

May 2022

RIIO-2 Business Plan 1 (2021-23)

2021-23 Mid-Scheme Report Executive Summary

Welcome

Welcome to our RIIO-2 2021-23 mid-scheme incentives report.

We are now half-way through our first 2-year business plan under RIIO-2. Our pace of delivery has increased, and we have reacted well to the unanticipated and highly challenging circumstances we have faced in the market. We have used the flexibility of our price control framework to deliver new initiatives, we also continue to review project costs and benefits to ensure they remain appropriate.



Foreword

Our Business Plan 1 is highly ambitious and we have worked hard to increase our pace of delivery. We have continued to invest in our people and capabilities, with 188 external hires and 195 internal ESO moves since the start of RIIO-2. We are confident that this will allow us to continue our accelerated delivery to ensure we meet our commitments by the end of the Business Plan 1 period.

This improved delivery performance has occurred despite the need to continue to deal with unanticipated challenges in the energy market, including the residual impacts of the COVID-19 pandemic and the energy/cost of living crisis, compounded by the war in Ukraine. We recognise that the actions we take to operate the system in a secure and reliable way result in direct costs on consumers, and we have worked hard to mitigate these costs wherever we can. Some of the actions we have taken are:

- Using our Frequency Risk and Control Report recommendations in real time operations to reduce costs.
- Completed reforms of ancillary service products including Dynamic Containment and Day-ahead STOR as well as looking into short-term market options, such as Local Constraint Markets, and delivered several pathfinders such as the Pennines Voltage and Stability Phase 2.
- Progressed our 5-point constraint plan, improving our forecasting and outage planning and using Regional Development Programmes to reduce costs.
- Team established to focus on tactical improvements that could deliver an immediate, positive and enduring impact on balancing costs. We will develop further improvements

following an end-to-end review of our processes across our Roles from a balancing cost perspective and monitor and measure their effectiveness.

We have also taken a step back in some areas to make sure that the costs we incur in delivering our commitments, and their associated consumer benefits, are still efficient and deliver value for money. In particular, our Balancing Programme, which seeks to deliver transformational change in how we balance the system, has experienced escalating costs. We have therefore initiated a review of this programme, engaging with stakeholders, to ensure we deliver the required capabilities and flexibility whilst managing our costs effectively.

Our price control framework gives us the flexibility to adapt our plans where we can see real value in doing so. We have used this flexibility to go beyond our original business plan to work on new initiatives, for example Offshore Coordination and Early Competition. Both these projects have the potential to deliver significant benefits to consumers and we have worked closely with Ofgem, BEIS and stakeholders while developing our proposals.

We have also listened to the feedback we received from stakeholders, Ofgem and the Performance Panel and worked hard to take corresponding actions. We look forward to continuing to work with you and receiving your future feedback as we look to deliver our Business Plan 1 commitments.

Fintan Slye
Director, Electricity System Operator



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

ESO performance on a page



Plan delivery

We have completed 208 of the 273 milestones which were due to be completed in this 12-month period.

Of the remaining milestones, 20 are ESO-related delays, 40 are outside of ESO's control, and 5 were delayed to deliver an improved consumer benefit.

To support our delivery, we have grown our invested in our people and capabilities with 188 external hires, and 195 internal ESO moves since the start of RIIO-2.



Metric performance

Over the 12-month period:

- 1 metric exceeding expectations
- 3 metrics meeting expectations
- 1 metric below expectations (1A Balancing costs)



Stakeholder evidence

Stakeholder survey:

11% exceeding expectations
73% meeting expectations
15% below expectations
(percentages may not add to 100% due to rounding)

Improving engagement: Stakeholders recognise and appreciate improvements in how we have engaged with them, the level of collaboration and our subject matter expertise.

Greater transparency on decisions: They would like us to be more transparent in our decision making and share our thinking earlier to help them with their own strategic planning decisions.

Project Delivery: They would like us to be more consistent in delivering our project on time and engage earlier when there are delays, recognising the impact these have on them.



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 consumer benefits delivered (compared to counterfactuals) include:

- Implementation of our FRCR recommendations, combined with our Accelerated Loss of Mains Programme and Dynamic Containment Low (DC-L) has allowed us to save £525m in the last 12 months.
- To realise the saving above, we have spent £90m procuring DC-L. However, we have made improvements to the granularity of DC-L procurement, reducing its cost by £18.7m since Nov 2021.
- Our Stability Phase 2 pathfinder will deliver future potential cost savings of £130m.



Value for money

Our forecast total expenditure across all three roles in BP1 is £548m, which is 8% higher than the benchmark of £506m.

Key drivers of the deviation are major IT investment programmes, in particular our Balancing Programme, EMR, Settlements and Charging & Billing. Increased costs are also driven by the delivery of new activities outside our BP1 plan such as Offshore Coordination and Early Competition.

Cost increases have been partially offset by reductions associated with EU Regulatory change and re-phasing of our Zero Carbon Operability project.

ESO delivery over the past 12 months

2021-22

Role 1

April	May	June	July	August	September	October	November	December	January	February	March
ESO joins global system operator consortium	Distributed ReStart Procurement and Compliance stakeholder engagement		ESO working with OCF on solar generation forecasting		TAC - discussed Digitalisation, Strategy & Action Plan, ways of working & TechOps model		Inertia measurement projects with GE Digital and Reactive Technologies		Operability Strategy Report 2022 published		
Electricity System Restoration Service contracts awarded	System Test Plan approved within NCER		8 Power System Engineering Apprentices have joined the ESO		North Sea Link (NSL) went live		Virtual Energy System launched		CrowdFlex domestic flexibility study		ESO working with Octopus Energy on Domestic Flexibility Trial

Role 2

Power Responsive guide to Demand Side Response published		Dynamic Containment to move to pay-as-clear auction		Whole System Technical Code (WSTC) project issued first consultation		Code Administrator Workshop		Single Markets Platform go-live	
Reserve Reform Workshop		Net Zero Market Reform - Case for Change Workshops		Autumn Markets Forum		GC0137 Minimum specification for equipment providing grid-forming capability implemented		Net Zero Market Reform phase 3 conclusions event	
Five-Year View of TNUoS Tariffs published	The road to net zero carbon electricity markets		Demand Side Response Summer Event		Dynamic Moderation and Dynamic Regulation Consultation		Stability Market Design workshop		
	Power Potential trial with UKPN	Dynamic Reserve Setting	Future of Reactive Power webinar		Final 2022-23 TNUoS tariffs published				

Role 3

		Winter Review and Consultation		Offshore Coordination		Carbon intensity dashboard launched		Network Options Assessment 2021/22 published		Bridging the Gap 2022 launched	
Enabling the DSO Transition consultation		Stability Pathfinder Phase 1 - Deeside Power go-live		RDP webinars hosted jointly with UKPN & WPD		progress publication					
		Energy Storage Technical Feasibility Assessment		Future Energy Scenarios (FES) 2021 launched		ENA publishes ESO-led consultation on standard agreement for ESO and DSO flexibility services		ETYS 2021 published		Launch of Stability Pathfinder Phase 2 commercial tender	
Summer Outlook Report		Addressing increasing constraint costs publication				Stability Pathfinder Phase 3 invitation to tender				Pennines Voltage Pathfinder contract awarded	
										Network Planning Review established	
										B6 Constraint Management Pathfinder contracts awarded	

Role 1:

Control centre operations

Over the past six months, we have experienced unprecedented prices in the market, driven by global gas costs and lately exacerbated by the crisis in Ukraine.

