Enabling demand side flexibility in NESO markets

December 2024

NESO
National Energy System Operator

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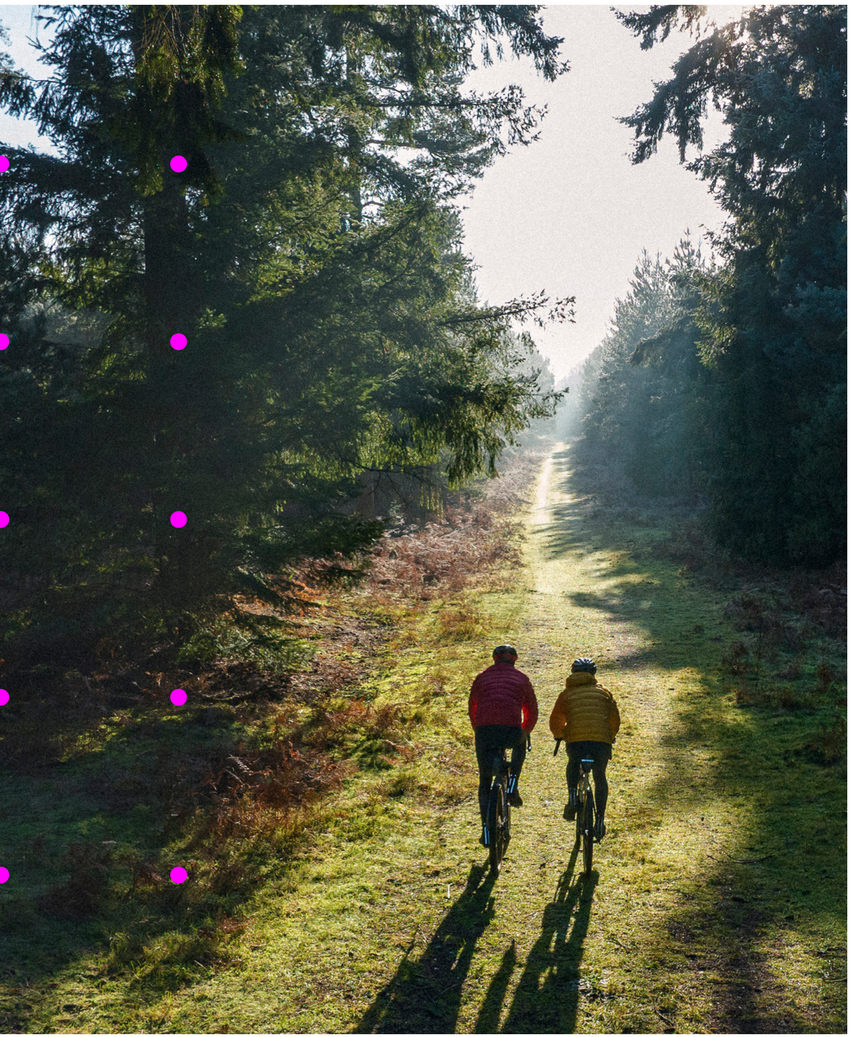

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Foreword

Flexibility is on everyone's mind at the moment. We can all see its potential. We all know that it is going to be fundamental to being able to operate a decarbonised electricity system, one which doesn't have flexible gas generation available. Having the right means to procure the flexibility needed to operate a system, dominated by renewable generation, is vital.

This report was born out of NESO's work over the past year to review and improve access by flexibility service providers to its markets. It has been informed by feedback from you via our call for input in June as well as from numerous meetings, workshops, chats and from our Power Responsive programme. Thank you for your support! And now, with the new government's target of clean power by 2030, the focus on flexibility has become even greater and has changed the wider context for the launch of this report, with an increased focus on the broader scope of flexibility. We've named this publication so that it highlights the focussed work we're doing to enable demand side flexibility in NESO electricity markets.

The bigger task of scaling up flexibility across all markets and delivering consumer value will need an industry-wide effort. NESO, government and Ofgem alongside the Market Facilitator and DNOs must work coherently together to make sure that we deliver the required market changes, regulatory frameworks, network upgrades and digitalisation needed to enable the flexibility required for 2030 and beyond.

The objectives and actions outlined in this report will form one part of an overarching programme of work across the whole industry, which will be needed to enable all types of low carbon flexibility, from domestic consumers and I&C businesses to storage providers and interconnectors.

Now that we have published this report, alongside the Routes to Market review, we will focus on delivering against the key actions outlined, as well as continually reviewing the approach and working collaboratively to ensure we can meet the large increase in flexibility required for Clean Power 2030. We will start engaging more with our stakeholders to discuss how best to go about this, through our Power Responsive programme. However, in the meantime, if you've got any feedback, please get in touch.

Rebecca Beresford
Director of Markets
National Energy System Operator

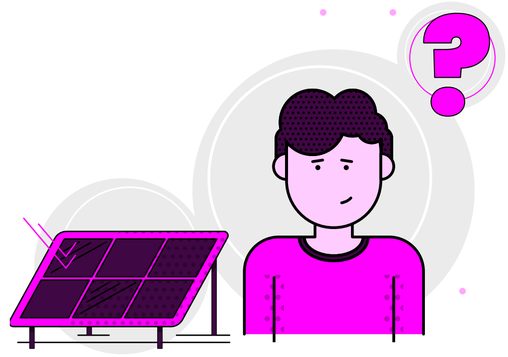
Executive summary

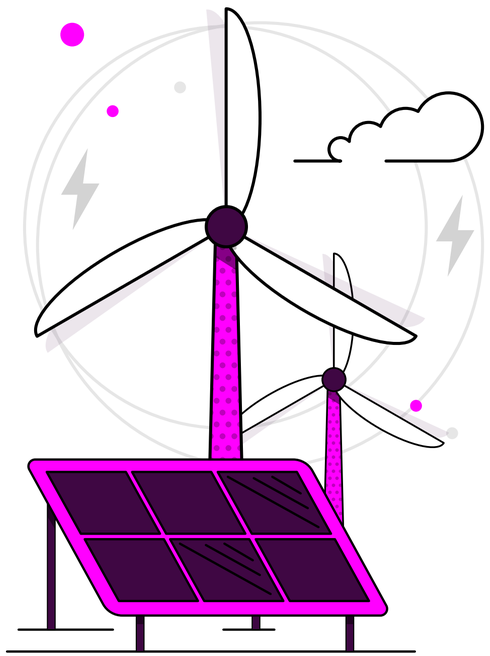
About this document

This publication is a response to the urgent need to mobilise demand side flexibility in NESO markets as GB shifts towards a greener future. It explores the no regret market reform actions which can be taken in the medium term to sharpen the explicit market signals for demand side flexibility and remove barriers. This is in anticipation of the enduring market design that will be established by the Review of Electricity Market Arrangements (REMA) and the implicit market signals to be enhanced by Market-wide Half-hourly Settlement (MHHS). This report positions us to enable demand side flexibility in support of the forthcoming Clean Power 2030 Action Plan. We have not referred to this report as the “Flexibility Market Strategy” acknowledging the need for a wider piece of work covering all the flexibility we will require.

Case for Change

The rise in weather-dependent generation, variation in demand and increasing electrification drives the need for flexibility at transmission and distribution levels. This is accompanied by a decline in flexibility from conventional dispatchable generation. Demand side flexibility will be a powerful tool to boost grid reliability and resilience, enabling full decarbonisation. It will allow consumers to benefit directly from the flexibility they provide from their homes and businesses. It will also help NESO to balance a decarbonised system at the most efficient cost and lowest carbon intensity, by effectively utilising existing grid resources and reducing renewable curtailment. According to our Clean Power 2030 (CP30) analysis, by 2030 the level of demand side flexibility can increase to four-to-five times today’s level and could reach 10-12 GW through smart charging of electric vehicles, moving household demand and enabling more responsive industrial demand, with a further 4 GW from storage heating. Despite government and industry commitments and innovation over recent years, there remain significant barriers to demand side flexibility. One of the barriers is the market design, implemented for yesterday’s system, which cannot adequately accommodate demand side flexibility. We also recognise we need a step change on "how" we design our markets and operate the system; this will ensure we can build trust with customers and deliver the best outcome at pace.





Demand Side Flexibility refers to flexibility across all consumer groups (domestic, industrial, commercial, and public sectors). It incorporates assets and technologies that can increase, decrease, shift demand for, and store electricity. Our demand side flexibility archetypes set out a high-level categorisation of demand side flexibility. It can generally be considered to be "behind the meter" generation, storage and controllable assets.

Process overview

For ease of reference, we have created a single-page process overview which outlines our vision, the outcomes and objectives we want to achieve, workstreams to deliver the outcomes, enablers and the principles we used to form this piece of work.

Our vision in flexibility markets is **'Enabling flexibility resources to operate seamlessly between markets, driven by effective market signals, delivering whole electricity system value to consumers and supporting the transition to net zero'**. This vision can only be achieved by effectively boosting competition in all NESO markets, promoting coordination between NESO and DNOs,[1] and enhancing coherence between the current and future market arrangements.

Call for Input Responses and next steps

Stakeholder feedback has guided this piece of work. We have reviewed all the feedback received and provided a summary and our response in the "You said, we did" annex.[2]

This publication captures our current thinking on how to enable demand flexibility in NESO markets. It will form one part of an overarching programme wider collaborative work which will be needed to scale up all types of low carbon flexibility to meet Clean Power by 2030. We are committed to ensure this work evolves in line with the changing landscape, for example the outcome of REMA and the next steps for CP30.

We are planning to conduct future engagement through Power Responsive to provide regular updates and to help keep our focus under review, as well as adding annual summaries into the Markets Roadmap.

