

October 2021

RIIO-2 Business Plan 1 (2021-23)

2021-22 Mid Year Report Executive Summary

Welcome

Welcome to our first six-monthly incentives report of RIIO-2.

Just under two years ago we published our RIIO-2 business plan. We are extremely proud of the plan we put together and have made great strides towards delivery, recognising the challenges of delivering against our highly ambitious plan.

Over the past 6 months we have taken a number of important steps:

- Our success lies in our people and we've invested significantly, growing our workforce size by 90 (approximately 12%) over this period, improving our capability and setting us up to deliver.
- We have started delivering significant benefits. Over the four months since the implementation of the recommendations of the Frequency Risk and Control Report (FRCR), RoCoF costs have been £72m lower than last year, although this is partly offset by an increase in response costs due to the new Dynamic Containment service.
- We are making good use of our new regulatory regime to be more agile and invest in additional activities where this brings a consumer benefit. Examples include progressing the Early Competition and Offshore Co-ordination projects, and setting up a new Market Monitoring team.

We remain focused on delivering the milestones set out in our Delivery Schedule (which covers the Business Plan 1 period from 2021-23). Despite a slower start in delivering some of our milestones, we are confident we will deliver our commitments by the end of this Business Plan period. We are forecasting a spend of 12% above our cost benchmark for the 2-year period, driven in part by additional investments in new activities providing additional consumer benefit outside our plan, and in part by increased estimates of the Balancing Programme cost and scope following detailed project planning during the last six months.



Foreword

While delivering our transformational activities, we continue to manage the operational challenges – most recently as a result of tight margins, which were a result of low winds, unprecedented increases in gas prices and interconnector outages. We are working hard with BEIS, Ofgem, and our customers and stakeholders across the industry to ensure we play our part in navigating through this winter, recognising that supplier failures and high costs impact consumers, the economy and society as a whole.

We continue to work hard to mitigate increases in balancing costs and our efforts have seen total constraint costs outturn below the benchmark over the period. However high wholesale energy prices have resulted in overall balancing costs significantly above the benchmark. In line with our commitment to increased transparency we are providing more information on the costs, their drivers and our actions via our Data Portal and weekly Operational Transparency Forum.

Looking to the future, we have responded to the Ofgem and BEIS consultation on the Future of the System Operator. We are excited by the opportunities the future presents and continue to collaborate with BEIS and Ofgem, as well as the wider industry, to shape the vital role a future system operator could play in the energy system's drive to net zero.

I look forward to continuing to work with you as we progress our Business Plan commitments.

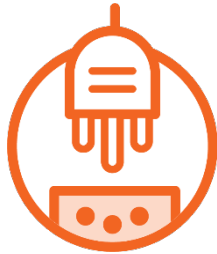
Fintan Slye
Director, Electricity System Operator

Contents

Welcome	2
Role 1 – Control centre operations	6
Role 2 – Market development and transactions	9
Role 3 – System insight, planning and network development	12
Progress towards our ESO mission	15
Annex	18
The ESO Incentive Scheme	19
Deep Dive: Future of the System Operator	20
Deep Dive: Transforming our IT capability	21
Deep Dive: Balancing Costs	22
Acting on feedback from the Performance Panel	23

For further information, please see our [Evidence Chapters document](#)

ESO performance on a page



Plan delivery

- We have completed 76 of the 112 milestones which were due to be completed in this 6-month period. Of the remaining milestones, 11 are ESO-related delays, 20 are outside of ESO's control, and 5 were delayed to deliver an improved consumer benefit
- To support our delivery, we have grown our workforce size by 90 (approximately 12%) over this period, with further increases planned for the rest of BP1.



Metric performance

- Over the 6-month period,
- 1 metric exceeding expectations
 - 3 metrics meeting expectations
 - 1 metric below expectations



Stakeholder evidence

Role 1 survey:
 19% exceeding expectations
 72% meeting expectations
 9% below expectations

Role 2 survey:
 8% exceeding expectations
 72% meeting expectations
 19% below expectations

Role 3 survey:
 18% exceeding expectations
 58% meeting expectations
 24% below expectations

(percentages may not add to 100% due to rounding)



Demonstration of plan benefits

- Our [RIIO-2 Business Plan](#) described net present value benefits of around £2 billion for consumers over the five-year RIIO-2 period. We are still expecting to deliver this benefit.

Examples of additional consumer benefits delivered include:

- We delivered £57m of consumer benefit via our Trading activities
- Competitive contracts for Restoration in the Northern region are expected to save approximately £14m over the next three years
- Loss of Mains changes are already saving consumers £20m/annum and are expected to reduce our actions to manage RoCoF risk from 7.4 TWh to 0.2 TWh per year.



Value for money

- Our forecast total expenditure across all three roles in BP1 is £568m, which is 12% higher than the benchmark of £506m
- Key drivers of the deviation are the Enhanced Balancing IT Programme, driven by improved understanding of cost and scope, as well as additional investment in Electricity Market Reform, and Offshore Co-ordination
- The changes we have made to the Balancing Programme are expected to deliver an additional consumer benefit of £27m per annum.

ESO delivery over the past 6 months

2021-22

April

May

June

July

August

September

Role 1

Record low carbon intensity for GB electricity	ESO joins global system operator consortium	Distributed ReStart Procurement and Compliance stakeholder engagement	Distributed ReStart desktop exercises	System Test Plan approved within Network Code on Emergency and Restoration (NCER)	ESO working with Open Climate Fix (OCF) on solar generation forecasting	Technical Advisory Council - discussed Digitalisation Strategy & Action Plan, ways of working & TechOps model
Electricity System Restoration Service contracts awarded		New record set for wind energy				8 Power System Engineering Apprentices have joined the ESO

Role 2

Five-Year View of TNUoS Tariffs published	Power Responsive guide to Demand Side Response published	Power Potential trial with UKPN	Dynamic Moderation and Dynamic Regulation workshops	Net Zero Market Reform - Case for Change Workshops	TNUoS tariffs 2022-23 forecast	Dynamic Containment to move to pay-as-clear auction	Dynamic Reserve Setting	Whole System Technical Code (WSTC) project issued first consultation
Dynamic Containment (DC) procurement webinar	Reserve Reform Workshop	The road to net zero carbon electricity markets				Demand Side Response Summer Event		Introducing Dynamic Containment High Frequency webinar

Role 3

Enabling the DSO Transition consultation	NOA 2021-22 methodology consultation	Stability Pathfinder Phase 1 - Deeside Power go-live	Winter Review and Consultation	Future Energy Scenarios (FES) 2021 launched	Annual Innovation summary	ENA publishes ESO-led consultation on a standard agreement for ESO and DSO flexibility services	Bridging the Gap 2022 project launched
Summer Outlook Report	Energy Storage Technical Feasibility Assessment	Voltage Screening Report	Stability Pathfinder Phase 2 extension to timeline	RDP webinars hosted jointly with UKPN & WPD			Stability Pathfinder Phase 3 pre-tender webinars
	DSO Transition Webinar	Addressing increasing constraint costs publication					

2021-22 Mid Year Report / ESO delivery over the past 6 months

Role 1:

Control centre operations

Over the past six months, we have observed the phased lifting of restrictions associated with COVID-19. As patterns of energy usage have gradually returned to normal, we have been faced with a different set of operability challenges, with changes to the generation mix, and market forces leading to power prices reaching all-time highs.

