

A landscape of a green field at sunset. The sun is low on the horizon, casting a warm glow. Several glowing green lines, representing energy or data, curve across the field from left to right. The field is lush and green, with some tracks visible in the distance.

Enabling the DSO transition

A consultation on the ESO's approach
to Distribution System Operation

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Foreword

The advancement of decentralised local markets for flexibility services is critical to the decarbonisation of the energy sector. These markets will only be enabled through the development of smart electricity distribution networks. Distribution System Operation (DSO) is the set of functions and services needed to run these future networks.

The transition to DSO will significantly affect traditional roles and responsibilities within the industry. This includes both the local Distribution Network Operators (DNOs) as well as Distributed Energy Resource (DER) service providers who are critical to the development of flexibility markets.

The transition will also impact the ESO and we need to ensure that our roles and responsibilities develop in co-ordination with DSO. This consultation provides our proposed high level approach for how we can support the DSO transition and our draft 2025 vision of a successful outcome. We would welcome your feedback on this consultation to inform how we can help you facilitate the DSO transition.



Julian Leslie
Head of Networks,
Electricity System Operator

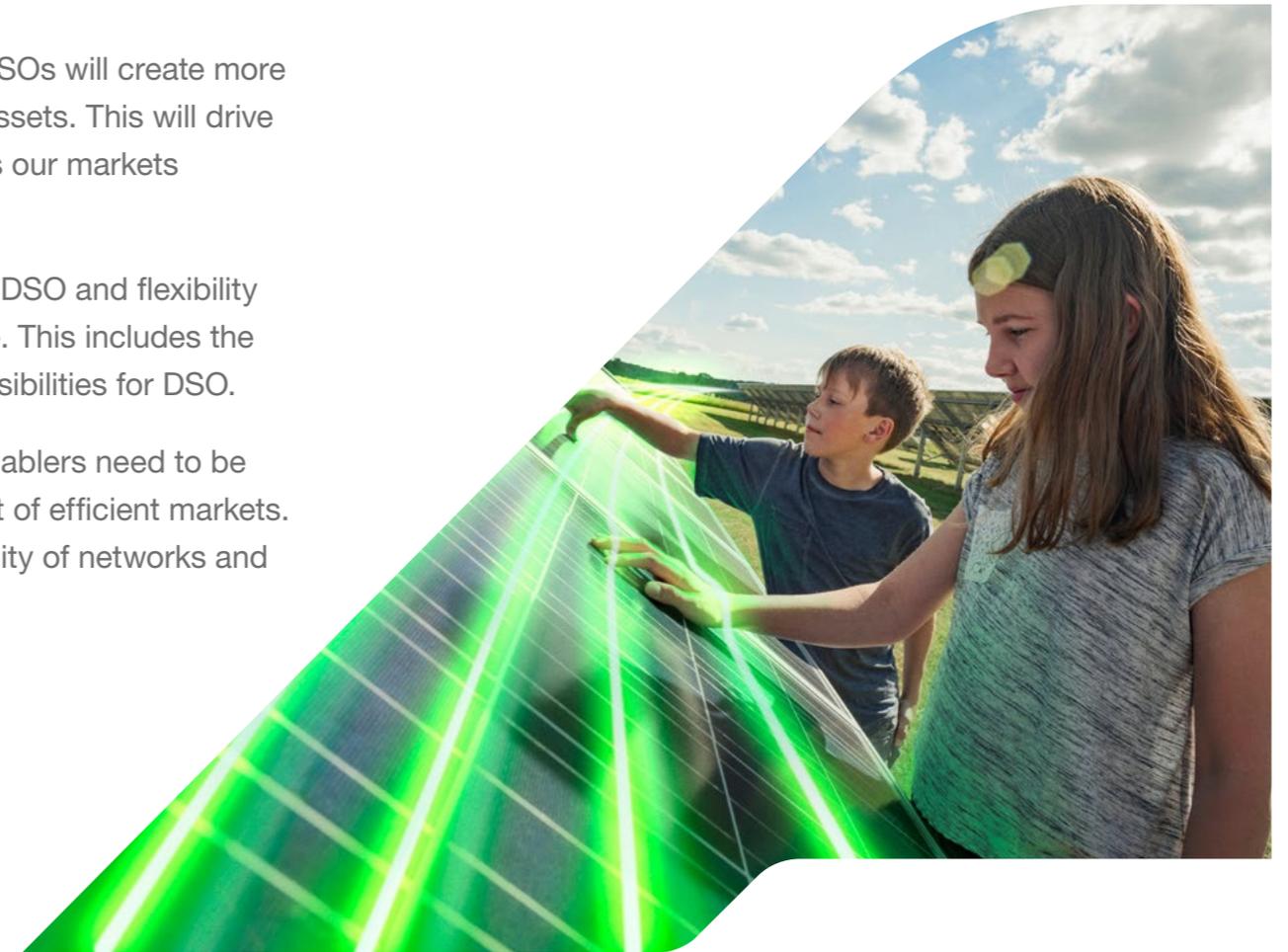


The ESO's principles to enable the DSO transition

The ESO is already actively supporting the DSO transition through participation in forums such as the ENA Open Networks project and trail blazing initiatives such as the Regional Development Programmes.

However, we recognise we need to do more to drive successful transition for DSO. We recognise that having a shared and aligned strategic view on a future state is essential with stakeholders, particularly with DNOs and Ofgem. We have therefore developed the following principles in our approach to the DSO transition;

- The ESO does not have any ambition to be a DSO.
- We believe our existing roles need to evolve to co-ordinate more strongly with DSOs across markets, system operations and our network development processes to enable enhanced outcomes for consumers.
- The efficient operation of DSO markets will help the achievement of net zero. Whole system operations and co-ordinated decisions across markets will provide strong value to consumers through efficient coordinated decisions.
- We believe that the establishment of DSOs will create more commercial opportunities for flexible assets. This will drive both efficiency and competition across our markets and system operations.
- Consistent and aligned approaches to DSO and flexibility markets are needed wherever possible. This includes the development of clear roles and responsibilities for DSO.
- Innovative business and technology enablers need to be embraced to facilitate the development of efficient markets. This includes greater operational visibility of networks and the connected parties.



Our proposed 2025 vision

In 2018 the ENA Open Networks project¹ defined system co-ordination as one of the critical functions of DSO. We agree that the need for system co-ordination is inherent in the roles of all system operators. We have considered how the ESO and DSO co-ordinate today and how co-ordination could work in the future to develop a proposed 2025 vision.

We already co-ordinate with DNOs across many of our functions. We believe that to enable the DSO transition, the ESO will need to extend these relationships and create new co-ordinating functions with DNOs.

Ofgem's DSO model² introduced three roles for DSO. These have broad alignment with the three ESO roles in the areas of development, markets, and operations. We believe that co-ordination will be needed across all three areas and that there will be multiple interactions. Our current thinking is shown in the diagram right.

In this section we present our high level 2025 visions of how we believe we will be working with DNOs in each of the above areas. We also introduce the 10 co-ordinating functions between ESO and DSO where we believe that we will either need to deepen our co-ordination with DSOs or develop new areas of co-ordination and alignment.