1 For simplicity we have used the term DNO to refer to both DNOs and DNOs.
2 "You said, we did" annex.

Process overview

Vision	**Enable flexibility resources to operate seamlessly between markets, driven by effective market signals, delivering whole electricity system value to consumers and supporting the transition to net zero**		
Outcomes	Fit for the future, **coherent** market arrangements	A level playing field and inclusive markets to maximise **competition** between all types of flexible resources	**Coordinated** flexibility markets across Great Britain
Objectives	**1.1** NESO markets evolved to address system needs with clear roadmaps and requirements to help Flexibility Service Providers maximise the potential of flexibility. **1.2** A coherent approach for enabling market arrangements, unlocking the demand side flexibility needed by the system.	**2.1** Ensure existing NESO markets are technology inclusive by removing barriers. **2.2** All new NESO markets to be technology inclusive. **2.3** Support demand side flexibility market innovation leveraging international best practice.	**3.1** Markets Facilitator coordination governance implemented. **3.2** Standardised NESO and DNO onboarding process. **3.3** Revenue stacking enabled across NESO-DNOs. **3.4** NESO market design standardised and aligned with DNOs market design. **3.5** Coordinated NESO – DNO network operations and planning
Workstreams (Implementation plans to follow)	Develop longer term roadmap for NESO markets Work with policy makers and industry: Foundation for future market arrangements	Identify and remove barriers	Transform our digital infrastructure to enable flexibility Standardisation across NESO and coordination with DNOs
Enablers	Data, Digitalisation and Technology	NESO Capabilities	Policy Network Access, Connection & Charging Reform Consumer Engagement
Principles	Digital first mindset	Transparent at every stage Deliver in partnership	Encourage innovation and creativity Technology inclusive Be flexible and adaptable Consumer value driven

Key Actions

Coherency

Develop coherent roadmaps for NESO markets, focusing first on more joined-up plans for thermal constraints markets coming later in 2025, to clarify how demand side flexibility can realise its potential.

Why first choice: Coherent roadmaps help to lay the firm foundation we need, sending efficient signals so flexibility can navigate the energy transition, operate confidently and grow, helping meet the changing operability needs of our system. We focus on the markets evolving in 2025, that will benefit most from coherent roadmaps.

Competition

Remove barriers from current NESO markets including the Balancing Mechanism and ensure demand side flexibility capabilities are informing service design for Slow Reserve and Static Recovery.

Why first choice: Demand side flexibility can help meet our operability needs for energy balancing and reserve, and we need to remove barriers to these services to enable participation.

Coordination

Include "stackable" in our market design principle and ensure the new services we launch will enable stacking where possible. Work with DNOs and the Market Facilitator to avoid operational conflicts through clear Stacking and Primacy rules.

Why first choice: As more flexible assets connect to the distribution network and participate in the NESO markets, the risk of conflicting actions between transmission and distribution system operators is likely to increase. Clear and transparent stacking rules and primacy rules will be needed to ensure assets can operate seamlessly between markets.

Our actions will be reviewed regularly, ensuring we closely aligned with the changing landscape.

Key topics and summary of stakeholder feedback and our responses (You said, we did)

Topic	You Said...	We did...
Scope	**Scope needs to be extended** as participants want to see a flexibility strategy for **interconnectors**, **batteries** and **cross-border coordination**.	• We have clarified the scope for this publication to be demand side flexibility. • Other flexible resources will be considered as we progress towards wider market reforms into REMA. • We will report shortly on *Enabling renewable and interconnector participation in GB ancillary services*. • We aim to annually update, signposting progress against the challenges identified in this report through the NESO's annual Markets Roadmap publication. The ultimate aim will be to ensure that GB ancillary services markets are accessible to the widest range of technology and business model types.
Coherent	Important to clarify how the NESO approach **aligns with other strategies**.	• A section has been added to explain the alignment of this report with other internal and external work, such as Smart Systems and Flexibility Plan, FES, Operability Strategy, Digitalisation Strategy and Action Plan, etc.
Barriers and pain points removal	The **priorities and milestones** must be defined to a higher degree of detail, and we need to simplify how we engage with industry.	• Our barrier removal process will better define priorities and milestones, and we will communicate via the Power Responsive channel going forwards.
Transform Digital Infrastructure	Enhancing Control Room **Data** and **Dispatch transparency** are the top enablers for demand side flexibility.	• Refer to page 34, Enablers, which highlights the need for enhancing capability including forecast and modelling, dispatch automation and dispatch transparency.
Standardisation	The **roles/accountability** of NESO and **DNOs** are not clear in coordinating the markets.	• We will be supporting Ofgem and the Market Facilitator in implementing a new governance process which will provide clarity in the roles and accountability of NESO and the DNOs which will be key for unlocking flexibility and coordination between NESO and the DNOs.
Coordination with DNOs	The **scope** of the DNOs coordination and standardisation is **overlapping**.	• We have combined workstream 4 and workstream 5 into one workstream that encapsulates the coordination and standardisation work we need to do alongside the DNOs.
Deliverability	Participants agree with the strategy but **do not trust NESO** to deliver this strategy. ESO has not historically delivered on time.	• We will continue to work with our stakeholders and keep on collaborating to build transparency throughout our processes and delivery of our work. • The prioritisation of barriers will allow us to deliver the most impactful work first, allowing us to deliver in a timely manner.

Introduction

The role of demand side flexibility and this document

The rise in weather dependent generation, coupled with variations in demand and increased electrification, will increase the need for flexibility at transmission and distribution levels. Flexibility will reinforce the role of consumers in a low carbon system. Their active participation will reduce the need for network reinforcement in the long run and enable better system operation in the short term. It will deliver benefits such as reductions in energy costs.

This *Enabling Demand side Flexibility in NESO markets* report (originally entitled Flexibility Market Strategy), is a response to the urgent need to mobilise demand side flexibility in NESO markets as Great Britan shifts towards a greener future. Demand side flexibility is essential in our decarbonisation journey to clean power by 2030 and net zero by 2050. This work aligns with NESO's RIIO 2 Business Plan 2 to facilitate the growth of distributed flexibility as well as NESO's primary and secondary duties as described in our commitments. In this document, we explore the no regret market reform actions which can be taken in the mid-term to sharpen the explicit market signals, while awaiting the enduring market arrangements that will be established by Review of Electricity Market Arrangements (REMA) and the implicit market signals enhanced by Market-wide Half-hourly Settlement. This work focuses on demand side flexibility, it clarifies our vision and the outcomes we want to achieve pre-REMA, as well as setting out a series of objectives that have to be met to deliver the outcomes. We will continuously evolve this work based on the outcomes of other ongoing activities such as the government's forthcoming Clean Power 2030 Action Plan (CP2030).

This report will support the CP2030 ambition. To avoid confusion, we decided not to refer to this work as "Flexibility Market Strategy", given the need for a wider piece of work relating to the flexibility required to deliver against CP2030.

Our dependencies

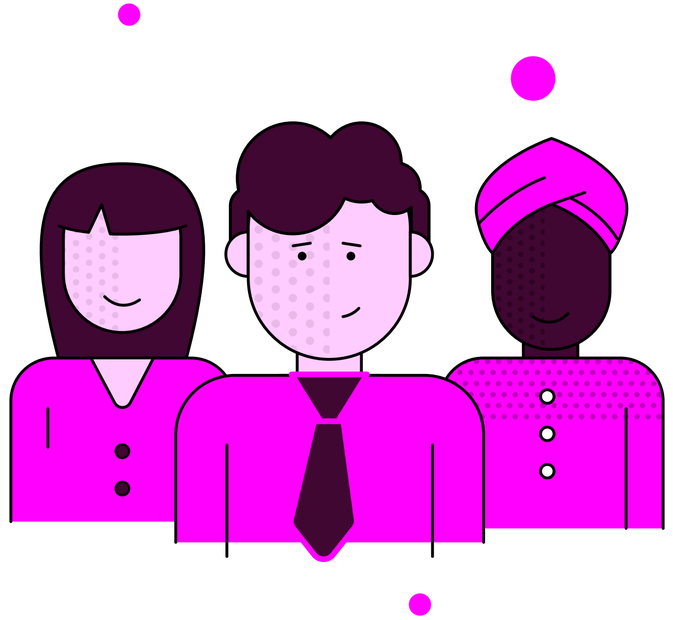
We are publishing this work now to respond to our Call for Input from June 2024 and to share the work we started before CP30.

We acknowledge this might require future updates to align with the government's Clean Power 2030 Action Plan and the new Market Facilitator (MF) role. We are working with Ofgem, DESNZ, Elexon and with the wider collaborations now needed to ensure our plans are coordinated. As regulatory frameworks, market structures, and technological advancements are continually evolving, this work will be agile and respond to these changes. We will continue our engagement and collaborate to achieve the outcomes described.

Our Stakeholders and their say

Our stakeholders repeatedly expressed their view that the “What” and “How” we deliver are equally important aspects. To ensure this work is more than just our voice, we undertook an industry Call for Input (CFI) on our initial thoughts. Based on the feedback, we have refined our views and developed this work with the initial focus on demand side flexibility. There were 44 responses to the CFI.[3] The majority agreed and welcomed our vision and desired outcomes.

We will continue to engage with stakeholders during our implementation. This collaborative and engaged approach will ensure the solutions we delivered address stakeholders’ needs and help to expedite change.



3 Detailed summary of our Call for Input is in our "You Said, We Did" annex.

Case for change

Decarbonisation, decentralisation, and digitalisation are driving significant change across the electricity system, impacting how we operate the system now and into the future. Greater flexibility is essential to maximise the use of existing assets and to support NESO's mission: a future where everyone has access to reliable, clean and affordable energy.

The changing system

The electricity system is evolving as we move towards net zero. Significant changes have been seen in how the electricity system is structured: integrating newer technologies across the system; large-scale offshore wind and domestic-scale solar panels; increased demand side participation, and increased electrification of heat and transport. These changes mean both supply and demand will become more variable and volatile. The decline in flexibility from conventional dispatchable generation underscores the critical role of demand side flexibility in helping to meet demand with clean energy at the most efficient cost. Demand side flexibility reinforces the important role of consumers in a low carbon system, whereby their participation can provide consumer benefit but also reduce network infrastructure and associated costs, enable system operation and drive overall bill reduction. According to our clean power 2030 analysis, by 2030 the level of demand side flexibility can increase by four-to-five times and reach 10-12 GW through smart charging of electric vehicles, moving household demand and enabling more responsive industrial demand, with a further 4 GW from storage heating. In our Balancing Cost Strategy,[4] we also point to the expected increase in costs out to 2030 driven by increased actions to manage constraints. With significant quantities of new renewable generation connecting behind constraints, we remain mindful of the need to unlock potential such as cost-effective demand turn up.

