibility markets.[60] While the detailed design and scope of FMAR continues to be developed, its role in improving asset visibility and consistency of data across markets remains a key component of the future data landscape. The precise data and scope of assets to be covered by FMAR is still to be determined, but this will ultimately provide a useful source of asset visibility data for NESO.
- **Data Sharing Infrastructure (DSI) -** The DSI aims to transform the energy sector by providing a solution that makes it easier to share data in a scalable, secure, and resilient way.[61] The DSI will be a critical enabler for delivering the capabilities needed to achieve distributed energy asset visibility and access.
- **Reformed National Pricing (RNP) –** Following DESNZ's Review of Electricity Market Arrangements outcome and the July 2025 decision to retain a single national price, RNP aims to modernise the GB electricity market arrangements through a series of reforms. This includes a proposal to lower the mandatory BM threshold, with current options of 10 MW or 1 MW and a phased rollout under assessment.[62] NESO's recommendation to Ofgem and DESNZ is expected in H2 2026. If approved, this would significantly increase the scope of distributed energy assets within the BM, increasing NESO's visibility of and access to these assets.

56 Primacy Rules | Elexon
57 Enhancing asset visibility: Distribution Network Operator options | Ofgem
58 Framework decision: electricity distribution price control (ED3) | Ofgem
59 Sector specific methodology consultation: electricity distribution price control (ED3) | Ofgem
60 Decision: flexibility market asset registration | Ofgem
61 Data Sharing Infrastructure (DSI) | National Energy System Operator
62 Reformed National Pricing Call For Input | National Energy System Operator

- **Consumer consent and data governance –** The development of consumer consent mechanisms, including solutions led by the Retail Energy Code Company (RECCo), will be an important enabler for data sharing involving consumer-owned assets. These arrangements will determine how consumer data is accessed and shared securely and proportionately, particularly for CERs located behind the meter. The approach taken will influence how visibility and access can be achieved for smaller assets while maintaining consumer trust and compliance with data governance requirements.
- **Energy Digitalisation Framework –** The Energy Digitalisation Framework sets the strategic direction for improving data accessibility, interoperability and governance across the energy system. As a cross-cutting initiative, it will influence the development of data standards, digital infrastructure and coordination mechanisms that underpin DER/CER visibility and access. NESO's role within this framework, alongside wider industry participants, will be critical in ensuring alignment between system needs, data architecture and delivery of interoperable solutions. The roles, governance, structures and outputs produced under this framework will evolve over time.
- **Strategic Spatial Energy Plan (SSEP) -** The SSEP will set the strategic direction for GB's energy system to accelerate and optimise the transition to clean, affordable and secure energy across GB. NESO's role is to develop the first SSEP which will map potential zonal locations, quantities and types of electricity and hydrogen generation and storage over time. The volumes of energy technologies, including DERs, optimised as part of the SSEP will influence the future operational challenges associated with visibility and access and the need for intervention.

Ahead of these decisions and initiatives being implemented, there remains uncertainty around the precise form that the solutions to achieve NESO's visibility and access will take. This is illustrated by the spectrum of future system operation models indicated in Figure 2.

Figure 2: **The spectrum of future system operation models**

Decentralised System Operation

- Forecasting undertaken by a range of organisations including suppliers, DSOs, aggregators and NESO
- Suppliers, aggregators and DSOs submit accurate PNs to NESO
- Participation in NESO markets for DERs/CERs managed through aggregators and DSOs
- Balancing instructions to DERs/CERs sent via aggregators and DSOs

Centralised System Operation

- Forecasting undertaken primarily by NESO
- Asset owners and intermediaries submit PNs to NESO
- DERs/CERs participate directly in NESO markets or via intermediaries
- Balancing instructions sent directly to DERs/CERs or via intermediaries, with agreed primacy rules to manage conflicts with DSOs

The diagram shows two extremes, from decentralised to centralised, but there are many options in between, including options that are more decentralised for some functions and more centralised for others. For example, a 'hybrid' model could be adopted, where visibility of DERs and CERs is achieved through enhanced forecasts from several organisations (NESO, DSOs, aggregators, suppliers and other grid-edge actors). This would enable NESO to access some assets directly for some markets in coordination with other actors (DSOs, Suppliers, Aggregators), who instruct other assets in other markets without NESO involvement.

Models across this spectrum are equally valid, each come with their own advantages and disadvantages, and will be informed by the decisions outlined above. We are not seeking to prescribe a single system operation model at this stage, and recognise that both more centralised and more decentralised approaches may be appropriate depending on the specific market, service or process.

Instead, we have sought to develop a roadmap which, so far as possible, avoids pre-empting the outcome of these decisions which require industry consensus. Activities set out in the Roadmap, including data sharing and MVPs, are intended to deliver capabilities that will be valuable regardless of the coordination model, but are also expected to provide evidence and practical insight to help inform future decisions on coordination models and solution options.

