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# Guidance

## ESO Roles Guidance


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The electricity system operator (ESO) has a central role in our energy system. It performs a number of important functions from the real time operation of the system, through to market development, managing connections and advising on network investment. We regulate the ESO to help ensure the actions it takes align with the interests of consumers. The ESO's regulatory and incentives framework aims to place wider system and consumer interests at the heart of its decision-making, create transparency around the ESO's performance and make the ESO more clearly accountable to its stakeholders.

This Guidance Document provides further explanation of the ESO's roles and the associated expectations, which underpin the ESO's regulatory framework. The purpose is to help to align expectations between the ESO, Ofgem and stakeholders, support the enforceability of the ESO's obligations and create a more transparent framework overall. Under the ESO's regulatory and incentives framework, the ESO must also provide evidence of how it has performed in relation to its roles.

This Guidance Document (version 5.0) builds on the previous Guidance Document (version 4.0). **The ESO Roles Guidance (version 5.0) will come into effect on the 1 April 2021 and will apply from 1 April 2021 until stated otherwise.**

# Contents

## Version history

We first published this guidance in July 2017 and made changes to Role 1 before publishing again in December 2017. We have since made a number of small changes in this iteration. The table below summarises the changes made to the ESO Roles Guidance:

| Version | Date published | To be applied | Summary of changes |
|---|---|---|---|
| 1.0[1] | July 2017 | July 2017 – March 2018 | N/A |
| Consultation on changes[2] | December 2017 | N/A | • Expanding Role 1 to better reflect the ESO's system operability role. |
| 2.0[3] | February 2018 | April 2018 - March 2019 | • Clarifications on the status and purpose of the roles and principles.<br>• Clarifications on how the roles and principles will be updated going forward.<br>• Clarification to Principle 4 to include European Network Codes. |
| 3.0[4] | March 2019 | April 2019 onwards | • Clarifications and updates to introductory text.<br>• Rewording the title of Principle 2.<br>• Clarifications to supporting principle guidance for Principles 2, 3, 5, 6 and 7. |
| Consultation on change[5] | January 2020 | N/A | • Streamlining the roles framework by moving from 4 to 3 roles. |

[1] Available at: https://www.ofgem.gov.uk/system/files/docs/2017/07/future_so_reg_framework_july_2017_working_paper.pdf

[2] Available at: https://www.ofgem.gov.uk/system/files/docs/2017/12/eso_roles_and_principles_appendix.pdf

[3] Available at: https://www.ofgem.gov.uk/system/files/docs/2018/02/eso_roles_and_principles.pdf

[4] Available at: https://www.ofgem.gov.uk/system/files/docs/2019/03/eso_roles_and_principles_guidance_2019-20.pdf

[5] Available at: https://www.ofgem.gov.uk/publications-and-updates/call-input-2020-21-eso-regulatory-and-incentives-framework

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| 4.0[6] | 6 March 2020 | 1 April 2020 – 30 March 2021 | • Streamlining the roles framework by moving from 4 to 3 roles.<br>• New text on competition and FES. |
| Consultation on change[7] | September 2020 & December 2020 | N/A | • Updated guidance to align with start of RIIO-2 price control. |
| 5.0 | 17 March 2021 | 1 April 2021 – 30 March 2023 | • Updated guidance to align with start of RIIO-2 price control. |
| 5.1 | 19 March 2021 | 1 April 2021 – 30 March 2023 | • Correction to Activity 2c: Industry codes and charging. |

[6] Available at: https://www.ofgem.gov.uk/system/files/docs/2020/03/eso_roles_and_principles_guidance_2020-21.pdf

[7] Available at: https://www.ofgem.gov.uk/publications-and-updates/consultation-eso-roles-guidance

# ESO roles

## Introduction

1.1. The ESO Roles Guidance provides further explanation of the ESO's roles and the associated expectations, which underpin the ESO's regulatory framework. The roles are a foundation of the ESO's regulatory and incentives framework. This guidance document outlines our current view of the activities and outcomes expected from the ESO in order to maintain an economic, efficient, and co-ordinated system. The ESO's roles were first introduced as part of our July 2017 Working Paper on the ESO's Future Regulatory Framework.[8] This document contains updated guidance (version 5.0). It builds on the previous guidance (version 4.0[9]) that was issued in March 2020 and our latest ESO RIIO-2 policy. This version of the ESO Roles Guidance (version 5.0) will continue to underpin the ESO's regulatory and incentives framework from April 2021 onwards.

1.2. Alongside the roles are the performance expectations, behaviours and the predominant licence conditions that they relate to. The guidance has been drafted with the intention that it should help to outline the types of activities that we would consider to be meeting expectations, or exceeding expectations with regard to the ESO's licence obligations. The ESO's licence conditions underpin the roles and remain the legal obligations that the ESO must fulfil.

1.3. In the rest of this chapter we set out further details of the three roles we have defined for the ESO. Throughout all of these roles are the cross-cutting themes of ensuring the ESO provides most value to consumers e.g. protecting consumers from undue costs, enabling secure cost-effective decarbonisation, being a trusted source of information and insight, transparency in its actions, and high levels of engagement with industry and other network operators. Although we have structured our incentive scheme around three overarching roles for the ESO, we acknowledge that, in reality, the roles have a degree of overlap and interaction.

[8] The original guidance can be found in our July 2017 Working Paper on the future regulatory framework: https://www.ofgem.gov.uk/ofgem-publications/118930

[9] Version 4.0 of the ESO roles and principles guidance: https://www.ofgem.gov.uk/system/files/docs/2020/03/eso_roles_and_principles_guidance_2020-21.pdf

**Status and purpose of the ESO Roles Guidance**

1.4. This document provides updated guidance on the ESO's roles and the behaviours we expect to see when the ESO fulfils its roles. This guidance should be considered as a non-exhaustive list of examples of how we currently envisage the ESO should fulfil its roles when undertaking its day-to-day system operator functions. The roles are underpinned by the ESO's binding licence obligations – particularly the Standard Licence Condition (SLC) C28 (Functions for an efficient, co-ordinated and economic electricity system operator)[10], which sets out our expectations of an economic, efficient and co-ordinated ESO. We've also structured the guidance to show what we expect to see as evidence of the ESO's compliance with its obligations under paragraph 4 of (SLC) C28.

1.5. **This version of the ESO's Roles Guidance will come into effect on 1 April 2021 and apply from 1 April 2021 onwards until stated otherwise.** Before then, the version of this guidance published in March 2020 will continue to have effect, and compliance with it may be taken into account from the date of its issue.

1.6. In the event that the ESO does not meet its licence obligations, it may be found to be non-compliant. This Guidance Document (in all its versions) will inform any future decisions taken by the Authority when considering possible investigation and enforcement issues arising out of non-compliance with the relevant licence obligations[11].

1.7. In the event of formal enforcement proceedings finding a breach of one or more relevant licence conditions, there may subsequently be made an order for payment of a financial penalty and/or consumer redress. The outcome of such procedures would be made publicly available.

[10] Our decision on the ESO's RIIO-2 licence: https://www.ofgem.gov.uk/publications-and-updates/decision-proposed-modifications-riio-2-transmission-gas-distribution-and-electricity-system-operator-licences.

[11] All decisions taken by the Authority relating to enforcement matters are subject to its Enforcement Guidelines and Penalty Policy.

**Updating the ESO's Roles Guidance**

1.8. We recognise that the transition in the energy system may mean that this guidance may need to change in future. We will therefore keep this under review. Where we believe changes are needed, we would consult with impacted parties, including the ESO.

1.9. For the purposes of the ESO incentives process, this guidance will only apply from the start of the 2021-22 regulatory year and we will not use the updated changes to retrospectively assess the ESO's performance as part of the incentives scheme in RIIO-1.