4 Balancing Cost Strategy

Challenges we see today

Despite wide ranging initiatives, policy commitments and innovation over recent years, there remains significant barriers for demand side flexibility. One of them is the current market arrangements, which were designed for yesterday's system, are no longer fit for purpose or able to provide effective market signals for demand side flexibility. Our Route to Market Review[5] indicates demand side flexibility is currently underrepresented across our services due to market rules, policy, and regulatory barriers. While awaiting the implicit market signals from the introduction of Market-wide Half-hourly Settlement and the enduring market arrangements to be established by Review of Electricity Market Arrangements (REMA), there are no regret actions can be taken immediately to improve the explicit market signals.

One of the challenges, identified by the Scheduling and Dispatch case for change[6] (developed for REMA) is that incomplete NESO visibility of market outcomes and limited access to some resources impacts coherence between wholesale market and balancing. Demand side flexibility represents a large part of those "limited visibility & inaccessible resources", which are often embedded non-BM assets and demand side assets behind metering. In order to make the most effective dispatch decision, we will need evolved market arrangements, quality data, alongside digital infrastructure with the processing power to maximise value from all types of flexibility.

Additionally, as we move towards net zero, we'll have an energy system with millions of decentralised assets actively impacting system balancing and network management. The role which distribution network operators play is important and evolving. Distribution-connected flexibility service providers generally make up over 40% of NESO's service providers. Insufficient coordination between NESO and DNO markets restricts the potential for demand-side flexibility. There is an urgent need to work collaboratively with our DNO colleagues and with the newly appointed Market Facilitator to ensure GB flexibility markets are competitive, coordinated and effective, providing a level playing field for flexibility resources of all types and sizes.

We also recognise we need a step change on "how" we design our markets and operate the system to make sure we can build trust with customers and deliver the best outcome at pace.

5 Route to Market Review
6 Scheduling and Dispatch case for change

Call for input summary

Overview

Our Call for Input (CFI) received 44 responses from a wide range of stakeholders. Most respondents welcomed the opportunity to provide feedback ahead of the report's release and believe the approach outlines the key challenges many stakeholders are facing to realising the potential of flexibility in services in the UK. The average rating for the approach and roadmap explanation was 7 out of 10.

We will continue to engage with our stakeholders and build industry support for our shared commitment to reach the desired vision and outcomes. We have summarised the feedback and our responses in the following three pages. A more detailed list of responses for each of the themes and questions can be found in our You Said, We Did annex.[7]

In the future, we will finalise our responses to each piece of feedback and share them publicly.

Our CFI requested answers to a variety of questions for each of the following topics:

1. Process overview (formally Strategy Map)
2. Scope and definitions
3. Success measures
4. Workstreams

Figure 1: Respondents

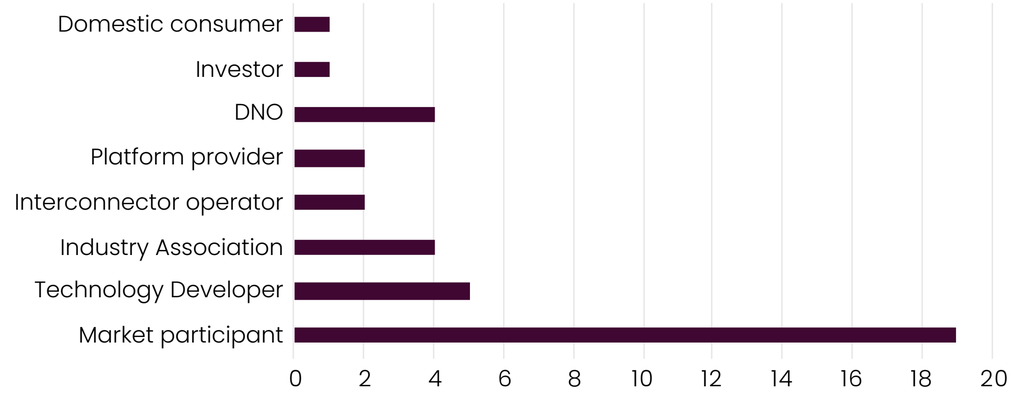
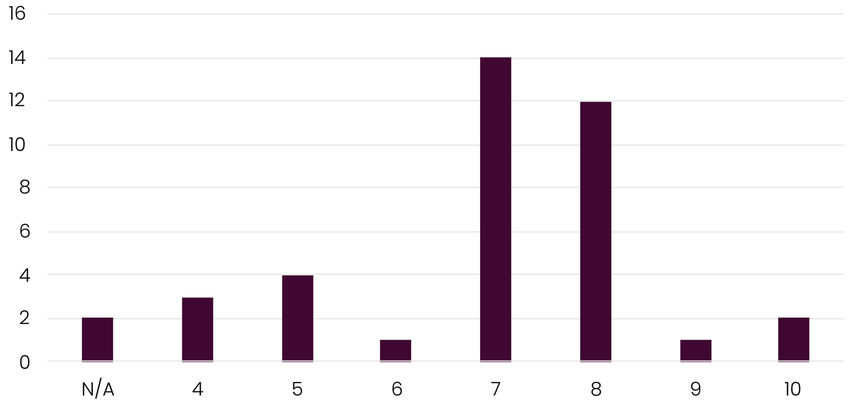


Figure 2: Rating for clarity



7 Detailed summary of our Call for Input is in our "You Said, We Did" annex.

Key topics and summary of messages and responses (You said, we did)

Topic	You Said...	We did...
Process overview	• You said the vision is not clear, and there are concerns about accessing markets.	• Now made this clearer, combining our Standardisation and Coordinated workstreams. • We have clarified our principles, workstreams and enablers needed to address this. • We have included objectives now directly mapped under each of our outcomes.
	• Additionally, you asked how we plan to set out workstreams to address everything that needs to happen pre-REMA.	• For each objective, we have given more details on where are we now and what needs to happen (see our no regret Workstream priorities). We plan to map the "what needs to happen" into our workstreams which we plan to develop and share next year.
Scope and definitions	• You highlighted the need to lock the scope of the publication for demand side flexibility and suggested publishing a flexibility markets strategy for batteries, interconnectors, and long-term duration storage.	• We have locked the scope of this publication for demand side flexibility.
	• You also requested more explanation on the approach, dependencies, and alignment with other NESO strategies.	• We have included more explanation on our approach and mentioned our dependencies and how this publication aligns with other NESO and external publication.
	• There were concerns about the lack of clarity on governance processes, the need.	• We will continue working on working with the Market Facilitator and also with Ofgem and DESNZ on wider governance process (Clean Power 2030 Action Plan) and we will conduct our future stakeholder engagement activities through Power Responsive for transparency.
Clear Governance & Success measures	We seek clear roles in implementing the strategy and we agree governance process are needed as well as more work to support timely implementation remaining closely engaged with our stakeholders. After careful consideration, we have decided to postpone the publication of our success measures and publish together with the detailed workstreams. We believe that we can establish the firm dependencies that are needed and illustrate our accountability by aligning with cross-industry clean power action plans, milestones and external dependencies. We will share more following clean power action planning when detailed workstream plans can be better set out. This will clarify where we are responsible and how we continuously engage and collaborate on our progress towards reaching the vision.	

Topic	You Said...	We did...
Develop longer term roadmap for NESO Markets	• You said that keeping in step with Clean Power decisions will be a key driver of priorities, as well as more coherent roadmaps for flexibility to participate in our services.	• We now show how we align with Clean Power 2030 Action Plan, upcoming government decisions, key linked strategies and the direction of the energy industry. • We have set clearer expectations on delivery timescales to align with Clean Power 2030 Action Plan. • We agree coherent roadmaps are needed to help grow flexibility and allow seamless operation in our services. We are focusing on external and internal commitment, working harder on tangible results e.g. increasing transparency on dispatch decisions.
	• Additionally, you asked how the approach will interlock with key NESO guiding documents like the Markets Roadmap and Operability Strategy.	• Under our objective of future-proofing our strategy we now clarify how our approach will interlock with the Operability Strategy, the Markets Roadmap and modelling. This enables us to develop initial views of the flexibility needed by the system and provide coherent roadmaps for NESO markets.
Barriers & pain points identification & removal	• You asked about whether interconnectors and transmission connected flexibility was in scope, and if we are putting too much focus on distributed flexibility. You also asked us to simplify our services and how we communicate and engage with stakeholders.	• We have clarified that the scope of this report is demand side flexibility, including all behind-the-meter flexibility and technologies, and that other flexibility technologies will be out of scope for this report.
	• You highlighted that we need to engage with the wider flexibility value chain, beyond flexibility providers, such as with manufacturers of flexibility enabling hardware and infrastructure. You asked us to include the Capacity Market in the scope of this workstream and wider strategy.	• We have widened the scope of our stakeholder engagement. This will now include technology manufacturers (for example heat pump manufacturers and market platforms). • We will continue to improve our communications with all NESO flexibility stakeholders to ensure our vision is understandable and accessible. • We are working with the NESO Electricity Market Reform (EMR) team and DESNZ to understand how we collaborate and coordinate on Capacity Market Barriers.

Topic	You Said...	We did...
Standardisation & coordination across all GB flexibility markets	You emphasised the need for common asset registration and the challenge it presents for seamless market integration. You pointed out the complexity of coordinating between multiple DNOs with varying requirements and the lack of NESO's accountability in coordination. Additionally, you mentioned the importance of clear steps and delivery of products, such as standard APIs, and the need for a robust, tiered licensing framework for FSPs.	• We have combined the standardisation of NESO services with the coordination workstream to better align our vision and projects. • Objectives have been introduced for coordination outcomes, showcasing current work and future plans. • We will work with the Market Facilitator to create a governance process including accountability for NESO to act upon changes instructed by the Market Facilitator. • More details have been included for each objective in the coordination outcome. • We will engage with stakeholders through Open Networks (ON) for further considerations on the licensing framework and standardisation opportunities.
Work with policy makers and industry to create a Foundation for the Future Market Arrangements	You said NESO depends greatly on a steer from government and trust in delivering may be low until dependencies are clearer, so long term plans and quick win activities are agreed, and we move forward together.	• We have made it clearer that we depend on government direction following Clean Power 2030 so, our activities to advise and influence coherently can target flexibility priorities and help close gaps. • We have mapped out how we will future-proof our approach by aligning it with wider external and internal strategies and key ongoing activities such as Smart Secure Energy System (SSES) and Market-wide Half Hourly Settlement (MHHS) and Open Networks. • Our dependency on agreeing on a joint industry roadmap to unlock flexibility is now highlighted so that NESO can deliver a more coherent, coordinated and competition-driving approach.

