Electricity Distribution

Operational Decision Making Framework

For Stakeholder Consultation

January 2025
V1

nationalgrid DSO

Contents

Foreword

I am extremely pleased to be able to share with you National Grid DSO's first-ever Operational Decision-Making Framework and our proposals for future development. This publication documents the comprehensive operational activities undertaken by our DSO, demonstrating the huge strides forwards we've made towards operating a smarter and more dynamic network.

By 2050, annual electricity demand is expected to more than double, from 285 TWh in 2023 to up to 700 TWh[1]. This will be driven by demand from low carbon technologies (LCTs), such as electric vehicles (EVs), heat pumps, photovoltaic (PV) generation and energy storage systems (ESS), along with larger embedded generation and industrial demand, all of which will be connected to the distribution network.

We know that traditional network build will play a significant role in accommodating these new connections. However, this network reinforcement alone is not sufficient to enable a fair energy transition for all customers, at the pace required. We project there could be 3.4 million domestic heat pumps, 7.7 million electric vehicles and over 25 GW of renewables capacity in the regions that we serve by 2035[2]. These technologies connected to the network will be important in providing flexibility to the energy system. This is where a critical role of the DSO adds value; making transparent and efficient decisions to maximise network capacity, whilst considering outcomes that benefit the whole-system.

We are already making significant progress to connect new demand to the network, however, we know we can do more through harnessing the power of data, technology and innovation.

We have some great ideas on the next steps we could take to advance our operational capability further, but in shaping these we want to hear what our stakeholders would like from us and where they see the greatest value.

In this publication we will demonstrate why having robust processes, quality data and clear decision-making frameworks for operational activities delivers value in enabling decarbonisation at the right time and cost in line with our DSO vision.

I do hope you enjoy hearing about our progress and do please share your views on where we should focus our efforts next.

Regards,

Cathy McClay
Managing Director of Distribution System Operator

[1] https://www.neso.energy/document/321046/download
[2] https://www.nationalgrid.co.uk/dso/distribution-future-energy-scenarios

Audience and Feedback

This document sets out the progress National Grid has made in establishing our frameworks for Operation Decision Making (ODM) and shares our proposals for ongoing development.

We encourage feedback on this document to ensure our decision making development priorities align with and focus on the areas that are most valued by our stakeholders. In March 2025 we will publish our response to this feedback and set out our roadmap for delivery.

Consultations questions are set out at the end of this document and we have identified the following stakeholder groups that we would greatly appreciate feedback from.

- Large generation connection customers.
- Customers subject to curtailment, such as customers connected via Active Network Management (ANM) schemes.
- Flexibility service providers.

Feedback on this document can be submitted to: **NGED.EMC@nationalgrid.co.uk**

In addition, we will host a webinar on the 23rd January to explain our Operational Decision Making Framework and directly gather feedback.

Consultation Timeline

15th January 2025	Operational Decision Making Framework launch
23rd January 2025	ODM Consultation Webinar
https://zoom.us/webinar/register/WN_ilJoFYyeTbWW2lRw3Q4i5Q	
17th February 2025	Consultation Close
21st March 2025	ODM Roadmap Publication

Introduction

The energy sector is undergoing a significant and exciting period of change as the UK works towards a net zero future. At the local level, decarbonisation, digitalisation and decentralisation are progressing at pace.

While providing a safe, stable and reliable electricity supply, we are committed to playing a leading role in enabling local and regional decarbonisation as the UK transitions towards a net zero carbon energy system. We are already supporting low carbon technologies (LCTs) to connect to our network. As the rollout of renewables, heat pumps and electric vehicles continues to ramp up, our forecasting shows that the demand to connect these LCTs will increase dramatically.

Our DSO vision is to enable and coordinate a smart, flexible energy system that facilitates local decarbonisation for all customers and communities at the right time and the lowest cost.

We will achieve our DSO vision by accelerating the development of flexibility markets and expanding access. This will maximise the capacity of the existing network and the benefits of demand side solutions in our regions. Operational decision-making is key to this approach. Making informed, planning and near-time decisions allows us to optimise network performance, respond swiftly to changes in demand and supply, and leverage flexibility markets effectively. We are committed to continuously improving our data, technology and processes. Enhancing the visibility of our network information and harnessing the latest data and digital solutions helps us to operate a dynamic network that is responsive to the needs of our customers and stakeholders.

The Distribution Network Operator (DNO) has traditionally, and continues to play, and important role in this transformation; building, maintaining and operating a safe and reliable network to keep the lights on for our customers. As demand on the network has grown, the focus has been on building more wires. Now, as the energy landscape evolves, there is an ever increasing role for the DSO in making sure a broader range of options are considered and used where they offer value for money to consumers. In this way, the DNO continues to provide a safe, stable, and reliable electricity supply at lower cost to consumers while supporting the rollout of LCTs such as renewables, heat pumps, and electric vehicles.

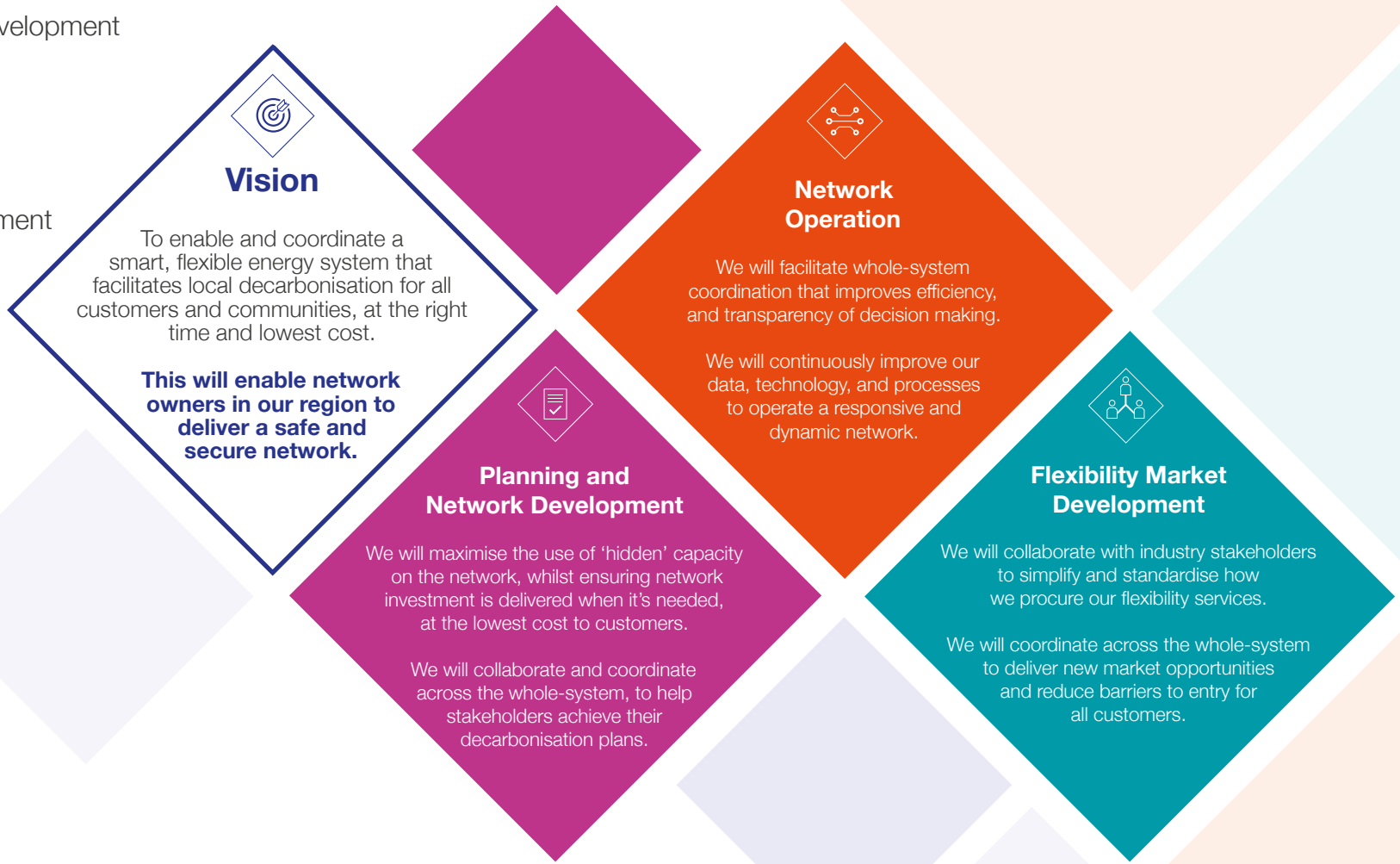
The relationship between the DSO and DNO needs to be underpinned by effective governance. That is why we have introduced a range of measures focused on ensuring independent, transparent and efficient decision making by our functionally separate DSO. While we are committed to managing any conflicts of interests or trade-offs between our DSO and DNO roles, we believe that a close working relationship between both functions is key to delivering optimal outcomes for consumers.