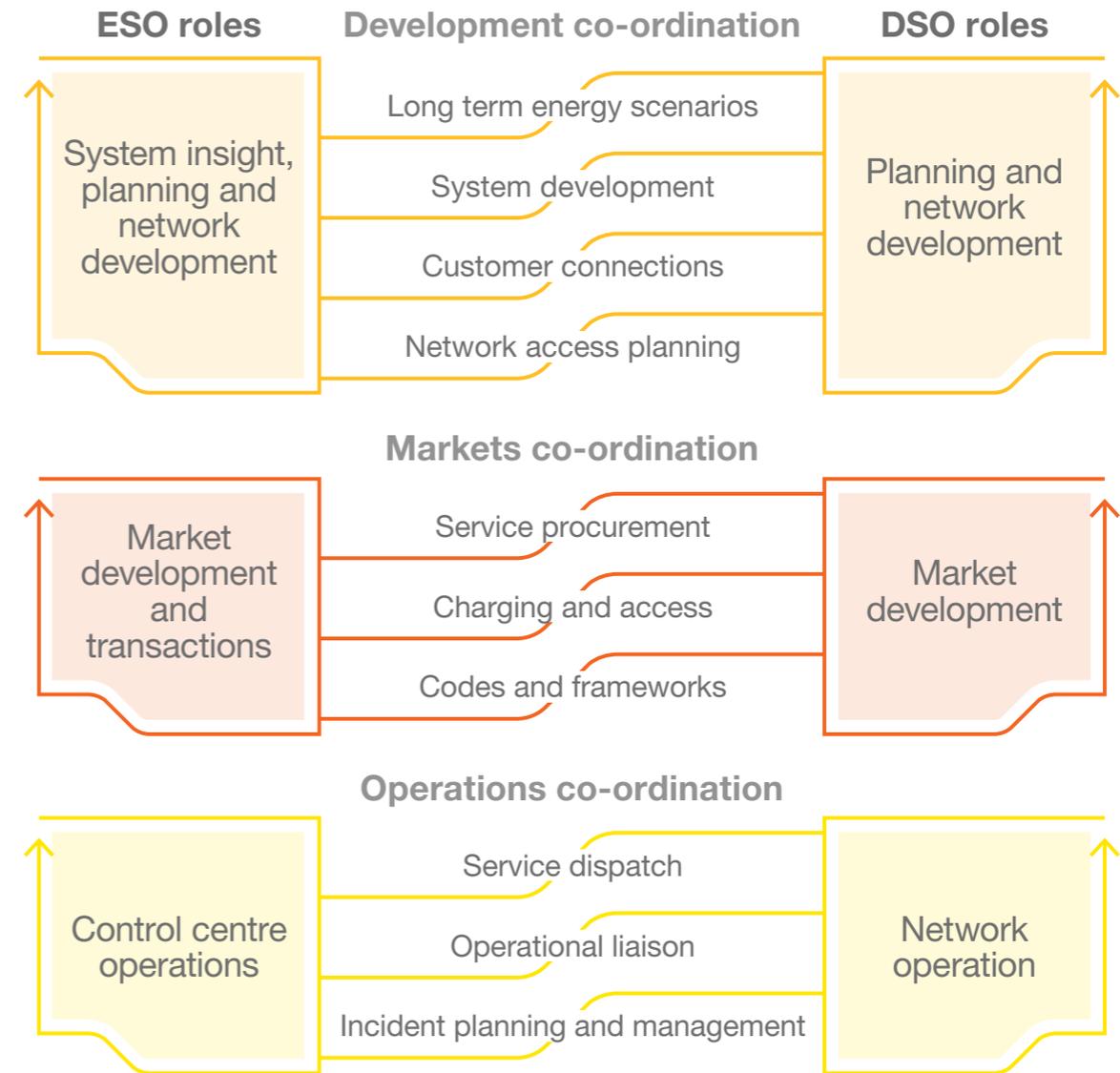


Figure 1 Co-ordination between ESO and DSO roles

¹ Open Networks (energynetworks.org)
² RIIO-ED2 Methodology Decision: Overview (ofgem.gov.uk)

Our proposed 2025 vision

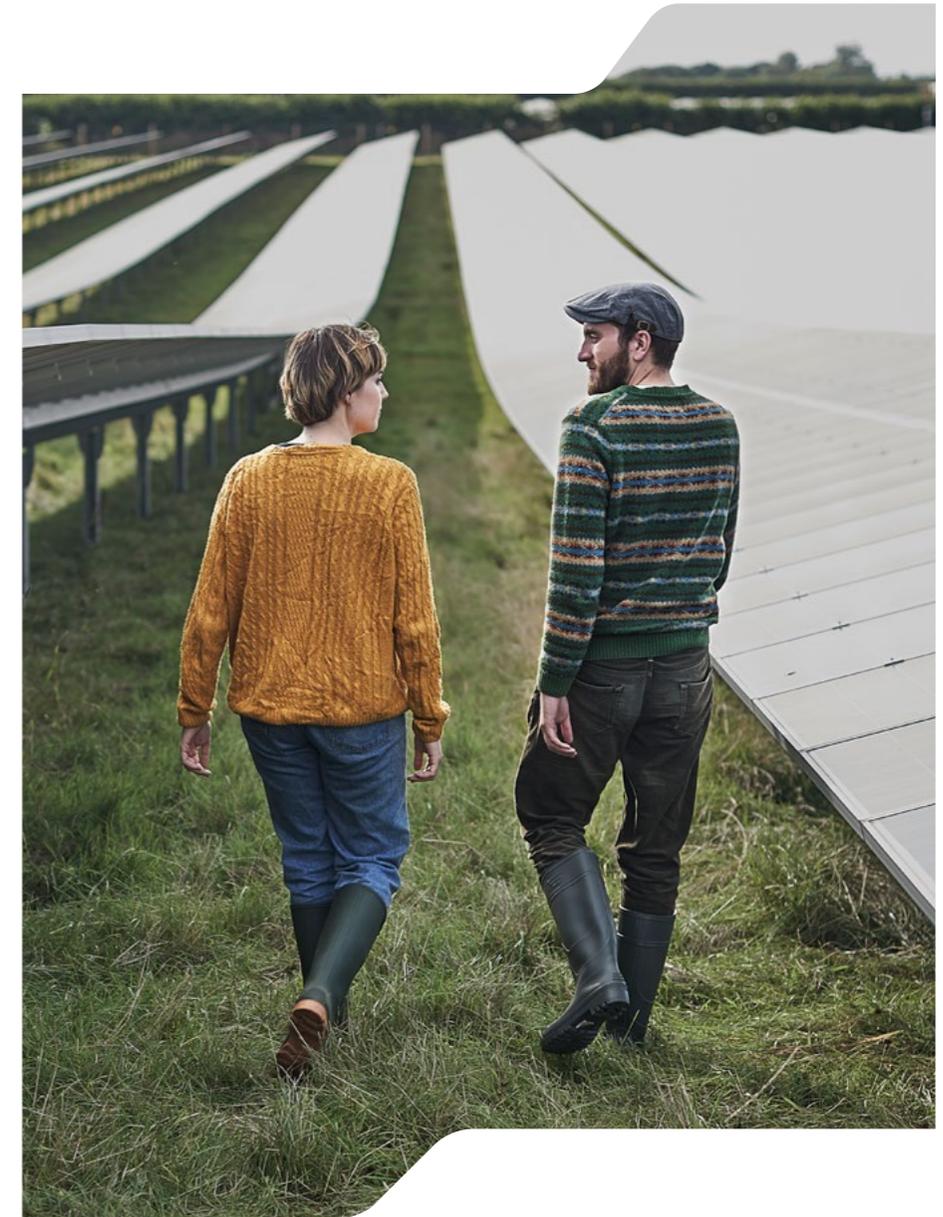
Development

How we work with DSOs today; This area covers the longer term needs of the system including the potential for flexibility services. In our respective development roles both ESO and DSO are considering the development and planning of their systems. In many areas we already have established co-ordinating activities which span timescales from days in advance to many years. Some of these areas have already seen significant change as part of the transition to DSO, for example the development of Distribution Future Energy Scenarios (DFES).