This roadmap will therefore require review as and when decisions are made which influence the enduring solutions for distributed energy visibility and access (see Implementation, Coordination and Ongoing Engagement for more detail).

NESO Capabilities for Visibility and Access of DERs and CERs

Delivering the vision and enabling NESO to continue to fulfil our role in an energy system with increasing volumes of DERs and CERs will be achieved in practice by developing a set of core capabilities. The capability definitions provided here are based on our working assumptions and may develop following consultation. For example, the need for NESO to see and understand distribution network connections and constraints as part of the Forecasting and Network planning capability description assumes that NESO will obtain visibility directly from assets. However, there are other options to achieving this capability for some asset groups, for example with DNOs sharing an aggregated view with NESO.

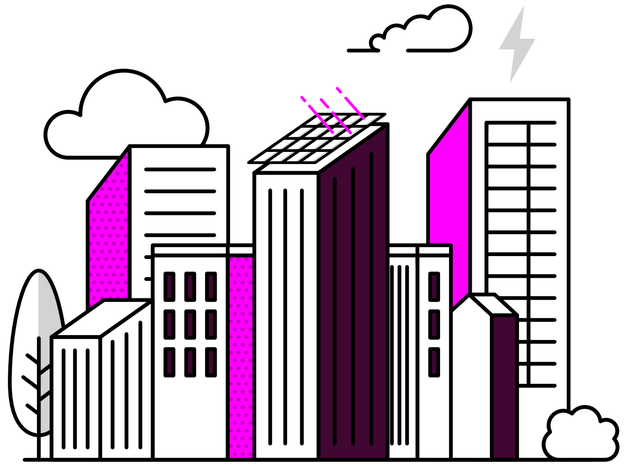
Real-time operations

Forecasting and network planning

Market facilitation and procurement

Restoration and resilience

Transparency and compliance monitoring



Real-time operations

NESO's role

To operate the electricity system in real-time, balancing supply and demand and managing system constraints.

Required capability

The ability to see the real-time status of distributed energy assets to improve situational awareness, to access services from these assets either directly or via an intermediary (aggregators, DSOs, suppliers, etc.) and to coordinate dispatch instructions with DSOs to operate the electricity system safely, cost-efficiently, and in line with clean power targets.

Section of the vision this will deliver on

- The electricity system
- Consumer benefits
- NESO/DSO Coordination

Forecasting and network planning

NESO's role

To forecast electricity generation and demand across all timescales and model the power system, enabling efficient network planning, procurement, scheduling, and dispatch.

Required capability

The ability to use distributed energy asset locations, capacity, planned availability, and historic behaviour, and the drivers of that behaviour (such as weather conditions and price signals), as well as visibility of distribution network connections and constraints, to improve the accuracy of forecasting and network planning ahead of real-time.

Section of the vision this will deliver on

- The electricity system
- Consumer benefits
- NESO/DSO Coordination

Market facilitation and procurement

NESO's role

To design and implement competitive, coordinated and coherent markets which provide tools and services needed to operate in a low-carbon energy system.

Required capability

The ability to understand distributed energy asset behaviour, agree an approach to coordination with DSOs in market operation, design appropriate market services, and procure services from distributed energy assets either directly or via an intermediary (aggregators, DSOs, suppliers, etc.).

Section of the vision this will deliver on

- Market access and participation
- Consumer benefits
- NESO/DSO Coordination

Restoration and resilience

NESO's role

To adequately understand, assess, prepare for, and respond to risks facing the electricity system, including the ability to investigate the root causes of events.

Required capability

The ability to understand the interaction of distributed energy assets with system restoration and resilience, to be able to identify, prepare for, and respond to risks, and the ability to access post-event data to investigate incidents.

Section of the vision this will deliver on

- The electricity system

Transparency and compliance monitoring

NESO's role

To monitor, validate and report on the performance and compliance of market participants, providing confidence that services are delivered as instructed and settled accurately, and that NESO's markets remain fair, transparent and trusted.

Required capability

The ability to validate delivery and compliance of distributed energy assets against market and operational requirements, to provide transparent reporting that supports accurate settlement, and deliver regulatory assurance and confidence on DER/CER participation.