As the capacity of wind generation connected to the network has increased, we have observed days where wind generation meets over 60% of the UK's electricity demand, and conversely days where it meets less than 10%.

In recent months, global gas supply shortages coincided with a period of low wind, which led to high power prices. This was compounded by the long-term outage of the French interconnector (IFA1) due to a fire.

Despite these challenges, we have continued to meet our security of supply standards and improved our wind generation forecasting. We continue a strong focus on Balancing Costs, given that they are significantly above our benchmark.

Over the past six months, we have demonstrated that the fundamental way we operate the system is changing. Key examples of this include the implementation of Frequency Risk and Control Report (FRCR) recommendations into real time operations, the go-live of more contracts under the first phase of the Stability Pathfinder, and new ways of working to facilitate the activities required to connect two new interconnectors.



Isabelle Haigh, Head of National Control

We have also worked closely with a Transmission Owner and challenged the Security and Quality of Supply Standards (SQSS), avoiding the need for a costly contract with a power station, saving circa £50m. These actions demonstrate that we are adopting the mindset needed to operate in a changing operational environment: something which will become ever more important as we work towards our ESO mission and facilitate the energy transition.

High Balancing Costs

Whilst we have undertaken significant activities to reduce balancing costs, the operational challenges over this period mean that we have continued to incur balancing costs which are significantly above our regulatory benchmark, even though the volume of actions has been substantially lower than in previous years. Our monthly incentive reports now provide clearer information about the drivers of balancing costs, and the extent to which they are within or outside our influence. The implementation of the recommendations of the Frequency Risk and Control Report allows us to make use of recent developments such as Dynamic Containment and Loss of Mains changes to optimise the balance between managing frequency and reducing costs for consumers.

Over the four months since the implementation of the recommendations of FRCR, RoCoF costs have been £72m lower than last year, which is partly offset by an increase in response costs due to the new Dynamic Containment service.

As we show in our case study, despite the overall increasing balancing cost trends, our trading actions over the past 6 months have led to balancing cost savings of £57m against not having taken these actions.

Transparency

Transparency has been a key area of focus in recent months. We have continued to run the weekly Operational Transparency Forum to provide more detail about each week's operational issues, as well as deep dives on topic such as inertia, the Frequency Risk and Control Report, and constraint costs. We've also added more information to our Data Portal, for example our new Dispatch Transparency dataset which allows stakeholders to view whether Balancing Mechanism participants were dispatched in merit order, and more data from our trading actions.

Control centre operations

Facilitating new infrastructure

Despite the operational challenges we have faced over this period, we have worked closely with our stakeholders to facilitate the work required to connect two new interconnectors: North Sea Link (NSL) to Norway, and Eleclink to France. The interconnector owners have welcomed the efforts of our teams in making it possible for these activities to happen.

Delivering our plan

We've made good progress on the deliverables we set out in our RIIO-2 business plan, including on our IT investments. Much of this activity has been to define the system requirements to a more granular level. We have also started to reform our Restoration activities, for example delivering new competitively tendered contracts, and progressing trials as part of our Distributed Restart project. We have also set up a new Market Monitoring

function, an additional activity outside our original business plan submission.

We have completed 25 out of the 47 milestones planned for this 6-month period. Of the 22 milestones which are not complete, a significant number (17) have been impacted by circumstances out of our control such as Brexit, COVID-19 and delays to the restoration standard going live. We remain confident to deliver our key commitments by the end of the Business Plan 1 period.

This will bring us closer to our ambition of being able to operate a zero carbon system. Our progress towards this ambition is also measured by the Zero Carbon Operation indicator (Regularly Reported Evidence item 1F), which measures the proportion of zero carbon transmission connected generation that the system can accommodate.

Stakeholder views

Overall, 91% of respondents to the Role 1 stakeholder survey rated the ESO as meeting or exceeding their expectations. We're analysing the themes of stakeholder feedback within this survey and hope to increase this percentage in future surveys. We've also continued to meet with our Technology Advisory Council and are taking their feedback on board as we progress our IT deliverables. We've set up the Ways of Working programme, bringing together IT and business teams to create a better delivery of our requirements and an improved digital experience for our customers. We provide more detail about the Ways of Working programme in the annex to this document.

Forecasting increased spend

We forecast spending 21% more than the cost benchmark for the Business Plan 1 period in Role

1. This is driven by increased estimates of the Balancing Programme cost and scope following detailed project planning during the last six-months. Additional spend also results from the new Market Monitoring activity which was not included in the original cost benchmark.

Next steps

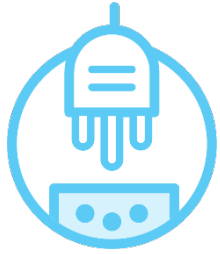
Looking ahead to the remainder of the year, I'm focused on driving further development of our IT programmes, particularly as the outputs of the Ways of Working programme are realised. I have valued the extent to which our stakeholders have shaped our activities so far, and look forward to engaging with them further during the remainder of the year.

