nationalgridESO

Whole Electricity System Development

How the ESO is working with others to facilitate the future energy landscape

National Grid ESO is undertaking a wide range of activities to inform the development of Whole Electricity System[1]. We achieve this through working with others and taking a 'design by doing' approach. This paper further describes our approach and what successful outcomes will look like for us. We recognise that our activities to develop whole electricity system outcomes cover a wide range of ESO functions across differing timescales. We believe that stakeholders would value a central reference for this information and have developed this document to provide a reference at this point in time for all transformational activities that we are involved in. We would value feedback on the usefulness of this paper; box.WholeElectricitySystem@nationalgrideso.com.

The focus of this paper is how the ESO is working with others to take a broader view across the whole electricity system, particularly in relation to Distribution System Operation (DSO). We are also working with others to develop new ways of working within the electricity transmission sector, for example through expansion of the Network Options Assessment (NOA) for other system needs such as end of life asset replacement.

Building on our earlier work to develop whole electricity system outcomes

In 2018 through two thought pieces[2] we described our whole electricity system vision as;

'a future where fluid and accessible flexibility markets drive value for the end consumer and provide revenue opportunities for service providers. In this future, the ESO will work with DNOs as they transition to DSO to ensure these markets, whether for local, regional or national needs, are consistent and compatible whilst managing operational requirements across the whole electricity system to ensure the lights stay on.'

We built on this vision, informed by stakeholder feedback, to describe five enabling areas that were critical for the ESO to develop this vision. These were:

- Appropriate information and data provision
- Accessible and aligned frameworks
- Consistent and transparent flexibility markets
- Clear and co-ordinated roles and responsibilities for system operation
- Managed risk and resilience

We have used these areas to frame our whole electricity system engagement informing our RIIO-2 business plan development as well as our 2019/21 Forward Plan deliverables. They have also informed our innovation strategy, with Whole Electricity System being considered a priority topic for ESO innovation by both internal and external experts.

In this paper we provide further context on how we are progressing activities to inform the ESO's whole electricity system thinking in these five enabling areas. We identify both those activities which we believe are of high significance in delivering whole electricity system outcomes as well as other activities which will also inform the whole electricity transition. For each activity we highlight which of the five enabling areas that we believe will be informed by our work through shading as illustrated below;

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

[1] We consider 'Whole Electricity System' to include everything that connects the sockets in consumers' homes through to large transmission connected generators

[2] https://www.nationalgrideso.com/insights/whole-electricity-system

Part 1 – Our approach to whole electricity system

How delivering Whole Electricity System outcomes supports the ESO mission

The ESO mission is to enable the transformation to a sustainable energy system and ensure delivery of reliable affordable energy for all consumers[3].

We are working with industry to develop whole electricity system outcomes that support the ESO mission and its measures of success in 2025. The table below summarises how we see the ESO working in a whole electricity manner in 2025 and how that will support our overall measures of success.

Success in 2025	2025 Whole Electricity System ways of working
An electricity system that can operate carbon free	• We are working with other network organisations, including DNOs, to ensure co-ordinated design and operation of the whole electricity system. • We are meeting our system needs through competitive solutions, working with DNOs to understand operational implications across the whole electricity system
A whole system strategy that supports net zero by 2050	• We understand the interactions between the whole electricity system and other energy systems, enabling the development of a whole system strategy. • We have developed a System Operability Framework that considers system needs from other energy sectors • We have extended our ‘design by doing’ ethos to trial new ways of working across other energy sectors
Competition everywhere	• We have worked with others to successfully develop co-ordinated and consistent markets across the whole electricity system. • All parties can readily access markets for transmission and distribution system needs; stacking revenues where appropriate • We are open and transparent in our decision making, providing accessible data to allow industry parties to make informed decisions
The Electricity System Operator is a trusted partner	• We have strong co-operative relationships with other network organisations • We have developed an inclusive framework for whole electricity system development that gives a voice to all parties • Our thought leadership is welcomed by stakeholders and policy makers

[3] https://www.nationalgrideso.com/about-us/our-mission

The ESO role in delivering Whole Electricity System outcomes

We consider our work on whole electricity system in two phases;

- *Developing whole electricity system ways of working ahead of RIIO-ED2 in April 2023* – significant progress is being made in this phase through 2019/21 Forward Plan deliverables and innovation projects.
- *Embedding whole electricity system ways of working and leveraging opportunities to extend learnings across energy sectors* – this phase is at an earlier stage recognising the development of whole electricity system ways of working, but will become increasingly apparent as we move into RIIO-2 timescales.