## Role 1: Control centre operations

1.10. Balancing the National Electricity Transmission System (NETS) in a safe, reliable and efficient way is a core function for the ESO. The Electricity National Control Centre (ENCC) performs the day-to-day, short-term (within day and day-ahead) operational activities for the NETS.

1.11. The ENCC carries out real-time system balancing by contracting and trading with energy market participants (e.g. generators, storage providers and third-party providers of aggregated flexibility). This is achieved primarily via the Balancing Mechanism (BM) and utilisation of contracted balancing services. The ENCC also requests transmission network owners (TOs) to optimise physical networks configurations using network assets, e.g. flexing voltage tolerances or amending specific circuit ratings or planned outages and maintenance.

1.12. Alongside the real-time operation of the NETS, other key control centre functions include:

- Coordinating with other network operators on operational decisions and outage changes and network planning out to one-year;
- Short-term energy forecasting;
- Managing and sharing system data and information; and
- Restoration and emergency response (to system instability events).

1.13. With regard to data and digitalisation, the ESO is responsible for providing information to market participants to facilitate informed decision-making, and for ensuring efficient operation of the system. The ESO is expected to do this transparently and in a user-friendly manner.

**Activity 1a: System operation**

Meets expectations predominantly underpinned by licence conditions:
C28 4(a) taking the most efficient actions to operate the national electricity transmission system based on all of the relevant information the licensee had available at the time;
C28 4(b) taking into account the impact such actions have on competition in the wholesale electricity market and on economic, efficient and coordinated operation and development of the total system;
C28 4(c) considering the impact any action would have on the total system;
C28 4(d) optimising the timing of transmission outages under the outage plan on the national electricity transmission system;
C28 4(h) procuring balancing services to ensure operational security;
C28 4(j) monitoring balancing services markets for potential breaches of the grid code, investigating where necessary and raising concerns to Ofgem where appropriate;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system; and
Special Condition 2.11. Digitalisation.

| Output | Meets expectations | Exceeds expectations |
|---|---|---|
| **Immediate and ongoing** | | |
| Balancing efficiently | • Balancing economically and efficiently, in line with the meets expectations benchmark of performance metric 1A (Balancing costs).<br><br>Including by:<br>➢ taking actions that minimise consumer costs irrespective of provider type or size.<br>➢ planning ahead to accurately forecast reserve, foot room requirements and system constraints. | • Implement a comprehensive plan to proactively mitigate any projected material increases to balancing costs, in line with the exceeds expectations benchmark of performance metric 1A (Balancing costs).<br><br>Including by:<br>➢ acting early and proactively to reduce drivers of higher costs.<br>➢ continually refreshing and upgrading control room processes to deliver a demonstrable improvement in |

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| | ➢ using the full range of available balancing services and options (e.g. from both market parties and network companies). | the accuracy of forecasting contingency needs and system constraints (evidenced, for example, through robust back-casting).<br>➢ exploring proactively, developing and utilising improvements to existing balancing services and new innovative types of services. |
| Maintaining security of supply | • Maintain system frequency and voltage within statutory limits (including the SQSS).<br>• Demonstrably minimise any increases in the number of instances where the system frequency is outside operational limits but within statutory limits (for example, excursions beyond 0.3Hz) or transparently demonstrate why tolerating increases in these excursions strikes an appropriate between security and cost-efficiency.<br>• Respond swiftly to any event (expected or unexpected), on the NETS or otherwise, to secure stable frequency across the NETS.<br>• Assess existing, emerging, and potential risks (including risks materialising from distribution networks) to the maintenance of stable frequency and security of supply across the NETS. Managing those risks appropriately to minimise | • Maintain stable system frequency and maintain or decrease the number of instances where the system frequency is outside operational limits but within statutory limits (for example, excursions between 0.3Hz and 0.5Hz).<br>• Develop innovative operability solutions to unexpected events that maintain system security and minimise costs in a fair and transparent way. |

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| | associated costs and occurrence of unexpected events. | |
| Making trade-offs across time horizons | • Consider the appropriate trade-offs between short-term costs and longer-term market developments in the interests of consumers now and in the future. | • Evidence of new processes, or innovative balancing actions, that reduce costs (compared to the counterfactual) in the short-term and facilitate market developments that provide longer-term cost reductions. |
| Ensuring future operability | • Development of plans to ensure known / expected future operability challenges can be managed once the challenges materialise (for example through the continued production of the System Operability Framework and Operability Strategy reports[12]).<br>• Produce and transparently share an assessment of the most material risks to system operability. | • Proactive testing of plans to manage future operability challenges and evidence of taking necessary steps to reduce the severity of the challenges before these challenges materialise.<br>• Produce and transparently share an assessment of the risks to system operability, with consideration of how these are likely to develop in future and identified mitigation measures. |
| Coordinating with other network operators | • Coordinate with other network/system operators to optimise the use of balancing resources.<br><br>Including by:<br>➢ identifying and progressing changes to outage plans in order to minimise constraint | • Coordinate with DNOs through ensuring ESO dispatch of DER and DNO network management actions deliver whole system[13] benefits.<br>• Facilitate the development and implementation of innovative services from network operators in order to achieve significant |

[12] More information about the Operability Strategy reports can be found at the following address: https://www.nationalgrideso.com/news/operability-strategy-report-our-insight-zero-carbon-electricity-system

[13] Also referred to as 'total system' in standard licence condition C28 for RIIO-2. For the purposes of this ESO Roles Guidance, Whole System means the national electricity transmission system and the distribution systems of all authorised electricity operators which are located in the national electricity transmission system operator area.

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| | costs (e.g. through the effective use of System Operator Transmission Owner Code (STC) processes), ensuring the costs put forward by TOs are reasonable.<br>➢ exchanging information and data with distribution network operators (DNOs) to ensure efficient dispatch of distributed energy resources (DER). | reductions to overall operational costs (compared to the counterfactual) across the whole system.<br><br>Including by:<br>➢ Providing network operators with a high degree of visibility of the transmission constraint cost savings that can be achieved through enhanced network services and conducting robust analysis on any services offered.<br>➢ Developing improved, integrated systems and processes that optimise whole system dispatch decisions. |
| Minimising outage changes caused by error | • A small proportion of short notice changes to planned outages are caused by ESO error, in line with the meets expectations benchmark of performance metric 1D (Short notice changes to planned outages). | • No or only a very small proportion of short notice changes to planned outages are caused by ESO error, in line with the exceeds expectations benchmark of performance metric 1D (Short notice changes to planned outages). |
| Oversight of balancing services markets | • Effective systems for surveillance of balancing market activity and monitoring the quality / accuracy of information received from market participants. Effective engagement with Ofgem on any concerns that come to light.<br>• Ensures balancing actions do not create significant inefficiencies and distortions in the balancing | • Proactive surveillance of market activity and swift engagement with Ofgem to support investigation of any anti-competitive behaviours or actions that may undermine balancing market integrity. |

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| | or wholesale markets or create perverse incentives with respect to market participants' behaviour or decision making. | |
| Maintaining effective and reliable IT systems | • Continual and responsive development of IT systems.<br>• High IT system availability and reliability compared to historical averages, with reduced unplanned outages from RIIO-1.<br>• Timely completion of ongoing and incremental upgrades to IT systems delayed from RIIO-1.<br>• Regular engagement with industry on design of ESO IT systems. | • Proactive development of innovative IT systems capable of adapting to future operational requirements.<br>• High IT system availability and reliability compared to historical averages, with progressive step change reductions in unplanned outages from RIIO-1.<br>• Proactive engagement with industry on all types of potential IT system solutions. Acting on stakeholder feedback, and any burdens imposed on stakeholders, to inform future IT development. |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Operating the network carbon free | • In a majority of settlement periods where the electricity markets deliver a carbon free solution, the ESO has the ability to efficiently and economically operate the system carbon free (ie all ESO actions are also carbon-free).<br><br>To underpin this<br>➢ ESO has replaced legacy IT systems with systems that are fit for purpose in the future energy system, shaped | • In all settlement periods where the electricity markets deliver a carbon free solution, the ESO has the ability to efficiently and economically operate the system carbon free (ie all ESO actions are also carbon-free).<br><br>To underpin this:<br>➢ ESO has engaged extensively with all types of energy industry stakeholders and IT solution providers to deliver high quality, flexible and |