How we believe we will be working with DSOs in 2025; By 2025 we believe that the level of co-ordination needed between ESO and DSO will have evolved to manage a more decentralised grid. Underlying this will potentially be greater availability of data in common formats that could allow the derivation of greater insights. We believe that many of the existing ESO and DSO documents will remain (e.g. Future Energy Scenarios, Electricity Ten Year Statement, Long Term Development Statement and Network Development Plan) and there will likely be greater co-ordination and sharing of insights.

Co-ordinating functions;

- **Long term energy scenarios** - Long term energy scenarios are produced by network entities to show long term trends in energy production and consumption. They are used to inform long term planning processes and there is currently some degree of co-ordination in their development.
- **System development** - The ESO co-ordinates future development needs, particularly on a regional basis, with local DSOs. Similarly, DSOs share their demand projections allowing efficient development of the transmission system.
- **Customer connections** - DER connections applications to distribution networks may trigger works on the transmission system and similarly transmission connections can have a distribution impact. Co-ordination therefore takes place to ensure connection requirements are devised in a co-ordinated manner.
- **Network access planning** - Operational activities on a network will affect adjacent networks and therefore need to be planned to ensure co-ordinated outcomes at least cost to the consumer.



Our proposed 2025 vision

Markets

How we work with DSOs today; Today, both the ESO and all six DNOs through their DSO service procurement role are actively buying services to meet transmission and distribution system needs respectively. The ENA Open Networks project has developed four standardised DSO active power services which are being procured in growing volumes. Frameworks have generally been developed as either applicable to transmission or distribution systems and there remains separate charging and access methodologies and philosophies in place.

How we believe we will be working with DSOs in 2025; By 2025 we believe that local DSO markets for voltage control, thermal constraint management and system restoration will be established in all DNO regions across GB. This will require co-ordination and alignment between us and DSOs to ensure optimal outcomes for markets. We believe that frameworks may have begun to become more greatly co-ordinated through initiatives such as the whole system Grid Code. New initiatives in areas such as network charging may also have begun.

Co-ordinating functions;

- **Service procurement** - The ESO procures services from DER for transmission system needs and DSOs procure services for distribution system needs. The co-ordination of these activities is being driven through Open Networks and initiatives such as Regional Development Programmes (RDPs)³.
- **Charging and access** - Separate transmission and distribution charging methodologies reside within the CUSC and DCUSA codes respectively. Payment of charges allows users to continue to have commercial access to networks.
- **Codes and frameworks** - Codes and frameworks govern the activities undertaken by the ESO and DSOs and their co-ordination. The ESO is code administrator for the CUSC, Grid Code and STC.



Our proposed 2025 vision

Operations

How we work with DSOs today; There is already significant operational liaison between ESO and DSO control rooms both to manage real time operations and also plan contingencies in the event of a system incident. This is predominately focused on the operation of networks and is generally technical co-ordination. Additionally the ESO dispatches energy resource, including DER, to manage a variety of real time system conditions. Increasingly DSOs are undertaking similar activities to manage their respective network needs.

How we believe we will be working with DSOs in 2025;

By 2025 we believe that DER could make up a larger slice of the energy mix both for the balancing of energy and also for the provision of other system services. There will likely be a greater need for operational co-ordination between ESO and DSO. Underpinning this will be a significant increase in the volume of real time data exchanged between control centres. We believe that developing consistent approaches will be key to efficient dispatch acknowledging that there may be differences in communications interfaces.

Co-ordinating functions;

- **Service dispatch** - The ESO dispatches energy resource, including DER, to manage real time system conditions. Increasingly DSOs are undertaking similar activities which need to be standardised and co-ordinated.
- **Operational liaison** - ESO and DSO control centres need to interact and co-ordinate to ensure continued system operability. This includes the transfer of data in real time.
- **Incident planning and management** - ESO and DSO control centres need to ensure a co-ordinated response to any system incident. Contingency plans need to be agreed in advance to facilitate timely system restoration.

Building a more detailed vision

This high level vision provides an overview of how we believe we need to be working with DNOs in 2025. It is recognised that further DSO developments will occur beyond 2025 with these snapshots providing a foundation to work towards in the medium term.

In Annex 1 we propose a detailed vision for each co-ordinating function in 2025. We are interested in stakeholder views both to our proposed high level vision and also the more detailed visions presented in [Annex 1](#).

Accompanying this vision are proposed perspectives of both DSOs⁴ and service providers. These are included to provide added context of our 2025 vision and we welcome feedback. We recognise that we are neither a DSO or service provider so have sought feedback from relevant stakeholders in preparing this material. We thank those stakeholders for their support in developing these perspectives so far.

4 For the purposes of this paper we refer our co-ordination with the Distribution System Operator recognising this is part of an overall DNO/DSO entity.

Developing a programme of works to meet this vision

Your feedback will help us understand what you see the ESO's role being in 2025 for each of the 10 co-ordinating functions. This will allow us to develop a programme of work to ensure the ESO can support the DSO transition.

We believe that we are already undertaking many of the required activities both through our involvement in the ENA Open Networks project and also through our existing ESO Business Plan activities in the period 2021-23⁵. We have listed the most significant activities for each co-ordinating function in [Annex 1](#). However we recognise that there may be more that needs to be done particularly in the period 2023-25 (also referred to as 'BP2').

It is critical that our activities co-ordinate and align with other industry initiatives. We will ensure that the work undertaken through Open Networks, as referenced in their updated DSO implementation plan, will be included.

We will work with the DNOs to ensure that our programme of works is aligned with the DNO's proposals for RIIO-ED2. Ultimately, as appropriate, this will feed into our own business planning proposals for the period 2023-25.

Following this consultation, we will provide an update to our work later in the year summarising comments received and updating our approach and vision as appropriate. We will use this revised approach and vision to develop relevant activities within our BP2 business plan as well as using the feedback to inform DNO RIIO-ED2 business planning. The proposed timeline for our next steps is shown ([Fig 2](#)).