Combined with ongoing operability challenges as we drive towards net zero, continuing to ensure a safe and reliable system to meet our customers' needs continues to be our core focus.

Our Winter Outlook Report highlighted the challenges we expected over the winter months. Whilst the anticipated margin notices did not materialise, the system still experienced many periods of tightness leading to scarcity pricing in the balancing market (BM). We took the decision to undertake a review of the BM to understand the factors driving the market, given that these costs are ultimately borne by consumers.

The drive towards net zero has led to significant volumes of wind generation, with its associated variability. In September, wind was less than 10% of overall generation compared to January, when we saw the most wind ever on GB's electricity system, with a record 19.6GW of wind power generated. This resulted in many occasions when boundary constraints have led to the curtailment of wind. The corresponding high-cost actions required to replace the energy from other sources, has led to some of the highest constraint costs we have experienced.

We have worked hard to mitigate the impacts of these market conditions, ensuring our control room tools allow us to focus on value-adding activities, using our Frequency Risk and Control Report (FRCR) recommendations in real time operations, and using our recently reformed market products to offset costs.



Isabelle Haigh, Head of National Control

We understand that expectations of our stakeholders and consumers are high, with a clear focus on how our operational decisions impact the cost of balancing the electricity system. The effectiveness and efficiency of these decisions requires transparency and we are committed to provide clear and concise justifications through our weekly Operational Transparency Forum (OTF), and through our ongoing incentives reporting.

High Balancing Costs

We have a strong focus on balancing costs across our business, but particularly in our control centre operations where we can see the cost of our decisions in real time. In meeting our security of supply standards, we often have little choice but to bear the market costs. Although we have taken lower volumes of actions this year, the prices in the day-ahead (DA) market and Balancing Market (BM) have still resulted in our costs being well above our benchmark.

We have responded to this by establishing a team to focus on tactical improvements that could deliver an immediate, positive and enduring impact on balancing costs. We will also review our end-to-end processes to develop further improvements.

Alongside this, we have launched a review of the BM to better understand the reasons behind the exceptionally high prices we have faced. This will build upon the actions we have taken to reduce balancing costs such as Stability Pathfinder Phase 1, introduction of Dynamic Containment and STOR DA procurement combined with implementation of FRCR and ongoing optimisation of balancing and trading actions.

Transparency

Our OTF provides an opportunity for the wider market to understand the actions we take and for us to seek feedback from our stakeholders and customers. It is a widely attended event, with nearly 1400 questions asked and responded to this year.

Our monthly incentive reporting has also been improved to provide clearer information about the drivers of balancing costs and how they are split between constraint and non-constraint costs. It also gives us the opportunity to demonstrate where costs are within or outside of our control to help us to identify the appropriate recommendations to help reduce costs going forward. More recently, we have been analysing some of the key factors driving costs and more detail on this can be found in our evidence chapters.

Control centre operations

System security

Although costs often understandably make the headlines, ensuring system security is just as vital. We have developed our capabilities through new power system modelling tools to help us detect issues such as system disturbances observed in Scotland, as well as new inertia monitoring tools. The latter have emerged out of innovation projects with our partners and will become increasingly important as traditional sources of inertia, such as conventional coal or gas plant, come off the system.

We've also continued to work closely with our counterparts in the EU under the Trade and Cooperation Agreement. The signing of a Memorandum of Understanding (MoU) between the ESO and ENTSO-E allows us unfettered access to tools and processes to support security of supply between GB and Europe.

Electricity System Restoration (ESR)

A critical component of our work is to plan for the worst and be certain that we can restore the system if ever required. We have established seven technical workgroups with industry to help progress towards meeting the new ESR Standard by December 2026, with associated code changes being developed.

In the shorter term, we successfully carried out a Black Start test in March, testing if a power island could be established across a significant geographical distance. This success then allowed us to demonstrate that we could link power islands across the high voltage transmission system. A good example of putting theory into practice.

Delivering our plan

Since the six-month report, we have accelerated our plan delivery despite the challenges we have faced, such as the energy crisis and the Ukraine war.

New real-time tools in the control room alongside power system modelling tools and inertia monitoring tools allow us to make more efficient, risk-based operational decisions.

We have continued to improve the transparency of the data we use to support our stakeholders and customers and made good progress on restoration, both with innovation projects and driving towards the new Restoration Standard.

We are confident that our increased pace of delivery will continue to allow us to meet our ambitious BP1 plan.

Stakeholder views

Overall, 94% of respondents to the Role 1 stakeholder survey rated the ESO as meeting or exceeding their expectations. In particular, we received positive feedback on our OTF and were told that day to day communications with the control room were always response and solution orientated. Suggested areas for improvement were around giving more notice when organising meetings and sharing information, with increased consultation. It was also suggested we should discuss and better explain outages in real time.

Value for Money

We forecast a spend of 18% more than the cost benchmark of £208m in the BP1 period for Role 1. This is primarily driven by increased estimates of the Balancing Programme costs and scope.

As a result, we have taken the decision to engage with industry to work collaboratively to find better ways to ensure we deliver the right capabilities, with the required flexibility, whilst managing our costs effectively.

Next Steps

Over the coming months, we will ensure the Eleclink interconnector goes live successfully and will work closely with Government and

industry on system resilience for this coming winter. We will continue to focus on implementing our balancing cost strategy to realise the benefits for consumers. Alongside this we will deliver the final report of our BM Review, discussing its finding with Ofgem, BEIS and industry. Our review of our the Balancing Programme will also be important to ensure it delivers value for money for consumers.

Engagement with our stakeholders and customers has been integral to our activities and I'm eager to continue to listen to feedback to allow us to continually improve further over the next six months and beyond.

Isabelle Haigh, Head of National Control



These OTF webinars are always useful, and I appreciate the efforts of the team to answer as many of the questions as possible at short notice.

OTF attendee

Control centre operations



Plan delivery

We have completed 66 out of the 92 milestones planned for this 12-month period. Of the 26 milestones which are not complete, 5 are ESO-related delays, and 21 are outside of ESO control. We have:

- Successfully operated the system under very challenging conditions.
- Launched a review of the Balancing Market and produced a balancing cost strategy.
- Continued with high levels of transparency and communication through the OTF.
- Developed new power system modelling tools and innovative inertia monitoring tools.
- Conducted a successful black start test and made good progress on the electricity restoration standard.
- Signed memorandum of understanding with ENTSO-E.