Topic	You Said...	We did...
Transform the Digital Infrastructure to enable flexibility	• You asked if the data is standardised across NESO products and with DNOs. You also mentioned issues with data quality and the need for a single platform for NESO and DNOs.	• We are working alongside our stakeholders to standardise and align the digital infrastructure through engagements such as working with the Automated Asset Registration (AAR); FMAR: Flexibility Market Asset Registration (FMAR); Flex Markets Unlocked (FMU) programmes. • We are discussing data quality issues with internal teams and wider stakeholders. • We have initiated work with the Single Market Platform (SMP) to collect all asset registration data (MPANs) into one platform – which will enable further DSO coordination. • An increasing number of NESO's services will be procured through the SMP, where possible. We will work with asset registration and FSP platforms to align the data requirements and enable access to NESO markets for aggregated flexibility assets.
	• Additionally, you highlighted the importance of data interoperability and improvements in forecasting supply and demand.	• Data interoperability and improvements in forecasting have been incorporated into NESO's digitalisation strategy and action plan.
	• You expressed concerns about the long timeline to achieve DER visibility.	• DER Visibility requires a comprehensive industry-wide transformation to enhance the visibility and utilisation of DER and CER through effective ESO & DSO coordination. While there are several ongoing initiatives delivering immediate benefits, our DER Visibility team are collaborating with the industry to develop a vision and roadmap, delivering tactical and strategic changes in parallel. This programme will deliver an industry transformation covering NESO Business changes, NESO Data & Systems changes and Industry changes (Policy, DNOs, TOs, Market Participants, Market Platforms). Given the complexity of this undertaking, it is crucial to approach these tasks thoughtfully to ensure the solutions co-created with industry are robust, effective and fit for purpose. Significant progress has been made in the DER Visibility programme to set it up for long-term success, for example, NESO business and technology capability impact assessments to identify necessary changes and their associated costs and timelines.

Scope and approach

This publication focuses on demand side flexibility and initially on enabling it to operate across NESO markets.

Demand Side Flexibility refers to flexibility across all consumer groups (domestic, industrial, commercial, and public sectors). It incorporates assets and technologies that can increase, decrease, shift demand for, and store electricity. Our demand side flexibility archetypes[8] set out a high-level categorisation of demand side flexibility. It can generally be considered to be "behind the meter" generation, storage and controllable assets.

The NESO voltage, stability and restoration markets are out-of-scope. This publication also outlines our responses to the CFI (You said, we did), including the resultant changes to our approach. It excludes detailed workstream plans and evaluation methodology.

8 neso.energy/document/318711/download

Decarbonisation →

- Electrification of demand
- Significant growth of renewable supply

→ to ensure demand can be met by variable clean resource at the lowest possible cost

- Increase energy efficiency
- Reinforce network / Network expansion
- Build more low carbon generation & storage
- Better use existing supply side and system level flexibility (such as interconnectors)
- **Flex the demand**

↓ to flex demand, we need

- Data, digitalisation & technology
- NESO capability
- Policy
- Network access, connection & charging reform
- Market reform
- Consumer engagement

Flexibility Markets include:

Key focus of this work and what we will drive

- Response & Reserve
- Demand Flexibility Services
- Balancing Mechanism
- Local Constraint Market
- MW Dispatch

Not in NESO remit, but we will be advising

- Capacity Market
- Wholesale Market
- DNO Markets

*Retail market: Out of scope, covered by Ofgem Multiyear Strategy

*Stability/Voltatge/Restoration Market: Out of scoop, are covered by Market Roadmap

Focus of this report

Interactions with plans, publications & strategies

Internal relevant activities

- **Future Energy Scenarios (FES):** set out supply and demand projections of pathways to Net Zero, keeps our approach future-ready.
- **Central Network Strategic Plan (CNSP), Strategic Spatial Energy Plan (SSEP), Regional Energy Strategic Plan (RESP):** We align with our new planning functions and gather input through CNSP's feed into the Operability Strategy.
- **Balancing Cost Strategy:** informs us on the markets we should prioritise and on the factors that are impacting the balancing costs.
- **Operability Strategy Report** informs how we enable flexibility for operability requirements, helps our Case for Change and keeps focus on system needs.
- Our strategic direction and delivery feeds into our **Markets Roadmap**: It details our vision for response, reserve, thermal, voltage, stability, restoration markets, and the Balancing Mechanism.
- **NESO's CP30 advice to the government** will be linked and all the latest insights will be applied to keep our strategic focus and direction aligned.

External relevant plans, publications and reports

This report is already aligned with:

- **Smart System and Flexibility Plan:** Informed our approach on the markets reform, barriers removal, digitalisation and change delivery.
- **Ofgem Future of Distributed Flexibility Consultation:** Informed our approach on the common vision for distributed flexibility, including a common digital energy infrastructure.
- **Energy Smart Appliances Consultation:** Aligned with DESNZ view on creating the technical and regulatory frameworks to enable the demand side flexibility.

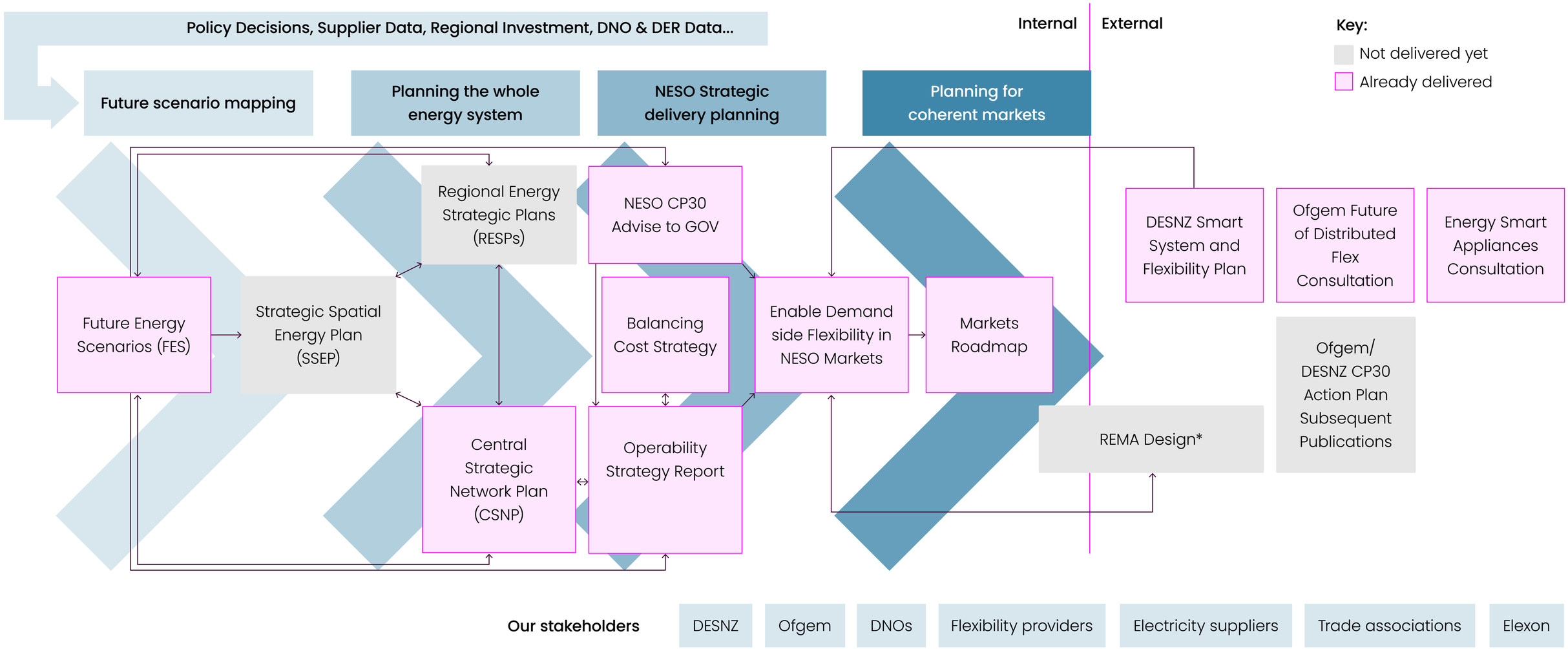
Future reviews of this report will be impacted by:

- **Government's Clean Power 2030 Action Plan and subsequent publications:** We need to work closely with DESNZ and Ofgem to coordinate our action plan with CP30 Action Plan and subsequent government and OFGEM publications to deliver a joint and coherent view on how to enable all flexibility resources required for 2030 and beyond.
- **REMA design**, as changes in the wholesale market dispatch and pricing design will impact the signals for demand side flexibility.

We heavily engage with different stakeholders:

- **DNOs:** Develop strategies to improve coordination of flexibility procurement.
- **Ofgem:** Collaborate on regulatory decisions and future roles required to achieve a net zero power system.
- **DESNZ:** Align our flexibility approach with government priorities.
- **Flexibility providers:** Seek feedback from flexibility providers that informs projects and supports diverse market participation.
- **Electricity suppliers:** Ensure we incentivise suppliers to provide flexibility that supports power system operation.
- **Trade Associations:** Seek feedback that allows us to take the best decision for our customers.
- **Elexon:** Collaborate on removing barriers that are preventing the full value of demand side flexibility being realised.

Interactions with Plans, Publications and Strategies



** To simplify the presentation, REMA's alignments with industrial and NESO programmes such as SSEP are ignored in this diagram.*

Enabling demand side flexibility

The NESO approach is captured in a single Process overview.