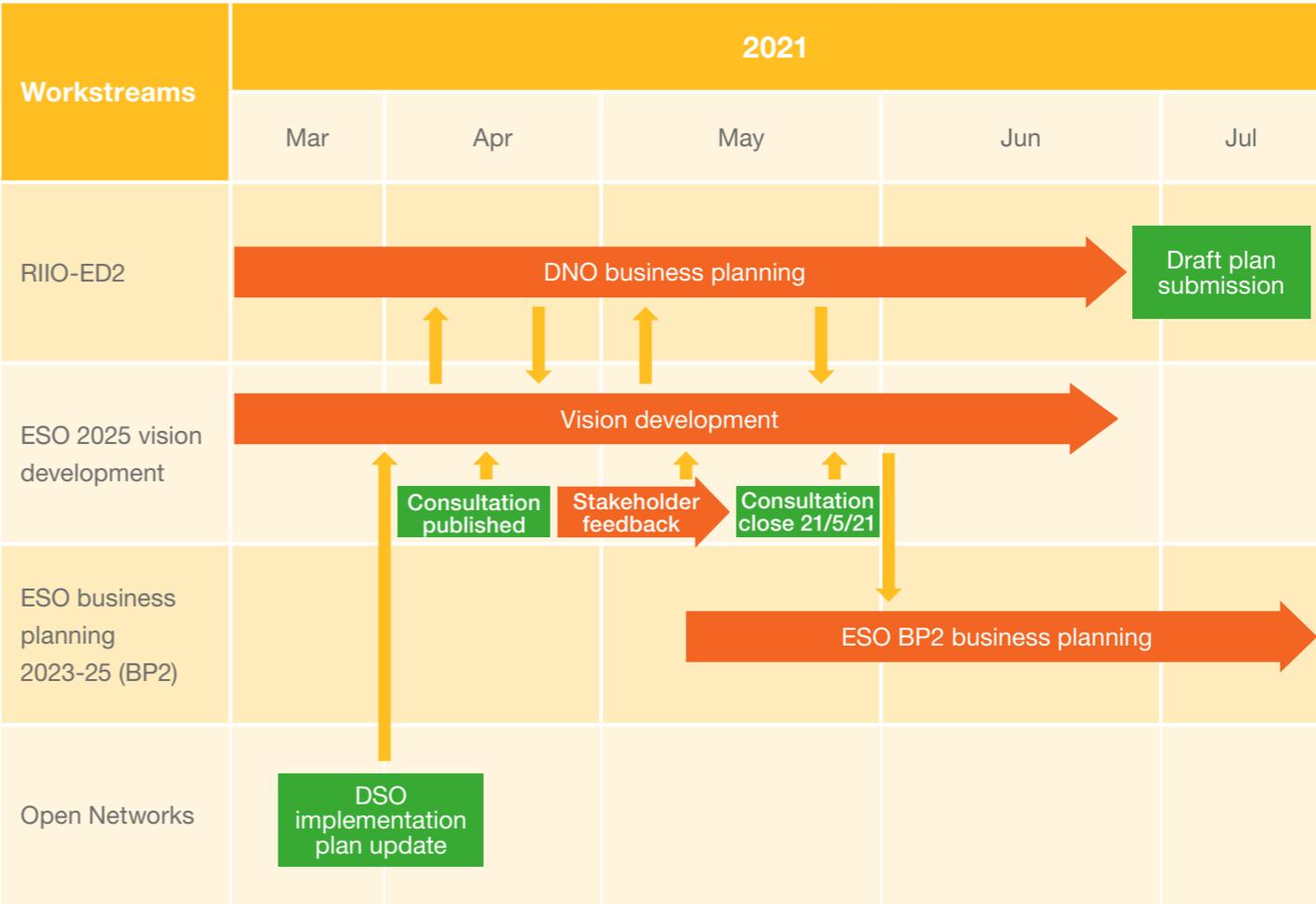


Figure 2 Timeline for proposed next steps

5 For more information please refer to our RIIO-2 Business Plan: nationalgrideso.com/our-strategy/riio/riio-2-final-business-plan

Responding to this consultation

We welcome your views on the ESO's approach to facilitate the DSO transition and have provided specific consultation questions on the right. Views received by 21 May 2021 will be used to inform the development of our vision and strategy as well as our draft programme of works. This will then be subject to further consultation. Responses can be provided to; box.WholeElectricitySystem@nationalgrideso.com



Consultation questions

1. The ESO's principles to enable the DSO transition.

- Do you support our proposed principles and approach to the DSO transition?

2. Our proposed 2025 vision

- Do you agree with our proposed high level vision?
- Do you have any comments on our proposed high level vision?
- Do you believe that there are any further co-ordinating functions between ESO and DSO that we should be considering?
- Do you have any comments on the draft vision for each of the 10 co-ordinating functions as described in Annex 1?
- What additional activities do you believe the ESO needs to undertake to facilitate our 2025 vision?

3. Proposed next steps

- Do you support our proposed next steps?
- Is there anything more you believe we should be doing to facilitate the DSO transition?

A landscape photograph featuring snow-capped mountains under a cloudy sky. In the foreground, several bright, glowing orange lines curve across a valley, suggesting energy or data flow. The lines are thick and have a soft glow, curving from the left towards the right and then back towards the left in a series of parallel paths.

Annex 1 - Proposed visions for each co-ordinating function

1. Long term energy scenarios

Context

Long term energy scenarios are produced by network entities to show long term trends in energy production and consumption. They are used to inform long term planning processes and there is currently some degree of co-ordination in their development.

Our proposed 2025 vision

It is expected that DSOs will produce standardised Distribution Future Energy Scenarios (DFES) documents annually and to a common standard, including data availability. These would feed into DSO development activities including their Long Term Development Statements and Network Development Plans.

We believe that Future Energy Scenarios (FES) will remain a separate activity to DFES with its own documents. However there would be a clearer process for insights exchange with the DSOs to inform both FES and DFES. Key to this may be greater exchange of standardised data allowing the FES to build on the more detailed regional insights potentially gathered by DSOs in their work with Local Authorities.

What could this mean for a DSO?

We believe that DSOs would use the national FES in developing the DFES publication in their licence areas. The DFES could provide more detailed insights about regional needs than may be provided by a national publication. Through their relationships with local stakeholders, DSOs may be able to enrich the FES insights for the communities they serve. This could benefit the GB FES as the ESO team would account for DSO insights and utilise them in the development of future FES as well as providing further valued industry insights. This would result in the development of joined up scenarios.

What could this mean for a DER service provider?

DER may use the DFES to understand the drivers for network changes in their area and would welcome regular opportunities to provide feedback to both the ESO and DSO as they produce these documents. Service providers may also appreciate standardisation throughout the documents which would ensure they were accessible to a wide range of stakeholders.

Current planned activities

ESO business plan

- Working with DNOs to understand what information we need to share to support development of DFES and ED2 submissions.
- Developing a new energy demand model, which will bring together all energy demand data in one place.
- The new energy demand model which will facilitate development of regional FES.

2021 Open Networks project

- Support further alignment and development of various Future Energy Scenarios (WS1B P2).
- Support network led data alignment for co-ordinated gathering of regional data (WS4 P3).

2. System development

Context

The ESO co-ordinates future development needs, particularly on a regional basis, with local DSOs. Similarly, DSOs share their demand projections allowing efficient development of the transmission system.

Our proposed 2025 vision

We believe that there will be separate processes for Network Options Assessment (NOA) and distribution equivalents, with co-ordination mechanisms and increased data sharing in place to deliver secure networks that enables the energy transition and provides the lowest cost solutions for consumers. We would work with the DSOs to develop their equivalents of the NOA process and make sure any insights from their development work are considered in future NOA development.

DSOs may also be able to provide distribution solutions for transmission system needs through the NOA and pathfinder projects. They would also support the technical assessment of distribution system solutions for transmission system needs. Appropriate processes would need to be in place to manage any perceived conflict of interest in these activities and appropriate flow of revenue.