Section of the vision this will deliver on

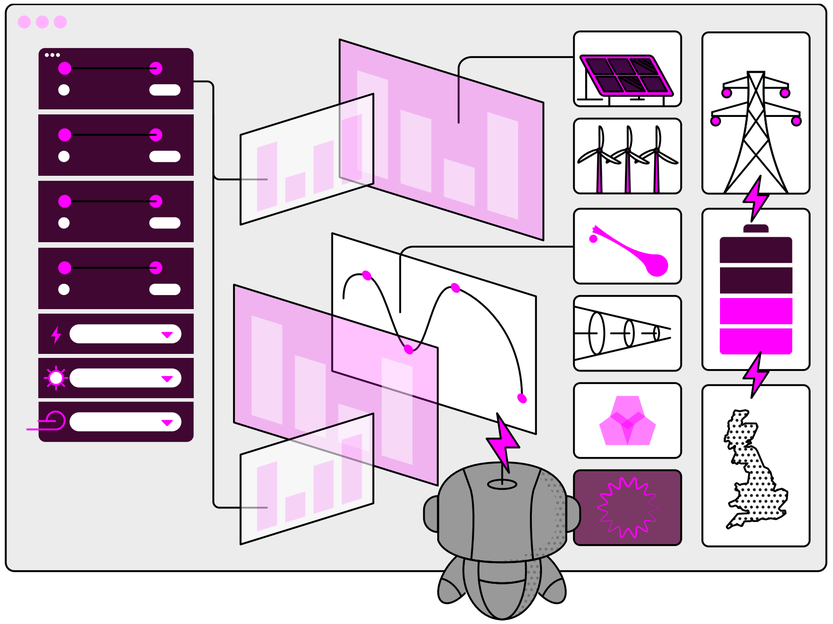
- Data sharing and future system architecture

Distributed Data Requirements

To develop these core capabilities and deliver our vision for distributed energy in GB, NESO will require increased access to data across five key categories. These categories are types of data which are supported by several more granular data groups and will serve a range of functions. For example, a combination of these data categories will provide the data required for energy forecasting, or network planning. The precise data points required may vary based on the outcome of key forthcoming decisions, but the data categories will be consistent.

Distributed data categories

1. Static asset data
2. Real-time and historic metering data
3. Distribution network-model and flow data
4. Market and dispatch data
5. Settlement and post-event data

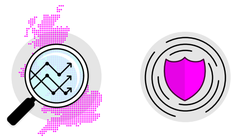


Static asset data

Static information about distributed energy assets (e.g., location, installed capacity, asset type, electrical parameters).

Relevance to capabilities

Underpins planning, forecasting, and modelling capabilities required for short- and long-term network planning, system operation, and scenario projections.



Proposed use

Visibility of this data would enable improved forecasting accuracy, which supports cost-effective constraint management and security of supply.[63] Static data is also key to the development of accurate network models used for long-term investment planning (for example, Regional Energy Strategic Plans).

Real-time and historic metering data

Live telemetry from distributed energy assets (e.g. real-time MW and MVAr outputs) and logging of data for retrospective use.

Relevance to capabilities

Inputs to balancing, constraint management, and restoration services during real-time operations and dispatch.

Proposed use

Forecasting both active and reactive power is required at Grid Supply Points (GSPs) to inform voltage and power flow studies in network access planning.[64] Access to this data would improve short-term forecast accuracy, and congestion and constraint management.[65] Real-time metering can also be used to improve post-event analysis by providing data for use in root cause analysis, and to refine and enhance situational awareness. Historical metering data facilitates development of energy profiles and projection of future trends, serving as inputs to services such as Regional Energy Strategic Planning (RESP).[66]

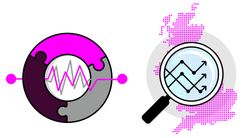
63 Energy Forecasting Strategy & Delivery Plan | National Energy System Operator
64 Energy Forecasting Strategy & Delivery Plan | National Energy System Operator
65 Operational Visibility of DERs | National Energy System Operator
66 Regional Energy Strategic Planning (RESP) | National Energy System Operator

Distribution network-model and flow data

Network topology (e.g., network models), running arrangements, and network flow data (e.g., busbar voltages, and MW/MVAr flows and real-time running arrangements).

Relevance to capabilities

Supports whole-system modelling and coordination to effectively manage constraints and avoid conflicts of action between NESO and DSOs.



Proposed use

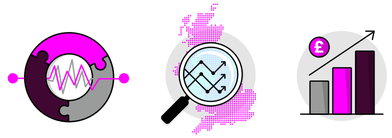
The incorporation of network topology into outage planning would ensure resilience and security of supply across transmission and distribution boundaries. Electricity flow data would support the identification of emerging constraints on the distribution network and optimisation of balancing and dispatch actions.

Market and dispatch data

Commercial and operational data for market participation (e.g., asset status, including: Physical Notifications, dispatch instructions, service commitments, planned availability and outages).

Relevance to capabilities

Facilitates market transparency, supporting fair competition and stacking across services, avoiding over-procurement.



Proposed use

Data on market participation would support flexibility markets and enable more informed dispatch and balancing decisions, ultimately supporting cost-effective operation of the power system.

Settlement and post-event data

Data captured after market and operational events (e.g., settlement outcomes, imbalance charges, performance metrics for services and assets).