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| | through good engagement with industry.<br>➢ The ESO's control centre engineers have fit for purpose training and simulation tools that enable them to efficiently operate a zero carbon network in most situations. | future proofed IT systems. These are capable of being updated ahead of system developments and interoperating with the digital systems of other related organisations in the sector and in other sectors.<br>➢ The ESO's training and simulation tools equip highly skilled control room engineers to achieve the outcomes and benefits expected in the RIIO-2 plan. |
| Coordinating with other network operators | • ESO ensures its processes and systems facilitate close operational coordination between different electricity network operators.<br><br>To underpin this:<br>➢ ESO exchanges all necessary real-time operational information with other network operators.<br>➢ ESO has regularly engaged with DNOs to inform DNOs' operability plans and process development and, where appropriate, has adapted its own plans and processes in light of DNO insights. | • ESO has proactively led the development and implementation of frameworks and processes that ensure the optimal real time operation of the whole energy system.<br><br>To underpin this:<br>➢ ESO IT systems capable of interoperating with the systems of other related organisations in the sector and in other sectors wherever this would provide overall benefit.<br>➢ The ESO has shared guidance and expertise (e.g. training) to DNOs to ensure common practices (e.g. through joint simulator training) are in place that maximise whole system benefits and facilitate |

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| | | seamless and efficient system operation across voltage levels. |

**Activity 1b: System Restoration**

Meets expectations predominantly underpinned by licence conditions:
C28 4(a) taking the most efficient actions to operate the national electricity transmission system based on all of the relevant information the licensee had available at the time;
C28 4(b) taking into account the impact such actions have on competition in the wholesale electricity market and on economic, efficient and coordinated operation and development of the total system;
C28 4(c) considering the impact any action would have on the total system;
C28 4(e) publishing easily accessible information which the licensee holds to generate value for consumers and stakeholders, including but not limited, to ensuring information services are designed to meet the needs of the service users;
C28 4(h) procuring balancing services to ensure operational security;
C28 4(i) ensuring the effective and non-discriminatory participation of all qualified market participants in the provision of balancing services, including not unduly restricting new and existing service providers from competing for the provision of such services;
C28 4(k) anticipating future national electricity transmission system requirements by using and developing competitive approaches to procuring balancing services wherever this is in the best interests of current and future electricity consumers in Great Britain; and
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system.

| Output | Meets expectations | Exceeds expectations |
|---|---|---|
| **Immediate and ongoing** | | |
| Restoration plans and tools | • Maintain fully-tested plans and processes to support incident management and system restoration. | • Develops and progresses future restoration plans and tools that can continuously adapt to network changes in advance of, and during, real time system operation or system restoration. |
| Restoration policy | • Publish a strategy for system restoration services on an annual basis, setting out how the ESO will ensure adequate restoration capabilities for the NETS over the next one to five years. | • Activities that lead, organise, convene and build consensus with Government, regulators and industry to drive improvements to the system restoration strategy for the future. |

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| | • Publish a procurement methodology for system restoration services on an annual basis, setting out how the ESO will: seek to procure new system restoration services and assess tenders; and assess whether it is economic and efficient to incur feasibility study costs to test new providers.<br>• Publish an ex-post annual report detailing the total costs that the ESO has incurred whilst procuring system restoration services during the year.<br>• Build consensus with Government, regulators and industry to drive improvements to the system restoration strategy for the future.<br>• If obligated to, determine an appropriate implementation framework to enable a system restoration standard to be met in a fair and non-discriminatory way. | • If obligated to, implement a system restoration standard by: leading, organising, and building consensus with industry on the most appropriate implementation framework that enables a system restoration standard to be met, whilst satisfying the majority of stakeholders and ensuring maximum value for money for consumers. |
| Restoration services procurement | • Provide accessible information to market participants on system restoration service requirements, costs and current and future needs. | • Actively maximises the ability for non-traditional sources of generation at all voltage levels to participate in restoration plans (and any restoration activities) to minimise restoration times in Great Britain (GB).<br>• Achieves a significant continual, and overall, increase in the level of restoration services that are competitively procured, that are |

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| | • Full implementation of RIIO-1 commitments in the Product Roadmap for Restoration[14].<br>• Progress and conclude the ESO's Distributed ReStart project[15] to establish a pathway to enabling the full participation of DER in restoration services.<br>• Achieves a continual increase in the level of restoration services that are competitively procured, that are consistent with meet expectations benchmarks performance metric 2A (Competitive procurement). | consistent with exceed expectations benchmarks performance metric 2A (Competitive procurement). |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Restoration plans and tools | • Plans and processes to support incident management and system restoration that are fit for purpose for a zero carbon electricity system. | • ESO has dynamic restoration tools that are able to advise control centre engineers on the best route for restoration at any point, enabling them to manage potentially hundreds of restoration providers, and demonstrably reducing potential restoration times.<br><br>To underpin this:<br>➢ successful development and implementation of the |

[14] The ESO's Roadmap for Restoration can be found at the following address: https://www.nationalgrideso.com/sites/eso/files/documents/National%20Grid%20SO%20Product%20Roadmap%20for%20Restoration.pdf

[15] More information about the project can be found at the following address: https://www.nationalgrideso.com/future-energy/projects/distributed-restart

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| | | necessary IT to enable such a decision-making tool, in close collaboration with other relevant parties. |
| Restoration service procurement | • Competitively procure the majority of system restoration services.<br>• Ensures that procurement is fair and accessible to all market participants and technologies at transmission and distribution voltage levels if they can meet the technical criteria. | • Develop liquid markets for system restoration services such that all providers, from transmission and distribution voltage levels, can be procured competitively at an economic price in all restoration zones if they can meet the technical criteria. |

**Activity 1c: Transparency, data and forecasting**

Meets expectations predominantly underpinned by licence conditions:
C28 4(e) publishing easily accessible information which the licensee holds to generate value for consumers and stakeholders, including but not limited to ensuring information services are designed to meet the needs of the service users;
C28 4(g) producing and publishing accurate and unbiased forecasts;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system;
C28 4(p) exchanging all necessary information and co-ordinating with holders of a distribution licence in so far as is necessary to ensure the optimal utilisation of resources, to ensure the economic and efficient operation of the system and to facilitate market development; and
Special Condition 2.11. Digitalisation.

| Output | Meets expectations | Exceeds expectations |
|---|---|---|
| **Immediate and ongoing** | | |
| Provision of market information | • Provide user-friendly, comprehensive and accurate information, including transparency on control room decision making.<br>• Provide transparency on the real-time system state. | • Proactive information provision that shares valuable information to market participants and network companies before this is requested, and ensures they have a high degree of understanding of the ESO's operations and decision-making. |
| Driving the energy sector digitalisation | • Make available a Digitalisation Strategy and Action Plan, with the Digitalisation Strategy and Action Plan[16] updated at least once every two years, and the Action Plan updated at least once every six months. Demonstrate | • In addition to the required actions to meet expectations the ESO will:<br>➢ Set an example to the whole sector for the pace of change and progress made delivering the Energy Data Task Force |