Isabelle Haigh, Head of National Control



“I appreciate the work you put in reaching out to everyone in order to improve the transparency and access to data. The [Operational Transparency] forum is very useful”- supplier

Highlights



Plan delivery

- We have completed 25 out of the 47 milestones planned for this 6-month period. Of the 22 milestones which are not complete, 4 are ESO-related delays, 17 are outside of ESO control, and 1 is delayed in order to deliver an improved outcome for consumers
- Successfully operated the system under challenging conditions
- Provided more transparency via our Data Portal, meeting data best practice
- Refreshed our Digitalisation Strategy and Action Plan
- Continued to develop IT tools, completing the first inertia forecasting system
- Working with academia to design ESO-specific training modules
- Progressed our Distributed Restart project, which is now in its final demonstration phase



Metric performance

Over the 6-month period:

- 1A Balancing costs: £966m vs benchmark of £562m (below expectations)
- 1B Demand forecasting: 2.2% vs benchmark of 2.1% (meeting expectations)
- 1C Wind generation forecasting: 3.7% vs benchmark of 4.7% (exceeding expectations)
- 1D Short notice changes to planned outages: 1.2 per 1000 outages vs benchmark of 1 to 2.5 per 1000 (meeting expectations)



Stakeholder evidence

Role 1 survey:

- 19% exceeding expectations
- 72% meeting expectations
- 9% below expectations

Highlights:

- Worked closely with our stakeholders to facilitate the work required to connect two new interconnectors, receiving positive feedback
- We met twice with our Technology Advisory Council, whose feedback is shaping our activities
- This year, our weekly Operational Transparency Forum received an average feedback score of 9 out of 10



Demonstration of plan benefits

- Control centre architecture and systems (A1) on track to deliver £305m consumer benefit over RIIO-2
- Control centre training and simulation (A2) on track to deliver £35m consumer benefit over RIIO-2
- Restoration (A3) on track to deliver £115m of net benefit from 2025 to 2050
- Delivered £57m of consumer benefit via our Trading activities

RREs:

- 1E Transparency of Operational Decision Making: 99.7% of actions have reason groups allocated
- 1F Zero Carbon Operability (ZCO) indicator: ESO has accommodated up to 84.6% zero carbon generation
- 1G Carbon intensity of ESO actions: Monthly average of 4.2gCO₂/kWh of actions taken by the ESO
- 1H Constraints cost savings from collaboration with TOs: £499m
- 1I Security of Supply reporting: 0 incidents
- 1J CNI outages: 1 planned BM outage



Value for money

- Our forecast total expenditure for role 1 in BP1 is £252m, which is 21% higher than the benchmark of £208m
- The main driver of the deviation is increased expenditure on the Balancing Programme, driven by improved understanding of cost and scope following detailed project planning during the last six months
- The changes we have made to the Balancing Programme are expected to deliver an additional consumer benefit of £27m per annum.

Role 2:

Market development and transactions

Over the past six months, we have made good initial progress on the activities we set out in our RII0-2 business plan. Building on the Markets Roadmap to 2025 we set out in March, we've made progress on our market reforms, implementing new products and engaging with stakeholders for upcoming reforms, as well as using the pass-through funding model to deliver additional activities such as our Net Zero Market Reform work.

We have also used our expertise to provide recommendations to the industry, taking a leadership role and working closely with BEIS and Ofgem on issues such as market strategy, charging and codes.

We are also working closely with colleagues from Role 3 to take a whole-system view, increasing our involvement in the Open Networks workstreams.

We've also taken forward a number of improvements for Electricity Market Reform, improving our IT systems and providing user-friendly auction guidance for our customers.



Kayte O'Neill, Head of Markets

Market Reforms

We have taken further steps towards our ambition of Competition Everywhere. We've awarded new restoration contracts for the Northern region of Britain as part of a new competitive process, and introduced new auction capability such as the Day-Ahead Short-Term Operating Reserve (STOR) product, and the EPEX auction platform for Dynamic Containment. Following the launch of these auctions, we have observed market behaviour and obtained feedback from Ofgem, leading us to initiate a review of the auction rules to ensure that the products deliver best value for consumers.

I've valued the continued engagement we have had with our stakeholders on reserve and reactive reform, and I'm hopeful that our upcoming innovation project will help us to take the learnings from our reactive Pathfinders to find a market-based solution for reactive power.

We have implemented the recommendations of the first phase of the Frequency Risk and Control Report. This means that, as a result of developments such as Dynamic Containment and Loss of Mains changes, we can optimise our procurement of balancing services, leading to savings for the end consumer.

Strategy and leadership

We have taken a leadership role on several key issues across the industry, using our expertise to provide recommendations and go beyond our traditional remit. For example, we continued to progress our Net Zero Market Reform project, where we are working closely with industry stakeholders, including BEIS and Ofgem, to proactively shape wider market arrangements and industry frameworks. We also advised Ofgem on operability issues associated with future network developments, continuing to play a valued role as a trusted advisor. We continue to work closely with BEIS, Ofgem and industry in respect of our Winter Outlook analysis in the context of tight margins and broader energy market challenges.

We've influenced several key European issues, including documenting new post-Brexit working arrangements, and introducing the concept of Net Transfer Capacity to ensure that interconnectors can be correctly compensated for reductions in their capacity.

We're also using innovation funding to investigate options for an end-to-end stability market, building on the work done as part of the Stability Pathfinders.

Market development and transactions

Whole system

As we progress towards Net Zero, it's becoming increasingly important for us to take a whole system approach. Stakeholder interactions are key to this, and we have increased our involvement with the Open Networks programme, leading on workstreams and products, and providing insight to inform the development of DSO plans. We're also working closely with Distribution Network Owners to align frameworks and procurement processes.

Electricity Market Reform (EMR)

We have focused on improving our customers' experience of interacting with the Capacity Market: providing accessible guidance, implementing new rules into our systems as early as possible, and progressing a new IT portal. We're also working closely with BEIS on the next allocation round for Contracts for Difference.

Codes and Charging

Frameworks for Codes and Charging will be important enablers of the energy transition. We've further developed our initial Strategic Code Change roadmap. This provides more clarity to stakeholders on how transformational activities such as Offshore Co-ordination will impact on our codes. We've made good progress on BSUoS reform and the Targeted Charging Review, and engaged with stakeholders to identify potential areas for changes to the Security and Quality of Supply Standard (SQSS) to ensure that it continues to be fit for purpose.

Delivering value for money

Our forecast total expenditure for Role 2 within the Business Plan 1 period is £174m, which is 9% higher than the cost benchmark. This is primarily due to improved visibility and clarity of costs for major IT programmes (Settlements, Charging and Billing, and Electricity Market Reform), which were early in the design phase at the time of submitting the Business Plan.

Stakeholder

Our role 2 survey shows that 80% of respondents felt that the ESO was either meeting or exceeding their expectations. We received positive feedback regarding the implementation and improvement of products and services. Suggested improvements included focussing on keeping to proposed timescales, greater transparency of decision making and data, and improving consistency and reliability.