DSO Roles and Responsibilities

The DSO has three core roles which were established by Ofgem in series of consultations and explained in their **guidance published in 2023**[3]:

1. Planning and Network Development
2. Network Operation
3. Flexibility Market Development

Our DSO charter outlines our **DSO vision and commitments** across these three roles, as shown in the diagram pictured[4].



[3] https://www.ofgem.gov.uk/publications/decision-proposed-modifications-rilo-2-electricity-distribution-licences
[4] https://www.nationalgrid.co.uk/downloads-view-reciteme/649243

The Role of DSO Operations

National Grid's distribution networks supply electricity to 20m people within the Midlands, South West and South Wales. As homes, businesses and industry rely on us to keep the lights on and keep the power flowing within our region night and day, maintaining the security of supply for existing customers has been a priority.

Evolution in both customer types and behaviour, and network design and control, requires us to operate more active and flexible electricity systems. Traditionally, distribution networks delivered power from the main transmission system to homes and businesses across the nation.

This process was relatively straightforward and predictable as power flowed in a single direction, starting from supply locations and reaching demand locations at lower voltages. Over the last decade there has been a significant growth in thermal and low carbon generation connected to our distribution networks. This has changed the flows of electricity across the networks and made these flows less predictable.

Over the next decade the growth of intermittent renewable generation will continue, reducing the predictability of network flows further. This will be accompanied by significant growth in EV chargers and heat pumps which can be operated flexibly to support whole system balancing and help manage flows on both the distribution and transmission networks.

The role of DSO Operations is central to ensuring that, that in this increasingly complex world, we continue to operate a safe and reliable network to keep the lights on for our customers.

Operational decision-making is a core element of our DSO Operations responsibility. It requires informed trade-offs to achieve the best whole-system outcomes while balancing our **three key objectives**:

DSO Operations Objectives

Managing the security of supply for our network

Managing the flow of power across our network is core to what we do. If the power our customers need exceeds the limits of the cables and equipment, it can cause damage such as overheating. This can cause faults on the network leading to customers experiencing power cuts and can also reduce the life of our assets which increases network costs.
Our capabilities within DSO Operations give us greater visibility of network conditions enabling us to ensure we make decisions that continue to reliably deliver the volume of electricity our customers need, when they need it, to power their homes and businesses.

Minimising the cost of running the network

As the UK transitions to be become less reliant on fossil fuels and consumers move towards cleaner electric power for transport and heating, the volume of power flowing through our network will continue to increase and the electricity infrastructure must also grow to accommodate it.
We will continue to invest in building our network bigger where it is needed. However sometimes the extra capacity is only needed for short periods when power flows are at their maximum. In these circumstances it may be cheaper for the DSO to alter the power flows using flexibility markets or by reconfiguring the network. By operating in a 'smarter way' we can reduce the overall cost of the distribution network and thereby reduce customers' energy bills.

Maximising system access for all network users

To support the UK's net zero targets we must ensure that that clean, cheap, renewable energy already connected onto our network is available to supply to customers when it is available.
We are maximising the volume of locally produced electricity generation, from clean energy sources such Solar Panels and Wind Turbines, that is passed through our network to serve UK customers.

The Role of DSO Operations

To meet our DSO Operations Objectives, our decisions span across three key enablers. Each of these has a tool-kit of measures we use;

Flexible Network Capacity

We are ensuring that the capacity of the network can meet the needs of our existing customers when and where they need it by leveraging services from local flexibility markets.

Flexibility services change the consumption and generation behaviour of customers, ranging from domestic customers who avoid charging their cars at peak times to larger commercial customers who can increase the volume of their generation production at times when the demand for electricity is greatest.

Tool-kit

Procurement of Flexibility Services: Up to a year ahead, using DSO produced load forecasts informed by historical data, we determine the volume of flexibility services we should contract to be available to us in the event we need to dispatch it to deliver as we get closer to real-time.

Dispatch of Flexibility Services: Week-ahead, we update our forecast of loading of the network using more recent load data in order to decide when to instruct the flexibility we've made available and any further flexibility we need to procure to manage our more accurate view of actual likely electricity demand as we get closer to real-time. We describe this process in more detail later in the document.

Faster Connections

We are advancing generation connections to release additional capacity to the existing network for customers who want to connect new demand.

Through optimising the running of our network and by offering tailored generation connections that prevent networks limits to be exceeded, we avoid making customers wait for new network build before they are able to connect.

Tool-kit

MW Dispatch & Technical Limits: We have worked with NESO to develop both of these pathways for advancing connections without needing to wait for transmission infrastructure. Network visibility for relevant generators or storage is provided to NESO in realtime, with connections accepting potential temporary reduction in export to connect quicker. This is discussed further later in the document.

Modelling Assumptions: Flexible connections enable accelerated connection without waiting for distribution or transmission assets to be built. We have taken a less conservative approach to network modelling particularly with batteries to provide improved curtailment analysis for customers progressing through Technical Limits.

Increased Generation Production

Through more dynamic assessment of our network assets and improved modelling of generation behaviour, we are able to better quantify any risks to the security of supply during planned network maintenance where sections of the network need to be taken offline.

This enables us to minimise the volume of restrictions to generation production that are necessary during planned maintenance.

Tool-kit

Network Maintenance Optimisation: During planned maintenance work we transfer the load of the section we've taken offline to another section of the network. This temporarily increases the power flows through the new section and we must manage any risk to ensure its isn't overloaded. Historically that has included preventing all generation from any production until the maintenance is complete. Now, before planned maintenance work is finalised and scheduled, DSO Operations assess the risk to the temporary network section, removing the curtailment of production or permitting partial production.

Network Maintenance Scheduling: Additionally, we are also able to find more suitable timings of network maintenance to minimise impact to generation production.