[16] More information about the Digitalisation Strategy and Action Plan can be found at the following address: https://www.ofgem.gov.uk/publications-and-updates/early-draft-digitalisation-strategy-and-action-plan-guidance-available

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| | progress against that plan and how it is driven by the needs of stakeholders and market expectations, such as the recommendations made by the Energy Data Task Force.[17] | recommendations and beyond (e.g. by demonstrating that the ESO is ahead of other parties in delivering those recommendations, and has actively encouraged broader up-take).<br>➢ participate in and lead cross-sectoral initiatives for UK infrastructure and Net Zero, such as the Centre for Digital Built Britain's Information Management Framework.[18] |
| Using and exchanging data | • The ESO ensures that its data is well-organised, accessible and shared proactively (where data collected by one team can benefit and inform the work of another team) by its teams within the organisation.<br>• Use of data by the ESO complies with the expectations of Data Best Practice, such as making available robust and reliable processes for exchanging operational information with DNOs.<br>• Treating energy system data as open for all to use by default,[19] | • ESO collaborates actively with DNOs to promote data sharing solutions and platforms that maximise consumer benefits. Collaboration should inform the development of DNO RIIO-2 Business Plans to ensure future platforms are fully interoperable.<br>• Making data (and its associated methods for data processing) widely available and easy to work with in open collaboration to give market participants opportunity for greater contributions to the decision- |

[17] More information about the Energy Data Taskforce can be found at the following address: https://www.gov.uk/government/groups/energy-data-taskforce

[18] More information can be found at the following address: https://www.cdbb.cam.ac.uk/news/pathway-towards-IMF

[19] The Data Triage programme would be a good starting point to contribute towards this expectation, although we expect the ESO to explore and implement other ways in which it can make energy system data open by default without waiting for stakeholders to request it.

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| | only restricting access where there is evidence of a good reason to do so (e.g. if the data contains sensitive information). | making processes related to system operation.<br>• Treating energy system data, processing methods and algorithms as open to all by default. |
| Forecasting | • Provide accurate forecasts with continuous incremental improvements to forecasting accuracy, in line with the meets expectations benchmark in performance metrics 1B (Demand forecasting) and 1C (Wind generation forecasting).<br>• Full implementation of Energy Forecasting Project Roadmap commitments for 2018-21.[20]<br>• Forecasts are accurate at both national and regional level and methodologies used are regularly updated to reflect changes at each Grid Supply Point (GSP).<br>• Model and understand developments on the distribution system which impact transmission-level demand. | • Step-change improvements in forecasting accuracy each year through improvements to forecasting models and processes, in line with the exceeds expectations benchmark in performance metrics 1B (Demand forecasting) and 1C (Wind generation forecasting).<br>• Dynamic forecasting processes which utilise machine learning to ensure forecasts are highly accurate for each half hour period, and both the national at the regional level.<br>• Undertakes activities that lead, organise, convene and build consensus to ensure all network operators are sharing and using consistent information to create accurate, whole system forecasts. |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Data use and exchange | • ESO has implemented a data and analytics platform (and an associated data portal) which | • ESO has integrated all tools and systems within its data and analytics platform, achieving all |

[20] The ESO's Energy Forecasting Project Roadmap is available at the following address: https://www.nationalgrideso.com/document/145941/download

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| | achieves most of the outcomes in its RIIO-2 Business Plan but may still require some additional functionality to achieve all planned outcomes. | outcomes set out in its RIIO-2 Business Plan, and receiving highly positive stakeholder feedback<br>• Data and analytics platform enables the seamless real time exchange of information with DNOs and other system users to enable efficient whole system operation. |

## Role 2: Market development and transactions

1.14. The ESO operates the balancing mechanism and develops and procures a number of additional balancing services to balance and operate the system in a safe, reliable and efficient way. The ESO's regulatory framework for procuring balancing services provides the ESO with significant scope and flexibility in the design of these services. The design of these services and approach to procurement are important as these can have significant impacts on the revenues available to different providers of these services and the ability for new entrants to compete with existing providers. This can also have a further impact upon short-term price signals and revenues in the wholesale traded electricity markets.

1.15. The ESO also has a number of additional roles related to market rules. The ESO administers the Connection and Use of System Code (CUSC), the Grid Code, the SO-TO Code (STC), and the Security and Quality of Supply Standard (SQSS). It is also a party to the Balancing and Settlement Code (BSC) and the Distribution Code. The ESO is able to propose changes to these codes, provide its expertise and analysis to aid industry discussions, and influence the final recommendations that go to the Authority. It is also the Electricity Market Reform (EMR) delivery body and has transmission system operator (TSO) responsibilities related to implementing European network codes and regulations.

**Activity 2a: Market Design**

Meets expectations predominantly underpinned by licence conditions:
C28 4(h) procuring balancing services to ensure operational security;
C28 4(i) ensuring the effective and non-discriminatory participation of all qualified market participants in the provision of balancing services, including not unduly restricting new and existing service providers from competing for the provision of such services;
C28 4(k) anticipating future national electricity transmission system requirements by using and developing competitive approaches to procuring balancing services wherever this is in the best interests of current and future electricity consumers in Great Britain;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system;
C28 4(n) co-ordinating and cooperating with transmission owners and holders of a distribution licence to identify actions and processes that advance the efficient and economic operation of the networks; and
C28 4(p) exchanging all necessary information and co-ordinating with holders of a distribution licence in so far as is necessary to ensure the optimal utilisation of resources, to ensure the economic and efficient operation of the system and to facilitate market development.

| Output | Meets expectations | Exceeds expectations |
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| **Immediate and ongoing** | | |
| Competitive, market-based procurement | • Procurement of balancing services through market-based competitive approaches, consistent with the meets expectations benchmark in performance metric 2A (Competitive procurement). | • Procurement of balancing services through market-based competitive approaches, consistent with the exceeds expectations benchmark in performance metric 2A (Competitive procurement). |
| Close to real time procurement | • Procurement of balancing services in timeframes compliant with relevant GB and European policy and regulations. | • Clear plans and demonstrable progress towards maximising the procurement of all balancing services at day-ahead, with a clear and transparent explanation of the circumstances in which this is not in consumers' overall interest. |

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| Delivering accessible markets | • Simplified suite of balancing services with participation requirements that provides opportunities for revenue-stacking[21], ensures a level playing field, and maximises participation regardless of provider type or size.<br><br>Including by:<br>➢ Transparent completion of all balancing market reform commitments made for the 2018-21 period[22] with justification of any necessary changes to priorities or plans.<br>➢ Ensuring fit for purpose, reliable procurement, communications and settlement systems that do not present any material barriers to participation, with the ESO clearly demonstrating how it has (or is) responding to previous issues raised.<br><br>• Using lessons learned from pathfinders, create a detailed plan for implementing enduring markets for solutions to stability, voltage and thermal constraints. | • Works extensively with industry to implement a complementary and fully integrated suite of balancing services, with no material barriers to participation (evidenced through stakeholder feedback).<br><br>Including by:<br>➢ Implementation of a single integrated platform for ESO markets (in line with RIIO-2 Business Plan timescales) in a joined-up manner with wider IT system changes and with positive user feedback.<br>➢ A year on year step change in the satisfaction levels of industry parties, with greater numbers and types of parties responding positively about the accessibility of platforms, and fewer reporting issues and delays in market access.<br><br>• Using lessons learned from pathfinders, demonstrate clear progress in implementing enduring markets for solutions to stability, voltage and thermal constraints. |

[21] Revenue-stacking is the ability to derive revenue from the provision of multiple services.