Delivering our plan

We have made good progress in delivery of our plan, building a strong foundation from which we will continue to deliver over the plan period. We have not met all milestones set out for this first 6-month period: two milestones are progressing more slowly than planned due to complexity of our reform efforts, and three are delayed due to changing external requirements such as Brexit or where we have listened to stakeholders and adjusted our plans to allow for more extensive engagement and co-creation activities.

Next steps

As we look forward to the second half of the year, I'm excited to see the implementation of further market reforms (such as new reserve products), as well as further improvements to our existing products.

Kayte O'Neill, Head of Markets



**"Thanks for all your efforts and open discussion. Much appreciated!"-
EMR customer**

Market development and transactions



Plan delivery

- We have completed 17 out of the 22 milestones planned for this 6-month period. Of the 5 milestones which are not complete, 2 are ESO-related delays, 2 are outside of ESO control, and 1 is delayed in order to deliver an improved outcome for consumers
- Awarded new competitive restoration contacts for Northern regions
- Launched Day-Ahead STOR product and auction platform for Dynamic Containment
- Progressed Net Zero Market Reform work
- Started innovation project for stability market design
- Continuous improvements to EMR activities
- Developed our Strategic Code Change roadmap
- Engaged with key stakeholders on potential areas for SQSS change



Metric performance

- 2A Competitive Procurement: 59% of all services procured through competitive means (meeting expectations)



Stakeholder evidence

- Role 2 survey:
- 8% exceeding expectations
 - 72% meeting expectations
 - 19% below expectations

Highlights:

- Increased involvement in Open Networks
- Continued engagement with stakeholders on highly complex reserve and reactive reform
- Extensive stakeholder engagement for Whole System Technical Code and fixing BSUoS
- EMR team responded to customer feedback by involving customers in design and testing of new portal
- We're acting on stakeholder feedback relating to auction design for STOR and DC



Demonstration of plan benefits

- Build the future balancing service and wholesale markets (A4) on track to deliver £106m consumer benefit over RIIO-2
- Transform access to the Capacity Market (A5) on track to deliver £74m consumer benefit over RIIO-2
- Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025 (A6.5) on track to deliver £10m consumer benefit over RIIO-2
- Reforming Balancing Services Use of System (BSUoS) charges (A6.6), including fixing BSUoS and changing the charging base now expected to lead to benefits of ~£1.3bn by 2040
- Competitive contracts for Restoration in the Northern region are expected to save approximately £14m over the next three years

RREs:

- 2B Diversity of service providers: Varying diversity across the different markets
- 2E Accuracy of forecasts for charge setting (BSUoS): Absolute percentage error of 16%



Value for money

- Our forecast total expenditure for role 2 in BP1 is £174m, which is 9% higher than the benchmark of £159m
- This is primarily due to improved visibility and clarity of costs for major IT programmes (Settlements, Charging and Billing, and Electricity Market Reform), which were early in the design phase at the time of submitting the Business Plan

Role 3:

System insight, planning and network development

Over the past six months, we have made good progress on many of our long-term projects. The different teams across role 3 have worked closely together, giving a joined up view of scenarios and network operability needs, and progressing novel solutions via the Pathfinders and Regional Development Programmes.

As well as progressing the activities in our RIIO-2 Business Plan, we've taken a trusted advisor role in leading on significant new activities such as Early Competition and Offshore Co-ordination. We have also provided strategic insight to the Ofgem and BEIS network planning reviews and made use of the pass-through funding model to carry out ad-hoc additional activities where needed.

We've also focussed on collaborating with our stakeholders and providing a high-quality service, and 76% of stakeholders rated Role 3 as meeting or exceeding their expectations.

We've heard from our stakeholders that they wanted to understand better how the different activities in Role 3 fit together. I covered this topic at a recent Operational Transparency Forum, and we're planning to publish a document which sets this out clearly.



Julian Leslie, Head of Networks

Pathfinders

A key focus so far this year has been progressing the Pathfinder projects, particularly Stability Phase 3 and the Constraint Management Pathfinder.

The Constraint Management Pathfinder tender has resulted in over 1.7GW of solutions putting forward prices. We expect that, once delivered, this piece of work could save consumers £30-50m per year.

In June, gas turbine units at Deeside power station started delivering the services contracted under Stability Pathfinder phase 1. Deeside was the first unit to convert a gas turbine rotor to provide stability services in synchronous compensation mode.

We have worked closely with Ofgem and Transmission Owners to resolve a number of regulatory and contractual issues, taking on board learnings from previous Pathfinders.

While Pathfinders have brought the benefits of competition to deliver innovative solutions to system issues, we recognise that it is important to define an enduring regime. We're working closely with colleagues in Role 2 to progress work to explore market-based solutions for reactive power and stability, and exploring the interactions between Early Competition and Pathfinders.

Progressing Competition Everywhere

We've also progressed further towards our ambition of Competition Everywhere by developing the Interested Persons' process within the Network Options Assessment (NOA). We regularly consult on and update our NOA methodology to take account of the latest developments.

As we continue to explore novel approaches to meeting system needs, this creates opportunities for our Transmission Owner (TO) colleagues to compete with a broader and more diverse range of providers. However, we recognise that this creates challenges for the TOs as alongside developing their own competitive positions, they also have to manage the additional workload to support the overall process. So, we've been working closely with Ofgem and TOs on potential solutions to reduce the workload burden for TOs, for example co-ordinating with NGET to reserve substation bays to streamline the Pathfinder process

Using our unique position

Our Whole Systems activities span both Markets and Networks, and we have stepped up our involvement in the various Energy Networks Association workstreams. We're taking learnings from Regional Development Programmes and applying these to future whole-system activities.

System insight, planning and network development

continued

We're using our unique position in the industry and the benefit of our expertise to contribute to numerous industry forums, including providing insight to Ofgem and BEIS as part of regular tripartite meetings. We're taking a long term strategic view on network planning, contributing to Ofgem's Electricity Transmission Networks Planning Review and the BEIS Offshore Transmission Network Review.

Constraint costs

Rising constraint costs continue to be a concern for us and our stakeholders. Following on from our five-point plan, we are further exploring the role of storage in helping to manage constraints, and have launched the commercial tender for our Constraint Management Pathfinder. We also recognise that improved forecasts of Balancing Services Use of System (BSUoS) charges would be valuable to our stakeholders, and have set up a new team and are developing new modelling capability to address this need.