The Role of DSO Operations

The decisions we make across our tool-kit are interrelated and interdependent. For instance, how we configure the network or schedule outages directly impacts the level of curtailment or flexibility services required. To ensure efficiency and coordination, our decision-making is guided by a consistent overarching philosophy that spans technical, operational, and commercial considerations;

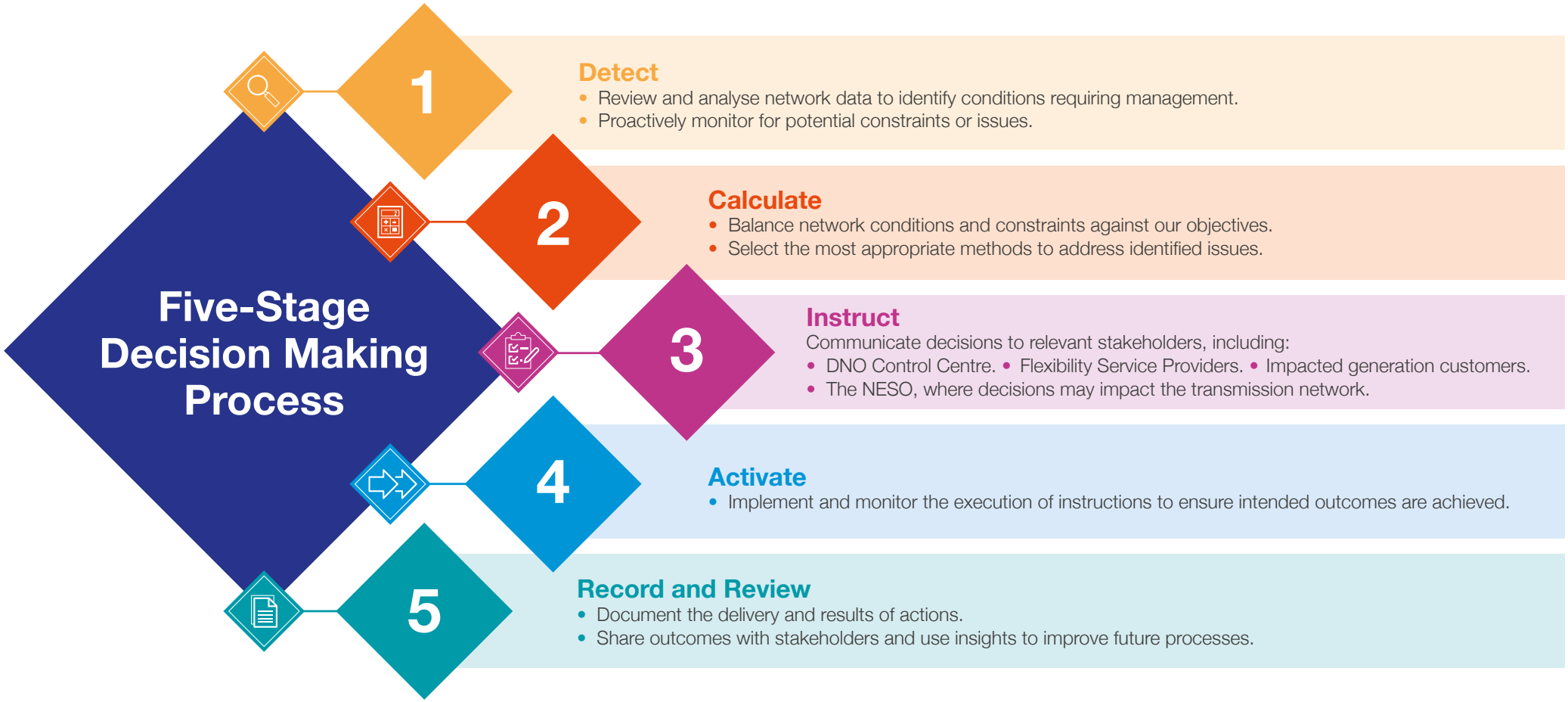
- **Technical:** the limits of our network equipment, to avoid overloading which can impacting the health of the equipment.
- **Operational:** the need to manage power flows on the network to ensure the security of supply to our customers.
- **Commercial:** customer access rights, defined in their connection agreements, which caps the total amount of generation production we can limit.

By carefully balancing these, we ensure that all decisions align with our broader objectives and the needs of our customers.

Five-Stage Decision-Making Process

It is important that our approach to decision making is well-informed and consistent, our decisions must be able to demonstrate that they balance our objectives and deliver the best outcome for the energy system as a whole and for our customers.

To support this, we have developed a structured five-stage process to define and guide our approach:



Operational Decision Making Timeframes

Operational decision making process occurs across defined timescales. From Planning timescales which begin 3-4 years ahead of real time, Programming timescales which begin eight weeks ahead, through to Control timescales which begin day-ahead. Our approach includes activities within both the DSO Operations Team and the DNO Control Centre.

		DSO Operations	DNO Control Centre
Planning Timescale Decisions	Long-Term; **3-4 years** Medium Term; **3-1 years** Short-Term; **1 year - 8 weeks**	During the Planning Phase, the DSO focuses on network assessment to identify where actions needs to be taken to ensure the network can meet the volume power that needs to flow through it. In parallel the DNO plans its network maintenance activities. **Identifying Where Flexibility Is Cost Effective** By analysing the limits of existing network equipment, considering both historical load data and future load growth forecasts, the DSO's System Planning and Network Development team determine areas of the network which cannot support future power flows and will require intervention. Where intervention is needed, options assessment is undertaken to determine the most economical solution. Where Flexibility is identified as the most economical solution, the DSO Operations team will then undertake further analysis to identify the volume of flex that should be secured to meet the load growth forecast. Following which flexibility procurement activity then begins, aiming to secure services ahead of time that can be available to deliver when dispatched in the Programming Timescale.	**Planning for Network Maintenance** Where NGED's distribution network requires routine maintenance and upgrades to ensure safety and longevity these activities often necessitate isolating sections of the network. The DNOs Outage Planning Team are responsible for identifying where the load on these areas of the network can be temporarily fed from. This creates an increase of load onto the temporary section of the network and that needs careful management to prevent asset damage. One way to manage is this is to prevent generation customers in that location from producing electricity onto the network during this time. This impacts how much clean energy is being made available on the UK energy system. DNO Outage planners share these impacts with the DSO operations Teams so they can be minimised.
Programming Timescale Decisions	Near Real-time **8 weeks - 24hrs**	During the Programming Phase, the DSO Operations Team focuses on flexibility scheduling and generation production optimisation during planned network maintenance: **Flexibility Dispatch Decisions** Using closer to near time network load data, the DSO Operations team undertakes analysis to determine the accuracy of the Planning Timescale forecast for flexibility and if any adjustments need to be made before making decisions on the volume of flexibility to dispatch to deliver services, drawing from both long-term and short-term markets. This phase ensures: • Potential over loading of power flows across all flexibility locations are mitigated. • Flexibility shortfalls are identified and resolved. **Optimising Generation During Planned Network Maintenance** The DNO share their planned network maintenance with the DSO Operations Team who can use advanced forecasting and modelling to explore alternative network operation strategies without compromising safety or equipment health. This means that generation customers can produce electricity unabated at the times when the energy system needs it. National Gird DSO is at the forefront of developing innovative approaches to reduce curtailment, delivering improved outcomes for customers and the energy system. Outages planned during this phase are studied with less conservative assumptions compared to the Planning Phase. The DSO prioritises optimsing outages that significantly impact generation production, ensuring resources are focused where they deliver the most value.	**Scheduling for Network Maintenance** Once the DSO Operations Teams assessment is shared back to the Outage Planning Team, they can schedule the work and inform any generators that might still be impacted.
Control Timescale Decisions	**24hrs - real-time**	The Control Phase ensures 24/7 operational support and efficient system coordination **Pre-Scheduled Dispatch** The DSO pre-schedules flexibility service dispatches, ensuring that commercial decisions are made independently from the DNO to avoid conflicts of interest. However, flexibility services during this phase cannot be dispatched without DNO visibility. **Post-Fault Advice** When unexpected faults happen on the network, the DSO provides post-fault recommendations to the DNO. This includes network studies and load reviews to recommend running arrangements that ensure continued supply security and network access.	**Real-time response** The DNO Control Centre has visibility of the real-time delivery of flexibility scheduled by the DSO Operations Team and monitors network conditions during planned maintenance so they are able to respond to any issues impacting network integrity.

Operating Flexibility

We are committed to ensuring the safe, secure, and efficient operation of the electricity network through the use of flexibility services. These services allow us to adapt to network demands and constraints dynamically, ensuring a more resilient energy system while minimising costs for consumers.