[22] Including those contained in the Product Roadmaps for Response, Reserve, Reactive, and Wider Access to the BM (https://www.nationalgrideso.com/research-publications/future-balancing-services)

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| Signalling procurement needs | • Transparent and clear communication to market participants on current and future system challenges and ESO balancing service needs, in line with the objectives of the Operability Strategy Report. | • Proactive, transparent development of balancing services markets to solve foreseen future system challenges (before the ESO would need to incur significant costs to address these challenges).<br>• Notice of procurement rounds signalled to stakeholders sufficiently in advance to enable optimal participation. |
| Coordinated procurement across the whole system | • Collaborates with other network operators to ensure that balancing services procurement is coordinated and where beneficial for consumers (e.g. contract terms, service requirements and frequency of procurement) standardised across networks.<br>• Active participation in projects and forums that drive improved coordination in procurement, including relevant data sharing (such as Open Networks). | • Inputting proactively into the development of distribution network ancillary services (including inputting actively to DNO RIIO-2 plans) to enable integration with ESO markets and facilitate the future efficient, whole system procurement of balancing / ancillary services.<br>• Organises, convenes and builds consensus with other network / system operators to drive changes that will optimise balancing service procurement across the whole electricity system, using high quality information / analysis to support the process. |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Competitive procurement | • ESO has introduced market-based, competitive procurement in most balancing services, with few, and only minor, examples of | • ESO has introduced full competition everywhere, in all balancing services with a transparent and well evidenced explanation of the circumstances |

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| | non-competitive procurement remaining. | in which this is not in consumers' interest. |
| Delivering accessible markets | • ESO has implemented most service procurement within a user-friendly single market platform.<br>• Few and only minor issues with market access, with the ESO acting quickly to improve functionally and address any issues as they arise.<br>• Introduction of an enduring markets for solutions to stability, voltage and thermal constraints. | • ESO has developed and implemented well-constructed markets that have incorporated procurement of all services within a single, highly accessible market platform, which is praised routinely by market participants.<br><br>In particular, the platform would:<br>➢ minimise cost and complexity for users, enabling them to easily capture the value they provide to the system across multiple services.<br>➢ maximise participation from all different types and sizes of participants or business models.<br>➢ be flexible, future proofed and easily adaptable to enable a quick response to feedback or changes in the wider system.<br><br>• Creation of competitive, fully-functioning, enduring markets for solutions to stability, voltage and thermal constraints, which provide appropriate, dependable investment signals for market participants. |
| Coordinated procurement | • ESO run markets are coordinated with distribution-level flexibility markets, providing minimal | • When in consumers' interests, service providers have a single, consistent set of procurement |

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| across the whole system | complexity for providers looking to maximise the value from their services. | requirements when looking to provide services to the ESO or DNOs.<br>• Providers have a single interface point (or consistent standardised interface points) for providing services to the ESO and DNOs. |

**Activity 2b: Electricity Market Reform**

Meets expectations predominantly underpinned by licence conditions:
C28 4(e) publishing easily accessible information which the licensee holds to generate value for consumers and stakeholders, including but not limited to ensuring information services are designed to meet the needs of the service users;
C28 4(g) producing and publishing accurate and unbiased forecasts; and
C28 4(m) providing accurate and timely guidance to all industry parties on the relevant rules for the Contracts for Difference (CfD) and Capacity Market (CM) prequalification and auction processes.

| Output | Meets expectations | Exceeds expectations |
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| **Immediate and ongoing** | | |
| User experience with the EMR portal | • An evident year-on-year improvement in the user experience from RIIO-1 (e.g. existing issues are resolved, resulting in lower barriers to entry for providers).<br><br>Underpinned by:<br>➢ Timely completion of the refreshed EMR IT portal with positive user feedback, which ensures the ESO and the IT portal has the ability to respond quickly and cost efficiently to change. | • A step change improvement in user experience for EMR participants, as demonstrated by user feedback, with a highly accessible platform that facilitates widening participation.<br><br>Underpinned by:<br>➢ Extensive engagement with industry to develop a highly accessible EMR portal. |
| Implementation of policy and rule changes | • Policy changes, or system workarounds, should be implemented continuously in a timely and cost efficient way to ensure compliance with legal obligations, and no later than 12 months following identification of the relevant | • Undertaking an enduring prioritisation exercise of all expected system change requirements by Delivery Partners, which results in a predictable, transparent and achievable roster of changes to be delivered. |

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| | Rules or Regulations, unless otherwise stated by Ofgem or BEIS. | |
| Providing support to EMR parties | • Supports industry parties through the CfD & CM prequalification and auction processes through provision of accurate & timely guidance to parties on relevant rules and changes to those rules.<br>• Ensure fair provision of guidance and support. This may require a targeted strategy depending on the type of Capacity Provider and eligible generator to ensure a level playing field. For example, smaller parties should not lose out due to lack of resource, with a variety of communication channels allowing for this. | • Delivery of an evidenced step change in query management with demonstrable improved feedback from Capacity Providers[23] and eligible generators[24]. |
| Making accurate prequalification decisions | • Accurate CM prequalification and agreement management decision making, based on compliance with the Capacity Market Rules and The Electricity Capacity Regulations 2014.<br>• Accurate CfD qualification decision making, based on compliance with the Rules and Regulations.<br>• Very few errors made or decisions overturned by Ofgem | • Performance in line with the exceeds expectations benchmark of regularly reported evidence 2C (EMR decision quality). |

[23] Market participants that have a capacity market agreement.

[24] As defined in the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 (as amended).

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| | in the Tier 2 process following CfD qualification. | |
| Improving EMR processes | • Readily, regularly and accurately present information demonstrating the ongoing effective operation of the Capacity Market processes with Delivery Partners.<br>• Ensure that auction recommendations assessments are accurate and responsive to recommendations for improvements. | • Evidence of continuous improvement to prequalification and auction delivery, resulting in improved user experience for Capacity Providers. Lessons learned implemented demonstrably and result in an increase in the effectiveness of applicants applying to prequalify and participate in the auctions. |
| Monitoring compliance with rules | • Proactive engagement with delivery partners when issues are identified and alerts Ofgem of any potential instances of non-compliance with their licence within a working day from discovery of the issue. Other issues are communicated in a timely fashion. | |
| Security of supply modelling | • Endorsement from the Panel of Technical Experts (PTE) on annual modelling approach.<br>• Engages with European Network of Transmission System Operators for Electricity (ENTSO-E) and effectively consults GB TSOs in respect to medium- and long-term security of supply modelling and direct foreign participation in the CM. | • Step change improvements in medium term demand forecast accuracy, through the proactive identification of changes to the methodologies and input data. |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |

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| User experience with the EMR portal | An EMR IT portal with a user-friendly and accessible interface – backed up by feedback with a consistent, high degree of satisfaction. | • Full integration of the EMR portal with other ESO markets within a single market platform with an evidenced step change in user experience. |

**Activity 2c: Industry codes and charging**

Meets expectations predominantly underpinned by licence conditions:
C28 4(i) ensuring the effective and non-discriminatory participation of all qualified market participants in the provision of balancing services, including not unduly restricting new and existing service providers from competing for the provision of such services;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system;
C28 4(q) proposing and supporting code arrangements that promote the relevant code objectives in a timely manner;
C28 4(r) developing, managing and maintenance of the process for the methodologies for use of system charging; and
C28 4(s) managing connection applications for access to the national electricity transmission network in a fair, consistent and timely manner.