Stakeholders

We have continued to work with our stakeholders to understand future trends to feed into our suite of insights documents, including launching the Future Energy Scenarios (FES) in July. As part of this launch, we held a panel session where we provided transparency of how the FES outputs are taken forward by other teams in the ESO, and invited industry stakeholders to share how they use the FES.

Our role 3 survey shows that 76% of respondents felt that the ESO was either meeting or exceeding their expectations. We will be analysing the feedback closely to understand what we can improve to ensure more of our stakeholders are satisfied by the service we provide.

Delivering our plan

We've made good progress on the deliverables we set out in our RIIO-2 business plan. In role 3, many of our projects relate to network planning and insights, and will lead to improved outcomes for future consumers. However, we're also starting to see the benefits of some of our activities, including our leadership of the Accelerated Loss of Mains Change Programme (covered in the case study in our Evidence Chapters) which is already contributing to lower balancing costs than would otherwise be the case.

Delivering value for money

For role 3, our forecast expenditure for the Business Plan 1 period is £142m, which is 2% more than the cost benchmark. This increase is primarily due to the ESO taking on new roles in Offshore Co-ordination and Early Competition (which were not included in the original Delivery Schedule or cost benchmark for BP1), although this is partially offset by reduced IT expenditure.

Promoting Engineering

As we explore innovative approaches to meeting the operability challenges, engineering continues to be very important to the ESO. In my role as the ESO's Chief Engineer, I've recently promoted Engineering Month, where ESO colleagues have had the opportunity to attend webinars about upcoming engineering challenges and been encouraged to apply for chartered engineer status. We've also introduced a new Engineering Advisory Council, which allows external experts to perform a critical friend role, bringing an external perspective to provide advice on engineering decisions.

Next steps

As we look to the future, I'm excited to see the ESO step up and provide a leadership role in the industry, and play a vital part in the transition to net zero.

Julian Leslie, Head of Networks



“I would like to acknowledge the continued effectiveness of ongoing engagement... This has allowed us to contribute to the development of the proposed NOA methodology and continues to be a good example of co-ordination between the ESO and all TOs.”- Transmission Owner

System insight, planning and network development



Plan delivery

- We have completed 34 out of the 43 milestones planned for this 6-month period. Of the 9 milestones which are not complete, 5 are ESO-related delays, 1 is outside of ESO control, and 3 are delayed in order to deliver an improved outcome for consumers
- Stability Pathfinder phase 1 contracts with Deeside went live in June- representing the first unit to convert a gas turbine rotor to provide stability services in synchronous compensation mode
- Stability Pathfinder phase 3 launched, learning from previous Pathfinders
- Launched commercial tender for Constraint Management pathfinder
- Conducted technical feasibility assessment on use of energy storage to manage transmission constraints
- Established new team to forecast constraint costs
- Providing expertise to Ofgem and BEIS reviews of network planning
- Progressed Regional Development Programmes, making significant progress towards the agreement of a basic Transmission Constraint Management service design..
- Progressed activities outside the Delivery Schedule including Offshore Co-ordination, Early Competition and additional operability work



Stakeholder evidence

Role 3 survey:

- 18% exceeding expectations
- 58% meeting expectations
- 24% below expectations

Highlights:

- Launched interactive Future Energy Scenarios with virtual event and podcast
- Increased engagement for Regional Development Programmes, with positive feedback from DNOs
- Launched Distribution System Operation consultation
- Provided transparency around timeline for Stability Pathfinder phase 2



Demonstration of plan benefits

- Network Options Assessment (NOA) enhancements (A7-A11) on track to deliver £663m consumer benefit over RIIO-2
- Taking a whole electricity system approach to connections (A14) on track to deliver £8m consumer benefit over RIIO-2
- Taking a whole energy system approach to promote zero carbon operability (A15) on track to deliver £548m consumer benefit over RIIO-2
- Delivering consumer benefits from improved network access planning (A16) on track to deliver £224m consumer benefit over RIIO-2
- Loss of Mains changes are already saving consumers £20m/annum, and are expected to reduce our actions to manage RoCoF risk from 7.4TWh to 0.2 TWh per year

RREs:

- 3A Future savings from operability solutions: £27m saved balancing costs in 2021-22, £13m saved infrastructure costs for each of RDPs 1 and 2, carbon reductions of £66m from pathfinders (2020-21 to 2024-25) and £28m from RDPs
- 3B Consumer value from the Network Options Assessment (NOA): £58m from ad-hoc CBAs, NOA consumer benefit to be calculated for End of Year report
- 3C Diversity of technologies considered in NOA processes: 137 asset-based solutions (including 22 new options) and 9 commercial solutions submitted to NOA 2021/22. A wide range of solutions were considered in NOA pathfinders





Value for money

- Our forecast total expenditure for role 3 in BP1 is £142m, which is 2% higher than the benchmark of £139m
- Increased expenditure due to Offshore co-ordination and Early Competition is offset by reduced IT expenditure in the Zero Carbon Operability and NOA projects



Progress towards our ESO mission

Our Mission is to enable the transformation to a sustainable energy system and ensure the delivery of reliable, affordable energy for all consumers.

We set out here how we have progressed towards each of our ambitions over the past 6 months.

ESO ambition for 2025	Progress towards this ambition (April-September 2021)
 <p>An electricity system that can operate carbon free</p>	<p>Our progress is shown by our Zero Carbon Dashboard (see page 17).</p>
 <p>A whole system strategy that supports net zero by 2050</p>	<p>Distribution System Operation (DSO): We launched our DSO consultation, introducing our proposed approach to supporting the transition to DSO.</p> <p>Regional Development Programmes: we held two webinars for Distributed Energy Resource (DER), in conjunction with each of WPD and UKPN.</p> <p>Leading the debate: FES key message 4 (infrastructure and whole energy system) highlighted the need for significant investment in whole energy system infrastructure. The Bridging the Gap project, launched in July, will continue to assess the flexibility needed to manage peaks and troughs of renewable electricity supplies.</p> <p>Co-ordinated market development: We have led key Open Networks deliverables on flexibility service development including the common contract and procurement processes.</p> <p>Ensuring operability: We held the first monthly Central Design group with BEIS, Ofgem and onshore TOs, which we will use to deliver a holistic network design to provide a co-ordinated National Electricity Transmission System, including onshore and offshore assets, to facilitate the connection of offshore wind.</p>