Similar to FES above, the Electricity Ten Year Statement (ETYS) would continue to be an ESO publication but would need greater alignment and data exchange with major DSO development products including the Network Development Plans and Long Term Development Statements. Data would be required in a standard format to facilitate interoperability.

System needs at the transmission - distribution interface would be identified through the DSO produced Network Development Plans (NDP). This would allow us to proactively plan for any needs in the future, rather than rely on connection applications from DSOs. They would also support timely development of Regional Development Programmes and for DSOs to develop local flexibility markets.

CBA assessments would be conducted relevant to the size and complexity of the problem. The NOA would be used for large scale transmission requirements with the Open Networks Common Evaluation Methodology⁶ used for more granular problems at distribution and transmission.

What could this mean for a DSO?

Through the NOA process and associated pathfinders, DSOs may clearly see commercial opportunities for distribution solutions to transmission system needs and the ESO would provide support for any proposal submitted. DSOs would work closely with the ESO to ensure that their roles in assessing third party proposals to meet transmission system needs are clearly delineated from these activities providing assurance to both the regulator and commercial entities.

Through the Network Development Process DSOs would identify capacity shortages on the distribution network and proactively forecast impacts of such shortages across the transmission - distribution interface. This would allow DSOs to work with the ESO and local Transmission Owner (TO) to develop innovative whole system solutions which would include, but not be limited to, the development of co-ordinated markets for flexibility services.

2. System development

What could this mean for a DER service provider?

DER service providers would use ESO and DSO publications like the NOA and NDPs to identify commercial opportunities for solutions to transmission system needs, whether using their existing or new assets connected to the distribution network. The ESO and DSO would provide support for any proposals submitted. DER service providers would understand network owners' roles in assessing third party proposals with clear delineation from other commercial endeavours. They would be reassured that sufficient network information is shared to ensure a level playing field and enable the identification of solutions that deliver maximum consumer benefit.

The ESO and DSO would publish information to help DER service providers understand the drivers for and evolution of system needs to support participation in co-ordinated markets for flexibility services.

Current planned activities

ESO business plan

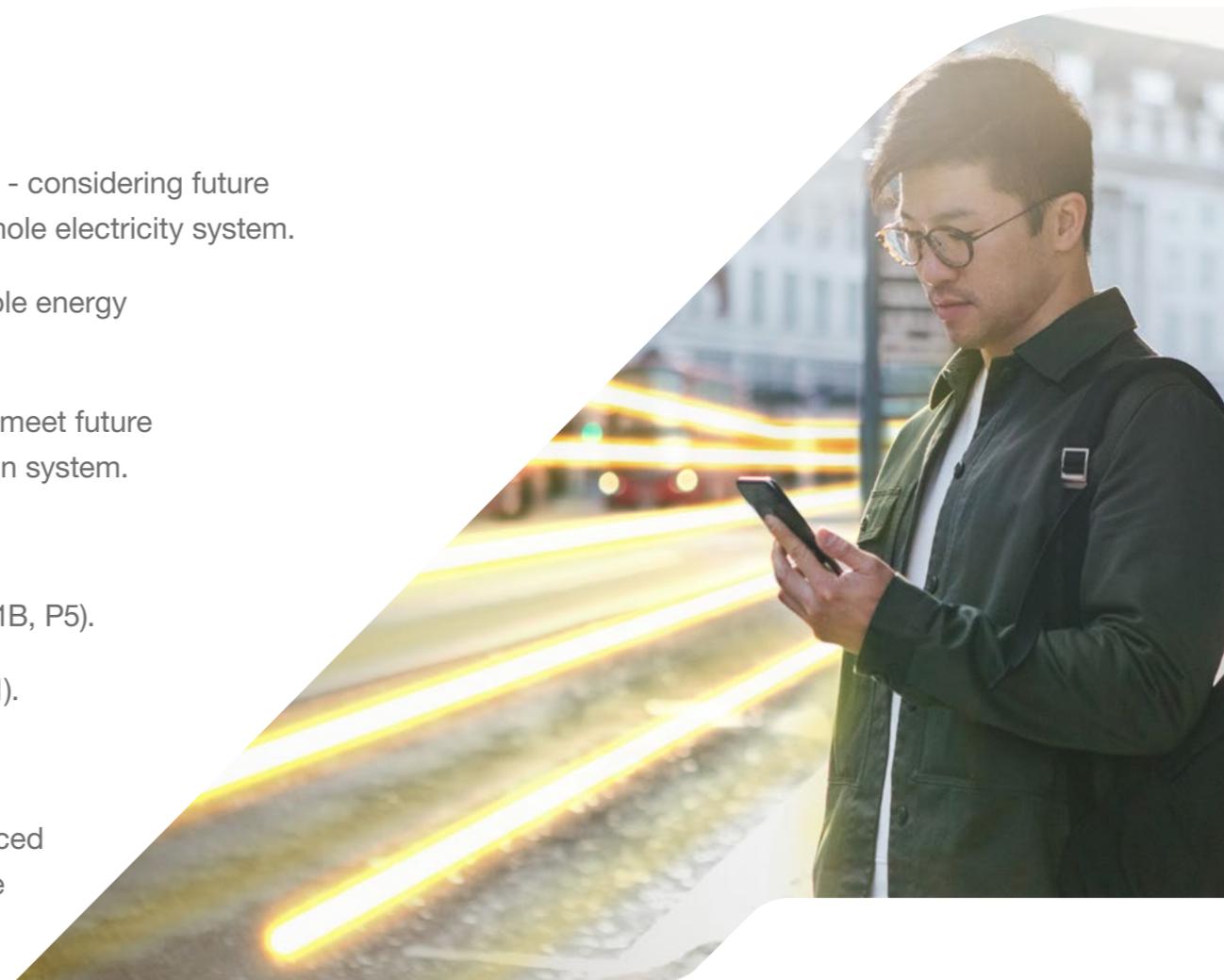
- NOA experience shared with DNOs.
- Regional Development Programmes - considering future regional design needs across the whole electricity system.
- Trial new innovation projects for whole energy system operability.
- Pathfinders - broadening options to meet future operability needs on the transmission system.

Open Networks project

- Network Development process (WS1B, P5).
- Whole energy system CBA (WS4, P1).

Other

- Grid Code proposal GC139 - Enhanced Planning Data Exchange to Facilitate Whole System Planning.



3. Customer connections

Context

DER connections applications to distribution networks may trigger works on the transmission system and similarly transmission connections can have a distribution impact. Collaboration therefore takes place to ensure connection requirements are devised in a co-ordinated manner.

Our proposed 2025 vision

We believe that the volume of new DER applications connecting to distribution networks will continue to increase. This will mean an increasing need to co-ordinate new connections with transmission. Building on work such as Appendix G & Transmission Impact Assessment, we believe that further evolution may be needed to assess whole system impacts on a regional basis. Consequently we may also need to spend more time supporting DER applications that have a transmission system impact to ensure their connections are facilitated as quickly as possible.

Whilst separate processes for the connection of customers to transmission and distribution networks will likely remain these would need to be consistent and easy for applicants to navigate. We would work closely with DSOs to provide co-ordinated information which we will share through our website and other appropriate channels. This could include information on future operability needs allowing DER service providers to understand locations that could provide the most value.

What could this mean for a DSO?