| Output | Meets expectations | Exceeds expectations |
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| **Immediate and ongoing** | | |
| Managing codes changes | • Quality code administration service in line with industry norms.<br>• Provide a code change process that supports participation of industry participants and integrates effectively with changes to other codes.<br>• Provides unbiased, detailed analysis or modelling to support code modifications. | • Exemplary code administration service compared to most other code administrators (demonstrated through comparative surveys and stakeholder feedback).<br>• Proactively works with Ofgem and government on improvements to energy code governance, including providing robust evidence and thought leadership into the Energy Codes Review. |
| Improving GB rules and standards | • Proactive identification of the most necessary changes to GB frameworks to remove distortions and to ensure a level playing field.<br>• Propose and support code modifications that promote the | • Continuous and frequent activities that organise, convene, listen and building consensus to ensure the GB electricity market framework develops in the best interests of consumers. |

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| | relevant code objectives, in the interests of GB consumers.<br>• Contributes views and analysis to aid the development of distribution-level rules and frameworks.<br>• Be as open and transparent as possible, sharing insights, comparisons of alternative proposals and robust analysis that can inform workgroup deliberations. | • Insights, analysis and change proposals that consider the links and dependencies between balancing, wholesale and capacity markets ie taking account of the potential impacts on areas outside of the discrete change proposal.<br>• Ensure change proposals evaluate effectively trade-offs between options, in the context of the broader reform environment (e.g. consideration of changes taking place in other energy codes and the sector more broadly).<br>• Proactively shapes and provides system operation expertise and insights into the development of distribution-level operational frameworks. |
| Influencing, implementing and administrating European rules | • Provide a consistent and holistic GB perspective during the development and implementation of European methodologies and processes, via membership of ENTSO-E.<br>• Timely implementation of all GB and European code changes to ensure the ESO's compliance.<br>• Subject to the details of EU exit arrangements, administers GB participation in the Inter-TSO Compensation (ITC) mechanism, meeting the requirements of UK and EU legislation, including through engagement with ITC | • Exemplary stakeholder engagement processes to ensure that GB's shaping of European developments represents a broad cross-section of stakeholders; including by communicating key outcomes and trade-offs to interested GB participants.<br>• Direct influencing of European market developments to ensure changes are in the interests of GB consumers.<br>• Monitor, influence and communicate the impact of changes in ITC mechanism |

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| | parties as relevant. Provides accurate and timely GB data for reporting purposes. | participation to maximise consumer benefit, such as GB participation post-Brexit. |
| Promoting efficient charging and access arrangements | • Competent and responsive development, management and maintenance of the charging process.<br>• Providing insight, clarity and transparency through role as Charging Futures lead secretariat.<br>• Chair relevant workgroups through Charging Futures.<br>• Take a leading role in the Access Significant Code Review (SCR) Delivery Group.[25] This should include providing modelling of transmission-level tariff options, analysis of the merits of different transmission options, comment on interactions with distribution-level changes and developing plans for option implementation.<br>• Ensures forecasts of industry charges are as accurate as possible by maintaining fit for purpose forecasting models and processes, consistent with the methodologies set out in the various Codes (e.g. the CUSC).<br>• Shares the information needed by other parties (where these | • Undertake activities that organise, convene and building consensus to contribute directly to the development of new approaches to transmission network charging, which maximise long-term benefits for consumers. This could include providing views on any links and dependencies between charging matters and its other works areas.<br>• Undertake activities that utilise the ESO's technical understanding of the transmission system and charging methodologies to provide additional insight and qualitative and quantitative policy inputs, such as modelling or analysis to show system benefits of options. |

[25] More information about the Access SCR Delivery Group can be found at the following address: http://www.chargingfutures.com/charging-reforms/access-forward-looking-charges/resources-2/scr-delivery-group/

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| | are onshore TOs, this information should be in accordance with the STC) to enable them to understand and manage their financial exposure to changes in expected charges. | |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Managing code changes | • ESO has successfully introduced a single digitalised grid code, with positive user experience. Some discrepancies between transmission and distribution code change processes may remain. | • ESO has introduced a single, accessible technical code for transmission and distribution which achieves the user functionality and benefits set out in its RIIO-2 plan. This includes the ESO successfully transforming the Grid Code to incorporate existing transmission and distribution codes into an IT system with artificial intelligence enabled navigation and, document and workflow management tools that provides users with a more user-friendly, inclusive and tailored experience. |
| Improving GB rules and standards | • ESO has progressed a number of key changes to technical standards to facilitate a zero carbon energy system, in line with government recommendations. | • ESO has proactively influenced, comprehensibly reviewed and (subject to BEIS conclusions) successfully implemented necessary changes to the Security and Quality of Supply Standard (SQSS) and other technical standards to ensure they are fit for purpose for a zero carbon energy system. |

## Role 3: System insight, planning and network development

1.16. The ESO performs a variety of insight, planning and network development activities. It publishes key insight documents that include credible long-term pathways for the energy sector through its Future Energy Scenarios (FES), it identifies long-term electricity system needs in the Electricity Ten Year Statement (ETYS) and also provides GB input, based on the FES, into the development of the pan-European Ten Year Network Development Plan (TYNDP).

1.17. The ESO's annual Network Options Assessment (NOA) is a central part of it network development activities. The NOA assesses and recommends solutions to electricity onshore and offshore transmission system needs and provides an analysis of optimal interconnector capacity growth. The wider NOA methodologies also provide a foundation for the ESO to contract for long-term operability solutions (e.g. to solve network constraints and stability issues) via its NOA pathfinding projects.

1.18. The ESO network development activities also include improving the coordination of offshore network development through the wider network benefit investment (WNBI) mechanism and working with DNOs to ensure that its efficient and coordinated network development activities maximise whole system benefits across network boundaries. In addition, the ESO carries out network development cost-benefit or impact assessments to inform Ofgem's decision-making, such as decisions on major new investments in the onshore transmission networks proposed by TOs.

1.19. At present, the ESO is undertaking further work to develop a plan to introduce Early Competition in network development and an assessment of options for a more coordinated approach to offshore transmission network planning and delivery. We expect to update this guidance with additional expectations in these areas once this existing work concludes.

1.20. The ESO is also responsible for the connections process to use the electricity transmission system and for managing the impacts on the NETS from new connections of new offshore generation as well as at distribution level, through liaison with developers and DNOs to ensure that offshore/onshore networks are planned holistically.

**Activity 3a: Connections and network access**

Meets expectations predominantly underpinned by licence conditions:
C28 4(d) optimising the timing of transmission outages under the outage plan on the national electricity transmission system;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system;
C28 4(n) co-ordinating and cooperating with transmission owners and holders of a distribution licence to identify actions and processes that advance the efficient and economic operation of the networks;
C28 4(o) using best endeavours to implement actions and processes identified and proposed through its activities under paragraph C28 4(n) of this condition that are in the interest of the efficient and economic operation of the total system;
C28 4(p) exchanging all necessary information and co-ordinating with holders of a distribution licence in so far as is necessary to ensure the optimal utilisation of resources, to ensure the economic and efficient operation of the system and to facilitate market development;
C28 4(s) managing connection applications for access to the national electricity transmission network in a fair, consistent and timely manner; and
C28 4(t) ensuring coordination with other network operators and interested parties and identifying and delivering the most efficient network planning and development of solutions to meet future transmission network needs. These solutions should include, but are not limited to, solutions that cost-effectively alleviate the need to upgrade or replace electricity network capacity.

| Output | Meets expectations | Exceeds expectations |
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| **Immediate and ongoing** | | |
| Managing connections | • Competent and responsive development, management and maintenance of the transmission network connections process (including onshore, offshore and interconnector connections).<br>Including by:<br>➢ Supporting all parties fairly, establishing dedicated account | ➢ Provides and supports a seamless connections experience to electricity networks across GB (including both transmission and distribution networks), in order to facilitate a timely and efficient transition to a Net Zero electricity system.<br>Including by: |