Progress towards our ESO mission

ESO ambition for 2025	Progress towards this ambition (April-September 2021)
 <p>Competition Everywhere</p>	<p>Market reforms: We awarded eight Restoration contracts for the Northern regions. We launched the EPEX auction platform for Dynamic Containment, implemented the Day-Ahead Short-Term Operating Reserve (STOR) product, and held workshops to co-create the Dynamic Moderation and Dynamic Regulation services with our stakeholders.</p> <p>Net Zero Market Reform work: Since April we have been analysing the case for market reform by understanding what net zero looks like, how supply and demand evolve in different scenarios, and what technologies the system needs to keep the lights on. We're also considering whether current market designs will deliver what we need, and how revenue streams will evolve for the key technologies necessary to meet net zero. We have also been developing assessment criteria to shortlist the best market reforms from the long list of potential reforms that we have created.</p> <p>Competition in networks: We submitted our Early Competition Plan to Ofgem. We launched Phase 3 of our Stability Pathfinder, and the commercial tender for our Constraint Management Pathfinder. We opened the consultation on our Network Options Assessment (NOA) methodology for 2021-22.</p> <p>Industry governance: We are moving towards more strategic code change by reducing barriers to entry and enabling market access for more participants.</p>
 <p>The Electricity System Operator (ESO) is a trusted partner</p>	<p>Transparency: We have continued to hold our weekly Operational Transparency Forum and add more data sets to our Data Portal.</p> <p>Stakeholder Engagement: We held our second Markets Forum, sharing recent updates and seeking feedback. We held a series of well-received co-creation workshops for net zero market reform. We worked closely with BEIS and our customers to produce the new Capacity Market guidance, and are supporting BEIS with the next Contracts For Difference allocation round. We co-created the technical procedures for post Brexit rules with the European frameworks group, ensuring a fair relationship across UK/EU boundaries.</p> <p>Leading the debate: We joined the Global Power System Transformation (G-PST) Consortium alongside other system operators from around the world, to help accelerate the net zero transition. We have been working closely with developers of in-flight offshore projects to understand costs, benefits, opportunities and blockers for greater coordination. We regularly provide insight and recommendations to Ofgem and BEIS as part of tripartite meetings, as well as leading on activities to review network planning processes.</p>

Zero carbon dashboard

Our goal: An electricity system that can operate carbon free by 2025

Our ambition is that when the market can economically and efficiently dispatch generation to meet all GB demand for energy with zero carbon solutions, then the ESO will be able to operate this carbon free system safely and securely. In order to facilitate this, by 2025 we will have introduced new tools and technologies into the market to manage real-time challenges such as thermal constraints, voltage and inertia.

Deliverables critical to our ambition

The deliverables listed below are critical to our zero-carbon ambition. The table shows our progress towards completing them. The delays to inertia monitoring (D1.2.2) milestones are due to the supplier's hardware issues, and the delays to competitive procurement of stability (D4.6.1 and D8.1) are delayed due to a large number of expressions of interest.

Role	Deliverable reference	Deliverable name	Milestones in BP1	Milestones due in Q1-Q2 2021-22	Milestones completed
1	D1.2.2	Inertia Monitoring	22	6	3
	D1.3.1	Improve situational awareness	25	11	11
	D1.3.4	Increased operational liaison with DNOs	3	1	1
2	D4.6.1	Competitive procurement of stability	9	2	1
	D4.6.2	Competitive procurement of reactive power	7	-	-
3	D8.1	New areas of need identified, and 3-6 tenders run	10	1	-
	D8.2	Improved tender approaches	2	-	-
	D15.1.1	System Operability Framework (SOF)	1	-	-
	D15.1.2	Innovation projects for new operability solutions	1	-	-

Reduced carbon impact of ESO actions in 2021-22

The overall system carbon emissions have been higher in the first half of 2021-22 than the same period last year due to both increased demand as the COVID-19 pandemic restrictions have lifted, and relatively low wind output.

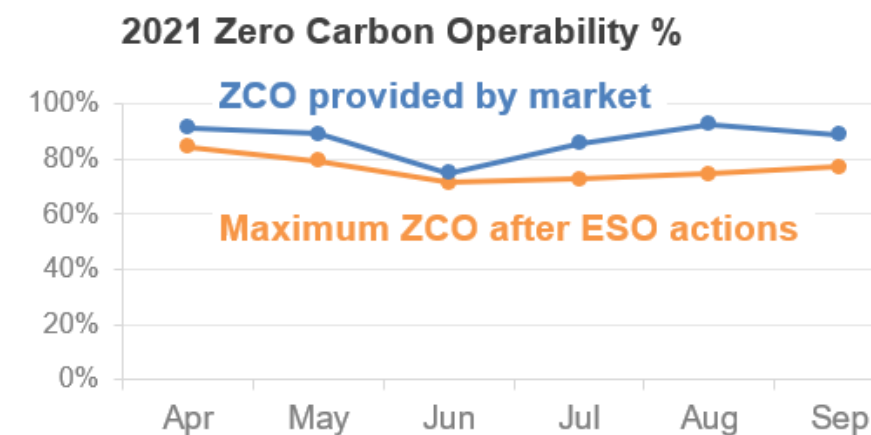
During this time, the ESO has reduced the carbon impact of its operational interventions. The combined effects of Dynamic Containment, the Accelerated Loss Of Mains Change Programme, the Frequency Risk and Control Report (FRCR) and the Pathfinder programmes mean that when the interventions are needed, their carbon impact is reduced.

The RREs (Regularly Reported Evidence) below help us to track our progress towards our 2025 ambition. On 5 April, ESO accommodated its maximum ZCO of the six-month period, of 84.6%.

RRE 1G Carbon impact of ESO actions

	Apr	May	Jun	Jul	Aug	Sep
Carbon intensity (gCO ₂ /kWh)	2.1	6.2	4.5	4.5	6.9	1.0

RRE 1F Zero Carbon Operability



Annex: further context



The ESO Incentive Scheme in RIIO-2

Our incentive reports set out our performance against our RIIO-2 Business Plan.

Under the ESO's evaluative incentive scheme, a Performance Panel assesses our performance against three roles:

- **Role 1: Control centre operations**
- **Role 2: Market development and transactions**
- **Role 3: System insight, planning and network development**

When assessing our performance for each of these roles, the Performance Panel considers five criteria:

- **Plan delivery**
- **Metric performance**
- **Stakeholder evidence**
- **Demonstration of plan benefits**
- **Value for money**

Table 5: Activities associated with each role

Role 1: Control centre operations	<ul style="list-style-type: none"> a. System operations b. System restoration c. Information, data and forecasting
Role 2: Market development and transactions	<ul style="list-style-type: none"> a. Market design b. EMR c. Industry codes and charging
Role 3: System insight, planning and network development	<ul style="list-style-type: none"> a. Connections and network access b. Strategy and Insight c. Long term network planning

Our documents are structured according to these three roles, and within the Evidence Chapters document each role chapter is sub-divided according to the evaluation criteria above.