We procure flexibility services across two main timeframes: our Long-Term flexibility market and our Short-Term flexibility market. These timeframes influence the operational decisions required to optimise the network;

Long-Term Flexibility - Year Ahead

Securing flexibility in Long-Term timeframes provides certainty for addressing known constraints within the planning phase ahead of the operational window. This proactive approach enables better investment decisions by ensuring the availability of flexibility to defer reinforcement. For this we need a product that provides the certainty needed for reinforcement deferral while allowing adjustments closer to dispatch. The standard product which achieves this is Scheduled Availability, Operational Utilisation – Day Ahead (SAOU_DA). Within the Long-Term market, we also procure Scheduled Utilisation, SU_SPP, which targets winter constraints on our Low Voltage network. Procuring this product one year ahead ensures certainty on which Low Voltage constraints can be managed adequately with flexibility, and any locations without enough market response can be programmed for reinforcement during the summer

Short-Term Flexibility - Week Ahead

The Short-Term market enables us to address immediate flexibility needs by supplementing Long-Term procurement. By utilising up-to-date datasets and forecasts closer to real time, we gain a more accurate understanding of network loadings. This approach reduces the risk of flexibility shortfalls and delivers better value to customers. Additionally, the Short-Term market broadens participation by accommodating Flexibility Service Providers (FSPs) that are unable to commit in the Long-Term, such as renewable generators and domestic aggregators.

In real-time conditions, the DNO Control Room is able to dispatch the DSO's fixed-price Operational Utilisation (OU_15) product, designed for rapid response to rare fault conditions.

Product	Attributes	Procured	Utilisation Dispatch Decision
SU_SPP Scheduled Utilisation - Specific Periods	Utilisation Only	Long-Term – Year Ahead	**Programming Phase:** Scheduled year ahead post procurement close
SAOU_DA Scheduled Availability, Operational Utilisation - Day Ahead	Scheduled Availability, Utilisation instructed day ahead	Long-Term – Year Ahead	**Programming Phase:** Day ahead
SU_SEP Scheduled Utilisation – Settlement Periods	Utilisation Only	Short-Term - Week Ahead	**Programming Phase:** Scheduled week ahead post procurement close
OU_15 Operational Utilisation – 15min	Utilisation Only	Long-Term – Year Ahead	**Control Phase:** In real-time

Flexibility Decision Making Principles

The effective dispatch of flexibility services is critical to maintaining security of supply and efficient operation of the electricity network. The principles that underpin our dispatch decisions ensure alignment with industry standards and our commitment to transparency and fairness.

These principles guide both our service selection processes and underpin the ongoing development of decision-making frameworks.

Background

Our approach to dispatching flexibility services is rooted in the guiding principles established by the Energy Networks Association (ENA) through the Open Networks Project. These principles were first created by NGED in 2019 and shared within Open Networks in 2020 to be further developed collaboratively to standardise dispatch and settlement processes across Distribution Network Operators (DNOs). National Grid Electricity Distribution (NGED) played a key role in shaping these principles, which have since been integrated into our operational practices.

Guiding Principles

The following principles form the foundation of our dispatch methodology:

Principle	Description
Security	Flexibility will be dispatched in a way that maintains the security of supply.
Cost	System needs will be met at the minimum level of cost.
Operability	Services will be selected based on their compatibility with operational requirements.
Competition	Transparency will be provided in all dispatch decisions and activities.
Fairness	Equal opportunities to participate will be ensured, supported by a fair dispatch methodology.

Prioritised Service Selection Principles

Within National Grid DSO, we have developed a prioritisation service selection framework which is our practical implementation of the ENA guiding principles. This prioritisation ensures consistency and clarity in decision-making and supports both immediate service selection and the ongoing development of rules for implementing an automated rule-based approach to dispatch.

Priority	Name	Description	Corresponding Open Networks Principle
1	**Technical Integrity**	Network and system frequency integrity requirements must be met, supported by appropriate flexibility services.	Security
2	**Customer Security**	The ability to meet customer demand and accept customer export under both normal and outage network conditions.	Security
3	**Value**	Flexibility services will be procured and operated to deliver cost-effective outcomes.	Operability & Cost
4	**Market Resilience**	Where multiple suitable services are available at similar costs, dispatch will be shared among providers.	Competition & Fairness

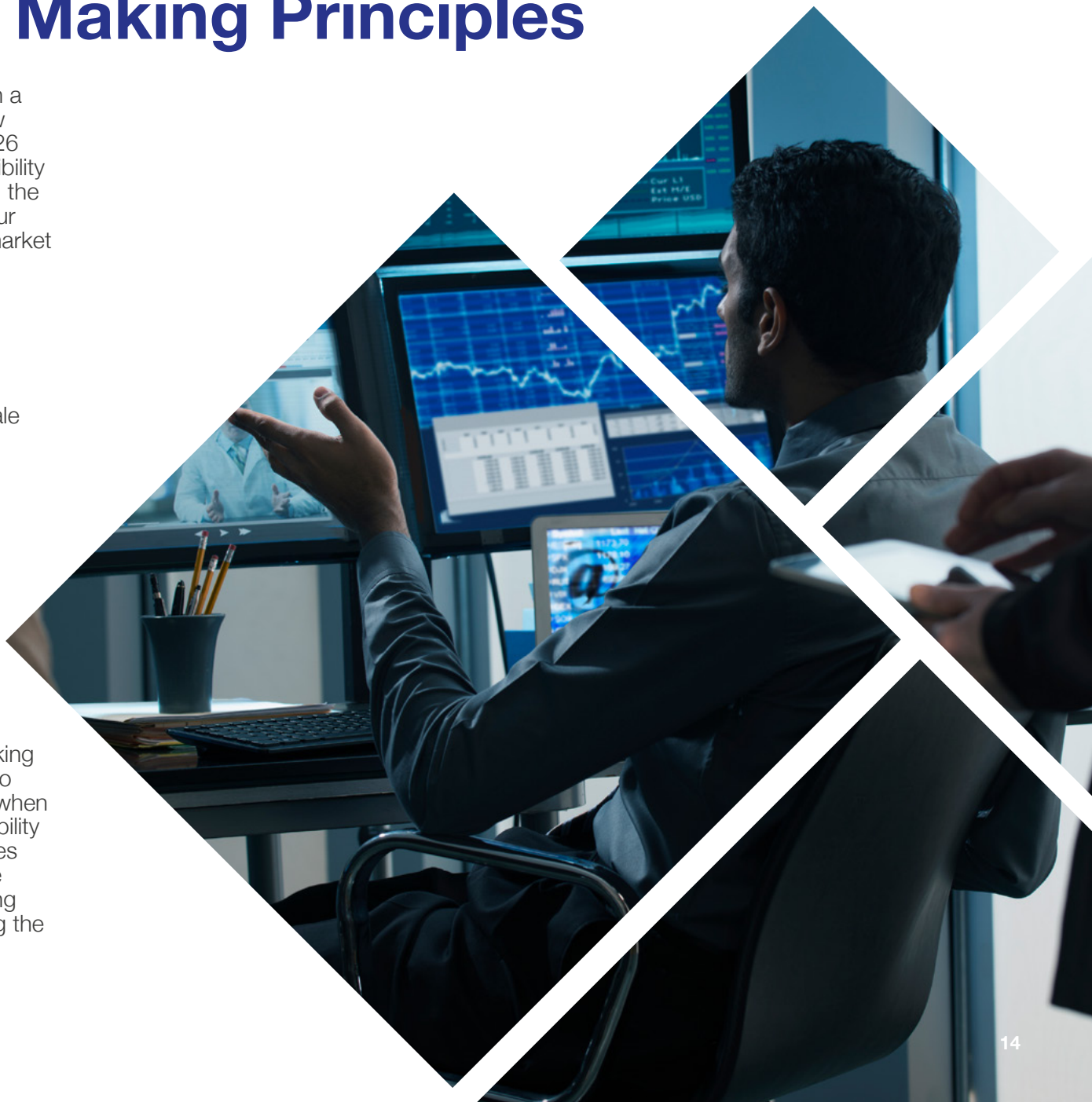
Flexible Network Capacity

Flexibility Decision Making Principles

The flexibility needs we've published to the market have seen a steady growth over the last 2 years, where previously we saw little to no competition. For example our LV Trades for 2025/26 Long-Term Procurement exercise saw a 15% increase in flexibility locations where we had a level of competition in bids beyond the volume we needed compared to our 2024/25. This means our dispatch principles will be increasing important as flexibility market participation continues to scale.