Developing Whole Electricity System ways of working

We recognise the consumer benefits that can be derived through establishing whole electricity system ways of working ahead of RIIO-ED2 in April 2023. To achieve this we are working with others through a blend of;

- Active participation in major industry programmes
- Developing ways of working with others through 'design by doing' initiatives

We believe that this approach will facilitate our 'design by doing' initiatives informing major industry programmes and that shared learning will help progress whole electricity system ways of working in a timely manner. We believe that such an approach will inform future framework developments through collaborative identification of best practice.

Active participation in major industry programmes

National Grid ESO is actively participating in two major industry programmes both of which progress the overall BEIS and Ofgem Smart Systems and Flexibility plan[4]. These initiatives are primarily focused at developments that need to happen in the period through to 2023, and are informing our approach to developing whole electricity system ways of working.

Ofgem's work on Distribution System Operation (DSO)[5]. The operation of active distribution systems is a significant factor in the development of whole electricity system outcomes. In August 2019 Ofgem published their regulatory priorities and approach to DSO through a position paper.

- *How this is informing our approach;* Consistent with the approach laid out by Ofgem we are taking an incremental approach to whole electricity system development focusing on its enablers and building on existing ways of working and key competencies. By taking such an approach we will be addressing needs as required whilst retaining the flexibility to adapt as requirements change. We are also considering DSO as a set of functions rather than specific roles and, consistent with our 'competition everywhere' approach we are looking to develop competitive solutions to whole electricity system challenges wherever possible.

The ENA Open Networks project[6]. The ENA Open Networks is a cross network project informing how energy networks operate and the development of smart grids. A significant focus for this project is the co-ordination of network activities across the transmission – distribution interface. In 2018, working with stakeholders, the project developed five future industry structures (the 'Future Worlds') looking across the whole electricity system. These were further informed through consultation and an independent impact assessment. As a result the Open Networks project has a preferred future model for the period through to 2025 which sees co-ordinated development of DSO and flexibility markets (World B). The project believes that this is a least regrets approach consistent with Ofgem's DSO position paper.

- *How this is informing our approach;* We are an active member of the Open Networks project, providing unique insights and ensuring strong co-ordination between transmission and distribution. We are advocates of the Open Networks preferred approach to the development of DSO and flexibility markets (World B) and have used it in the development of our activities.

[4] https://www.gov.uk/government/publications/upgrading-our-energy-system-smart-systems-and-flexibility-plan
[5] https://www.ofgem.gov.uk/publications-and-updates/ofgem-position-paper-distribution-system-operation-our-approach-and-regulatory-priorities
[6] http://www.energynetworks.org/electricity/futures/open-networks-project/

We are conscious that the delivery of whole electricity system outcomes will also be influenced by other significant industry initiatives. We are working with the initiatives listed below to ensure a whole system view is taken;

- The Energy Data Taskforce recommendations[7]
- BEIS and Ofgem views on the changes to energy codes governance framework; 'Reforming the energy industry codes'
- Ofgem's work on System Operator Reform
- BEIS and Ofgem independent review of electrical engineering standards

'Design by Doing' with others

We believe that a 'Design by Doing' approach to develop whole electricity outcomes will facilitate timely progression to new ways of working through undertaking new activities to deliver value for consumers and customers. Through this approach we will share valuable insights with others, accelerating the transition to net zero.