Whilst an increasing proportion of connection applications may cause potential impacts on the transmission system a more proactive system development process would help to identify these in advance. DSOs would work closely with their ESO counterparts to give customers a co-ordinated experience that looks to get them connected at least cost and as quickly as possible.

What could this mean for a DER service provider?

DER service providers would clearly understand the connections applications process and the flow of information between the DSO and ESO required to enable connection to the distribution network. They would have confidence that their connection would be delivered as quickly as possible and at least cost.

DER service providers would be able to attend virtual 'whole system' connections seminars and this, along with other improvements such as dedicated account managers and improved support material would mean that their needs would be met and they would receive a high standard of customer service. They would be able to see future service opportunities in advance of connection to inform their siting decisions.

3. Customer connections

Current planned activities

ESO business plan

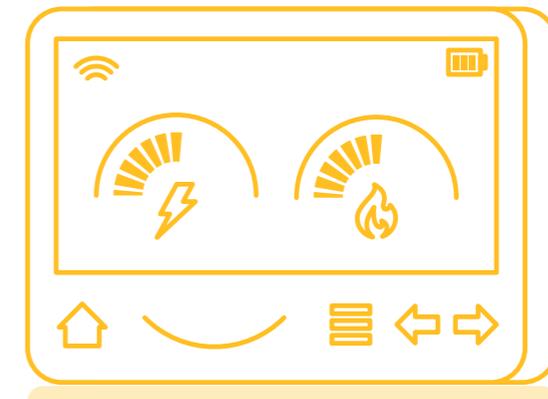
- Establish dedicated DER account management function. This is to support smaller parties who may have transmission related issues with their connection applications.
- Whole electricity system connections seminars which will incorporate DNO input in addition to existing involvement from the TOs to the customer seminars that we already offer to customers.
- ESO connections hub, including online account management and integration with other network organisation websites.
- Regional Development Programmes - developing market based solutions to facilitate the connection of DER.

2021 Open Networks project

- Embedded Capacity Register (WS2, P1).
- Queue management (WS2, P2).
- Interactivity (WS2, P3).

Other

- CUSC modification proposal CMP328 - Connections Triggering Distribution Impact Assessment.
- CUSC modification proposal CMP298 - Updating the Statement of Works process to facilitate aggregated assessment of relevant and collectively relevant embedded generation.



4. Network access planning

Context

Operational activities on a network will affect adjacent networks and therefore need to be planned to ensure co-ordinated outcomes at least cost to the consumer.

Our proposed 2025 vision

Distribution networks may become more active with greater volumes of DER connected. In this future, DSOs would be managing these networks using flexibility services and smart grid technologies. This would significantly increase the range of operational actions available to DSO access planners who would be able to manage their networks more intensively than before. The ESO would need to work with the DSO access planners to understand their plans and proposals and the impact of their activities on the transmission system.

We would work together to ensure that decisions taken in access planning are made on a whole system basis to deliver overall value to the end consumer.

We would also be procuring greater volumes of DER services to help manage transmission system needs. We would need to communicate and co-ordinate our plans with the DSO access planners to allow them to understand the impact on their networks and make optimal decisions. Greater visibility of DER and their connectivity within distribution networks would be needed to support efficient procurement decisions.

We would also need to explore potential options DSOs may have to mitigate congestion costs associated with transmission system outages, particularly across the transmission - distribution interface. The development of a process like the Network Access Policy⁷ at a transmission level could support this, but we need to reflect the difference in roles of a TO as an asset owner from that of a DSO. Appropriate processes would need to be in place to manage any perceived conflicts of interest when these options are considered alongside the use of flexibility services.

What could this mean for a DSO?

DSOs would work closely with the transmission access planners to develop co-ordinated plans. Central to this relationship would be the sharing of information and the co-creation of operational strategies. Together, DSO and ESO would work out the best way to operate networks. If the support of third party service providers was needed it would be done in co-ordination, ensuring the greatest value for the end consumer.

The DSO would be able to develop innovative ideas to reduce that impact of transmission outages on their customers. If the ESO believes they have value, they would be willing to contribute towards the costs.

⁷ The Network Access Policy facilitates transmission owners recovering additional costs associated with modifying their network access requirements to reduce transmission system operating costs.

4. Network access planning

What could this mean for a DER service provider?

The DER service provider would understand the impacts of transmission network planned outages on their operations and would have confidence that the ESO and DSO are working together to minimise impacts. Service providers would be able to offer up potential services to the ESO and/or DSO to help facilitate system outages at lower cost to the consumer. This would provide a new potential revenue opportunity for their organisations whilst maximising consumer benefit.

Current planned activities

ESO business plan

- Closer working relationships with DNOs and DER to enhance co-ordination of system access.
- Delivery of enhancements to outage notifications, to stimulate flexibility markets as an additional tool for efficient outage management.
- Data & Analytics platform - major upgrades to our offline modelling tools, which will allow us to model a more complex system.

2021 Open Networks project

- Develop conflict management and co-optimisation techniques (WS1A, P5).



5. Service procurement

Context

The ESO procures services from DER for transmission system needs and DSOs procure services for distribution system needs. The co-ordination of these activities is being driven through Open Networks and initiatives such as Regional Development Programmes.

Our proposed 2025 vision

In 2025 local DSO markets for voltage control, thermal and restoration may exist in all Grid Supply Point (GSP) groups at different levels of maturity. Building on the work ongoing through Open Networks DSOs will use common procurement methodologies and technical specifications for these services. The ESO's emerging and existing markets for these services would align with these technical specifications to make participation decisions easier for providers. Similar products, ones where an ESO and DSO contract could not be "stacked" together in the same delivery period by a provider and are meeting the same system need, would be procured in synchronised procurement rounds. The contract durations for these similar products may need to be identical, as far as is practicable, to support matching procurement cycles.

Consistent service framework agreements will have been developed in conjunction with DSOs through Open Networks to ensure all providers can participate in their local or the national market as per their assessment of the commercial incentives, whilst avoiding any conflicts of provision between products. Flexibility tender results and market metrics would be published on data portals using a consistent format between ESO and DSO. This would support entry into multiple markets (both transmission and distribution) and increase transparency. The ESO and DSOs would be proactively working with third party innovators to maximise market efficiencies where possible.

The ESO would continue to procure national response and reserve services with markets open to all providers above 1MW and smaller parties via third party aggregators or Virtual Lead Parties (VLP). The ESO would be procuring a bigger proportion of its national level services from DER (including Demand Side Flexibility) compared to today and visibility of potential service providers would be key to both ESO and DSO. The ESO would be procuring services either directly from DER or a commercial agent.

What could this mean for a DSO?

The DSO would be regularly procuring flexibility services to meet distribution system needs. These flexibility services would have common technical requirements and procurement methodologies across all DSOs as developed through the ENA's Open Networks project. ESO services would be standardised against these requirements. DSOs would have clear visibility of the timing of ESO procurement rounds and be involved in the development of any new services.

5. Service procurement

What could this mean for a DER service provider

DER service providers would have clear visibility of ESO and DSO procurement rounds for flexibility services and their co-ordinated scheduling would allow potential participation in multiple flexibility markets. DER service providers would understand the technical requirements for participation and may have inputted into their development through ENA Open Network's consultations. DER service providers would have the opportunity to be involved in the development of any new services recognising that the ESO and DSO are taking a whole systems approach to service development.