- **Consistency and Scalability**
  The principles provide a consistent approach to decision-making across diverse scenarios, enabling their application as both our operational experience and the scale of the flexibility market grows.
- **Scenario Analysis**
  The framework supports hypothetical scenario testing to enhance understanding and refine fixed rules.
- **Transition to Automation**
  As our operational knowledge expands, we are developing rules-based decision-making processes to enable faster, more consistent dispatch decisions. This transition aims to streamline operations and ensure consistent outcomes.

By integrating these principles into our flexibility decision-making frameworks we can leverage flexibility to meet our objective to reliably deliver the volume of electricity our customers need, when they need it. While also promoting a fair and transparent flexibility market that is attractive to providers of flexibility and stimulates competition. Increased market competition further lowers the costs of operating flexibility offering improved savings, meeting our objective deliver an efficient electricity system by reducing the overall cost of flexibility operation.



Operating Flexibility

Day in the life of James; Flexibility Dispatch Engineer

Meet James, a dispatch engineer at the heart of our flexibility operations. James plays a crucial role in ensuring the network operates smoothly, responding to real-time network needs while planning for future demands.

This is a glimpse into the activities carries out every week on a Wednesday, following the receipt of weekly Short-Term flexibility bids on Tuesday. It's an important stage gate within our flexibility market operations and James must balance proactive planning with effective operational decision making to keep the energy flowing to our customers.

Starting the Day: Real-Time Forecasting of Network Loading

James begins his day with a review of the network's current and forecasted state. Leveraging real-time data and historical insights, he analyses how the network is performing compared to predictions made in the Planning Phase in order to produce a closer to real-time forecast. James assesses network activity, asking: Are current loadings within expected ranges? Are there potential constraints that need attention? If he finds a discrepancy, James can anticipate challenges and implement strategies to mitigate risks before they materialise.

Reviewing Long-Term Flexibility Availability

James then shifts focus to long-term flexibility resources. He examines existing contracts and agreements to compare how they align with the closer to real-time forecasted electricity demand. James' goal is to ensure that long-term resources provide a solid foundation for network security and identifying any gaps that may need to be met through the Short-Term flexibility market.

Making Decisions: Selection of Short-Term Flexibility Services

Around mid-morning, James turns his attention to short-term flexibility offers. He reviews week-ahead market bids to top up flexibility gaps where needed. His process involves:

- Prioritising bids in price order to ensure we take the cheapest options in order to maximise cost-efficiency.
- Evaluating how offers align with both operational requirements and financial targets.
- James addresses situations where there is competition between flexibility offers by applying the dispatch principles previously described in this document and using an industry standard Pay-As-Clear (PaC) model, this model discourages bidding activity that could distort the market. This ensures that competitive pricing is maintained by setting the marginal offer rate as the clearing price, meaning all successful bids are awarded the same price.
- James understands that there is value in smaller assets for their ability to provide services across multiple voltage levels and enhance dispatch accuracy, so he ensures where the bid price is competitive these are not skipped within the PaC process when a larger asset could fulfil the entire requirement alone. Small assets are often domestic Low Carbon Technologies like heat pumps and Electric Vehicle Chargers aggregated to deliver flexibility as a group, making sure these asset types receive value from flexibility participation helps stimulate future market growth.

Ensuring Market Value

Late morning James will carry out analysis to ensure that the flexibility he chooses provides a balance of utilisation between both the long-term and short-term flexibility he chooses stimulates value in both the long-term and short-term flexibility markets, while also aiming to maximise value for the operation of the network.

Tackling Flexibility Shortfalls

In the afternoon, following flexibility selection James identifies any locations where there has not been enough flexibility offered by the market meaning there is a shortfall in the volume need to meet the closer to real-time forecast. By analysing demand patterns, he identifies areas where resources may be insufficient. Once he spots a gap, James collaborates with the DNO Control Centre to explore additional options and resolve issues quickly. We've further described how we manage shortfalls later in this document.

Coordination with the DNO Control Centre

Working closely with the DNO Control Centre, James shares detailed information on pre-scheduled flexibility resources and information of further resources that can be made available in real-time if needed. This transparency ensures everyone is on the same page, enabling swift action should unexpected constraints occur in the Control Phase.

Informing the Market

As the day winds down, James updates the Flexible Power Portal with the details of his flexibility utilisation decisions. The market must be informed of our decisions by midday each Thursday. This step is critical for maintaining transparency and ensuring flexibility providers receive timely dispatch instructions.

By leveraging the portal's API, the process of sending start/stop messages is streamlined and receiving, making flexibility market operations efficient and reliable.

James' day reflects the dedication and precision required to manage the complexities of the energy system. Through proactive planning, collaboration, and real-time responsiveness, he plays a vital role in delivering a resilient and efficient network.

Management of flexibility shortfall

Despite our best efforts to procure adequate flexibility, shortfalls can occur. These are identified during the Programming and Control phases, after bids have been received in the week-ahead flexibility market. Addressing these shortfalls is critical to maintaining network security and compliance with regulations.

Consequences of Unmitigated Shortfalls

Unaddressed flexibility shortfalls can have significant impacts because it means that power flows over the network may exceed thermal ratings of some equipment. These impacts include:

- **Security risks:** Should a fault occur on the network and we can't meet the demand expected to be mitigated by flexibility, customers could experience power cuts.
- **Asset stress:** Overloading can reduce the lifespan of network equipment
- **Regulatory non-compliance:** Breaching standards such as the Electricity Safety Quality and Continuity Relations 2002 (ESQCR) and the Electricity at Work Regulations, which could have safety, financial and reputational consequences.
- **Increased curtailment:** Unexpected restrictions on generation production, required to bring power flows back within acceptable operation limits

We proactively and consistently monitor the likelihood of flexibility shortfalls and introduce mitigations when needed, this starts well ahead of realtime in Programming Timescales and continues through the Control Phase;

Programming Phase; 8 weeks to 24hrs

During this phase, we assess flexibility availability alongside network outages and load forecasts. To mitigate for shortfalls first we will consider options for Network Optimisation;

- **Dynamic capacity assessment:** Leveraging weather forecast data to more accurately predict loading on the network, colder weather = more demand
- **Network reconfiguration:** Re-routing power flows to transfer loads to different sections of the network

If further mitigation is needed, we will consider;

Unplanned customer behaviour changes: Where connection agreements allow, requesting that generators reduce output or battery assets alter their planned charging and discharging.

- **Outage rescheduling:** Shifting planned network maintenance to less critical periods, thereby maintaining the maximum power flow across the network.

Lastly we can consider;

- **Temporary reinforcement:** Deploying mobile generators or temporary infrastructure such as a portable substation.

Control Phase; 24hrs to real-time

In this phase, our DNO Control Centre actively monitors network performance through alarm systems that detect exceedances in network capability. In the Control Phase, shortfalls arise due to;

- An under-delivery of flexibility services, or
- Unforeseen load increases or unplanned outages.

To address these the DNO Control Centre will use the same mitigations used by DSO Operations in the Programming Phase. In addition they can utilise additional flexibility products such as Operational Utilisation (15-minute instruction).