The overview is presented on the next page followed by an explanation of each of the elements.

Process overview

Vision	**Enable flexibility resources to operate seamlessly between markets, driven by effective market signals, delivering whole electricity system value to consumers and supporting the transition to net zero**		
Outcomes	Fit for the future, **coherent** market arrangements	A level playing field and inclusive markets to maximise **competition** between all types of flexible resources	**Coordinated** flexibility markets across Great Britain
Objectives	**1.1** NESO markets evolved to address system needs with clear roadmaps and requirements to help Flexibility Service Providers maximise the potential of flexibility. **1.2** A coherent approach for enabling market arrangements, unlocking the demand side flexibility needed by the system.	**2.1** Ensure existing NESO markets are technology inclusive by removing barriers. **2.2** All new NESO markets to be technology inclusive. **2.3** Support demand side flexibility market innovation leveraging international best practice.	**3.1** Markets Facilitator coordination governance implemented. **3.2** Standardised NESO and DNO onboarding process. **3.3** Revenue stacking enabled across NESO-DNOs. **3.4** NESO market design standardised and aligned with DNOs market design. **3.5** Coordinated NESO – DNO network operations and planning
Workstreams (Implementation plans to follow)	Develop longer term roadmap for NESO markets Work with policy makers and industry: Foundation for future market arrangements	Identify and remove barriers	Transform our digital infrastructure to enable flexibility Standardisation across NESO and coordination with DNOs
Enablers	Data, Digitalisation and Technology	NESO Capabilities	Policy Network Access, Connection & Charging Reform Consumer Engagement
Principles	Digital first mindset Transparent at every stage Deliver in partnership Encourage innovation and creativity Technology inclusive Be flexible and adaptable Consumer value driven		

Vision & Outcomes

Demand side flexibility reinforces the important role of consumers in a low carbon system, whereby their participation can provide consumer benefits but also reduce network infrastructure and associated costs, enabling system operation and driving overall bill reduction.

Our vision is to support the transition to net zero by enabling flexibility resources to operate seamlessly between markets, driven by effective market signals, delivering whole energy system value to consumers.

To access the demand side flexibility required in the most cost-effective manner, all flexibility markets need to be competitive and work together in a coordinated and coherent way.

Outcomes

1. Coherency

We need to support our flexibility stakeholders to plan with confidence. Our enabling activities must work together to build a firm foundation for future arrangements and nourish timely flexibility growth, with market arrangements falling into place. Coherency means focussing our efforts on working with key external policy and industry bodies. Within NESO, we will join-up midterm roadmaps to support the growth of flexibility as we navigate and transition into REMA to future proof our approach. Our new commitment to 'create coherent markets' underpins this.[9]

2. Competition

We believe that deep, inclusive, and liquid markets that foster competition will deliver the greatest value for consumers. Therefore, our goal is to create a fair and level playing field where all capable technologies can compete. We will continue to remove barriers within the existing markets and ensure that no technology or providers are unfairly excluded. Additionally, we will ensure that all new markets are open to any capable technology, including new technologies.

3. Coordination

By enabling flexibility to provide whole system value in a coordinated manner, costs to the end consumer should come down. System operators need to be able to dispatch flexible assets without fear of conflict and market providers can access stackable revenue streams. Coordination must extend beyond NESO and DSO markets to consider the wholesale and retail markets and price signals from network charging. Common data standards and coordinated digital infrastructure, which minimise the cost of investment for Flexibility Service Providers (FSP) is also a vital element.

9 Strategic priorities | National Energy System Operator

Coherency Objectives

Why is this important?

As we accelerate to net zero operation, we will need more flexibility to decarbonise and to meet demanding conditions of constraint, manage higher volatility and tighter margins. Coherent signals become pivotal. To grow and use more flexibility, investors and providers need a clear view of system needs. A joined-up roadmap is required, aligned with system needs, to unlock the full potential of flexibility at the right time, and with the right capabilities. Growth equally depends on a coherent approach showing how we work with policies and market arrangements during the Review of Electricity Market Arrangements (REMA) transition. Together these will help create a clearer and unified way forward with the collaborative engagement to deliver the flexibility we need. Only with coherent development of this longer-term roadmap can price and investment signals drive growth and essential sources of flexibility operate effectively in our markets.

Where are we now?

Flexible assets have potential to participate in a wide variety of energy markets. We need a coherent approach to inform stakeholders, build confidence and grow investment targeted at balancing our system. We are improving some quantitative analysis of our system needs but this has stopped short of showing clearly the scale and nature of flexibility we need for NESO markets and we need more actionable analysis. Our Markets Roadmap shows timescales, but our stakeholders lack a coherent development roadmap which shows how NESO markets are planned and developed for our system needs pre-REMA. In addition, some pre-existing market arrangements continue to make flexibility markets appear complex, uncertain and potentially costly to access, with some historical price signals tending to distort more efficient markets and restrict growth of the flexibility we need for the future. We have also yet to agree cross-industry net zero market reform transition plans. Coherency is therefore an immediate focus to help navigate the landscape of codes and regulatory changes leading to 2030, develop a clear way forward and to grow flexibility for future needs.

Strategic objectives

Objective 1.1: NESO markets evolved to address system needs with clear roadmaps and requirements to help Flexibility Service Providers maximise the potential of flexibility

- Understand NESO operability needs for flexibility In our unique role as system operator, NESO can deliver our most direct impact by fully understanding the needs of our system and better articulating these operability needs for our stakeholders, government and our wider stakeholders.
- Develop coherent roadmaps for NESO markets, reshaping our markets for clean power system needs, remove barriers, deliver clear locational and markets signals, and say clearly what flexibility we expect in NESO markets.

Objective 1.2: Deliver a coherent approach for enabling market arrangements, unlocking the flexibility required for CP2030

- Align with industry, influencing coherently to build firm flexibility foundations for delivering clean power by 2030.
- Collaborating and influencing for flexibility enabling reforms, helping to unlock present flexibility growth and pave the way for 2030. Many changes beyond NESO are key to unlocking more flexibility across GB markets – changes to mid-term policies for smart meters, tariffs and assets for example. We will work collaboratively to better influence and articulate where consideration must be given to key enabling market arrangements.

Competition Objectives

Why is this important?

Deep liquid markets that maximise competition will result in maximum value for end consumers. Every technology capable of providing NESO markets should be able to compete in markets, with a fair and level playing field. Increased competition between flexibility technologies and providers is vital to deliver a fair/equitable, affordable, secure and zero carbon electricity system.

Where are we now?

Volumes of Distributed Energy Resources (DER) and demand side flexibility have been increasing over the past decade as the electricity system decarbonises, decentralises and digitised. From community wind farms to electrified business processes and home heating, Distributed flexibility are creating value for investors and consumers by optimising price signals and participating in formal electricity markets. DNOs are increasingly procuring flexibility and have contracted 2.4 GW of distributed flexible capacity for pre and post fault network management. NESO has launched the Demand Flexibility Market and dispatched over 3.7 GWh of demand side flexibility in winter 23/24. The door has been opened to enable Virtual Lead Parties to participate in wholesale markets with demand side flexibility.

While DER and demand side flexibility are playing an increasing role in formal electricity and flexibility markets, there remain several barriers and an unlevel playing field with traditional supply side, transmission connected technologies.

Distributed flexibility is inherently more geographically dispersed and smaller in scale than transmission connected resources, and while advances in technology and digitalisation are enabling aggregation, automation and increased visibility, some significant barriers still need attention, so these smaller assets have comparable options and access. Routes to market have been opening up for a range of flexibility market providers over the past decade, including the introduction of Virtual Lead Parties(VLP) and Asset Meter VLPs (AMVLP), and enabling non-Balancing Mechanism (non-BM) qualifying parties to participate in certain balancing market markets and DNO markets.

A range of innovation activities are being undertaken to enable flexibility to participate in NESO services, such as the Crowdflex project focusing on domestic consumers, and the Data Derived Baselines project focusing on behind the meter batteries.

Strategic objectives

We have prioritised removing barriers to our current markets for demand side flexibility, which builds on considerable work enabling batteries and other technologies to participate in our services. We have also set out in the Market Design Framework how competition and investability are key considerations in market design and will expand on how this framework will ensure technology inclusive market design going forwards.

Objective 2.1: Ensure existing NESO markets are technology inclusive by removing barriers

In order to deliver deep liquid markets that maximise competition in a zero-carbon system, NESO markets need to be fully technology inclusive for technologies that can meet given system operability needs. The Routes to Market Review for Demand Side Flexibility is setting out our approach to removing barriers.

Objective 2.2: All new NESO markets to be technology inclusive

We need to ensure that our new markets are technology inclusive from the onset, and set out a framework so we avoid putting barriers and hurdles in place inadvertently.

Objective 2.3: Support demand side flexibility market innovation leveraging international best practice

We need to proactively encourage and support competition and innovation across flexibility. This includes strategic innovation projects utilising RIIO innovation funding (Network Innovations Allowance (NIA), Strategic Innovation Funds (SIF)), collaboration with other public funding innovation programmes and collaborating with industry on flexibility innovation. We need to learn from and contribute to existing and emerging international best practice.

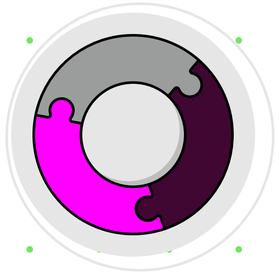
Coordination Objectives

Why is this important?

The number of flexible assets, especially low carbon technologies (such as renewable generation, electric vehicles, and heat pumps) connecting to distribution networks, is growing, and is expected to accelerate as we transition to a net zero power system. Flexible assets connected to distribution networks can participate in both NESO and DNOs markets. Therefore, it is possible that the actions taken by NESO impact the operation of a distribution network and vice versa. As the number of flexible assets connected to distribution networks increases, the likelihood of these occurrences increases, as well as their potential impacts.