Metric performance

Over the 6-month period:

- *1A Balancing costs:* £3,132m vs benchmark of £1,321m (below expectations)
- *1B Demand forecasting:* 2.2% vs benchmark of 2.1% (meeting expectations)
- *1C Wind generation forecasting:* 4.2% vs benchmark of 5.0% (exceeding expectations)
- *1D Short notice changes to planned outages:* 1.3 per 1000 outages vs benchmark of 1 to 2.5 per 1000 (meeting expectations)



Stakeholder evidence

Role 1 survey:

9% exceeding expectations
84% meeting expectations
6% below expectations

Highlights:

- Our Operational Transparency Forum remains highly valuable weekly event for the ESO and industry.
- Acted on feedback to ensure planned outages proceed without delay, minimising system disturbances and taking action to secure sensitive demand following unplanned faults.
- Acted on feedback following our quarterly Technology Advisory Council.
- Engage extensively with industry on Restoration Standard.



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
- Implementation of Frequency Risk & Control Report (FRCR) has driven savings of approximately £435m in one calendar year

RREs:

- *1E Transparency of Operational Decision Making:* 99.8% of actions have reason groups allocated
- *1F Zero Carbon Operability (ZCO) indicator:* ESO has accommodated up to 87% zero carbon generation
- *1G Carbon intensity of ESO actions:* Monthly average of 5.2 gCO₂/kWh of actions taken by the ESO
- *1H Constraints cost savings from collaboration with TOs:* £1,938m
- *1I Security of Supply reporting:* 0 incidents
- *1J CNI outages:* 3 planned BM outages



Value for money

Our forecast total expenditure for role 1 in BP1 is £246m, which is 18% higher than the benchmark of £208m.

The main driver of the deviation is increased expenditure on the Balancing Programme.

Since our six-month report, we have re-assessed our delivery roadmap for the Balancing Programme given escalating costs.

We are engaging with industry to seek feedback on our next steps to ensure we deliver the right outcomes whilst managing our costs.

Role 2:

Market development and transactions

Over the past six months, we have made good progress on our market reforms to facilitate the pathway to net zero and to make our markets more efficient and accessible to all participants. Alongside this, we continue to work hard to meet the pace of regulatory and technological change in our codes and systems. Whilst we have had to make some key prioritisation decisions, we are confident in our ability to deliver the transformations required.

The exceptional market conditions we currently face have highlighted the importance of reforming the markets we use to help us operate the system. We have now completed our suite of faster-acting frequency response products to allow us to continue to operate the system within operational limits in an economic and efficient manner. The changing generation mix has made these products increasingly important and helps us drive strong consumer benefits. Building on our model of “implement and improve”, we have refined and enhanced our new response products and will continue to keep these products under review to identify further opportunities to drive value over the coming 12 months and beyond.

As we have progressed reserve reform, we have determined that there is benefit for consumers and market participants in re-assessing our implementation strategy for the new products. Whilst we appreciate that this may be disappointing to stakeholders, it is critical that we engage and listen to industry over the coming months to identify the optimum approach.



Kayte O'Neill, Head of Markets

We have delivered Capacity Market (CM) Auctions, Contracts for Differences (CfD) allocation processes, an update to the Electricity Market Reform (EMR) Portal and provided ongoing advice to BEIS and Ofgem on their policy and regulatory change programmes.

Code change delivery is an important aspect of our role and we have successfully driven some key changes such as Grid Forming, Fixing BSUoS costs and working towards a Whole System Technical Code (WSTC).

Market Reforms

We launched Dynamic Containment on the EPEX platform in September 2021. This has allowed us to introduce more granular, integrated day-ahead procurement to help reduce costs in the balancing mechanism and drive consumer benefits. We have followed this with pre-fault services, Dynamic Moderation and Dynamic Regulation, which have progressed through EBR Article 18 consultation approval. The first auctions are running in April and May respectively.

A key element of these reforms is ongoing monitoring and analysis of the outcomes, to help us identify further improvements. This has led to introduction of EFA block specific buy orders for DC as well as removal of the merit order constraint. Similarly, in our DA STOR product, we listened to feedback and adjusted the buy order in response to market conditions in order to increase volumes procured at day-ahead and avoid very costly

alternative actions in the BM.

Our aim was to follow the response reform products with a phased suite of reserve products, initially starting with an optional negative slow reserve product, with further products released later in 2022. We believe a consolidated approach with fewer releases has advantages as it can be delivered at lower cost whilst allowing us to drive forward Regional Development Plans in parallel, which can realise significant consumer benefits. We will learn from our previous product developments in response and continue to listen to feedback from stakeholders to ensure the optimum outcome.

Single Market Platform (SMP)

Whilst market reform is essential if we are to drive towards net zero, how participants engage with the market is important to ensure Competition Everywhere. The foundational release of our SMP is a vital component of us becoming a better buyer of balancing services and making it easier to do business with the ESO. This first release supports the onboarding process for new and enduring frequency response products and is the first step to a seamless experience to access ESO markets.

Market development and transactions

Electricity Market Reform (EMR)

We recently ran the CM prequalification process for the T-1 and T-4 capacity auctions, guiding 1,234 applications through the process culminating in the Capacity Market auctions in February.

For CfD allocation round 4, the ESO implemented regulatory changes and tailored guidance and webinars for our customers. We have successfully assessed all application and are now setting up process and customer guidance for the Allocation Rounds (auctions) later in the year. process was successfully delivered, and we have assessed all applications.

In both CM and CFD, we have worked with BEIS and other EMR delivery partners to drive and implement policy changes into our business processes and auction systems.

We have prioritised our customers. In FY22 we handled 2000 queries and prioritised the delivery of a new EMR portal, the first release of this went live with customers in March.

Codes and Charging

Ensuring our codes and charging frameworks develop alongside the changes in the market is vital to deliver major net zero programmes e.g. offshore coordination and onshore competition. Ongoing evolution of our charging methodologies to meet our customers needs is key, particularly given the pace of change to comply with the Transmission Charging Review (TCR) outcomes and the decision to move to a fixed BSUoS charging regime. We have made good progress on all of these activities.

We have also seen a significant success in delivering GC0137, also known as Grid Forming. This has created a specification to enable a wider range of parties (e.g. wind farms, HVDC interconnectors and solar parks) to provide

grid stability services. Setting such a specifications is a world first achievement and helps meet our ambition of Competition Everywhere.

New Initiatives

Our Net Zero Market Reform project completed its second phase with a report setting out the case for change and the key challenges for markets to address. Phase 3 involved an assessment of market design options and our conclusions event with a panel discussion to obtain further feedback and we will continue this work over the coming months.

We are also looking at short-term options in the market to drive consumer value and are seeking to establish a local constraint market (LCM) to target the Anglo-Scottish (B6) boundary, which currently has the highest constraints of any GB boundary. We are taking learnings from our ODFM service and look to develop and agile, light-touch system to help accelerate the DER market in the area.

Delivering our plan

Since our 6-monthly report, we have made strong progress in our plan delivery with a significant increase in milestones completed.

We have completed our reform of the frequency response market and continue to monitor these new products, as well as DA STOR to deliver further benefits for consumers. However, we have made prioritisation decisions, particularly around reserve reform, in order to maximise consumer benefits.

Therefore, whilst some milestones are still delayed, we remain confident that we can deliver our ambitious BP1 plan.