While the DNO Control Centre manages real-time operations, it collaborates closely with DSO Operations to leverage pre-scheduled and additional flexibility options effectively.

Operating flexibility is integral to our ability to maintain a safe and reliable electricity network while meeting the needs of a decarbonising energy system. By procuring flexibility across long- and short-term markets and implementing effective shortfall management strategies, we ensure the delivery of high-value services to customers.

Ongoing collaboration between the DNO and DSO remains essential to achieving our vision of a secure, flexible, and future-ready energy network.

Transparency of our Flexibility Decisions

Our aim is to develop competitive flexibility markets that create value for both participants and consumers. We therefore publish extensive data on our trade requirements, results and dispatch data with the aim to be as transparent as possible in a both our requirement setting and decision making. All our datasets are available on our **Connected Data Portal**, with additional information on how to participate in our flexibility market on the **Flexible Power website**.

			Long-Term Market (LV)	Long-Term Market (HV)	Short-Term Market
	Dataset	**Description**	**SU_SPP** (Scheduled Utilisation-specific periods)	**SAOU_DA** (Scheduled Availability, Day Ahead Operational Utilisation) **OU_15** (15 minute notice Operational Utilisation)	**SU_SEP** (Scheduled Utilisation- settlement period)
Annual Flexibility Assessment Data	**WHERE** Postcode and polygon data	Ahead of registering MPAN data with us, you can get a good indication of whether your assets are with a CMZ using these files.		**Click here**	
	HOW MUCH Ceiling prices	We have set ceiling prices for all Zones, this data set outlines the maximum price of bids we'll accept.	**Click here**	**Click here**	
	WHEN Requirement volumes	A forecast of what peak volume we potentially need in each CMZ.		**Click here**	
	WHEN Requirement profiles	A forecast of what volumes we may need in each CMZ per settlement period.		**Click here**	
Trade Opportunity Data	Trade Parameters	The actual flexibility needs that we want to buy. Detailed per settlement period, with ceiling prices and volumes. We also publish **graphs** to support the Long-Term Trade Parameter Data.	**Click here**	**Click here**	**Click here**
Archive Data	Flex Assessment Data	Records of previous Annual Flex Assessment data. Until we publish Short-Term Trade Opportunity data in October, the T8A data set found here will include some requirements which are being actively procured in our Short-Term Market.		**Click here**	
Result Data	Long-Term Trade Results	Published information on our Long-Term procurement activities to date.	**Click here**		**Click here**
Visibility Data	Flexibility Reporting	The data we share with Ofgem to report on our flex activities, including transparent data on our utilisation decisions. You will need to have registered a registered account to access this data which you can do **here**.		**Click here**	

Faster Connections

Advancing Connections through Technical Limits

The growing pipeline of generation and storage projects wishing to connect to the transmission distribution network has led to long timescales to connect across GB.

We have worked with other system and network operators through the ENA, to enable faster connections without needing to wait for major transmission works to be completed. This initiative formalises a “Technical Limits” envelope of network operation at the transmission-distribution boundary to allow additional embedded generation connections on a non-firm basis.

Customers advancing their connection via this pathway agree to their site export being temporarily reduced when needed by NESO ahead of the completion of required transmission reinforcement works. This reduction is managed by the deployment of an automated control scheme, such as Active Network Management (ANM) or Distributed Energy Resource Management System (DERMS), and the subsequent control of generation customers’ power imports and exports.

As understanding the impacts on site export are an important part of the customer’s investment decision making process, we provide updated curtailment information and analysis for connections advancing through Technical Limits. This data and insight can support the customer‘s own risk assessment of the potential for a reduction in generation output. We further enhance this assessment by providing a sensitivity of different background modelling assumptions, particularly around the behaviour of energy storage.

Through swift adoption of this initiative and roll out across over 90% of our Grid Supply Points, we have been able to secure 10GW of transmission capacity to support acceleration of generation connections.

The primary impact on customers choosing to advance their connection through this initiative is their subjection to unpaid curtailment under specific conditions (an automatically applied reduction in the power export or import of the site). The level of this curtailment will vary, dependent on a customer’s connection queue position, and how the relevant DNO implements the curtailment.

10GW of capacity secured for reallocation and advancing new generation connections

Full queue order visibility at each GSP through ClearView Connect

Curtailment assessments for every project expressing an interest in accelerating

Increased Generation Production

Maximising Generation

The electricity flowing across our networks used to be generated by a relatively low number of large centrally located power stations connected to the transmission network. Over the past two decades, the amount of electricity generated locally has isen and now accounts for around 20% of energy used in our region.

Of the 1,200 generators sized at 1MW and above connected to our network, the vast majority are renewable technologies such as solar, wind and hydro. Moving away from dispatchable generation, such as gas and towards more intermittent technologies which have more variable output patterns has required us to adapt the way we operate our network.

Should it all be running at the same time, the 13GW of generation connected to our network would exceed the demand being consumed for the majority of the year. Early development of our network control systems has allowed us to integrate the distributed generators and we regularly reconfigure our network to best accommodate the flows under all conditions.

As our experience of operating a network with embedded renewable generation has grown, we have developed improved modelling enhancements to enable us to connect even more capacity.

DSO has developed capability in a number of areas to support efficient system operation:

Maximising production during planned network outages
As we connect more customers to our networks and upgrade assets for capacity or age-related conditions, we need to take some assets out of service temporarily. Peak demand conditions occur in the winter and there is typically sufficient windows in the summer with lower demand levels to enable outages without affecting customers. Generation connections do not follow the same load patterns and so during these planned outages, it may be necessary to require generators to reduce output whilst the network is running in an abnormal condition to prevent overloads.

Through the use of dynamic forecasting methods and improved network visibility, the DSO can further optimise planned outage windows to reduce generation curtailment. Moving planned outages to periods of lower production or increased adjacent demand, aligning with the generator's own outage programme or reducing the outage time period itself are all used to maximise production of generation on our network.

Maximising security contributions during unplanned outages
Generation connections embedded in our network will produce electricity to support adjacent customer demand, removing some of the electricity needing to flow down from the transmission system.

Traditionally, distribution networks have needed to size assets to accommodate worst case conditions of peak demand through the whole year. Using improved network visibility and time-series modelling techniques, the DSO can determine the security contribution from the local generation connected within a network area and factor this in to future network asset upgrade requirements.

This is particularly important at the transmission-distribution boundary, where the large volume of generation embedded within the lower voltage networks can contribute significantly in supporting local demand security.

Faster Connections

Co-ordination with NESO

Managing conflicts across markets

It is important that flexible assets on the distribution system can access the widest range of markets possible, including those run by the NESO. We achieve this in part through carefully considering service design to maximise potential revenue stacking.

Having assets on the distribution system participating in both DSO and NESO markets increases complexity of operation and we must work closely together to ensure efficient consumer outcomes.

Example of a problem

Consider a region of the distribution network which has several assets taking part in the NESO flexibility markets. Distribution network conditions mean that power flows out of the region are constrained in this period and there can be no further power flow out onto the rest of the network. If NESO activates flexibility in this region to either reduce demand or increase generation then the power flow out will exceed the constraint limit. If this occurs, the DSO will take an action through its flexibility market or, where available, the Automatic Network Management system will automatically act to reduce the power flow.

This is not efficient as the NESO will have paid the flexibility provider for an increase in output and received no net change after the DSO action to reduce the power flow to below the constraint limit.