The ESO incentive scheme covers the two-year "Business Plan 1" period from April 2021 to March 2023. The maximum reward we can achieve for this period is £30m, and the maximum penalty is -£12m.

We publish incentives reports [on our website](#) on a monthly basis, covering different criteria depending on whether it is a monthly, quarterly, six-monthly, mid-scheme or end-of-scheme report.

For more information about the ESO incentive scheme, please see Ofgem's [Electricity System Operator Reporting and Incentive Arrangements \(ESORI\) guidance document](#)

Deep Dive: Future of the System Operator

Legal separation

Since 2019, the ESO has been legally separate from the rest of National Grid. This has meant operating under our own licence, having a separate set of regulatory arrangements, separate stakeholder relationships, and strict ringfences for information. We have also developed our own culture and identity.

The legal separation of the ESO within the National Grid Group was the right model for its time, enabling the organisation to keep household bills down by working to promote more competition, coordination and innovation across the electricity system, while successfully addressing any perception of potential conflicts of interest. It has enabled the ESO to step up and lead important pieces of work:

- As part of our RIIO-2 Business Plan, we set out an ambition to support ‘competition everywhere’, including in network development. Both our Early Competition Plan and the Network Options Assessment Pathfinders broaden the range of third parties able to provide network solutions, and exploring pre-legislative options demonstrates our commitment to progress this as quickly as possible.
- Since 2020, the ESO has played an important role as project partner of the BEIS-led Offshore Transmission Network Review (OTNR), conducting crucial technical and cost-benefit analysis on the coordination of offshore networks. We are helping to ensure policy development benefits from our expertise, and also leading on agreed elements of the OTNR. This has involved us taking on new roles that expand our current scope to lead delivery of holistic network design, such as network planning offshore and, alongside the onshore TOs, coordinating this with onshore network developments.



Future of the System Operator

The energy system is integral to the UK meeting its net zero targets and we will need to see an unparalleled change in the energy market, in consumer behaviour and in technological progress. Structures and roles across the industry will need to evolve rapidly, and entirely new roles will need to be developed to achieve a truly whole system view of energy. Over the summer, Ofgem and BEIS consulted on the [Future Role of the System Operator](#), proposing that the creation of a future system operator with additional roles and responsibilities is a key next step.

We are strongly motivated to use and to grow the existing capabilities and insights of our people to deliver a future system operator that is fit for the challenges of net zero, while maintaining current world-class system operation and security of supply, and ensuring the successful delivery of our ambitious RIIO-2 plans. The key messages of our response are:

- Bringing electricity and some gas roles together starts to build a holistic whole system perspective and address the increased operational and planning challenges across energy vectors.
- We agree with almost all of the new and expanded roles proposed for the future system operator, and are excited by the opportunities they represent. Many of the roles, such as those in strategic network planning and driving competition in energy networks, represent a natural evolution of our existing work and our ambitions developed in RIIO-2.
- While the ownership model is important, fundamentally it is the characteristics and attributes of the organisation, and how they are enabled, that will set the future system operator up for success. The implementation of the organisational model must enable agility and innovation, while limiting unnecessary bureaucracy that could slow progress towards net zero.
- To unlock maximum value, we believe implementation should move at pace without introducing undue risk. The approach to transition should minimise uncertainty in both timelines and outcomes for our people, as well as for the customers and stakeholders we interact with daily.

A future system operator, with the right roles and capabilities to take a truly whole system perspective and an organisational design with the appropriate governance to enable agility and innovation, will play a vital role in the energy system’s drive to net zero. We look forward to continued collaboration with BEIS and Ofgem, and the wider industry, to agree how this vision can be achieved.

Deep Dive: Transforming our IT capability

Our vision is to create a better everyday digital experience for our customers that puts them at the heart of our technology solutions. Our [Digital Strategy and Action Plan](#) outlines our desire to have a fanatical focus on people – their needs, wants, desires, expectations, and experiences. We want to make it fluent, easy, and actively engaging to take part in the energy market. We will do this through:

- Customer centric products aligned to the customer experience journey.
- Being responsive to the needs of the marketplace, adapting and prioritising accordingly
- Building modular technology platforms that support incremental, continuous improvement

Our **ways of working** (WoW) are changing to achieve this. We are increasing collaboration between technology (Tech) and ESO operations (Ops) to form multidisciplinary, TechOps teams. This connects the people developing systems with the people using the solutions.

Culture is fundamental to our success. Our cultural survey highlighted that we have great people who operate in supportive and collaborate teams. We take professional pride in being part of a purpose-driven organisation. We have opportunities to increase collaboration, empowerment and streamline governance. Our first culture change sprint aims to increase collaboration and empowerment.

Customer journeys help us to understand customer needs. We have mapped customer journeys for energy service providers (Role 2) and our Electricity National Control Centre colleagues (Role 1). We will validate with our customers and invite them to co-create the future experience. In parallel, we will extend this approach to Networks (Role 3).

Technology investments in our Single Markets Platform (SMP), Digital Engagement Platform (DEP), data and analytics, enhanced balancing, and zero carbon operation are fundamental for digital operations. These activities are in-flight, making good progress, and will enable quality data, transparency, and iterative delivery.

We introduced design thinking in SMP/DEP where we ran user research sessions with 14 organisations to better understand why and how our customers and stakeholders engage with the ESO, what tasks they are trying to complete and the challenges they face.

Our transformation journey



In support of this, we have moved reporting lines for our solution engineering, domain architecture, service management, and critical national infrastructure (CNI) applications teams to report directly to the ESO Chief Information Officer (CIO).

The **Technical Advisory Council** (TAC) was launched in December 2020 with an independent Chair. Engagement from all members is extremely high and we will benefit from the experience, skills, and contacts of the Council members. On 3 September 2021 we tested with the TAC our approach to culture, product model, and agile delivery. We received valuable insight and affirmation of the importance of customer centricity, one-team approach, empowerment, and leadership. We are working to integrate this feedback into our next change increment.

Deep Dive: Balancing costs

During the first 6 months of 2020-21, the ESO's balancing costs were £966m, in comparison to the benchmark of £562m, which corresponds to "below expectations".