We recognise that 'Design by Doing' in a whole electricity system context can only be done in partnership with others. The main body of this paper list the activities we are undertaking with others to whole electricity system outcomes. We have highlighted those projects which we believe are most significantly informing whole electricity system outcomes, indicating, where appropriate, our project partners.

[7] We are actively involved in the ENA's Data Working Group which is progressing a number of the Energy Data Taskforce recommendations

Embedding whole electricity system ways of working and leveraging opportunities to extend learnings across energy sectors.

As we move into a new decade we are migrating from our 'design by doing' phase into an ESO which is embedding new whole electricity system ways of working. This will happen incrementally as specific initiatives and projects inform the way we work with others. This progression is primarily captured through our RIIO-2 business plan proposal. We recognise a significant element of our activities will need to be co-ordinated with DNOs in the development of their RIIO-ED2 business plan proposals.

We also see the development of whole electricity ways of working as a template for how we develop whole energy system thinking. This too is evident in our RIIO-2 business plan proposal.

Supporting the development of RIIO-ED2

From April 2023, revised DNO funding mechanisms and incentives will take effect through the RIIO-ED2 framework. We believe that new whole electricity system ways of working need to be established ahead of RIIO-ED2 to maximise consumer value during the new DNO price control period.

To facilitate these efficient whole electricity system ways of working we believe that it is important that there is appropriate alignment between this framework and the later years of our RIIO-2 business plan which starts in April 2021. We are, therefore, actively engaged in the development of this framework through participation in Ofgem's overarching working group to ensure alignment.

Developing whole energy system thinking

In the changing energy landscape, we believe that taking whole system views will ensure the sector evolves in a way that delivers consumer value. This paper outlines how we are taking a whole system view of electricity networks and markets. We are aware that this is increasingly just one part of a transforming energy landscape. Recognising the increasingly interconnected nature of our systems and infrastructure, our thinking needs to go beyond traditional boundaries. Through doing this we believe we can help facilitate GB's Net Zero target in a way that maximises consumer value.

This work has already started. Our Strategy and Energy Analysis teams, who are used to considering cross energy sector opportunities through the development of the ESO *Future Energy Scenarios (FES)* publication, are more deeply considering the impacts of decarbonisation of transport and heat sectors enabling them to inform future energy policy. This includes the '*Bridging the gap to Net Zero*' programme [8] as well as our work to develop a Clean Heat Strategy. Building on these core strengths the team are leading the Whole Energy workstream within the ENA Open Networks project[9]. This workstream brings together stakeholders from diverse backgrounds to develop new whole energy system ways of working.

Our work on Whole Energy System will increase as cross-sector ways of working mature and this is reflected in relevant transformational activities in our RIIO-2 Business Plan[10]. These proposed activities are also referenced within this document.

[8] http://fes.nationalgrid.com/bridging/
[9] http://www.energynetworks.org/electricity/futures/open-networks-project/
[10] https://www.nationalgrideso.com/about-us/business-planning-riio/riio-2-final-business-plan

Part 2 – The initiatives that facilitate whole electricity system development

From now until the start of RIIO-2 in April 2021 we are progressing a range of activities to evolve our traditional ways of working to take a whole electricity system view. We are achieving this through a blend of initiatives through our 2019/21 Forward Plan programme[11][12]. These are summarised below with links to more information where available.

We are also testing new ways of working through bespoke innovation projects and initiatives funded from a range of means. Recognising the collaborative nature of whole electricity system, many of these initiatives are undertaken in collaboration with other organisations.

Many of these innovation projects and Forward Plan deliverables will inform our work through the next decade including our proposed RIIO-2 activities described in the next section.

2019/21 Forward Plan Deliverables

We have recently consulted with stakeholders on proposed deliverables in our 2020/21 Forward Plan. Currently these are being reviewed, and the following list has been produced prior to production of the final 2020/21 Forward Plan. In listing these activities we have taken the most recent information available, primarily from the draft ESO Forward Plan 2020/21.

Significant 'Design by Doing' initiatives

We believe that these activities will have a significant bearing on the delivery of whole electricity system outcomes in the period through to April 2021.