To minimise the curtailment of generation and, therefore, to enable clean power we will have to enable coordinated demand side flexibility markets. To ensure a smooth and secure integration of flexibility services at both NESO and DNO levels, it is essential to ensure the alignments and coordination between NESO and DNO markets. By enhancing the standardisation and coordination across these markets, we are aiming to promote the participation and competition across both NESO and DNOs markets. Without them, the complexity of market access for Flexibility Service Providers (FSP) is too high and flexibility resources cannot always provide whole system value due to technical conflicts between grid operators.

Additionally, the cost of participating in NESO and DNOs markets is very high for the providers due to complex landscape of services and inefficient customer journey, while revenue stacking is not always possible and hence the investment case for smaller distribution assets is not always justified.



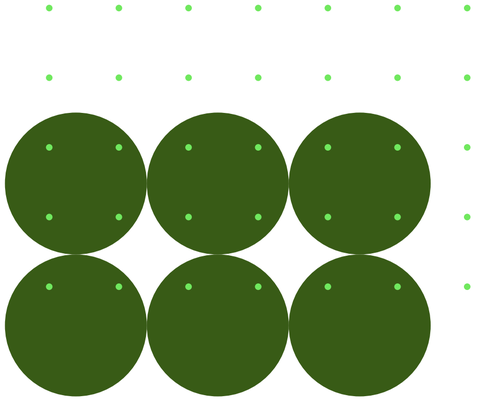
Where are we now?

Alongside our response and reserve reform, we are making progress on a more standardised pre-qualification process through our Single Market Platform (SMP).

Through ENA Open Networks Open Networks project (ON) working groups, we are making progress in aligning DSO and NESO flexibility service design. Progress is being made on unified stacking definition and stacking barriers identification. We are also working towards better coordinated network operations with the DNOs on the matter of primacy and dispatch interoperability.

We are excited to be taking up the new Regional Energy Strategic Plan (RESP) function, as well as working towards a single plan for Strategic Energy Planning, encompassing Strategic Spatial Energy Plan (SSEP), Centralised Strategic Network Plan (CSNP) and RESP.

Ofgem has appointed Elexon to the Market Facilitator role. We will work closely with Elexon in shaping the governance model and design of this role.



Strategic objectives

The strategic objectives associated with each of the outcomes presented above have been prioritised based on the criticality of delivery. Therefore, we aim to initially accelerate our coordination and collaboration with the new Market Facilitator in supporting the design and implementation of the role. We will revise our internal governance process to co-ordinate priorities and implement changes required by the Market Facilitator. In parallel, we will accelerate with our work on asset registration and revenue stacking and primacy. Additionally, through our new RESP function, we will continue the collaboration with our stakeholders towards standardising planning data and forecasting and delivering a coordinated planning process that aligns regionally and nationally.

Objective 3.1: Market Facilitator coordination governance implemented

Support Market Facilitator to establish a new governance model with clear roles, responsibilities and priorities prior to the MF operation.

Objective 3.2: Coordinated NESO-DNO network operations and planning

- Understand the impact of distribution-connected assets on both transmission and distribution level to improve whole system forecasting and planning.
- Enable dispatch interoperability between system operators, without fear of technical conflicts or increased balancing cost between system operators.

Objective 3.3: Standardised onboarding process across NESO markets that align with DNOs

Support Ofgem & MF to coordinate and standardise FSPs' onboarding journey which includes, exploring the potential markets, registration, prequalification and coordinated contract terms.

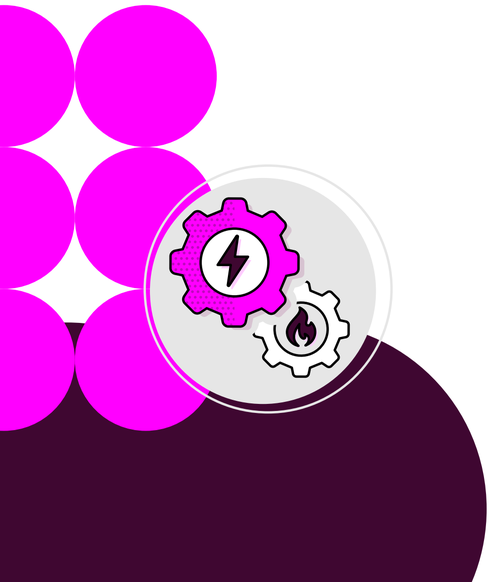
Objective 3.4: Revenue stacking enabled across NESO-DNOs

Enable FSPs to participate in multiple services across NESO and DNO markets to maximise revenue from an asset.

Objective 3.5: Standardised market design

Coordinate the markets design between NESO/DNO markets where appropriate, such as baseline methodology, market windows and penalty setting.

Workstreams to deliver Outcomes and Objectives



Develop longer term roadmaps for NESO markets

Coherency | Objective: 1.1

Developing our longer term roadmap for NESO markets will improve transparency over future whole system needs and will provide vital insights so markets can develop. This will include assessing if new products or services are needed, and if we can improve our current suite of services to better deliver our vision.

Key actions: Modelling our future flexibility requirements is a fundamental part of informing market design criteria. With this in place we can begin to develop a more coherent longer term roadmap for flexibility. Energy balancing will continue to evolve and models can provide some key input.

- Model within day & adequacy flexibility requirements; draw on wider models across NESO and beyond to inform our focus on flexibility growth.
- In addition constraints costs are predicted to rise out to 2030 and any potential to unlock demand side flexibility needs to follow a clear roadmap. Priority: Thermal constraint strategy development; coherent roadmap to clarify potential for demand flexibility.

Work with policy makers and industry to create a foundation for the future market arrangements

Coherency | Objective: 1.2

Paving the way for future market arrangements by working with policy makers to understand the current and future reforms, creating the vital coherence required across the sector.

Key actions: As NESO, we are playing a key role in advising government, and in working with industry to deliver the foundations for a clean power system.

- Align with key enabling initiatives, influencing coherently to build firm flexibility foundations guided by Clean Power 2030 Action Plan.
- Working with our delivery teams to coordinate where NESO can better influence mid-term policies: Smart meters; Smart appliances; Market-wide HH settlement; Smart tariffs; Investment to support electrification; Code reforms enabling wider competition.
- Design for REMA smooth transition: reform options & market arrangements through our programme delivery partner DESNZ.

Identify and remove barriers

Competition | Objective: 2.1, 2.2, 2.3

Identifying and removing barriers to optimise the use of all available assets and make our markets more accessible, especially for new technologies and business models.

Key actions: Demand side flexibility will play a vital role in balancing supply and demand, and in helping NESO maintain system frequency. Barriers preventing demand side participation must be removed to enable this potential.

- Remove barriers for demand side flexibility in current NESO markets including the Balancing Mechanism and ensure demand side flexibility capabilities are fully understood in upcoming service design including Slow Reserve and Static Recovery.
- Incorporate technology inclusiveness into our market design framework and build NESO insights on demand side flexibility capabilities and characteristics, including through innovation projects such as Crowdflex (SIF) and Market Signals for the Electrification of Heat(NIA).

Transform our digital infrastructure to enable flexibility

Competition & Coordination | Objective: 2.1, 3.2, 3.3, 3.4, 3.5

Transforming our flexibility market digital infrastructure to enables success of all other workstreams.

Key actions: Modern Digital infrastructure is vital to enable the increasing role of demand and distributed flexibility in balancing supply and demand on a decarbonised electricity system.

- Support the creation of a Data Sharing Infrastructure.
- Support the creation of a single solution for FSP to register for markets, a common registrar of all Low Carbon Technologies, and a simple system for consumer consent for their use by flexibility service providers, and meter data.
- Increase Distributed Energy Resources (DER) visibility through joint NESO-DSO programme.

Standardisation across NESO and Coordination with DNOs

Coordination | Objective: 3.1, 3.2, 3.3, 3.4, 3.5

Standardising NESO flexibility markets where appropriate and coordinating with DNO markets to simplify providers' participation experience of services and processes, lower admin costs, so flexibility resources are able to operate seamlessly between NESO and DNO markets.

Key actions: Standardisation and coordination with DNOs is vital to unlock the full potential of demand and distributed flexibility, ensuring that distribution & transmission networks and energy balancing are optimised at lowest cost to consumers.

- Work with the Market Facilitator to clarify roles and responsibilities and create a new governance process.
- Enable revenue stacking with other NESO and DNO products for existing and new services.
- Coordinate network operations and planning between NESO and DNOs.
- Standardise onboarding and market design across NESO markets.

Enablers

We define enablers as initiatives that will allow NESO to effectively enable demand side flexibility to operate seamlessly between markets, driven by effective market signals, delivering whole electricity system value to consumers and supporting the transition to net zero. The enablers to scale up demand side flexibility to the required levels to operate a clean power system by 2030 can be found in NESO's Clean Power 2030 report.[10]

We have identified a list of enablers that are necessary to achieve our outcomes. We cannot drive or control all the enablers. However, we may have the opportunity to influence them.

For the enablers with both key indicators present, this is due to a combination of activities: some that we deliver internally and others that we jointly deliver in collaboration with policy makers and industry stakeholders.

01 Data, Digitalisation & Technology	02 NESO Capabilities	03 Policy	04 Network Access & Charges	05 Consumer Engagement
Digital infrastructure ●●	Dispatch automation and transparency ●	Smart meters ●	Network access, connections and charging reform ●●	Education and building trust ●
Data standards ●●	Workforce and skills ●	Smart appliances ●		Consumer buy-in ●
	Visibility of distributed assets ●●	MHHS ●		
	Forecasting and modelling ●	Smart tariff ●		
		Investment policies ●		
		Code reforms ●		

Key:

- ● NESO directly involved
- ● NESO indirectly involved

10 NESO's Clean Power 2030 report

01

Data, digitalisation and technology

The electricity system is undergoing a major shift as electricity generation becomes more distributed and variable due to the nature of renewable energy resources. We are moving away from a centralised operational model to a system that is increasingly decentralised and digitised, and where demand is increasingly an active participant in the system.

Our challenges are related to:

- Our systems are designed for large power plants.
- NESO has limited visibility of distributed flexibility assets from both a locational and temporal perspective.
- NESO's digital infrastructure does not always allow for the rapid deployment of solutions.
- We need higher levels of automation of our manual process which is limiting our capability to run large numbers of small and distributed assets.