Stakeholder views

Overall, 87% of respondents to the Role 2 stakeholder survey rated the ESO as meeting or exceeding their expectations, an improvement from our 6-month position. Stakeholders told us that our delivery of Dynamic Modulation and Dynamic Regulation was good and that we had excellent engagement on our Net Zero Market reform leading to good progress. Areas for improvement were around increased transparency for future market products, moving away from tendered services towards market approaches and giving more time to respond to consultations.

Next Steps

Over the coming six months we will embed our new Dynamic Regulation and Dynamic Moderation services and engage closely with stakeholders on options for implementing Reserve Reform – ensuring that we prioritise effectively to best meet system and market needs, effectively and efficiently.

We also look forward to the challenge and support provided by our new Markets Advisory Council, in considering our approach and progress on evolving ESO markets and driving more broadly towards markets for Net Zero.

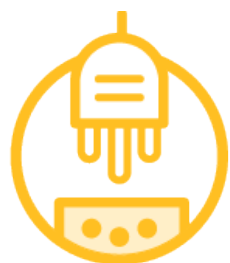
Kayte O'Neill, Head of Markets



Good progress on thinking and leadership on net zero market reform.

Industry participant

Market development and transactions



Plan delivery

We have completed 49 out of the 65 milestones planned for this 12-month period. Of the 16 milestones which are not complete, 5 are ESO-related delays, 10 are outside of ESO control, and 1 is delayed in order to deliver an improved outcome for consumers. We have:

- Completed our suite of fast-acting frequency response products, with ongoing refinements.
- Delivered the first release of our Single Markets Platform to allow onboarding.
- Supported customers in migrating across to our new EMR Portal.
- Progressed and delivered numerous code changes such as GC0137.
- Updated DA STOR in response to market conditions.



Metric performance

- *2A Competitive Procurement*: 51% of all services procured through competitive means (meeting expectations)



Stakeholder evidence

Role 2 survey:

17% exceeding expectations
70% meeting expectations
13% below expectations

Highlights:

- Ongoing engagement with stakeholders on market reforms and product design.
- Webpage created, webinars and bilateral discussions on our Stability Market Design NIA project.
- Working with GB stakeholders and TSOs following EU Exit to consider enduring UK-EU cooperation.
- Engage with an external user group of industry volunteers to develop the EMR Portal.
- Hosted dozens of events for Net Zero Market Reform project, engaging with over 1000 stakeholders.



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) now expected to lead to an estimated saving of £68 million over RIIO-2
- Moving to more granular procurement of Dynamic Containment has resulted in a saving of around £18.7m

RREs:

- *2B Diversity of service providers*: Varying diversity across the different markets
- *2C EMR decision quality*: Awaiting data from Ofgem
- *2D EMR demand forecasting accuracy*: peak demand accuracy 6.6% for T-1 (below expectations), 3.8% for T-4 (meeting expectations)
- *2E Accuracy of forecasts for charge setting*: Absolute Percentage Error of 20% (BSUoS) and of 0.5% (TNUoS)



Value for money

Our forecast total expenditure for role 2 in BP1 is £160m, which is 1% higher than the benchmark of £159m.

The main variances are increased costs associated with major IT programmes (Settlements, Charging and Billing and EMR). These are driven by a range of factor from changes to scope, improved understanding of complexity driven by greater regulatory change and delays to delivery.

These increases are offset by reductions associated with EU Regulatory changes. Several planned activities (such as participation in TERRE or MARI) are no longer relevant following EU exit.

Role 3:

System insight, planning and network development

Over the past six months, we have made strong progress on our long-term projects and ambition of being able to operate the system at zero carbon by 2025. It is through this ambition that we are maintaining the operation of one of the most reliable electricity systems in the World, reducing costs to the consumer, and decarbonising the electricity system.

Building on the work of the previous years this year has seen the connection and completion of the outcomes of Stability Phase 1, allowing us to save money through the year by running less conventional generation to provide grid stability services and achieving a new record of operating the system at 87% zero carbon generation.

We are the first System Operator in the world to place the technical requirements that defines Grid Forming Invertors or Synthetic Inertia in the Grid Code. This means that batteries and other renewable technologies can connect using grid forming invertors and participate in our stability markets. Through the results of Stability Phase 2, 5 of the 10 successful contract winners

are using this new technology to provide stability services - again the first in the world where multiple grid forming devices are working together to ensure grid stability.

Looking to the future network, the work to develop the worlds first integrated offshore design is nearing completion, and will facilitate the connection of over 50GW of offshore wind by 2030 in line with the British Energy Strategy. We are also making good progress towards implementing a strategic network planning process that will create a 'blue print' for the future Electricity Network and allow for anticipatory investment – this is a vital component to ensure the network enables the whole energy system transition to net zero by 2050.



Julian Leslie, Head of Networks

Pathfinders

Our focus on pathfinders is critical in ensuring we deliver competitive, alternative options to meet the future system needs. We launched our consultation for CMP in February, with service delivery in 2024-25 with the aim to reduce constraint costs on the Anglo-Scottish (B6) boundary.

We ran a successful competitive process for the Pennines Voltage Pathfinder to deliver 700MVar of reactive power capability between 2024 and 2034. The process compared market based solutions against transmission owner solutions and is the first time that an Offshore generator will provide such services.

We also opened the commercial submission window in November for the Stability Pathfinder Phase 2 which will procure additional volumes of inertia, short circuit level and fast acting dynamic voltage support across Scotland between 2024 and 2034. The assessment is now complete with 10 contracts awarded to four companies worth a total of £323m and provide net zero solutions to stability issues.

Facilitating distributed flexibility

We have worked closely with DNOs to develop future regional constraint markets and solutions. This includes

our work on Regional Development Programmes to unlock more capacity for smaller, regionally-connected (and often renewable) power sources. We have also initiated work to facilitate smaller providers into our markets and provide greater visibility of DER.

Bigger Picture

We continue to lead the debate when looking at whole system planning and solutions. This is critical to deliver good outcomes for consumers and we engage, collaborate and drive the discussion in this area through industry forums, participation in ENA workstreams and providing advice and insight to BEIS and Ofgem in their respective Offshore Transmission Network Review (OTNR) and Electricity Transmission Network Planning Review (ETNPR). Being involved in such a breadth of activity allows us to share learnings and best practice to help lead the industry in this key area.

We have also been engaging with Ofgem about future development of the FES given the significant interactions with these workstreams, looking at how this may need to evolve to meet our zero carbon operability challenges.

System insight, planning and network development

In January, we published our annual NOA 2021/22 which assesses the reinforcements required for the electricity transmission networks and makes recommendations.

To allow us to factor in outputs from the ongoing OTNR and Holistic Network Design activities, this NOA has focused on progress for the next six months rather than a full year. This demonstrates an agile approach whilst we manage the many interacting reviews that are in progress.

Bridging the Gap

Following the publication of FES 2021 in July, we have undertaken extensive engagement with stakeholders to gather insight for FES 2022 and published our Stakeholder feedback document in March.