Regional Development Programmes
We are implementing new commercial contracts that optimise use of existing network assets by allowing DER to connect and provide transmission constraint management services to help manage their impact. We are working with DNOs and TOs to develop enhanced ways of working that facilitate active DER management for transmission system needs. We will work with DNOs to develop a process that facilitates proactive identification of future RDPs.
Partners; UKPN, WPD, SPEN, ENW, SSE-N, NGET, SPT
https://www.nationalgrideso.com/insights/whole-electricity-system/regional-development-programmes

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Pathfinder Projects
Through our pathfinder projects we are working with TOs, DNOs and service providers to establish methods to identify the most cost effective approach to addressing transmission system needs. As such we are continuing our work to consider whole electricity system options to meet transmission system voltage needs in the Mersey and Pennines regions. We are similarly progressing work through pathfinders for stability and thermal congestion needs.
https://www.nationalgrideso.com/publications/network-options-assessment-noa/network-development-roadmap

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Other activities that will support the Whole Electricity System transition

We believe that these activities will support the whole electricity system transition in the period through to April 2021.

Loss of Mains Protection Settings
We are working with the ENA, DNOs, and Independent DNOs (IDNOs) on a programme to accelerate compliance with new 'Loss of Mains' protection requirements in the Distribution Code. This will involve four tender rounds through 2019 and 2020.
http://www.energynetworks.org/electricity/engineering/accelerated-loss-of-mains-change-programme.html

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

[11] https://www.nationalgrideso.com/about-us/business-planning-riio/how-were-performing

Energy Forecasting
We have published a roadmap to develop our energy forecasting strategy. This roadmap describes how we will evolve our systems to create a new advanced platform for energy forecasting (PEF). This transformation will see us providing more information in an accessible manner to all stakeholders. This will include information relevant to Distribution System Operation including additional solar and wind forecasts.
https://www.nationalgrideso.com/document/145941/download

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Information access
We have rolled out our new data explorer providing access to data across the ESO and have commenced work on our new data portal[13]. This will facilitate data access to parties across the whole electricity system. We see DNOs and parties connected to distribution networks as being valued stakeholders in this process.
https://www.nationalgrideso.com/balancing-data/data-finder-and-explorer

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Inertia measurement
We are implementing a first of a kind tool to measure system inertia in real-time and will use it to optimise real-time operation, service procurement and network development.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Publish our strategy for the future of reactive power
We will develop a strategy outlining how we will look to integrate learnings from all reactive power projects (pathfinders, Power Potential, DNO boundary investigations) to create a coherent plan for the development for the future of reactive power.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Power Responsive
We are delivering innovation projects to unlock demand flexibility and continuing to engage with stakeholders through Power Responsive in the development of flexibility markets. This will increasingly take a whole electricity system view as we work with DNOs to develop co-ordinated markets for flexibility needs.
http://powerresponsive.com/

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Wider access to the Balancing Mechanism
We have collaborated with industry to provide clearer accession requirements for BM participation and enabled aggregated BMU participation. We are using better technology and systems to improve efficiency of installing communications with BM providers and optimising BMU dispatch. This is facilitating participation of new types of provider, many of whom are connected to distribution networks. Going forwards we will deliver a plan which sets out proposals and timescales for widening access to the web-based API and any associated code and policy modifications which will be required to facilitate this. This will allow providers choice of which communications system they use, and improve the provider experience.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Charging Futures
We are facilitating reform of charging across the whole electricity system by communicating with all users and creating opportunities for them to learn, ask and contribute to reform. Complementary to Charging Futures, we will provide extra guidance on how this will affect users' charges in understandable, real terms.
http://www.chargingfutures.com/about-charging-futures/charging-futures-overview/

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Deeper Access Planning
We are developing ways to work more efficiently with network stakeholders (leading to fewer outage cancellations and less re-work) which will lead to a more efficient use of time for the ESO and network licencees.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

[13] https://data.nationalgrideso.com/

Innovation projects and initiatives

Significant 'Design by Doing' initiatives

We believe that these projects will have a significant bearing on the delivery of whole electricity system outcomes in the period through to April 2021.