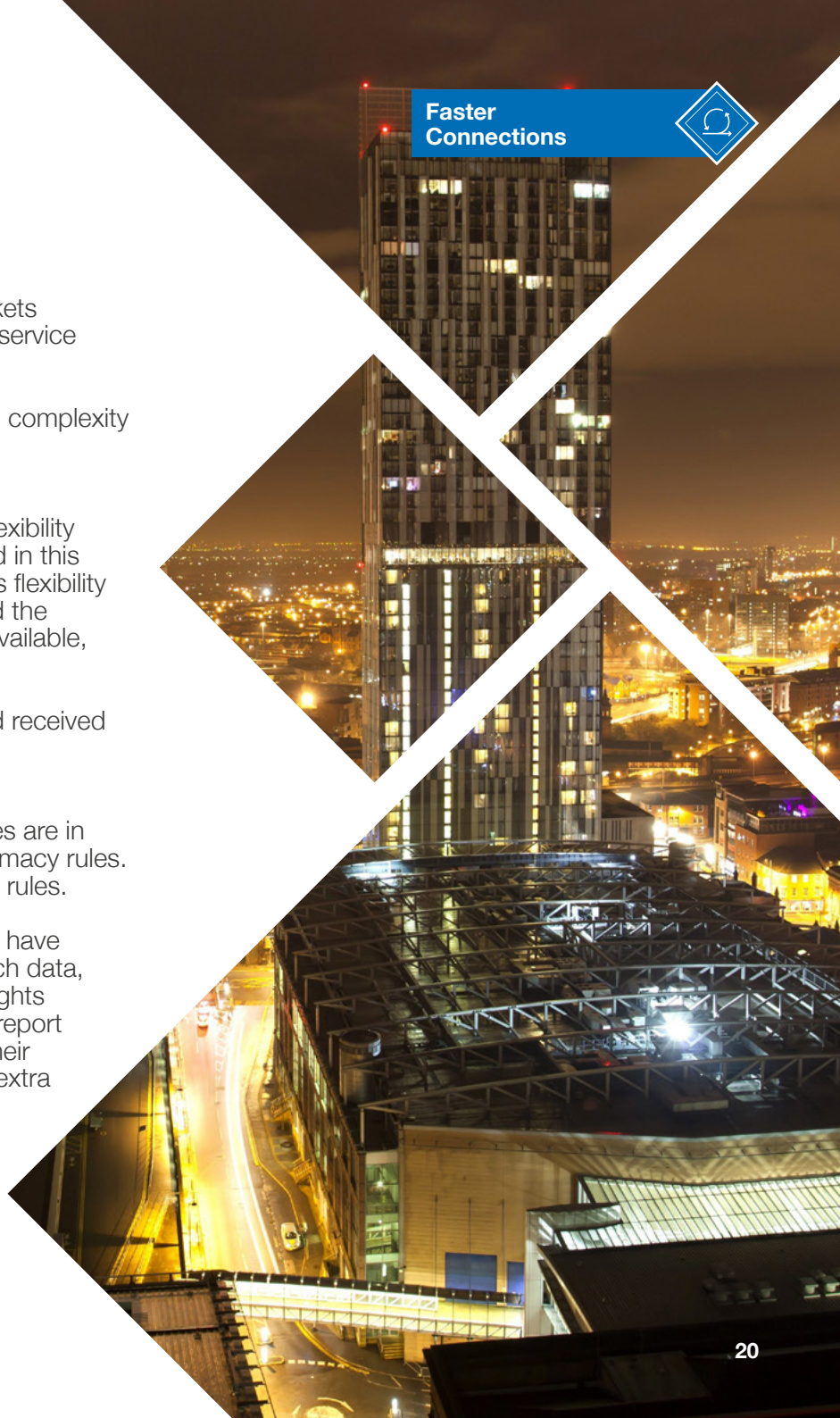
Discussion of solution

There are many examples of this conflict between NESO and DSO requirements and a set of rules are in development to determine which actor has priority in any given situation. These are known as primacy rules. National Grid DSO co-leads the ENA working group to define and implement these standardised rules.

A key enabler of efficiency is to provide NESO with the visibility they need to make decisions. We have developed a process which takes asset data from NESO and compares it to our flexibility dispatch data, outage plans and MW Dispatch unavailability report to create a Risk of Conflict report. This highlights assets that are unavailable for NESO/DSO flexibility procurement due to a potential conflict. The report is automatically published to our Connected Data Portal, allowing NESO to access this data at their convenience. This process is scalable, enabling future primacy rules to be added without lots of extra development, thus speeding up implementation.

The key benefits of our approach are

- More efficient DSO and NESO markets leading to lower costs for consumers
- Increased security of supply



Co-ordination with NESO

Managing transmission constraints

The volume of renewable generation has increased significantly on our distribution network and to drive forward decarbonisation we are keen to connect further volumes as soon as we can. Under the Connect and Manage regime introduced in 2010 renewable generation can connect before the transmission network reinforcement is completed and any resulting constraints can be managed typically through the Balancing Mechanism. However, many smaller assets embedded in the distribution network don't participate in the Balancing Mechanism and so can't help manage constraints in this way.

Our MW Dispatch initiative in collaboration with NESO supports management of transmission constraints in South West England. It allows NESO to expand its 'Connect and Manage' approach to assets which do not directly participate in the Balancing Mechanism. This service provides NESO with increased visibility and commercial control of distribution connected generation, whilst coordinating with the DSO. It uses our existing Distributed Energy Resource Management System (DERMS) to provide visibility and control of assets to NESO, with no additional technical complexity for the connecting customer. This avoids the need to build digital interfaces with wider NESO systems which might be prohibitive for smaller DER.

In collaboration with NESO we created;

- A simple contractual process for DER
- Mapping of assets across systems so we can give the NESO real-time visibility of each individual MW Dispatch generator including its output and availability status
- 'Risk of conflict' reports highlighting to the NESO when the MW Dispatch generators might be unavailable due to outages on the Distribution Network, or where NESO actions clash with DSO flexibility services or Active Network Management systems.

This initiative is a great example of whole system thinking. It allows more low carbon generation to connect to the system, reduces costs for consumers and provides a further potential income stream for flexible distribution assets.

Our Track Record

Flexible Network Capacity

5,275
Number of Bids assessed[3]

154,462
Number of Assets Registered

2.79kgCO2e/MWh
Carbon Intensity of the Flexibility Services Dispatched[4]

2,205MWh
Volume of Flexibility Dispatched[3]

123
Number of Flexibility Service Providers Registered

9
Whole system Coordination; Number of Primacy use cases implemented

Increased Generation Production

268
GWH volume of curtailment avoided

43
Number of complex outages assessed

3
Generation turn down/demand turn up locations currently held in trial

Faster Connections

106/64
Number of Accelerated Connection Offers Issued/Accepted[4]

49.7MW
DER Volume now available to NESO through MW Dispatch Project

3.2/2.1
GW Volume of Accelerated Connection Offers Issued/Accepted[4]

Average connection offer accelerated by[4]
6.7 years

[3] 2023/24 figures, published in our annual flexibility reporting; https://www.nationalgrid.co.uk/distribution-flexibility-services-reporting
[4] 2024/25 YTD

Operational Decision Making Development

Stakeholder engagement is at the heart of our approach to operating as a DSO. Over the past year, we have collaborated extensively with stakeholders to develop our DSO Charter, and this included gathering feedback across our ongoing DSO development activities.

As the transition to low-carbon technologies accelerates, driven by electric vehicles (EVs) and heat pumps, the scale and complexity of our operational decisions will continue to grow. As National Grid DSO we control the largest number of assets of any GB DSO, So we need to more heavily rely on digital capability and automation to support our decision making. To meet these challenges, we are committed to enhancing our capabilities and adapting to customers evolving needs. Our ODM development priorities, build on what we've heard from stakeholders in our DSO Charter development, and ensure our operational decision-making capabilities align with the evolving needs of the electricity network.

Below are the key themes we have identified from our DSO Charter stakeholder engagement and the development areas we have identified to focus on to drive Operational Decision Making development.