We published our Bridging the Gap 22 Report in March, building upon the FES key messages to develop a “day in the Life of 2035” to illustrate what this might look like and the steps to get there. We worked with stakeholders to join the dots between ESO activities, industry plans and strategies to build a flexibility timeline with required actions and milestones to get to a flexible energy system.

Operational Visibility of DER

We have commenced new work investigating how we can better facilitate access for DER to ESO markets, with a key enabler being appropriate operational visibility of DER to

ensure we can manage operational risks. This work builds on initial work undertaken as part of the Open Networks project and we have now developed a clear position and planned future work. An early success in this area has been adopting a different approach to our treatment of Balancing Mechanism operational metering for aggregated portfolios, which has been welcomed by service providers and will promote standardisation and proportional investment costs of all market participants.

New Initiatives

We have utilised the flexibility of price control framework to progress our work on Offshore Coordination, working closely with BEIS and Ofgem to support the OTNR as well as improving the routes for stakeholder engagement and feedback. We have worked with developers to refine their proposed coordination opportunities, with a gaps and challenges analysis with the present codes, standards and process supporting this work. We have continued to engage with the Central Design Group to develop the Holistic Network Design, with the aim to publish in June 2022.

Our Early Competition project has completed and submitted “low regrets” activities to Ofgem in December, with this published in March on our website. We have worked closely with Ofgem to agree an implementation plan and are preparing to quickly mobilise a sizable delivery team following a decision from Ofgem to implement Early Competition. We have continued to engage

with the TOs to discuss elements of early competition and worked closely with the ENA to explore how the transmission model could be applied at a distribution level.

Plan Delivery

Since our 6-monthly report, we have accelerated our plan delivery, with a significant increase in milestones completed. Our work on pathfinders, RDPs and network planning are all vital to help deliver consumer benefits in the future by reducing balancing costs.

We believe that we can build upon this progress and are confident we can deliver our ambitious BP1 plan.

Stakeholder views

Overall, 79% of respondents to the Role 3 stakeholder survey felt that the ESO was meeting or exceeding their expectations. Stakeholders told us they liked our progressive thinking around adapting to net zero system operation and consideration of non-traditional options. They also felt that we were tailoring our connections solutions to customer needs. Improvements included pace of delivery for Holistic Network Design and Regional Development Programmes and greater thought leadership for whole systems strategy and planning.

Next Steps

The next 6 months are critical for the delivery of the Offshore Holistic Design and the associated onshore works. In June we will publish the results of this work which will allow the next steps to be taken to facilitate the connection of 50GW of offshore wind by 2030. This combined holistic network design will be the first step to creating a Central Strategic Network Plan as part of the Electricity Transmission Network Planning Review Programme.

By the Autumn we shall also have published our results of the Pathfinder Phase 3, which is procuring short circuit level and inertia, in England and Wales. This is essential to maintain grid stability in a low carbon, high renewable system. This will be the largest of the Pathfinders so far and we expect a range of solutions will be provided.

Julian Leslie, Head of Networks



The ESO is taking a proactive approach to adapt for the zero-emission system operation and takes a leading role across the world to prepare for the future system.

System insight, planning and network development



Plan delivery

We have completed 93 out of the 116 milestones planned for this 12-month period. Of the 23 milestones which are not complete, 10 are ESO-related delays, 9 are outside of ESO control, and 4 are delayed in order to deliver an improved outcome for consumers. We have:

- Made significant progress on constraint management pathfinder, with contracts awarded under Pennines Voltage and Stability Phase 2 pathfinders.
- Collaborated with DNOs to progress regional development plans.
- Delivered network planning activities via the Network Options assessment and FES.
- Had a leading role in whole systems planning, engaging with BEIS and Ofgem on their respective reviews (OTNR and ETNPR).
- Commenced new work investigating how we can better facilitate access for DER to ESO markets.



Stakeholder evidence

Role 3 survey:

8% exceeding expectations
71% meeting expectations
20% below expectations

Highlights:

- Lessons learnt from Stability Phase 2 incorporated into improvements for Stability Phase 3.
- Improvements to NOA 2021-22 to make it more concise and easier to understand.
- Website publication for ETYS 2021 was well received and helped us reach a wider audience.
- Virtual networking sessions and webinars to support FES 2021 and Bridging the Gap.
- Connections team has grown to address growth and is working with TO's to find improved ways of working.



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
- Stability Pathfinder Phase 2 successfully tendered, the bids chosen will deliver 11.55 GVA of SCL and 6.75 GVAs of inertia worth a total of £323 million. Potential future savings are £130m compared to the counterfactual.

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 £42m from RDPs
- *3B Consumer value from the Network Options Assessment (NOA):* £208m from ad-hoc CBAs, £313m from LOTI CBAs, NOA consumer benefit £212m
- *3C Diversity of technologies considered in NOA processes:* 136 asset-based solutions (including 22 new options) and 8 commercial solutions submitted to NOA 2021/22. A wide range of solutions were considered in NOA pathfinders (NB this will be different from mid-year as we're at a different stage in the NOA process)



Value for money

Our forecast total expenditure for role 3 in BP1 is £141m, which is 1% higher than the benchmark of £139m.



The main cost variances are increases associated with delivering new activities that were not included in our BP1 such as Offshore Coordination and Early Competition.

These increases are offset by reductions elsewhere, most notably with our Zero Carbon Operability project. This was due to a re-phasing of work to include a Discovery Phase, pushing spend from BP1 to BP2.



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 six months.

ESO ambition for 2025		Progress towards this ambition (October 2021-March 2022)	
	An electricity system that can operate carbon free	<p>Zero carbon operability indicator: The highest proportion of zero carbon transmission connected generation that the system could accommodate reached a new maximum of 87.1% in January 2022. We expect this to continue increasing next year and we are on course for carbon free operation by 2025.</p> <p>Deliverables: There are 80 deliverables that are critical to our zero-carbon ambition. 51 of these were due to be completed in 2021-22, of which 41 are now complete. Of the 10 that are delayed, 6 of these relate to the inertia monitoring deliverable.</p> <p>Our progress is shown by our Zero Carbon Dashboard (see page 17).</p>	
	A whole system strategy that supports net zero by 2050	<p>Distribution System Operation (DSO): Continued support in enabling the transition to DSO with ESO vision document published and engagement with RIIO-ED2 business plans and DSO strategies as well as our work in Open Networks.</p> <p>Regional Development Programmes: We continue to work with DNOs to develop new ways to get DER connected to the system. This includes the development of regional constraints markets such as MW dispatch.</p> <p>Leading the debate: Building upon our Bridging the Gap work and key messages, we have published a report which sets out actions required by industry over the next 5 to 10 years to drive towards net zero. We continue to participate strongly in ENA Open Networks and chair the project's Whole Energy System workstream which has produced products such as a whole system CBA.</p> <p>Co-ordinated market development: Work through ENA Open Networks leading the development of procurement processes, standard contractual agreements and primacy rules.</p> <p>Network Design: We have continued our engagement with BEIS and Ofgem through their respective Electricity Transmission Network Planning Review and Offshore Network Planning Review, providing key insight and advice. This will help to ensure a holistic network design.</p>	