Distributed ReStart
We are working with SPEN and TNEI to explore how DER can be used to restore power in the highly unlikely event of a total or partial blackout of the National Electricity Transmission System.
Partners; SPEN, TNEI
https://www.nationalgrideso.com/innovation/projects/distributed-restart

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Power Potential
We are working with UKPN to understand how reactive power services can be co-ordinated for both transmission and distribution needs. Through this we will generate additional capacity on the whole electricity system.
Partners; UKPN
https://www.nationalgrideso.com/innovation/projects/power-potential

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Cornwall Local Energy Market
We are trialling, with Western Power Distribution, coordinated flexibility procurement through a common platform.
Partners; WPD, Centrica
https://www.nationalgrideso.com/news/eso-participates-cornish-energy-market-world-first-project

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Other projects that will support the Whole Electricity System transition

We believe that these projects will inform the whole electricity system transition.

Solar PV Monitoring Phase 3
We are further improving the way we forecast Solar Generation. This will enable us to better plan and operate the transmission system and also provide a better forecasting system to the wider industry.
https://www.nationalgrideso.com/innovation/projects/network-innovation-allowance-nia

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Virtual Synchronous Machines Demonstrator
The volume of traditional synchronous power sources is falling. In order for us operate a zero-carbon network in 2025 we need to consider new forms of synchronism. This project considers the use of power electronics to help non-synchronous generators, such as windfarms, develop synchronicity and therefore help us operate the system.
https://www.smarternetworks.org/project/nia_ngso0004

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Hybrid Grid Forming Converter
We are developing capabilities to operate a zero-carbon system by 2025. As part of this we are developing alternative solutions to system stability needs. Through this project we are investigating technologies that will facilitate offshore HVDC networks supporting system stability.
https://www.smarternetworks.org/project/nia_ngso0019

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Residential Response
This project is developing new approaches for testing, monitoring and managing portfolios of residential-scale assets for participation in Balancing Services.
https://www.smarternetworks.org/project/nia_ngso0025

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

RecorDER
With UKPN, SPEN and blockchain software developer Electron, we are building a whole-electricity system register for flexibility and generation assets on a blockchain platform. This will enable parties to use and reference a shared data set of generation and flexibility resources.
https://www.smarternetworks.org/project/NIA_NGSO0018

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Enhancing Energy Flexibility from Wastewater Catchments through a Whole System Approach
We are testing whether DSR through controlling a whole water system is more cost-effective than focusing on a single asset or process.
https://www.smarternetworks.org/project/nia_ngso0024

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Part 3 - Looking towards RIIO-2 and zero carbon operability

Our RIIO-2 business plan sets out how we will deliver this mission and meet the success criteria. Embedded through the plan is the need to develop ways of working that consider the whole electricity system. Below we provide a consolidated list of these activities listed against the relevant theme of our RIIO-2 final business plan, along with the activity reference number (e.g. A1). Further details of these activities can be found in the relevant Role / Theme chapter of the business plan[14], and key milestones can be found in the relevant architecture tables provided in Annex 1[15] of the RIIO-2 business plan.

Role 1: Control Centre operations.

A1 Control Centre architecture and systems
We will develop new balancing and network control tools to enable us to analyse and visualise increased volumes of operational data and dispatch a greater number of market participants than we currently can. These tools will be developed in an agile, modular fashion. The design authority, which is likely to consist of network and market participants (amongst others), will ensure the capabilities we develop reflect future market needs and provide a step-change in levels of transparency and accountability into solution development.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A2 Control Centre training and simulation
We will develop new training and simulation capabilities to complement the new balancing and control systems. We will work with industry to define future skills for system operation, and run new university modules to ensure there is a pipeline of talent with these skills. We will implement more cross-network secondments and industry training events, and work with DNOs to understand what our role in future DNO/DSO training could be, including the potential for joint whole system training and simulation.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A3 Restoration
We will implement the new GB restoration standard, including undertaking the annual assurance validation process on behalf of the electricity industry. We will continue to work with DNOs and distributed energy resources (DER) on the Distributed ReStart project[16], trialling case studies to confirm feasibility and, as appropriate, implementing the proof of concept findings. We will continue to progress our plans for all technologies to be able to participate in restoration services as standard through competitive procurement methods.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Role 2: Market development and transactions.