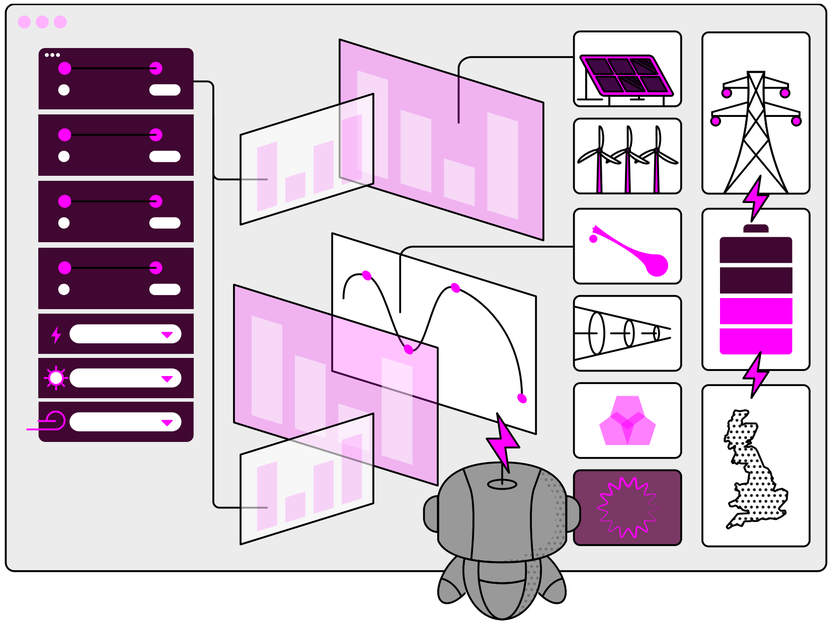
Relevance to capabilities

Provides transparency and accountability for market participants, supports accurate settlement processes, and informs future procurement and operational strategies.

Proposed use

This data would enable the validation of service delivery and assessment of market efficiency to identify and address systemic issues and support regulatory compliance regarding settlement processes.

Retrospective measurements of power output via settlement data can also be used for GSP demand corrections.[67]



Delivering these data requirements will depend not only on identifying the right data, but also on ensuring that data is validated, standardised and interpreted consistently across organisations and use cases. This will be progressed in collaboration with industry on an activity-by-activity basis.

Data requirements will be proportionate to the relevant use case and asset class. While some use cases may require asset-level real-time data, others, particularly for smaller or consumer-level assets, may be met through aggregated, synthetic metering or higher-latency data approaches. For these smaller assets, aggregation is expected to be an important route through which visibility and access can be delivered in a scalable way.

NESO recognises that data sharing and asset access requirements, particularly for household-level CERs, must be designed with appropriate consideration of privacy, cost and practical implementation, ensuring that solutions remain proportionate while enabling effective system operation.

The development and implementation of data requirements will be guided by a set of overarching data principles. These principles are intended to support consistent, proportionate and secure approaches to data sharing, while enabling the delivery of the capabilities outlined in this roadmap.

Proportionality - Data requirements will be commensurate with the operational need, balancing the expected benefits of improved visibility against the costs and complexity of data provision. This includes recognising that different approaches, such as asset-level, aggregated or synthetic data, may be appropriate depending on the context, and that delivery should be prioritised toward higher-value use cases. In some cases, detailed visibility may not be justified, while in others it may be appropriate over time as system needs evolve.

Minimum necessary data - Only the data required to deliver a specific capability will be requested. This approach is intended to reduce unnecessary burden on stakeholders and ensure efficient and targeted data sharing.

Standardisation and interoperability - Data should be standardised and structured in a consistent way to enable interoperability across systems, reduce complexity, and support effective use across multiple organisations and use cases. This will be supported by alignment with wider industry initiatives and frameworks.

Transparency and clarity - Data requirements, including their purpose and intended use, will be clearly defined and communicated. This will support stakeholder understanding, facilitate implementation, and ensure that data is used appropriately and consistently.

Consumer protection and privacy - Data sharing involving consumer-owned assets must be designed with appropriate safeguards to protect privacy and ensure compliance with applicable regulation and consent frameworks. This is particularly important for CERs, where trust and clear governance arrangements are critical to enabling participation.

In addition to these high level target data requirements, NESO will set out specific data requirements on an activity by activity basis, aligned to specific use cases and programme phases, supported by the development of a ‘Minimum Visibility and Access Methodology’ to provide a structured and repeatable approach to assessing visibility and access needs. Each activity will have its own target data sets based on the operational capability being developed. These activity specific requirements will be supported by accompanying technical materials that describe the relevant data attributes, structures and exchange mechanisms, ensuring that stakeholders have clarity on the underpinning data points required.

We are considering a range of routes for data exchange between NESO and DSOs including Inter-Control Centre Protocol links, Application Programming Interfaces (APIs), and via the DSI. Precise data exchange processes will be determined on a case-by-case basis. In the near term, NESO will prioritise opportunities to make better use of relevant data that is already available within NESO or held by other organisations, recognising that while this data may not fully meet all requirements, it can deliver early value and help inform the development of more complete and enduring solutions.

The wider benefits of two-way data sharing

The focus of this roadmap is on establishing NESO's requirements with respect to the sharing of distributed energy data to enable DER and CER visibility and access. However, we recognise there are opportunities to deliver broader benefits through two-way data sharing, including the sharing of transmission data with DNOs/DSOs and IDNOS (where appropriate), Flexibility Service Providers and other stakeholders.