(all in £m)	Constraint costs	Non-constraint costs	Total costs
Benchmark	314	248	562
Outturn	265	701	966

Monthly balancing cost outturn vs benchmark



Non-constraint costs have been higher than the benchmark, and higher than the same period of 2020-21, due to:

- Substantially increased day ahead power prices (the average day ahead baseload price doubled from August to September)
- Tight margins during 2021-22 (due to interconnector outages and low wind levels)

Constraint costs have been lower than the benchmark, and lower than the same period of 2020-21, due to:

- Changes to inertia management due to the implementation of the Frequency Risk and Control Report (FRCR) recommendations
- Low wind levels during 2021-22
- Good availability of the transmission network during 2021-22
- No spend on COVID-19 mitigation measures during 2021-22 (which had impacted on constraint costs in 2020-21)

Balancing Costs are a result of numerous factors and the level of ESO influence varies for each factor. The table below sets out the main drivers of balancing costs within Role 1 timescales.

ESO influence:	High	Medium	Low
Factor:	<ul style="list-style-type: none"> • Balancing actions taken • Operating margin 	<ul style="list-style-type: none"> • BM prices • Boundary availability 	<ul style="list-style-type: none"> • Wholesale prices • Wind level • Provider and generation outages

In addition, as more generation connects to the system, the impact of Connect and Manage, while reducing TNUoS cost and wholesale energy prices, drives an increase in balancing costs.

The ESO is always seeking to control balancing costs: this consists of taking some long-term actions (which may not deliver until future years), and some short-term actions (for which the benefit is realised within-year). Longer term actions as well as our activities to control balancing costs over the past 6 months are summarised below.

Short term actions Impact during 2021-22 only	Long term actions Impact in future years
<ul style="list-style-type: none"> • Contracts to secure against specific transmission constraints • Trading actions • Collaboration with transmission owners in planning timescales • Optimising balancing actions 	<ul style="list-style-type: none"> • Implementing FRCR phase 1 • Introducing Dynamic Containment • Accelerated Loss of Mains Change programme • Stability Pathfinder • Fast reserve • Short term operating reserve (STOR) day-ahead procurement

We regularly discuss balancing costs at our weekly **Operational Transparency forum**. We also provide more detail in metric 1A in our Evidence Chapters.

Acting on feedback from the Performance Panel

Role	Feedback	Action taken	Relevant section of this report
1	Going forward, the Panel would like to see evidence that the new initiatives (e.g. Frequency Risk and Control Report) are helping to improve transparency for stakeholders.	We discuss these initiatives at the weekly Operational Transparency Forum, using Deep Dives to provide more detail about topics such as the impact of the Frequency Risk and Control Report.	<ul style="list-style-type: none"> Evidence chapters: Role 1 stakeholder evidence
1	The Panel would also like to see stronger evidence to demonstrate how ESO actions are having an effect on reducing or minimising overall balancing costs.	We have improved the Balancing Costs (metric 1A) reporting in our monthly incentive reports to provide a more detailed breakdown of the drivers of balancing costs. We regularly discuss Balancing Costs at our Operational Transparency Forum. Our Role 1 Case Study shows how our trading actions have benefitted consumers. We have also challenged the SQSS, avoiding the need for a costly contract with a power station.	<ul style="list-style-type: none"> Deep Dive: balancing costs Evidence chapters: Metric 1A Evidence chapters: Role 1 case study
2	Going forward, to improve stakeholder confidence, the Panel would like to see strong prioritisation of on-the-ground implementation of clearly defined, integrated market reforms, more consistent outcomes from the ESO's cocreation activities and improved accuracy of BSUoS forecasts.	We have implemented new products for Day-Ahead Short-Term Operating Reserve (STOR), launched the EPEX auction platform for Dynamic Containment, and competitively awarded contracts to new Restoration providers. We are continuing to engage with stakeholders for reserve and reactive reform, and have set up a new team to produce a rolling 24 month forecast of constraint costs (which are a significant part of BSUoS costs).	<ul style="list-style-type: none"> Evidence chapters: Role 2 plan delivery Evidence chapters: Role 2 stakeholder evidence
2	The Panel would also like to see greater focus on fast-tracking the initiatives that are expected to have the greatest impact on reducing the high level of balancing costs, as well as the improvements in code administration maintained in the future.	We have started to implement the recommendations of the Frequency Risk and Control Report, and are seeing the impact of projects such as Dynamic Containment and Loss of Mains changes on balancing costs. We have used stakeholder feedback to shape our plans for Code Administration.	<ul style="list-style-type: none"> Evidence chapters: Role 2 plan delivery Evidence chapters: Role 2 stakeholder

Acting on feedback from the Performance Panel

Role	Feedback	Action taken	Relevant section of this report
3	Going forward, the Panel expects to see the ESO make a step-change in providing leadership and signposting to industry what needs to happen to optimise future system development	We're contributing to Ofgem's Electricity Transmission Networks Planning Review and BEIS's Offshore Transmission Network Review, as well as providing strategic input to tripartite discussions.	<ul style="list-style-type: none"> Evidence chapters: Role 3 plan delivery
3	This also includes providing greater clarity on how the ESO's Role 3 activities form a coherent package, and that alternative non-network solutions are fully considered.	Our Pathfinders and Regional Development Programmes are continuing to explore alternatives to traditional network reinforcements. Our updated NOA methodology provides more clarity about how commercial solutions are considered. As part of the Operational Transparency Forum, we have set out how Role 3 fits together, and will follow this up with a published document.	<ul style="list-style-type: none"> Evidence chapters: Role 3 plan delivery
3	The Panel expect the ESO to develop links between Role 3 activities and Role 2, in order to progress from provisional learning-by-doing activities into established market processes.	Roles 2 and 3 work closely together on Whole System, Regional Development Programmes and Pathfinders. We are undertaking innovation projects where we will use learnings from the Pathfinders to inform the development of market processes for stability and reactive power.	<ul style="list-style-type: none"> Evidence chapters: Role 2 plan delivery Evidence chapters: Role 3 plan delivery



Thank you for reading our Mid-Year report.
For further information, please contact:

Gareth Davies

ESO Regulation Senior Manager,
National Grid ESO

E: box.soincentives.electricity@nationalgrideso.com

For further details on the ESO incentive scheme, please visit our website at <https://www.nationalgrideso.com/our-strategy/riio/how-were-performing-under-riio-2>
You can also find out more about our RIIO-2 Business Plan at <https://www.nationalgrideso.com/our-strategy/riio/riio2-business-plan>