A4.3 Deliver a single day-ahead response and reserve market
In the delivery of day ahead market for frequency response we will work with stakeholders, including DNOs, to ensure that ESO markets are consistent and coordinated with other markets.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A4.4 Deliver a single, integrated platform for ESO Markets
We will deliver a single markets platform through which market participants will be able to participate in balancing and capacity markets. The markets platform will cover the end to end process for market participation including communications, data input and management, messaging and validation. We will work with DNOs and others to ensure that common standards, including interoperable systems, a common data model and shared minimum specifications are central to the design and delivery of the single markets platform. This interface will also allow us, and operators of other markets, better visibility of what services are being provided to whom, as well as any network limitations on service provision.
The foundation of the platform will be an asset register identifying each unique asset on the transmission or distribution system that is participating in markets.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

[14] https://www.nationalgrideso.com/about-us/business-planning-riio/riio-2-final-business-plan
[15] https://www.nationalgrideso.com/document/158056/download
[16] https://www.nationalgrideso.com/innovation/projects/distributed-restart

A6.5 Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025
We believe the customer experience will be improved through bringing together technical codes into a single accessible document. Out proposal for a whole system Grid Code would see combining of transmission and distribution codes in an IT system with artificial intelligence (AI)-enabled navigation and, document and workflow management tools.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

Role 3: System insight, planning and network development

A10.1 Support DNOs to develop NOA
We believe that further consumer value can be generated by DNOs adopting a NOA-type approach to higher voltage networks and will work with them to develop effective processes. This will build on the work already underway through the ENA Open Networks project and will be completed ahead of RIIO-ED2 in 2023. Additionally we propose to take on an additional role to ensure consistency of methodologies thereby facilitating whole system planning.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A13.5 Integrating FES with other networks
We will deepen our relationships & co-ordination with DNOs and TOs as they embed their own regional future scenarios. As a result we will develop more granular models for future energy scenarios (FES) enabling us to publish further data, analysis and insights. This will involve replacing our current electricity demand model with a whole system modelling by early 2023.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A14.3 Further enhance the customer connection experience including broader support for smaller parties
We will step up the level of support for smaller parties from 2021. This will include smaller parties who may have transmission related issues with their connection applications. We will also broaden the remit of our customer connection seminars to incorporate input from DNOs from 2022.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A15.5 Regional Development Programmes (RDPs)
We will continue to work closely with DNOs to release additional network capacity that will facilitate the connection of DER. We estimate six new RDPs will be initiated during RIIO-2.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A15.6 Transform our capability in modelling & data management
We will look to evolve our data and modelling capabilities to use more granular information on distribution networks and connected parties. This will inform more efficient development and operation of the GB transmission system and aligns with our broader work to develop an ESO data platform.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A15.8 Provide technical support to DSO and whole electricity system alignment
Ahead of RIIO-ED2 in 2023 we will support the timely development of DSO. This will include, as required, the alignment of operational standards across the whole electricity system.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A15.9 Identify future operability needs across the whole energy system
We will look to develop our future system operability needs across the whole energy system. This will include development of a whole energy system operability framework as well as targeted innovation and regional initiatives.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A16.3 Work more closely with DNOs and distributed energy resources (DER) to facilitate network access
We will extend our existing operational planning practices with DNOs to ensure co-ordinated procurement of DER services facilitating efficient release of network assets for construction and maintenance requirements.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience

A16.4 Outage notification awareness

We will widen the scope of our outage planning notification tools ensuring that affected customers connected to distribution networks are aware of any transmission restrictions. This will also facilitate the development of DER markets to facilitate network outages.

Information & data	Frameworks	Markets	Roles & Responsibilities	Risk & Resilience