We expect that there will be opportunities for two-way data sharing to unlock broader benefits as part of many of activities on the Roadmap, for example, ODS and PODE:

Operational Data Sharing (ODS)

NESO is progressing work on harmonising and standardising data sharing across the transmission-distribution boundary as part of the ODS Minimum Viable Product (MVP). As part of this work, we are also actively seeking to make key datasets available to DNOs to support their operational visibility needs (particularly on the high voltage side of GSPs) and to enable the development and refinement of DNO and ANM systems. This activity is designed to ensure that data flows are efficient, interoperable, and aligned with operational needs across both transmission and distribution networks.

Planning and Outage Data Exchange (PODE)

As part of our PODE data sharing solution being implemented with UKPN, we are delivering the capability and processes to share regular NESO system performance reports (e.g. Operating Code No. 2)[68] with UKPN via an API-enabled data exchange, rather than the previous provision of this information via a pdf file. This will allow UKPN to feed this data into their planning systems directly and digitally and avoid the current manual entry process.

We want to continue working with stakeholders to consider the wider benefits of our roadmap and identify further opportunities to facilitate NESO/DSO data sharing. We welcome feedback on what future data sharing would be most valuable.

68 Operating Code No. 2 | National Energy System Operator

03

NESO DER/CER Visibility and Access Delivery Roadmap

Our Approach

This roadmap presents our view of the in-flight and planned activities NESO will undertake to deliver DER and CER visibility and access. These activities are intended to both improve visibility and access in the near-term and gather evidence which will enable longer-term decision making.

To develop it, we first defined the capabilities that NESO will need to achieve our vision for distributed energy in GB. We then identified the activities required to develop these capabilities, aligning these with existing initiatives where appropriate, and outlining additional initiatives to address any gaps. This approach will continue to be applied as new activities are brought forward.

We also mapped each activity to the data we expect it to facilitate access to, to determine how they collectively meet NESO's distributed energy data requirements. Meeting these requirements is fundamental to developing the capabilities needed to realise the vision for distributed energy in GB. The identification of requirements and associated activities has therefore been driven by system needs, rather than any single outcome. While some activities support expanded market access, others focus on improving system operation, forecasting, resilience and transparency, reflecting the full range of roles that DERs and CERs will play.

Although this roadmap focuses on NESO activities to deliver DER and CER visibility and access, success depends on strong collaboration across the industry. Many of these actions cannot be achieved by NESO alone and have significant dependencies on wider industry decisions (see Key Decisions and Uncertainties).

We recognise that there is therefore optionality in how improved visibility and access could be delivered, and different design pathways come with different costs and benefits. For this reason, the long-term design will require industry input and alignment, ensuring that the chosen approach is both proportionate and deliverable.

In determining appropriate solutions, NESO will adopt a flexible and evidence-led approach. Data requirements and delivery mechanisms will be defined on a service-specific and use case basis, with options including asset-level, aggregated or synthetic data, and varying latency requirements depending on the operational need. Activities such as Minimum Viable Products (MVPs), pilots and demonstrators will be used to test approaches and generate evidence ahead of wider implementation.