Progress towards our ESO mission

ESO ambition for 2025	Progress towards this ambition (October 2021-March 2022)
 <p>Competition Everywhere</p>	<p>Market reforms: We have completed our suite of fast-acting frequency response products, with Dynamic Containment, Dynamic Regulation and Dynamic Modulation. This ensures we have the capability to meet the changing needs of the system whilst improving competition to deliver consumer benefits. We also have clear processes to monitor the outcomes in these markets to help us identify further refinements.</p> <p>Net Zero Market Reform work: We set out the case for change and an assessment framework for market design options to meet the challenges we foresee and have used this to produce final design options. Good engagement with industry has allowed us to test our conclusions.</p> <p>Competition in networks: The Pennines Voltage and Stability Phase 2 pathfinders have awarded contracts to successful parties, with competition driving value in this process. The commercial tender for our Constraint Management Pathfinder will build upon this success. We produced our Network Options Assessment, adapting to the opportunities created by the ongoing offshore Network Planning Review by BEIS.</p> <p>Industry governance: We have continued to deliver code reform to keep up with the pace of change in the market. GC0137 Grid Forming change has allowed a wider range of parties to compete to provide stability services.</p>
 <p>The Electricity System Operator (ESO) is a trusted partner</p>	<p>Transparency: We aim to build further transparency into all of the work we do. This year we held the first in person Markets Forum to share our thinking with industry and get feedback on our Markets roadmap, Net Zero market reform and the FSO. The Operational Transparency forum also continues to evolve to meet the needs of our customers and share data on the areas of our operation that customers most want to hear about. We also utilise forums such as; ERSO, the Technology Advisory Council and newly formed Markets Advisory Council to share our thinking early with key stakeholders across the industry and get feedback on our current and future plans.</p> <p>Stakeholder Engagement: We involve customers in all our project and process improvement work and proactively seek their views to ensure we are really co-creating together. Our stakeholders are working with us and providing input all the time, whether that's through FES bilateral meetings and Bridging the Gap webinars which help us build what the energy system of the future might look like, or using workshops to input into the design of our new Balancing Services programme, Single Markets Platform and Connections Portal.</p> <p>Leading the debate: We continue to work with Ofgem and BEIS and provide our view on the needs of the energy system and consumers and how that can best be met. Our involvement in COP26 and speaking at events like Utility week show we are keen to share our views and hear stakeholder views as we move together towards net zero.</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 majority of the delays are for the inertia monitoring deliverable. The reasons for the delays vary, including a high number of applications received for Stability Phase 2, technical difficulties with the second supplier’s inertia monitoring tool, and updates to much earlier estimates of timelines.

Role	Deliverable reference	Deliverable name	Milestones in BP1	Milestones due in 2021-22	Milestones completed
1	D1.2.2	Inertia Monitoring	22	13	7
	D1.3.1	Improve situational awareness	25	18	16
	D1.3.4	Increased operational liaison with DNOs	3	1	1
2	D4.6.1	Competitive procurement of stability	9	7	6
	D4.6.2	Competitive procurement of reactive power	7	4	4
3	D8.1	New areas of need identified, and 3-6 tenders run	10	6	5
	D8.2	Improved tender approaches	2	1	1
	D15.1.1	System Operability Framework (SOF)	1	1	1
	D15.1.2	Innovation projects for new operability solutions	1	-	-

Reduced carbon impact of ESO actions in 2021-22

Throughout the year we have seen an improvement in our ability to operate the electricity system carbon free. The Zero Carbon Operability (ZCO) indicator measures the proportion of zero carbon transmission connected generation that the system can accommodate. At the start of the year, the maximum ZCO we had seen was 84.8%. This was achieved on 5th April 2021, settlement period (SP) 31. By the end of the year, our new maximum ZCO was 87.1%, achieved on 5th January 2022 SP5. This increase is due to the successful implementation of our operability strategy and the commissioning of new stability pathfinder phase 1 providers. We expect this to carry on increasing into next year and we are on course for carbon free operation by 2025.

RRE 1G Carbon intensity of ESO actions

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Full Year
Carbon intensity (gCO2/kWh)	2.1	6.2	4.5	4.5	6.9	1.0	4.8	9.4	3.4	6.4	10.6	3.1	5.2

RRE 1F Zero Carbon Operability Indicator



Annex: further context

The image features a solid yellow background. In the bottom right corner, there are several parallel, wavy lines in a darker yellow or orange color, creating a decorative, flowing effect that extends from the left side of the bottom edge towards the right.

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	a. System operations b. System restoration c. Information, data and forecasting
Role 2: Market development and transactions	a. Market design b. EMR c. Industry codes and charging
Role 3: System insight, planning and network development	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: Prioritisation

Prioritisation Process development

- Following our 6-month incentive report, we received feedback from both the Performance Panel and Ofgem to improve the transparency around how we prioritise activities and, where required, improve the processes that sit behind such decisions.
- We outline the work that we have undertaken in this area but recognise that further steps will be required through the remainder of BP1.
- We have also given two examples of key prioritisation decisions we have made recently, explaining how/why we have made these decisions and the potential impacts and benefits of them.

Improvements implemented in FY21/22

- A new cross-role Portfolio Review Board (PRB) was implemented in January 2022 to manage overall deliverability of the portfolio, including:
 - Project / Programme escalations
 - Resourcing constraints
 - Dependency management
- The PRB is responsible for taking ESO-wide prioritisation decisions both on a short-term basis and as part of the Quarterly Rolling Forecast process.
- The PRB group have identified improved prioritisation as a key area of focus in the first half of FY22/23.

Improvements planned in FY22/23

- Work is underway with the aim of allocating an overarching prioritisation grade for all activities.
- The existing prioritisation section of PRB will be further developed to include greater detail and standardisation, for example to ensure all cross-role considerations are included and scored.
- The existing portfolio reporting system, Adobe Workfront, will be developed to support the improved process, e.g. by capturing standardised decision criteria, dependency assessment and decision audit trail.



Deep Dive: Prioritisation (NSR/RDP)

In the autumn, we announced that our first release of new reserve products would be Negative Slow Reserve in Summer 2022, followed by other products and a firm market through later releases.

Delays in the reserve project meant that the resource needed to deliver certain system upgrades on the Ancillary Services Dispatch Platform (ASDP) was also committed to delivering changes for the first Regional Development Programme (RDP) at the same time. Originally the ASDP development team were going to work on frequency response, RDP and reserve reform one after another, however due to delays over the summer and the push to get DM/DR ready for spring this created a conflict.

A CBA was undertaken to explore which project would deliver greatest consumer value and which should be postponed, assuming a postponement of no longer than 6 months. Based on this assessment, it was decided that the delivery of RDP1 should take precedence over Negative Slow Reserve, as it would deliver higher consumer value through avoided postponement.

Once this decision was made, further work identified that there was additional consumer benefit over and above this by taking a holistic look at reserve reform and combining the delivery of functionality for more than one product. This would reduce the regret spend on a number of legacy systems, as well as mitigate higher costs on system upgrades. As a result of this work, we announced in February that we would review our launch strategy to identify the optimum approach to deliver the new reserve product suite. This would deliver better value to consumers and a create a better experience for providers by aligning the launch of new reserve services with other strategic deliverables, such as the Enduring Auction Capability (EAC) project, the Balancing Transformation project and the Settlements replacement system.