What our stakeholders told us	Our Development Areas
• **Ensure clear and coordinated operational decision making across the whole-system, that is aligned at both the national and local level.** • **Standardise operation of the network across DSOs, through the common use of digital technologies and automation.** • **Move our data to be closer to real-time and embrace dynamic operation.**	We will enhance **digitalisation and automation** to enable scaling of decision-making processes to ensure timely and consistent decisions can be made closer to real-time.
• **Improved forecasting to support Distributed Energy Resources (DER) make decisions on how to deliver services and optimise assets.** • **Data should be high-quality and accurate if it is used as an input into decision-making and planning processes.**	We will increase **situational awareness** to provide a robust foundation for well-informed decisions and support the integration of low carbon connections onto the energy system. We will invest in enhanced forecasting tools and methodologies to support customers and ensure data accuracy.
• **Greater clarity and transparency of decision making criteria for dispatching flexibility and curtailment.** • **Make data sources open, transparent and accessible for stakeholders.** • **Enhanced access to market information around flexibility dispatch decisions, particularly in relation to location, availability, price, and carbon intensity.**	We will work to increase **transparency** across our operational decision-making processes. This includes making both the data that informs decisions and the outcomes of those decisions more accessible to stakeholders. By improving access to market information, we aim to build trust and ensure stakeholders have the tools they need to engage effectively with the flexibility market.

Operational Decision Making Development

Across these three development areas; Digitalisation and Automation, Situational Awareness, and Transparency, we've identified development priorities that reflect our ambition to enhancing decision-making processes, leveraging advanced digital tools, and fostering whole-system collaboration.

Digitalisation and Automation

We recognise the increasing complexity of flexibility markets and the need for scalable, automated solutions. Our focus areas include:

Flexibility Market Clearing: As participation in flexibility markets grows, clearing activities will become more complex.

- Engage with Flexibility Service Providers (FSPs) to understand their priorities across more complex clearing scenarios.
- Partner with experts to develop appropriate clearing algorithms which are transparent and shared with market participants.
- Integrate these algorithms into our tool suite to enhance automation and efficiency.

Curtailment Modelling: Existing manual processes require development to ensure scalability.

- Develop new tools to automate outage-related studies and improve their scalability.

Whole System Constraint Management: Building on our current work, we aim to expand use cases for managing constraints.

- Implement the next phase of the MW Dispatch project.
- Collaborate with the National Electricity System Operator (NESO) to explore further coordination opportunities.

Situational Awareness

Improving our situational awareness is essential for delivering improved and timely operational decisions. Our focus areas include:

Flexibility Services: Enhance the quality and granularity of data by accessing wider datasets.

- Utilise insights from the ongoing rollout of low-voltage (LV) monitoring within the DNO.
- Leverage smart meter data to refine our understanding of network conditions.

Short-term Load Forecasting: expand our data sources to strengthen forecasting capabilities.

- Develop more representative day loading cycles for improved modelling.
- Continuously improve operational forecasting through integration with wider datasets.

Managing Market Conflicts: Increase coordination with NESO.

- Gain greater visibility into service conflict frequency and high-risk areas.

Transparency

Transparency is key to building trust and ensuring that stakeholders can engage effectively with our processes. Our focus areas include:

Flexibility Services: Provide stakeholders with accurate and up to date visibility into flexibility needs and decision outcomes.

- Develop automation tools to share flexibility Opportunities and dispatch decision outcomes on a weekly basis, evolving to a daily basis as we introduce day ahead flexibility trading.
- Introduce feedback mechanisms to explain the rationale behind decision-making.

Increased Curtailment Identification: Open, transparent and accessible data.

- Collaborate more closely with outage planners to review annual outage plans proactively.
- Enhance communication with stakeholders by sharing outcomes of curtailment modelling activity.

Managing Market Conflicts: Open, transparent and accessible data

- Simplify the development and implementation of primacy rules to improve industry understanding.
- Tailor reports as part of the ENA's Open Networks programme for wider accessibility.

Proactive development in these areas will ensure that;

Flexible Network Capacity

Flexibility markets can continue to grow and be operated at scale, enabling more consumers can access the revenue and savings available from participation in flexibility, while benefiting the energy system through greater system operability and lower system costs.

Increased Generation Production

Our digital and modelling capabilities will advance, meaning Generation production experiences minimal restriction, delivering clean power to consumers when they need it.

Faster Connections

We will have increased visibility of network conditions, meaning we will be able to dynamically optimise the capacity of the network so that customers can continue to connect new electricity demand, such as EVs and Heat Pumps, onto the distribution network without risk to the security of supply, supporting the UK's net zero targets.

Operational Decision Making Governance

As outlined in the earlier timeframes section of this document, the DSO and DNO have parallel activities across the three operational timeframes; planning, programming and control. Effective governance is essential to ensuring effective DSO/DNO coordination.

Robust governance structures support operational decision-making, facilitate collaboration, and deliver outcomes that benefit consumers and the energy system. By strengthening our governance approach, we aim to build trust, ensure accountability, and deliver lasting value to all stakeholders.

Coordination with the DNO

We have established a joint Operations Working Group with the DNO to ensure effective coordination across operational activities. This group includes representatives from: DNO Control Centre Engineers, DNO Outage Planners and DSO Operations leadership and engineers.

The group meets monthly to:

- discuss and resolve operational issues
- agree on ongoing developments to ways of working
- share information and feedback to promote continuous improvement.

Within this Working Group, clear methods of communication have been defined for planning, programming, and control timeframes. Dedicated routes of escalation and identified contacts for both the DSO and DNO are in place to ensure timely resolution of operational activities.

Policy Alignment

To solidify these practices, we are actively collaborating with the DNO to formalise these approaches into policy, ensuring consistency and long-term adherence.

Annual Review of the ODM Framework

This framework provides a clear roadmap of our development activities and reflects stakeholder feedback gathered through consultations.

Governance Commitments:

- **Transparency:** The ODM Framework will be reviewed and published annually to share our progress openly.
- **Continuous Improvement:** Each iteration of the framework will incorporate feedback from stakeholders, ensuring it evolves to meet emerging needs and challenges.

Stakeholder Engagement

We invite stakeholders to actively participate in consultations and provide feedback. Your input is critical to shaping a governance framework that aligns with shared goals for a reliable, accessible, and efficient energy system.

Over the next year, in relation to governance, we will:

1. publish our ODM Development Roadmap, incorporating insights from this consultation and outlining how we will deliver developments to our ODM capabilities
2. enhance our collaboration with the DNO through joint policy development and operational refinements
3. provide updates on DNO/DSO governance initiatives and their impact on network operations.

Feedback and Next Steps

Consultation Questions

1. Have we been clear in describing the remit of our operational decision making and the frameworks we employ to ensure effectiveness?
2. Has the information we've provided been transparent enough or are there areas where we need to provide more detail?
3. Do you agree with our development priorities? In particular;
   a. The publication of flexibility opportunity and dispatch decision data on a more frequent basis.
   b. Increasing our ability to make operational decisions at a greater scale to meet energy demand and flexibility market growth.
4. Which of our development priorities deliver the most/least value to you?
5. Are there development priorities we haven't described that would deliver significant value to you?

How to feedback

You can submit feedback on this document to **NGED.EMC@nationalgrid.co.uk**

You can also submit feedback to us by joining our webinar on the 23rd January 2025, **register here https://zoom.us/webinar/register/WN_ilJoFYyeTbWW2lRw3Q4i5Q#/registration**

We're also offering Surgeries for stakeholders who'd like to discuss our Operational Decision Making with us in more detail, please email us at **NGED.EMC@nationalgrid.co.uk** to arrange.

Timeline for consultation

15th January 2025 Operational Decision Making Framework launch

23rd January 2025 ODM Consultation Webinar

https://zoom.us/webinar/register/WN_ilJoFYyeTbWW2lRw3Q4i5Q#/registration

17th February 2025 Consultation Close

Post consultation

On the 21st March 2025, we'll publish our ODM development roadmap, which will show our updated and aligned development priorities directly informed by the feedback we receive.

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