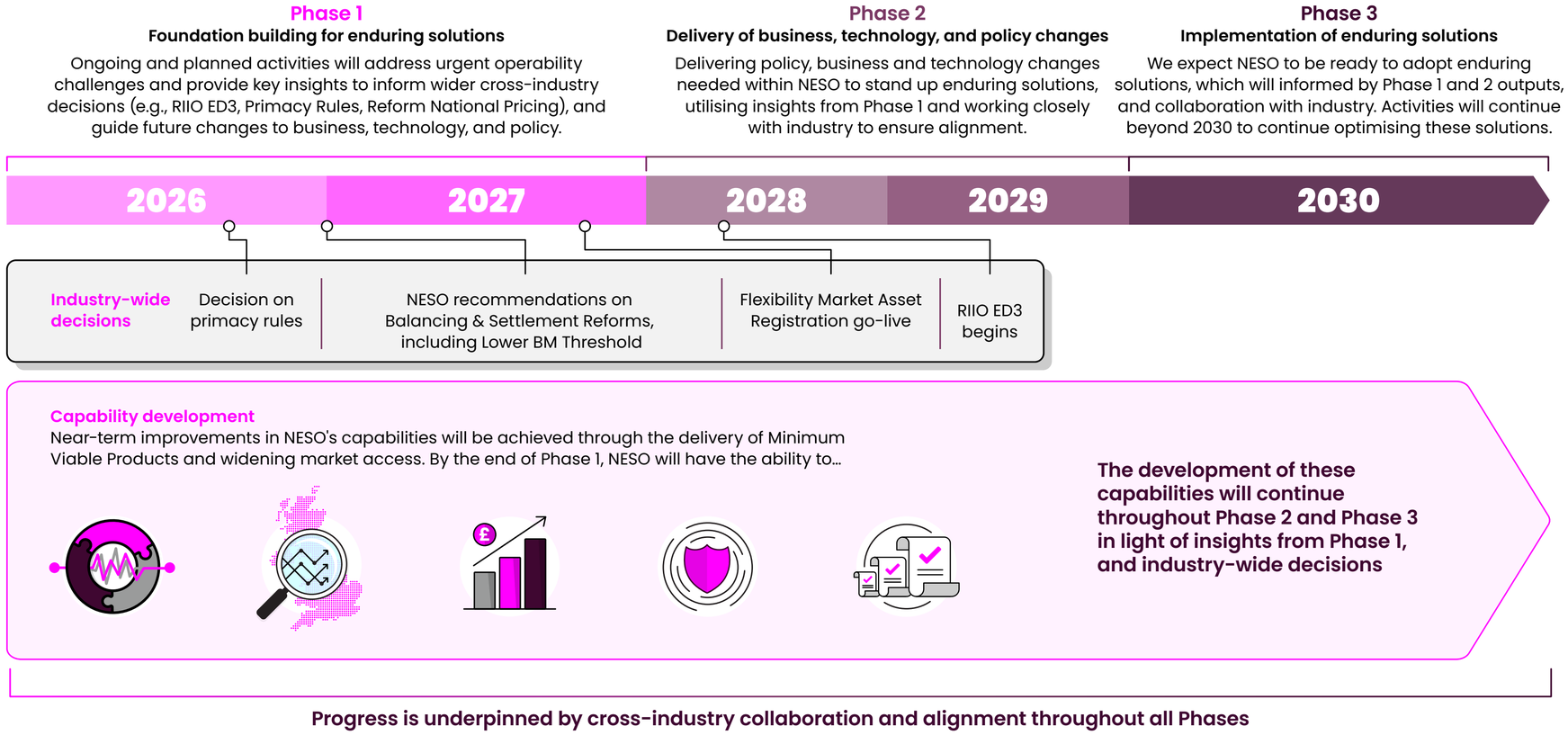
Looking ahead, several additional principles will be considered to develop suitable solutions. These will be determined on a use-case basis, ensuring that requirements are clearly linked to the capabilities and outcomes they are intended to support. The evolution of target system architecture and digital standards will also be considered, enabling actors to align delivery towards interoperable and scalable solutions. In addition, approaches will consider the need for local and locational solutions where appropriate, rather than assuming a single national model, reflecting the diversity of network conditions and system needs.

We will continue working closely with stakeholders to support delivery of the activities within the Roadmap and to ensure it remains responsive to system needs and market developments. The material in this report and roadmap has already been strengthened through a consultation and supporting engagement which provided feedback on our proposed content, and we intend to adopt a similar approach in future. Further detail on our planned stakeholder engagement and roadmap governance, can be found in Implementation, Coordination and Ongoing Engagement.

High-level View of the Roadmap

We have articulated three key delivery phases through which the Roadmap activities will deliver the capabilities and data required to achieve the vision. These phases reflect the relatively high level of certainty over nearer term activities, and lower certainty related to longer term activities. Although a rough timeline for these phases is provided, this is indicative and subject to wider dependencies.

Figure 3: High-level view of the NESO DER/CER Visibility and Access Roadmap



High-level view of the NESO DER/CER Visibility and Access Roadmap

Real-time operations

...monitor and access services from more DER/CERs in real time, enabled by data-sharing MVPs and the widening of Balancing Mechanism access

Forecasting and network planning

... create better forecasting and planning models using information about distribution network status and DER/CER behaviour that is provided through improved data sharing between DNOs, DSOs, and NESO

Market facilitation and procurement

... access more services from DERs/CERs through the development of new market services, and coordinate instructions between NESO and DSOs through risk of conflict reporting

Restoration and resilience

.. view more information about DSO networks and access more DERs for system restoration, continue enabling compliance with the Electricity Restoration Standard (ESRS)

Transparency and compliance monitoring

... enable improved performance monitoring with more information about DER/CER assets provided through increased access to metering data

01

Phase 1: Foundation building for enduring solutions

Phase 1 represents the activity planned for delivery ahead of key industry-wide decisions being made. The focus of this phase will be a continuation of the gradual opening of NESO's markets to a wider pool of distributed energy assets, as well as the delivery of a set of critical Minimum Viable Products (MVPs) to demonstrate the data sharing and processes needed to integrate distributed energy assets into NESO's systems. This includes Operational Data Sharing (ODS), the real-time data sharing MVP, Fractal Flow, and CASCADE innovation projects, among others. Where possible, Phase 1 will prioritise the use of existing and available data, enabling early insights and value to be realised while more complex solutions continue to be developed.

This phase will provide immediate value by addressing urgent operability challenges caused by limited visibility of and access to DERs and CERs, while generating the evidence required to inform longer-term decisions. MVPs will play a key role in testing the practicalities of obtaining, processing and using new data, and in assessing how this can be applied across different operational and market use cases ahead of wider implementation.