DER service providers would be able to stack contracts from different markets where this provides value to the end consumer and is technically feasible. The ESO and DSO would work together to ensure that exclusivity restrictions are well-considered and updated as the energy landscape evolves.

Consistent framework agreements would simplify participation in markets for both transmission and distribution system needs.

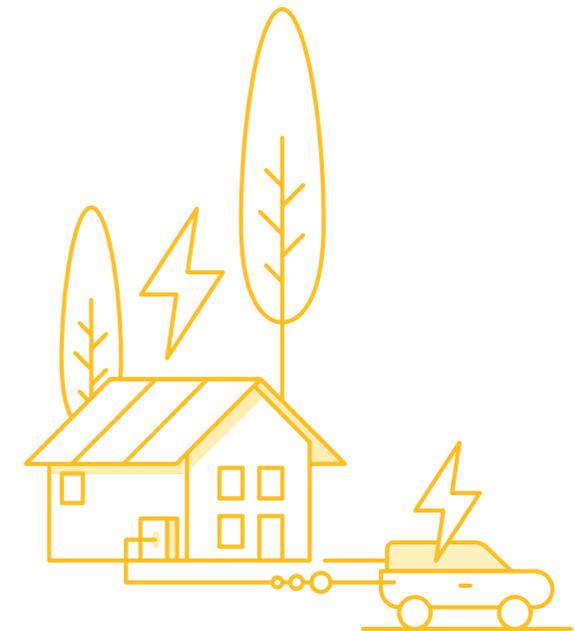
Current planned activities

ESO business plan

- Provision of enhanced data to provide greater clarity and consistent information about the individual actions taken.
- A market platform through which market participants will be able to participate in balancing and capacity markets.
- Common standards, including interoperable systems, a common data model and shared minimum specifications between ESO and other flexibility platforms as well as at the distribution level.
- Development of competitive approaches to procurement of reactive power.
- Regional Development Programmes - co-ordinated procurement of constraint management services with DNOs and service providers.

2021 Open Networks project

- ESO-DSO flexibility services tendering and procurement timescales alignment (WS1A, P2).
- ESO-DSO flexibility services contract alignment (WS1A, P4).



6. Charging and access

Context

Separate transmission and distribution charging methodologies reside within the CUSC and DCUSA codes respectively. Payment of charges allows users to continue to have commercial access to networks.

Our proposed 2025 vision

We believe that a review may have commenced to consider how the signals from network charges and electricity markets (wholesale, ancillary services, Capacity Market (CM) and Balancing Mechanism (BM)) can complement one another. This review could inform further work to potentially align network charging methodologies (DUoS and TNUoS). Revenues associated with DSO costs could have grown significantly and the review may also consider the need for more mature mechanisms for charging of these costs.

Aligned charging methodologies may simplify charging arrangements and reduce the complexity of the commercial codes. This could make the energy industry more accessible for new entrants many of whom may be small players.

ESO and DSOs would be working together to develop whole system solutions to manage network constraints which would

enable export/import access for distributed generation (DG). Building the capability of DG to participate in system service markets would support the maturity of regional DSO service markets.

What could this mean for a DSO?

The Access and Forward Looking Charges Significant Code Review would have concluded and DSOs may be implementing an Ofgem directed solution for DUoS charging reform in combination with the ESO and ELEXON where applicable. DSOs may be involved in work to consider the benefits and drawbacks of greater alignment of TNUoS and DUoS. They may also be helping to shape the methodologies for recovering costs associated with DSO activities with potentially a methodology in place for the start of RIIO-ED3 in 2028.

DER could have defined access rights to the distribution network which would support baselining of flexible connections and any service requirements. The implications of DER connections on the transmission system would be well understood and a DSO's role in the overall process would be clear.

What could this mean for a DER service provider?

DER service providers would understand the network charges they face and the principles and methodologies that calculate them. They would be inputting into work to consider the benefits and drawbacks of aligning TNUoS and DUoS where their views would be heard on network charging principles and the effects reform has on their organisation.

DER service providers could have defined access rights to distribution networks which would support participation in flexibility markets. They would be aware of the access options available to them and associated costs.

Current planned activities

ESO business plan

- Delivery of the recommendation from the BSUoS taskforce around reducing the volatility of BSUoS forecasting.

Other

- Deliver required changes needed to implement outputs of Ofgem's SCR on Forward Looking Charges and Access arrangements⁸.

7. Codes and frameworks

Context

Codes and frameworks govern the activities undertaken by the ESO and DSOs and their co-ordination. The ESO is code administrator for the CUSC, Grid Code and System Operator Transmission Owner Code (STC).

Our proposed 2025 vision

The ESO would have consolidated standard ways of working with emerging DSOs across key activities such as planning, connections and access. A set of procedures would be drafted to explain the ways of working between ESO and DSO where required. The appropriate repository for these procedures would need to align with the outcome of the Energy Codes Review, potentially via changes to the STC to recognise the broader relationships between system operators and regulated asset owners.

To support a whole systems approach, technical requirements of connection and use of system would be standardised where possible between the Grid Code and Distribution Code. This will result in a whole system, digitalised Grid Code by 2025.

What could this mean for a DSO?

Many of the policies developed through Open Networks may have been codified to aid transparency. The combination of the Grid Code and Distribution Code into a whole system technical network code could help clarify arrangements and ensure standardisation. This could also help visibility and control of DER, and provide clearer rules for these parties.

DSOs would work with the ESO to model whole system impacts of code modifications. They would use knowledge of distribution system operation to support modifications that deliver whole system outcomes.

What could this mean for a DER service provider?

DER service providers would clearly see the framework which governs DSO and ESO interactions and this would help the understanding of each party's function in system operation roles.

The combination of the Grid Code and Distribution Code into a whole system technical network code would help provide clear and transparent rules for connection and operation.

DER service providers would continue to have support from the ESO through the code modification process for CUSC and Grid Code.

Current planned activities

ESO business plan

- The Grid Code combines transmission and distribution codes in an IT system with artificial intelligence enabled navigation.

8. Service dispatch

Context

The ESO dispatches energy resource, including DER, to manage real time system conditions. Increasingly DSOs are undertaking similar activities which need to be standardised and co-ordinated.

Our proposed 2025 vision

DER will make up a significantly larger slice of the energy mix in 2025, both for the balancing of energy and for the provision of services. Developing consistent approaches will be key to efficient dispatch. However we acknowledge that the nature and visibility of DER may be varied and that DSO communications interfaces may differ.

Balancing Mechanism (BM) participation would have shifted from a few hundred large, transmission connected providers to several thousand providers spread across the transmission and distribution system. This could include more aggregated balancing mechanism units made up of very small individual providers. This may be supported by a range of DER not registered to the BM but still providing services to the ESO.

BM and non-BM participants would look to stack the provision of energy and services to DSO and ESO. This would help resolve a range of interrelated national and locational operability challenges. Stackability principles would have been carefully designed to make sure there is no inappropriate double counting/compensation for services dispatched that meet both ESO and DSO needs.

Dispatch of most DER providers for ESO services would be realised through the Balancing Mechanism application programming interface (API), alongside within-day and day-ahead markets for services. In some areas, where there is a specific regional need, we may need to access greater volumes of DER than can be accessed through the BM. In such cases we would do this through efficiently using third party infrastructure, such as DSO Distributed Energy Resource Management System (DERMS), to view and dispatch DER. Ultimately, from an ESO Control Room perspective, there would be a single channel for service dispatch of DER providers, regardless of the actual dispatch mechanism.