Cost Benefit Assessment:

For Negative Slow Reserve, the consumer benefit of delivering by Summer 2022 was estimated at between **£0 and £341k per month**, depending on providers' bid prices.

This was based on the assumption of 5 extremely low demand days per month (based on 2021 data) and a provider base of 100MW-280MW (based on OFDM data).

For RDP1, the consumer benefit of avoiding a programme delay was estimated at between **£30k and £830k per month**. This assumed that the service is used for three hours per day, and that it attracts a reduction of £20MW/h compared to BM prices, and also includes £30k per month to keep the majority of the IT team stood up.



Deep Dive: Prioritisation: Digitalised Whole System Technical Code (dWSTC)

Our DWSTC programme is led by stakeholder agreement of scope and priorities (through consultations and a Steering Group) with industry led “go/no-go” prioritisation decisions as a key element of the first BP1 period.

Stakeholders told us that:

Consolidation could address some of the issues associated harmonisation, complexity, and the need to track two sets of code modifications. Support for consolidation was identified on the basis that:

- Any resulting text is simplified
- The new DWSTC is structured to aide users in understanding their obligations
- The result is not an excessively large document

BUT consolidation should be put on hold until the outcome of the ongoing Energy Code Reform (ECR) is known.

Digitalisation would have benefits including:

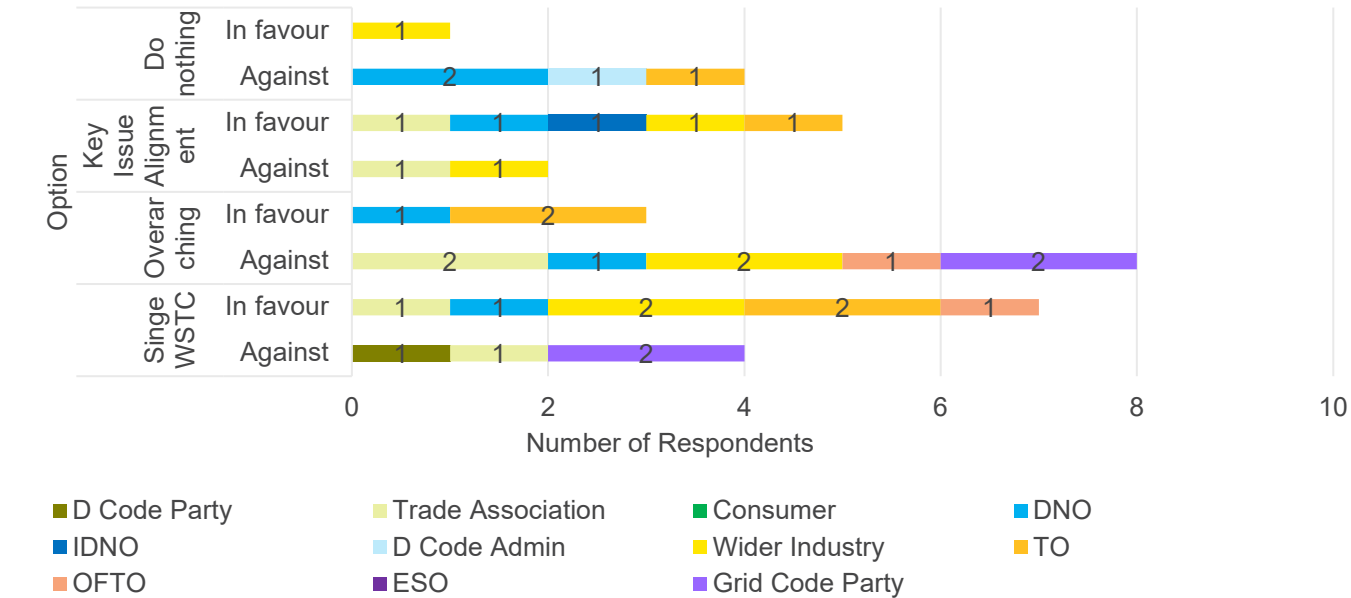
- Making obligations easier to understand
- Signposts to related materials (such as industry codes)
- Increasing efficiency for users
- Aiding navigation

Stakeholders identified that this work could proceed without jeopardising any progress that may be made outside of the project (e.g. ECR scope). Other elements of rationalisation/simplification could also continue on an example basis but subject to normal code processes if changes were identified.

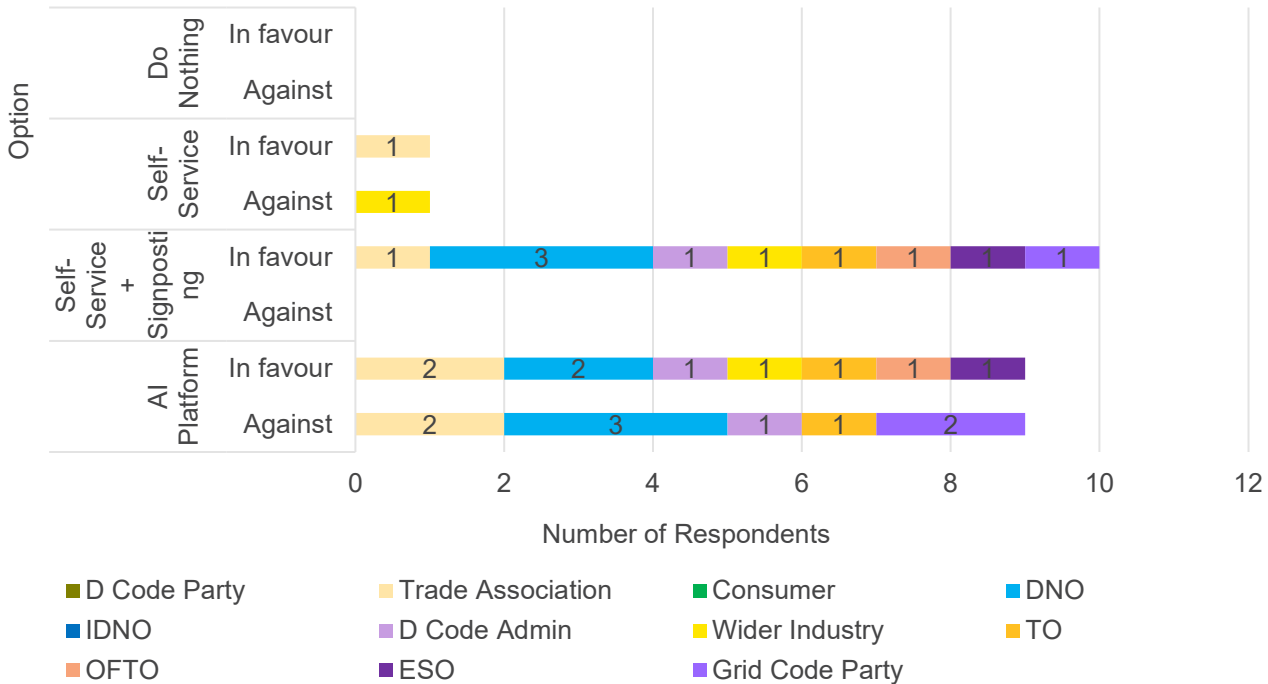
By focusing on digitalisation and deferring consolidation, we have:

- Shown that we are responding to industry feedback and recognise the wider environment we are working in,
- Been able to save FTE costs on this project and prioritise value-adding activities elsewhere such as on product development,
- Ultimately deliver better value for consumers as it will allow us to align between consolidation and the ECR.