Delivery of Phase 1 activities will require close collaboration with industry. NESO will develop and refine activities through ongoing programmes and MVPs, which will be coordinated at both an activity and overarching roadmap level to ensure alignment between projects and industry.

The outputs of Phase 1 will inform subsequent policy, technology and business decisions. Importantly, Phase 1 activity is intended to generate evidence and practical insight and does not determine or constrain the enduring coordination model, which will continue to be shaped by wider industry decisions and stakeholder engagement.

02

Phase 2: Delivery of business, technology, and policy changes

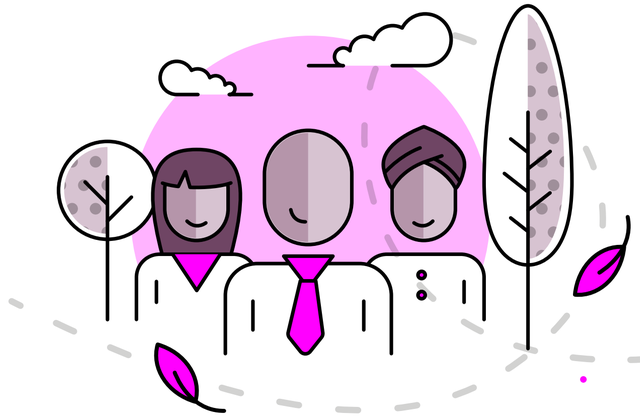
By Phase 2, we expect to have largely completed the Phase 1 MVPs, and to have used the results of these projects to inform the cross-industry decisions being taken (which will inform NESO's enduring form of DER/CER visibility and access). The focus of Phase 2 will be delivering the policy, business and technology changes needed within NESO to adopt these enduring solutions, building on and informed by the evidence and practical insights generated through Phase 1 activities and working closely with industry to ensure alignment.

NESO recognises that the changes required to deliver visibility and access may create costs and operational impacts for stakeholders. Enduring solutions will therefore need to be designed proportionately, informed by evidence from Phase 1 activity and, where appropriate, supported by cost-benefit analysis. This will require continued collaboration with stakeholders to develop a robust understanding of costs, benefits and impacts across the system.

03

Phase 3: Implementation of enduring solutions

Phase 3 represents the point at which NESO is ready to adopt enduring solutions, informed by the activities conducted in Phase 1 and 2 and close collaboration with industry. By this point, many of the key decisions and uncertainties outlined in 'Key Decisions and Uncertainties' are expected to have concluded and there will be greater clarity on the precise form that NESO's visibility of and access to DERs and CERs will take. Activities to deliver visibility and access for NESO will continue beyond 2030 to continue optimising and scaling enduring solutions and meet long-term power system requirements.



The Roadmap

The Roadmap represents our view of the activities which will deliver the capabilities and data required for NESO to achieve sufficient visibility of and access to DERs and CERs. Improved visibility and access to distributed energy assets will enable NESO to better understand and respond to their behaviour and ultimately operate an increasingly decentralised power system safely, reliably and efficiently. By establishing interoperable and standardised data sharing arrangements across the transmission-distribution boundary, the activities directly support real time operations, network planning and effective use of distributed flexibility, in line with Clean Power ambitions.

The sequencing and timing shown in the Roadmap reflect the current state of planning and prioritisation of activities, rather than fixed milestones or deadlines. Timelines will continue to evolve in line with emerging evidence, dependencies and wider industry developments.

We are confident that these activities will progress us towards our vision for distributed energy in GB and provide greater clarity on future requirements. We will develop the vision in line with insights emerging from these value-adding activities in Phase 1 and wider feedback from industry. Most of these activities are already in-flight and have been prioritised as part of our recent NESO1 business plan.[69] We have also identified a small number of new activities which will be scoped and planned in detail before we hold regulatory discussions on inclusion in our business plan and funding mechanisms.

While the Roadmap focuses on NESO activities to deliver visibility of and access to DERs and CERs, there are dependencies on industry action and engagement to achieve these goals.

NESO will continue to engage with industry on the delivery of roadmap activities, including through established forums and ongoing programmes, to identify and address implementation challenges and ensure that solutions remain aligned with the objectives of the Roadmap.