To address these challenges:

- We need to upgrade our digital infrastructure moving towards a modern cloud-based architecture. This modern architecture is necessary to enable rapid, secure deployment of solutions.
- Data is at the heart of digitalisation and the essential enabler to operate a decentralised grid. Grid operators require data to balance the net zero grid when connected to many distributed assets. Flexibility providers require data to make informed decisions.

1.1 Upgrading digital infrastructure

We have been working on a new suite of platforms to replace our legacy systems. These systems, developed as part of our RIIO-1 and 2 aim to support the retirement of our legacy systems. The new systems covers the customer journey from onboarding to settlements, and replace the control room's balancing platform, and planning/forecasting infrastructure. The new cloud-based systems are designed to enable rapid deployment of solutions based on business requirements. Full descriptions are in the NESO Digitalisation Strategy and Action Plan.[11]

We will continue transitioning to the new digital infrastructure. Additionally, we will explore coordination and standardisation options with the DNO's platform to create a cohesive digital experience for flexibility providers (see coordination across markets).

1.2 Data standards

Data is the foundation needed to digitalise our systems and develop coherence, coordinated flexibility markets that are accessible to all providers. We need to identify the data required to plan, monitor and operate different types of flexibility in markets across NESO and DNOs. We must define standards and data protocols, build infrastructure to share data across the whole system and create governance for data sharing. Finally, we need to ensure access to high quality data.

We will work with our partners and stakeholders to identify the required data and data standards as part of the DER Visibility project and Open Networks initiatives. The DER Visibility project will identify the data needed for planning and operation of all flexibility assets connected to distribution networks and ensure data interoperability between NESO and DNOs. It will identify the changes (technology, policy, etc) needed to enable the use of the data by operators.

The Data Sharing Infrastructure (DSI) and governance initiatives will facilitate the secure and resilient sharing of data across the industry, at scale, which is not possible today. It is also essential to develop a governance model with clear roles, and ownership to ensure that secure access to shared data is granted for relevant parties. This project is fundamental for elements of data sharing in coordinated energy markets which were essential to minimise cost and to support growing flexibility in the medium to long term.

11 NESO's Digitalisation Strategy and Action Plan

02 NESO Capability

We need to improve our capabilities to ensure we can operate a net zero grid. The following areas of improvement are needed to ensure we can balance our grid using different types of flexibilities that are in the scope of this report.

2.1 Dispatch automation and transparency

We need further improvements to our dispatch process and platforms to further enable the dispatch of new types of flexibility. This includes collection of the related data for assets such as heat pumps, electric vehicles etc. and automating to create an efficient dispatch process based on cost, system security and constraints. Our existing balancing programme was established to enhance and automate the balancing capabilities that our control centre needs to deliver reliable and secure system operation, facilitate competition everywhere and meet our ambition for net zero carbon operability. To date, the programme has completed extensive work to modify our existing capabilities to meet changing market conditions and customer requirements. As part of NESO's approach to improving skip rates, core deliverables of the Open Balancing Platform have already delivered increased use of under-utilised assets, and we will continue to make further improvements to the dispatch process to ensure we can maximise value from all types of flexibility.

Transparency of dispatch decisions is essential to create a level playing field for all providers and ensure they have the required insight. We have been working on improving our transparency through operational forums and reporting. It is essential to improve data quality to support new types of flexibility in our markets.

2.2 Workforce & skills

We need to review the existing capabilities and supporting functions in terms of skills, enabling systems and processes to operate distribution connected assets. Operating multiple small flexibility units presents new challenges and requires new capabilities in our control centre. It is essential to identify and develop these capabilities and processes to ensure the efficient operation of the new type of flexibilities.

2.3 Visibility of distributed assets

As we transition to net zero, we are seeing a proliferation of flexible assets connecting to distribution networks. This changes how they behave but also unlocks additional flexibility for NESO and DNOs. We need greater visibility of these assets to better plan, connect, and operate networks, increase market liquidity and maintain system resilience through greater coordination between NESO and DSO operational activities. Our initial assessment, complimentary to work ongoing in Open Networks, identified consumer benefits of up to £150M per year[12] from greater DER Visibility to NESO alone. To enable the transition to net zero by 2030 the GB electricity system and network operators need better visibility of distributed assets including consumer energy resources, and to enable them to be active market participants. DER visibility programme, a cross-industry initiative, will design and deliver data, standards, technology, policies and processes needed to deliver DER visibility across NESO and DNOs. This enables system operators to have the required visibility to plan, forecast, monitor, dispatch and settle DERs in flexibility markets.

2.4 Forecasting and modelling

Weather dependent generation, distributed flexibility and unpredictable small consumer flexibility means we need to improve our existing forecasting and modelling capabilities. Improving demand and generation forecasting and reliable forecasts of available flexibility from consumer and distribution connected assets. Our DER Visibility programme is looking at the required data and changes required for improved forecasting. The establishment of our RESP teams will coordinate data, planning and visibility in creating a “whole system” forecast.

12 neso.energy/document/250251/download

03 Policy

Cross-industry policies are important enablers to ensure consumers have the capabilities and opportunity to deliver flexibility to grid operators. To facilitate flexibility from consumers by 2030 and beyond, a foundation needs to be created.

3.1 Smart meters

Completing the rollout of smart meters and access to smart meter data is essential to enabling demand side flexibility in different markets, especially for the demand reduction necessary for net zero.

3.2 Smart appliances

Smart appliance regulations will allow the consumer to better understand and utilise their energy profile, building better opportunities for wider participation in flexibility markets. Hardware interoperability will ensure consumers are not restricted to one FSP. The Smart and Secure Electricity System Plan is an essential programme that aims to enable smart appliances.

3.3 Marketwide Half Hourly Settlement (MHHS)

Implementation of market-wide half hourly settlement is a key enabler of the move to a smarter, more flexible energy system. This is an essential enabler to allow flexibility in implicit markets.

3.4 Smart tariffs

Offering smart tariffs to consumers and effectively engage to increase their uptake is a key to growing demand side response. There are existing smart tariff offers from suppliers for EV charging. All suppliers will need to offer innovative tariffs or other retail offerings to enable the size of demand side response that is necessary for a net zero power system.

3.5 Investment policies

Investment policy reforms are needed to ensure the electrification of heat and transport scale up to the level needed for net zero and encourage investment in new assets such as batteries and consumer appliances.

3.6 Code reform

Code Reform is needed to ensure suppliers and aggregators compete on a level playing field.

04 Network access & charges

Increased demand side flexibility poses risks to the traditional distribution network planning approach of assuming diversity of demand, and consumers need equitable access to import and export onto the system.

4.1 Network access, connections and charging reform

Reform is needed to enable equitable consumer access to the electricity system, so that all consumers have fair access rights, and that they can benefit and be rewarded for being flexible.

05 Consumer engagement

Consumer flexibility and engagement will play a major role in maximising the value of flexibility in our net zero journey. NESO will support increased consumer engagement by working with flexibility service providers and consumer bodies and industry stakeholders.

5.1 Education and building trust

There is a need for increased consumer awareness to enable all types of consumers to benefit from a flexible energy system. Collaborations have already started to build trust on flexibility through customer activities. For example, NESO's DFS enabled access to additional flexibility when the national demand was at its highest over winter. Additionally, standards and regulations for all flexibility providers and load controllers need to ensure that standards are in place for consumers so that flexibility is inclusive, fair and transparent, with accountability. NESO has supported the HomeFLEX, Flex Assure and projects.