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| | functions for DER where necessary.<br>➢ Provides visibility and understanding of connections process and considerations for all parties, including through well run seminars and events.<br>➢ Planning ahead to consider the pipeline of future connections across the whole electricity network and use this to inform actions today.<br>➢ Developing processes where an accumulation of connection requests in a given area can be considered together, rather than processed in isolation, e.g. the development of a regional Connection and Infrastructure Options Note (CION) process.<br>➢ Processing connection requests in a sufficiently timely manner and providing developers with certainty over their respective connection completion date.<br>➢ Recording all options considered when processing a connection request for an offshore wind farm, including whether the ESO has considered Developer Associated Wider Works. | ➢ Developing connections processes and systems in close collaboration with other network operators, industry and developers, that are consistent across networks and flexible to future system changes.<br>➢ Processing connection requests in a sufficiently timely manner such that the rate of connection requests processed by the ESO is at least equal to the rate of incoming connection requests, ie the ESO does its part to prevent a growing backlog of requests.<br>➢ Proactively identifying challenges and potential longer-term responses to connection planning issues, particularly in response to offshore transmission, interconnection and implementation of government policy.<br>➢ Working with connecting parties to understand early whether there are services they can provide to the system that would mitigate other system costs.<br>➢ Leading industry thinking by developing economic and efficient conceptual solutions for coordinating the development of the NETS in offshore waters, whilst taking account of pan-European network development plans. |
| Outage and medium- | • Coordinate with all TOs and significant sources of generation | • Facilitates an optimal, whole system approach to network |

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| term access planning | to implement efficient outage plans that minimise costs to consumers.<br>• Provide visibility on the costs and benefits associated with changing network outages, through system analysis and cost assessments.<br>• Transmission access programmes planned on a whole system basis using open data where appropriate.<br>• Works with DNOs to coordinate and collectively optimise network access and planning through exchanging all relevant data in consistent formats. | access and planning by coordinating seamlessly with all network operators via common data exchange systems (with use of open data where appropriate) to shape the future development of network access polices.<br>• Works with network operators to identify and bring forward innovative, medium-term network solutions that drive significant constraints savings for consumers (e.g. through Joint Works projects). |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Managing connections<br><br>Outage and medium-term access planning | • The ESO has helped to deliver a high degree of coordination between connections and network access processes across transmission and distribution networks.<br>• To underpin this, the ESO's website clearly directs connecting parties to other network companies' connections webpages / customer portals. | • ESO has actively extended connection and network access planning approaches across the whole electricity system, with a single point of contact, run in cooperation or coordination with other network operators, that ensures a seamless experience for all types of parties and facilitates efficient planning across transmission and distribution networks.<br>To underpin this:<br>➢ The ESO has contributed to the implementation of a central highly accessible hub for connections, which is fully interoperable with the systems of other network operators, and delivers the |

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| | | outcomes described in its RIIO-2 plan (e.g. an enhanced understanding for all parties of the available capacity and the costs of connecting to different parts of the whole network).<br>➢ The hub advises customers of capacity opportunities on both the distribution and transmission networks and acts as a one stop shop for all connection-related information (e.g. signed agreements, charges, operational notifications and tracks the progress of their connections). |

**Activity 3b: Operational strategy and insights**

Meets expectations predominantly underpinned by licence conditions:
C28 4(e) publishing easily accessible information which the licensee holds to generate value for consumers and stakeholders, including but not limited to ensuring information services are designed to meet the needs of the service users;
C28 4(f) publishing reliable scenarios of the long term development of the energy system and its needs under different scenarios;
C28 4(g) producing and publishing accurate and unbiased forecasts;
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system
C28 4(n) co-ordinating and cooperating with transmission owners and holders of a distribution licence to identify actions and processes that advance the efficient and economic operation of the networks; and
C28 4(p) exchanging all necessary information and co-ordinating with holders of a distribution licence in so far as is necessary to ensure the optimal utilisation of resources, to ensure the economic and efficient operation of the system and to facilitate market development.

| Output | Meets expectations | Exceeds expectations |
|---|---|---|
| **Immediate and ongoing until the end of RIIO-2** | | |
| Providing energy insights | • Informs the future development of the electricity and gas systems through the production of clear, accessible and timely insight documents, which are informed by robust stakeholder engagement. | • Uses expertise to produce trusted and highly valued insights that shape policy decisions on the energy transition and support the UK's 2050 net zero commitment. |
| Producing analytically robust scenarios and long-term forecasts | • Competent and responsive development, management and maintenance of the Future Energy Scenarios (FES) process, with evidence for assumptions and decisions through a record of data inputs and the cross section of stakeholders views gathered. | • Monitors and evaluates previous analysis / scenarios, including by analysing forecast vs. actual outcomes as part of the EMR demand forecasting incentive (e.g. to include supply as well as demand elements for this five year period), to improve accuracy in future publications |

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| | • Provide justifiable and credible long-term scenarios (updated at least annually) covering a sufficiently wide range of outcomes, both in terms of future energy system development and the associated costs of operating the electricity system in those scenarios.<br>• Stress-testing of scenarios, analysis and assumptions and consideration of whether scenarios and forecasts remain fit for purpose at least on an annual basis.<br>• High degree of engagement, transparency and justification of decision making to stakeholders throughout the development process.<br>• Work collaboratively with other parties to improve industry data (where possible and relevant) to support the development of scenarios. | and explain clearly the reasons for shorter-term deviations between forecast and realised outcomes.<br>• Invites and proactively facilitates collaboration from all interested stakeholders to drive forward the improvement of industry data to achieve more reliable forecasting capabilities.<br>• Continually expands the functionality of demand models to provide step changes in accuracy, in particular by better taking into account profiles across the year, changes at the regional level and developments across vectors. |
| Ensuring coordinated scenario development | • Engages and coordinates with other licensees (e.g. Gas System Operator, DNOs) to ensure regional and cross-sectoral interactions are clearly taken into account in the scenario development processes.<br>• Provides accurate and consistent GB scenario data into European processes via ENTSO-E membership and contributes to | • Proactively brings together as many relevant industry parties as possible, both directly and through working with open data, to produce consistent factual data that can be used to identify pathways to achieving scenarios that meet decarbonisation targets, across the whole energy system.<br>• All insight and scenarios documents (including the FES, |

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| | the development of the ENTSO-E TYNDP.<br>• Supporting DNOs in developing Distribution FES ("DFES") processes, for example through timely sharing of data, to provide a coherent set of whole-system scenarios. | ETYS, Operability Strategy Reports, and the System Operability Framework Report) work together seamlessly to present a clear, coherent, and coordinated view of all future needs across the whole electricity system (evidenced through stakeholder feedback). This includes sharing all data, assumptions and methodology so that any party can reliably reproduce the FES. |

**Activity 3c: Optimal network investment**

Predominantly underpinned by current, as well as proposed, licence conditions:
C28 4(l) facilitating an economic and efficient transition to a zero carbon energy system;
C28 4(n) co-ordinating and cooperating with transmission owners and holders of a distribution licence to identify actions and processes that advance the efficient and economic operation of the networks;
C28 4(o) using all best endeavours to implement actions and processes identified and proposed through its activities under paragraph C28 4(n) of this condition that are in the interest of the efficient and economic operation of the total system;
C28 4(p) exchanging all necessary information and co-ordinating with holders of a distribution licence in so far as is necessary to ensure the optimal utilisation of resources, to ensure the economic and efficient operation of the system and to facilitate market development; and
C28 4(t) ensuring coordination with other network operators and interested parties and identifying and delivering the most efficient network planning and development of solutions to meet future transmission network needs. These solutions should include, but are not limited to, solutions that cost-effectively alleviate the need to upgrade or replace electricity network capacity.