View NESO's interactive DER/CER Visibility and Access roadmap here

69 Our regulatory business plan for 2026-2028 | National Energy System Operator

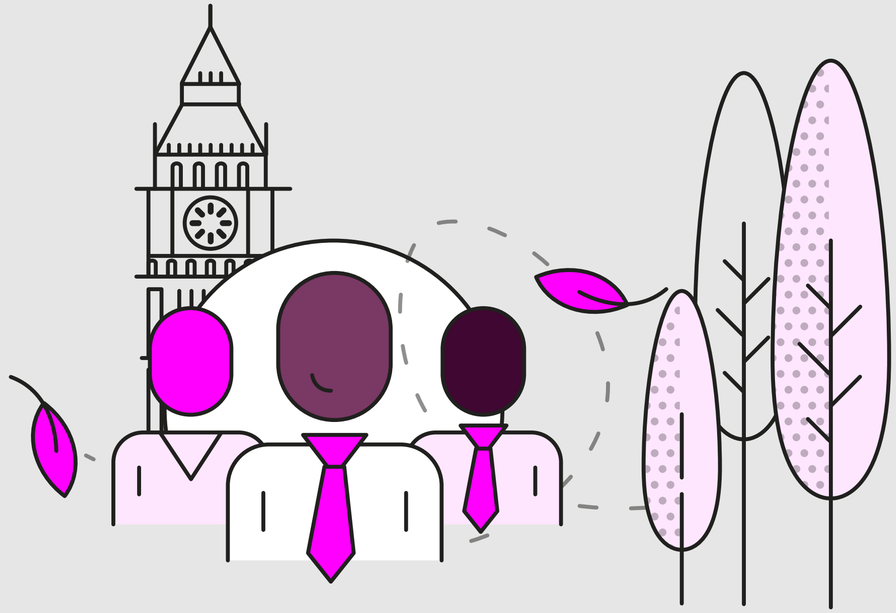
Implementation, Coordination and Ongoing Engagement

Successful delivery of this roadmap will require continued coordination across NESO and wider industry participants. While the Roadmap provides a consolidated view of activities, these activities will be delivered through a range of existing programmes, initiatives and governance structures rather than as a single centralised programme. NESO will maintain a joined-up view of progress across these activities, ensuring that delivery remains coordinated and aligned to intended outcomes across the Roadmap as a whole, and providing clarity to industry on how different elements contribute to the overall achievement of DER/CER visibility and access.

Ongoing collaboration and information sharing with stakeholders will be essential to support delivery and inform future decision-making. In particular, this will be critical to enabling robust cost-benefit analysis of enduring solutions, as NESO requires industry input to understand the costs, benefits and operational impacts of proposed changes across different stakeholders. Governance for future decisions will therefore need to consider implementation costs, expected benefits, proportionality and deliverability prior to committing to enduring approaches.

Feedback received through consultation and engagement has highlighted the importance of clear coordination, governance, and ongoing communication. NESO will take this feedback forward in the development of proposals for governance arrangements and engagement approaches. Updates on progress and any changes to the Roadmap will be provided in due course.

In line with industry feedback, NESO intends to establish a regular cycle of engagement and communication to support transparency and ongoing input. This is expected to include an annual review of the roadmap, supported by more regular (e.g. half-yearly) progress updates. This approach will provide industry with regular visibility of progress, emerging insights and future priorities, while supporting ongoing alignment as delivery progresses.



Key Terms and Acronyms

Term	Description
Access	Ability for NESO and DSOs to make changes to the input or output of units
ANM	Active Network Management
API	Application Programming Interfaces
BESS	Battery Energy Storage System
BM	Balancing Mechanism
BMU	Balancing Mechanism Unit
BtM	Behind the Meter
CER	Consumer Energy Resources **Definition:** Consumer-owned assets that are connected to the distribution grid at consumer premises.
CP30	Clean Power 2030
DESNZ	Department for Energy Security and Net Zero
DER	Distributed Energy Resources **Definition:** Business-owned small-scale power generation, storage, and demand devices connected to the distribution grid and located close to where energy is consumed.
DFS	Demand Flexibility Service
Distributed energy assets	This phrase refers collectively to Distributed Energy Resources (DERs) and Consumer Energy Resources (CERs)
DNO	Distribution Network Operator

Term	Description
DSI	Digital System Infrastructure
DSO	Distribution System Operator
DUKES	Digest of UK Energy Statistics
ECR	Embedded Capacity Register
EDSF	Enabling Demand-side Flexibility
ED3	Electricity Distribution Price Control 3
EV	Electric Vehicle
FES	Future Energy Scenarios
FMAR	Flexibility Market Asset Registration
GB	Great Britain
GW	Gigawatt
GSP	Grid Supply Point
HVDC	High Voltage Direct Current
IBT	Inverter-Based Technology
IDNO	Independent Distribution Network Operator
LCM	Local Constraint Market
LMS	Load Management Scheme
MVAr	Megavolt ampere reactive, a unit used to measure reactive power

Term	Description
MVP	Minimum Viable Product
MW	Megawatt
NESO	National Energy System Operator
NESO1	NESO's business plan for April 2026 to March 2028
OBP	Open Balancing Platform
Ofgem	Office of Gas and Electricity Markets
PN	Physical Notification
PODE	Planning and Outage Data Exchange
RESP	Regional Energy Strategic Planning
RNP	Reformed National Pricing
SMP	Single Markets Platform
SSEP	Strategic Spatial Energy Planning
Solar PV	Solar photovoltaic
TO	Transmission Owner
Visibility	Awareness for NESO and DSOs of units

NESO

National Energy
System Operator