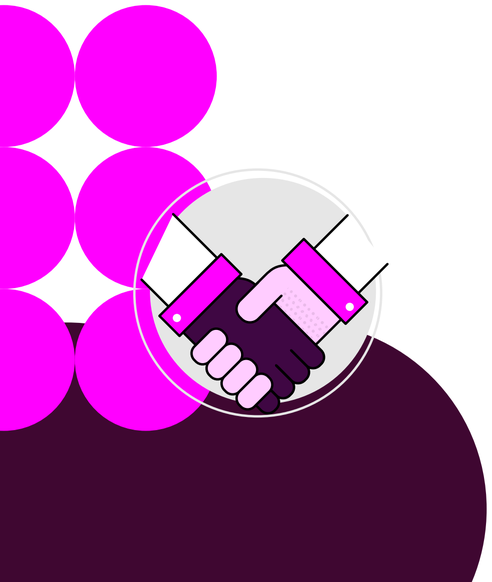
5.2 Consumer buy-in

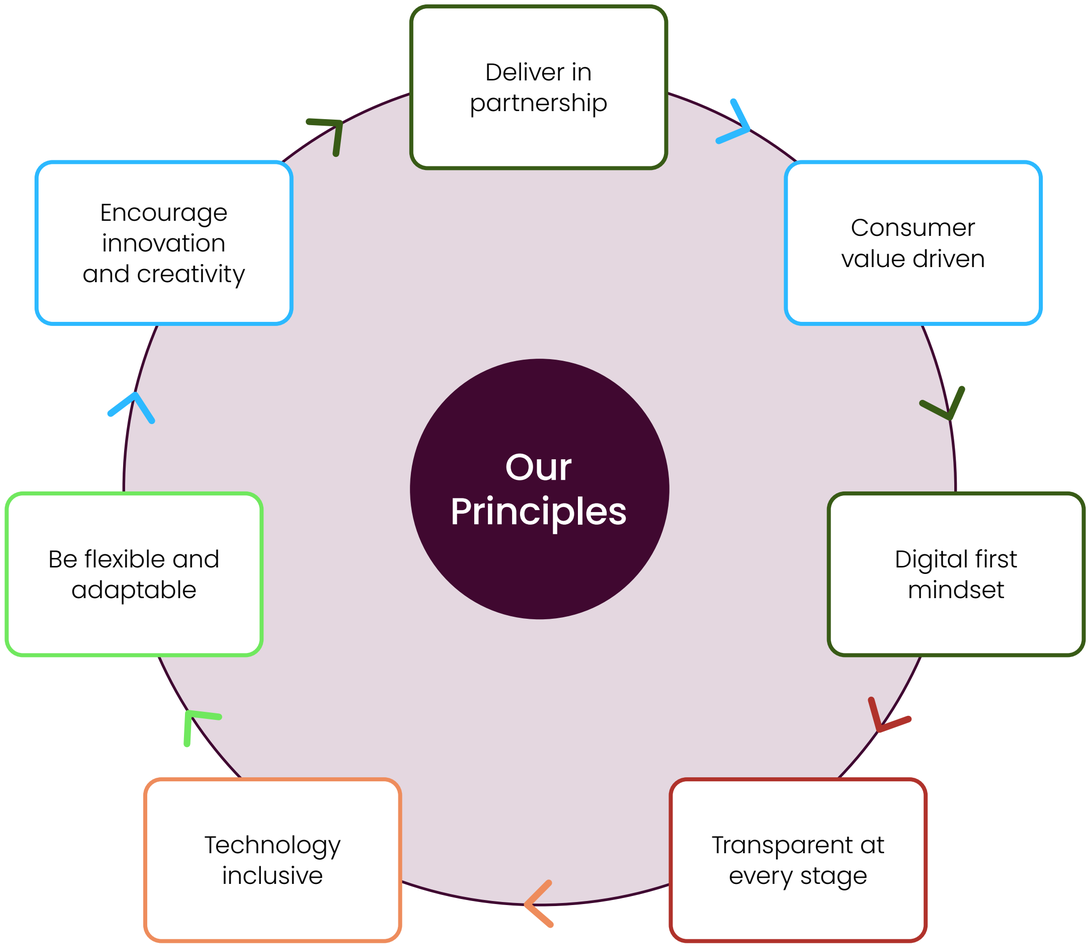
Work is required to help consumers understand net zero and the benefits to them, directly and indirectly, from engaging in more flexible energy use. We need to minimise the customer effort required to participate in flexibility initiatives, via smart meters, tariffs and services available. Consumers need simple solutions to providing (and withdrawing) consent to use their smart meter data and flexible assets. Additionally, load controller licencing and reforms of the retail market are required to encourage innovation and competition and protect vulnerable consumers.

Principles

We have adopted the following principles to form the foundation of a robust and forward-thinking approach to enable our demand side flexibility markets. As we accelerate towards a low-carbon, decentralised energy system, it is essential to create a framework that is both consumer-focused and adaptable to the rapidly evolving landscape.

These principles are designed to guide the development of markets which are efficient, transparent, and inclusive of diverse technologies.





Collaboration and **delivering in partnership** is key to unlocking the full potential of flexibility markets. By working in partnership with a broad range of stakeholders such as energy suppliers, regulators, FSPs, and local communities we can build an integrated ecosystem that maximises value for all.

At the core of this work is the goal of delivering tangible **benefits to consumers**. Whether it's through lower energy bills, enhanced energy security, or providing consumers with more control over their energy usage, consumer value, fairness and inclusion must guide decision-making. Flexibility services should be accessible, affordable, and understandable to all consumers, allowing them to participate in the journey to net zero.

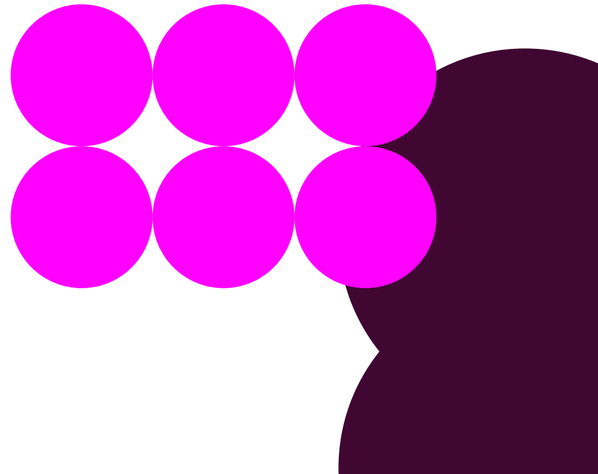
A **digital-first mindset** is essential to unlocking the potential of flexibility in energy markets. Embracing technologies such as smart meters, real-time data analytics and AI will allow efficient monitoring, management, and optimisation of energy systems. Digital infrastructure will streamline market participation by automating transactions, providing greater visibility into system needs, and enabling rapid decision-making. In a digital-first environment, consumers can more easily engage with flexibility services, while grid operators and energy suppliers can optimise grid performance, balancing supply and demand more effectively.

Transparency builds trust and confidence in the flexibility markets, ensuring that all participants understand how the system operates. It ensures that the value proposition of flexibility services is evident to consumers and businesses alike, reducing barriers to entry and encouraging wider participation. Additionally, transparency allows us to be more connected with our customers and showcase them how we use their feedback in our processes and work delivery.

The future of flexibility markets lies in being **technology-inclusive**, where all forms of technologies can participate and provide value. This inclusivity extends to technologies such as battery storage, electric vehicles, heat pumps, and decentralized renewable energy generation, enabling a broader range of assets to contribute to grid stability and flexibility. By remaining technology-agnostic, the markets can support innovation and allow for diverse solutions that meet different needs, encouraging competition and driving down costs.

In this rapidly changing landscape, our approach must itself be **flexible and adaptable**. Regulatory frameworks, markets structures, and technological advancements are continually evolving, and the flexibility markets must be agile enough to respond to these shifts.

To drive the next wave of energy solutions, it’s crucial to create an environment that **encourages innovation and creativity**. Flexibility markets should be designed to not only accommodate but also actively promote new ideas, business models, and technologies to all consumer types.



Summary of progress to date and next steps

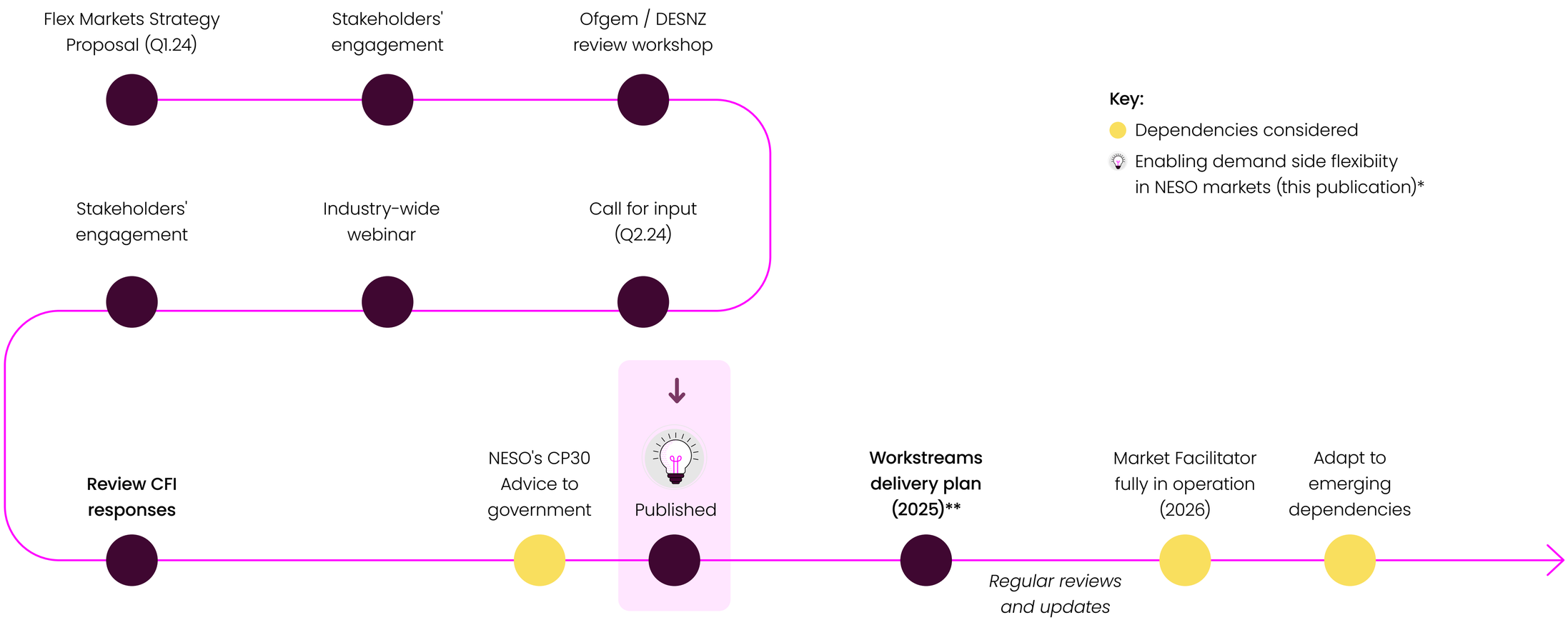
Firstly, we extend our sincere thanks to all the participants for taking the time to respond to our CFI. Your valuable feedback has been instrumental in shaping this work to align with industry needs. We have carefully incorporated your insights into this report.

Through this report and the Route to Market Review stage 1 & 2 reports,[13] our immediate goal is to establish a shared understanding of "what" and "why". However, we recognise the importance of addressing " when" "how" and "who" in the next phase.

To that end, our upcoming priority is to finalise the detailed plan for our workstreams and deliver the key actions outlined. Any outstanding feedback not addressed in this report will be incorporated into further phases of development.

The forthcoming Clean Power 2030 Action Plan to be published by DESNZ will set out the path to decarbonise the electricity grid. Our work will form one part of that bigger picture. NESO will continue to work closely with the government and Ofgem to deliver a joint and coherent view on flexibility for 2030 and beyond as you suggested in the Call for Input. We are committed to ensure this work evolves in line with the changing landscape such as CP30, REMA reforms, MF and MHHS implementation. To maintain transparency, we will regularly engage with stakeholders and provide progress updates via Power Responsive channel as well as annual summaries in the Markets Roadmap.

13 Stage 1 & Stage 2 reports



*Some of the elements of Enabling demand side flexibility in NESO markets and its implementation are dependent upon other organisations and external decisions. For example, the Market Facilitator and the government's decisions on CP2030.

**We will adopt an agile approach to planning.

NESO

National Energy
System Operator