| Output | Meets expectations | Exceeds expectations |
|---|---|---|
| **Immediate and ongoing** | | |
| Identifying network needs and solutions | • Make recommendations to other parties and take ESO procurement decisions that lead to the economic and efficient design and operation of the transmission network (including onshore, connections for offshore wind and interconnection).<br><br>• Conducting fit-for-purpose analytical assessments, including by:<br>➢ Ensuring that all commitments made in | • Make recommendations to other parties and take ESO procurement decisions that lead to the economic and efficient design and operation of the transmission network (including onshore, connections for offshore wind and interconnection), by optimising demonstrably the number and types of solutions available and taking into consideration the system needs associated with Net-Zero. |

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| | previous Network Development Roadmaps are completed in a transparent, timely manner with justification of any necessary changes to priorities or plans.<br>➢ Identifying future high-cost network issues in advance of the additional costs being incurred.<br>➢ Assessing all options fairly, based on robust and transparent cost benefit analysis.<br>➢ Producing clear, accessible and timely NOA publications.<br>➢ Regular engagement with Ofgem, industry and interested stakeholders on NOA methodology development to ensure that the year-on-year system planning process is fit for purpose.<br>➢ Building on past learning to continually improve the models, methodologies and analytical tools underpinning the assessment process of the NOA and NOA pathfinders.<br>➢ Progressing the pathfinders from a 'proof of concept' | • Conducting exemplary analytical assessments, including by:<br>➢ Identifying all material transmission network needs[26] issues in advance of additional costs being incurred.<br>➢ Introducing timely, significant improvements to the analytical tools underpinning the assessment processes (for example: developing tools to allow Optimal Power Flow (OPF) analysis to perform circuit-based thermal assessment considering market actions; introduction of year-round assessment considerations; and a stability tool for SQSS transient analysis).<br>➢ Assessing all options based on a high quality, robust and transparent cost benefit analysis that provides a high degree of confidence that the ESO has recommended the optimal solution(s).<br>➢ Where appropriate, identifying additional solutions not proposed by other parties, recommending optimised combinations of |

[26] At present we understand that thermal constraints, voltage and stability issues are the most material network needs. We expect the ESO to keep all network needs under review and, if necessary, expand upon this.

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| | stage and integrating these into an established and coherent set of assessments governed by the NOA methodology.<br><br>• Ensure wide participation in assessments and tenders, including by:<br>➢ Inviting all types of providers (network and non-network, transmission and distribution connected) to provide solutions to the most high-cost network issues.<br>➢ Seeking and inviting potential commercial alternative solutions to compete against traditional network reinforcement-based solutions. | solutions to target a known issue, or identifying a solution that may address multiple issues.<br>➢ Using medium-term market solutions as a cost-effective approach to keep network investment options open against uncertainty.<br><br>• Ensure maximum possible participation in assessments and tenders, including by:<br>➢ Proactively facilitating and encouraging all types of providers (network and non-network, transmission and distribution connected) to provide solutions to all material transmission network needs Ensure that all assessments and tenders are accessible to all potential providers of commercial alternative solutions, facilitating effective competition against traditional network reinforcement based solutions. |

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| Coordination between network assessments | • Ensuring coordination between the different assessments of solutions to the most high value transmission network needs (e.g. ensuring coherence between the annual NOA assessment, the pathfinder assessments and offshore wind connections).<br><br>Including by:<br>➢ Setting out and meeting a clear and coherent timetable / calendar for when the different assessments are to take place. Ensuring that it is easily accessible to all that wish to engage with the NOA, Pathfinders and any new assessment / tender processes.<br>➢ Identifying barriers to achieving greater coordination (both technical and regulatory), making these barriers clear to all parties, and proposing solutions to overcome these barriers. | • Setting a clear plan for (and making demonstrable progress towards) the introduction of a co-optimised[27] assessment of all solutions to all material transmission network needs.<br><br>Including by:<br>➢ Developing a clear future vision and strategy for an optimal network assessment process (or suite of integrated processes with harmonised timings) capable of addressing Net-Zero system needs.<br>➢ Identifying the barriers to achieving this vision (both technical and regulatory), making these barriers clear to all parties, and developing solutions for overcoming these barriers.<br>➢ Implementing solutions for addressing these barriers when these are within the ESO gift. |
| Procurement of network solutions | • Share well-defined, timely, clear needs specifications for all tenders.<br>• Continual improvements made to the procurement process informed by stakeholder feedback. | • Share well-defined, timely, clear needs specifications for all tenders, which contain requirements that do not limit the participation of any technologies or potential commercial solutions (or |

[27] In this context co-optimised means: (1) greater integration between the different modelling tools to better understand the interactions between different possible solutions to different network needs; and (2) optimising the timing / synchronicity of different assessments. Co-optimisation should ensure optimal economic decision-making across all assessments of the relevant network needs. For the avoidance of doubt, this may or may not be a single co-optimisation tool.

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| | • Use the methodologies and lessons learned through developing the Pathfinders to create a plan to implement regular, dependable, bankable markets for stability, voltage and thermal constraints (to be implemented under Activity 2a). | transparently demonstrate why requirements that limit participation are in consumers' interests).<br>• Use of the methodologies and lessons learned through developing the Pathfinders and is implementing regular, dependable, bankable markets for stability, voltage and thermal constraints (to be implemented under Activity 2a). |
| **By the end of RIIO-2**<br>(with evident progress demonstrated by March 2023) | | |
| Identifying network needs and solutions | • The ESO has ensured that a wider range of types of solutions, to transmission network needs are fully and equally assessed in all of its long-term network development work.<br>• The ESO has ensured that its network planning processes enable a long-sighted, strategic planning function at the onshore / offshore boundary (subject to the outcomes of the Offshore Coordination Project[28]).<br>• The NOA process and tools have been progressively extended year-on-year to facilitate the submission of innovative | • The ESO methods and analytical tools (including IT systems) ensure that all different types of solutions, to all material transmission network needs are fully and equally assessed and the most efficient solutions are brought forward.<br>• The ESO has implemented new processes to identify the optimal combination of options to address the full range of year-round challenges over the medium and long-term.<br>• The ESO has implemented tools and processes that ensure that different types of solutions to all material transmission network |

[28] More information about the Offshore Coordination Project can be found at the following address: https://www.nationalgrideso.com/future-energy/projects/offshore-coordination-project

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| | solutions to transmission network needs. | needs are fully assessed, using all FES scenarios, which cover a full range of within-year conditions ("year-round assessments") and ensure the optimal solutions are brought forward. This includes:<br>➢ high-quality, fully tested, year-round tools for: voltage optimisation; OPF analysis for thermal assessments; stability assessments and analysis of dynamic stability, RoCoF, new technology challenges and load model impacts.<br>➢ Improvements to model outage planning in year-round. |
| Coordination between network solutions | • The ESO's long-term network development process ensures that all assessments and tenders are part of a complementary and coordinated set of processes which ensures the efficient solutions are brought forward.<br>• The ESO has produced, and continually updated, one overarching methodology and timetable that clearly shows how the different assessments of solutions to different transmission network needs interact. | • The ESO's network planning process ensures that all relevant different types of solutions, to all stability, voltage and thermal constraints needs, are fully and equally assessed in a co-optimised[29] manner to ensure the optimal whole-system solutions are brought forward. |

[29] See footnote 31.

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| Consistency with distribution network planning | • The ESO has assisted the DNO's in developing network planning processes and methodologies which are consistent with those at the transmission level, engaging at regular intervals to share expertise. | • Network planning processes and assessments at the transmission level are fully coordinated with those at the distribution level (e.g. apply consistent processes and methodologies and are timed such that they take account of their respective outputs), with the ESO having supported and proactively made recommendations to shape the DNO's RIIO-2 Business Plans to ensure optimal whole system network development. |