Whilst commercial relationships would be between the buyer and the service provider, there would be a need for greater

co-ordination of service dispatch between system operators. In all cases ESO dispatch decisions for DER would be done in co-ordination with the relevant DSO. The rules and principles for co-ordination would need to be transparently shared and agreed with service providers in advance of delivery, and the dispatch decisions made would need to be clearly communicated to affected parties.

What could this mean for a DSO?

Increasing volumes of flexibility services may mean that DSOs are taking an increasingly automated approach to the dispatch of services. These could rely on DERMS technology to optimise services, but also increasingly use API interfaces. Whilst there may be lower contracted volumes for services than the ESO, DSOs would be utilising flexibility services from many smaller parties.

Co-ordination with the ESO would be essential as the actions of their contracted/potential service providers may influence distribution system needs. Automated systems may be in place to manage these conflicts. Whilst these may be initially focused on network pinch points, they could be rolled out more widely.

8. Service dispatch

The ESO may be using DSO DERMS infrastructure to enable DER services and provide visibility and control. In addition, DSOs may have standard API protocols which would allow service providers to access both sets of markets.

What could this mean for a DER service provider?

The ESO and DSO would send signals to dispatch DER assets in a way which would best suit the service provider's business model whether directly via EDL/EDT or via an API interface. API protocols would be standardised so there would be no need for different communication requirements to enter ESO or DSO markets.

DER service providers would understand the service dispatch decisions made between the ESO and DSO. Service stacking principles would be clear and service providers would understand the impact of service dispatch on meeting the obligations of stacked contracts.

Current planned activities

ESO business plan

- New real time situational awareness tool, so control centre engineers can better understand changing network.
- Enhanced network modelling capabilities with online analysis of voltage and power flow profiles closer to real time.
- Increased operational liaison with DNOs.
- Regional Development Programmes - developing DER dispatch functionality with DNOs and service providers.

2021 Open Networks project

- Develop conflict management and co-optimisation techniques (WS1A, P5).



9. Operational liaison

Context

ESO and DSO control centres need to interact and co-ordinate to ensure continued system operability. This includes the transfer of data in real time.

Our proposed 2025 vision

Traditionally, interfaces between ESO and DSOs have primarily been focused on network operations such as coordination of system access and the management of faults, events and emergency situations. In 2025, ESO and DSO liaison could have broadened to include coordination of energy and balancing services. Operability of the distribution and transmission networks may be more heavily influenced by each other. System conditions, such as stability and voltage, could be entwined across the transmission and distribution boundary.

DSOs would be actively managing their networks and we would need to ensure that our operational activities do not conflict with DSO activities and vice-versa. This would include the exchange of more real time information, including DERMS status and DER actions taken and planned. Underpinning this would be a need

for greater real time visibility of DER for both transmission and distribution system needs. Lines of communication will need to be clearly defined as the relationship between ESO, DSO and provider increases in complexity.

Due to the large volumes of instructions and the potential for service conflict, much of this co-ordination would need to be carried out ahead of real-time. It may also need to be undertaken automatically using increasingly sophisticated algorithms. This would ensure efficient service procurement and dispatch. This may require enhanced system integration and data exchange between ESO and DSO across several time horizons.

An agile approach may be needed for service dispatch including the releasing of contracted providers to participate in closer to real time markets for ESO/DSO if their availability is ultimately not required.

What could this mean for a DSO?

Whilst there is a strong need for service co-ordination, DSOs may also need to know more about the day to day operation of the transmission system. Flows across the transmission network can greatly affect the operation of higher voltage distribution networks and DSOs would receive information from the ESO to allow them to accurately simulate potential events. This would include ESO decisions in markets including the Balancing Mechanism.

In parallel the ESO may want to know more about how distribution networks are operating. This could include network status as well as greater visibility of distributed generation and demand.

What could this mean for a DER service provider?

Service providers would be made aware of any impacts on their operations. They would understand and support the rationale for providing greater visibility of their operations to the ESO and DSO, as it would allow the whole electricity system to be more efficiently managed.

9. Operational liaison

Current planned activities

ESO business plan

- Enhanced training and simulation with DNOs and wider industry.
- New real time situational awareness tool, so control centre engineers can better understand changing network limitations, leading to a more efficient risk based operation of the system.
- Data and analytics platform - enhanced network modelling capabilities with online analysis of voltage and power flow profiles closer to real time.
- Increased operational liaison with DNOs.
- Regional Development Programmes - developing service co-ordination functionality to manage constrained areas of the network.
- Creation of a data and analytics platform that will act as the foundation for our new control centre architecture.

2021 Open Networks project

- Improved operational DER visibility and monitoring (WS1B, P6).
- Operational data sharing (WS1B, P7).



10. Incident planning and management

Context

ESO and DSO control centres need to ensure a co-ordinated response to any system Incident. Contingency plans need to be agreed in advance to facilitate timely system restoration.

Our proposed 2025 vision

Events on transmission and distribution networks in 2025 could have a larger impact on each other. Distribution events may impact on availability of energy or balancing services and transmission events could trigger automatic actions on DER within the distribution network. By working with DSOs and TOs we would have established clear roles and responsibilities that would allow more effective and transparent management of system events.

Greater real time visibility of DER and the services that they are providing would be critical to incident planning and management. Greater volumes of DER may be providing contingency services such as black start, and restoration plans need to be mindful of the role of the DSO.

With larger volumes of DER providing energy and balancing services, there may be changing requirements on DSOs to deliver the emergency provisions required of them, such as demand and/or generation disconnection. This would require greater coordination and data sharing, both prior to and during an emergency situation.

Improved monitoring of distribution networks, and greater use of smartgrid technologies (such as DERMS), would help facilitate new approaches to the management of system events such as low frequency excursions. The ESO would have a pivotal role in facilitating opportunities to improve system resilience.

What could this mean for a DSO?

DSOs would have greater clarity on roles and responsibilities during system incidents. This, combined with greater visibility and data of what is happening on distribution networks, would enable DSOs to make a quick response to any ESO emergencies in a co-ordinated manner.

What could this mean for a DER service provider?

Service providers would have confidence that ESO and DSO incident planning and management will maintain a secure system and minimise risks to assets. They would have the opportunity to provide black start services to both DSO and ESO. DER service providers would clearly understand their role in the event of a need for system restoration.



10. Incident planning and management

Current planned activities

ESO business plan

- Commence System State Targeted Monitoring and Control System (MCS) staged roll out (related to inertia).
- Implementing findings from Distributed Restart.
- Engage and collaborate with industry to plan and develop the new GB restoration standard, including the annual assurance framework, consistent with our licence obligations.
- Restoration decision making support tool designed and developed to aid faster restoration times in line with stakeholder expectations.
- Increased operational liaison with DNOs.

Other

- Delivery of accelerated loss of mains protection change programme.
- Grid Code modification GC147 - Last resort disconnection of embedded generation - enduring solution.





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**Help us shape our vision
by sharing your views
on this consultation
by 21 May 2021.**

Contact the team:
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Visit our webpage:
**www.nationalgrideso.com/
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