Whole System Alignment or Consolidation



Digitalisation

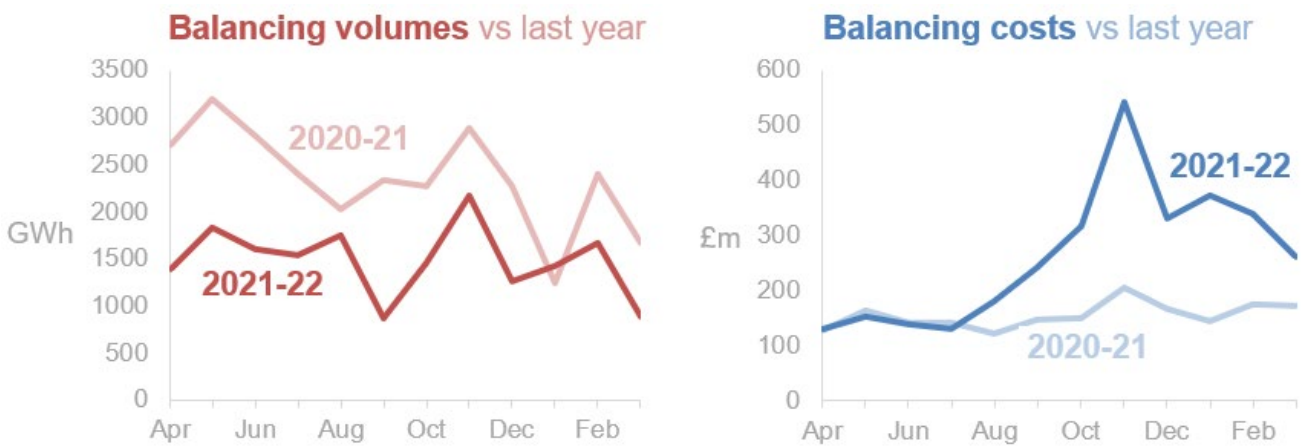


Deep Dive: Balancing Costs

The cost of operating the electricity system this year have been very high and well above the benchmark for Metric 1A. Actual balancing costs this year were £3.1bn compared to a benchmark of £1.3bn and therefore below expectations.

Unprecedented increases in wholesale prices of electricity, coupled with extreme peaks in prices submitted in the Balancing Mechanism (BM) during periods of tight system margins due to market scarcity have been the key challenge throughout the year, and particularly over the winter period.

The ESO's real time actions, trading activities and newly introduced changes for this year, such as the Frequency Risk and Control Report (FRCR), have had demonstrable impacts on costs and volumes of energy procured. The **volumes procured** this year were lower than the previous year, but the cost per MWh was higher, leading to higher overall **balancing costs**.



Deferral of Winter BSUoS costs

CUSC code modification CMP381 sought to defer exceptionally high Winter 2021/22 BSUoS costs to 2022/23. ESO worked closely in the workgroups and with Ofgem to facilitate this modification which introduced a cap on BSUoS charges protecting market participants over the winter period. These costs will be recovered across 2022/23.

Balancing costs strategy

The ESO understands the impact of Balancing Costs on its customers and their businesses and ultimately to all consumers, particularly given the overall increase in other energy costs and general cost of living crisis. This created a need to take additional action and move beyond the ESO's regular, continuous improvement activities to ensure that the ESO is doing as much as possible to effectively manage the elements that are under its control.

A team was established to carry out this enhancement work, focussed on three main areas:

Tactical improvement activities that will have an immediate and enduring impact on balancing costs. Three initial proposals are being analysed for piloting during April to June with the potential to realise savings in the range £10m - £50m in balancing costs per year based on current electricity prices. Longer term actions to be pursued during the next performance year.

An end-to-end process review to fully understand our processes from a Balancing Cost perspective and to develop improvements in activities that span multiple teams.

Improved monitoring and measurement of our Balancing Cost activities and actions in all timescales to ensure that improvement activities are tracked, and benefits measured.

Review of the balancing market

Our Market Monitoring team are carrying out a review of the Balancing Market, which is seeking to understand the reasons behind the exceptionally high cost of balancing on certain days in the latter half of 2021.

Initial findings from the data analysis phase of the work have were shared with stakeholders via a webinar on 29th March. The stakeholder engagement phase is underway, for which we have held four multi-party roundtables, one single-party call and a questionnaire.

We are now following some additional lines of investigation as a result of our engagement, and we hope to have a finalised report to share with Ofgem during May.

Deep Dive: People and capability

Capability Build	University Strategy	STEM Approach	Workforce planning, recruitment, onboarding & induction
<ul style="list-style-type: none"> As part of our people strategy we want to further develop the ESO's culture as a learning and development-centric organisation. We know our colleagues are critical to what we do and we want to help them flourish during their entire employee journey. We have developed a central People & Capability Hub, a one-stop-shop of all the ESO learning and development material. This includes resources and training for the eight identified ESO specific capabilities, with descriptions of different levels of expertise to support development planning. We also launched two new e-learning modules to boost new starters' understanding of the ESO – these are: <ul style="list-style-type: none"> Introduction to the Electricity Industry Introduction to Power Systems Career maps have also been created, which are a visually-compelling representation of the diversity of careers in the ESO. This interactive document also shares a more detailed view of what careers in engineering, data and commerciality could look like and support on development planning. A Capability Lead Network has been developed that will share best practise and expertise in ESO capabilities to ensure we are working together to build capabilities needed in the future. 	<ul style="list-style-type: none"> We recently reviewed all our university engagements to ensure a coordinated view of the different ways in which colleagues across the organisation work with universities. We found that ESO has multiple touch points with a variety of universities serving a variety of purposes. Generally these relationships are targeted by need and location, with the main drivers being to: <ul style="list-style-type: none"> build ESO brand recognition; increase a diverse talent pipeline; update the university curriculum; gain research partners; promote our projects to engage university PhD students; and provide critical friends and industry allies. A set of recommendations were developed, the first step being to establish a University Strategy Steering Group to give direction and gain momentum with our university relationships, delivering a focused and targeted approach that meets the needs of ESO. As well as building our brand for recruitment and attraction purposes, we also need to leverage our relationships with universities to create strategic partnerships and use their influence, intellect and knowledge to help us achieve our ambitions. This means as well as focusing on the traditional engineering disciplines we continue to require in volumes, also looking to the future and broadening the degrees we consider and targeting for new emerging capabilities we need as we consider the needs of future system operations (e.g. data science, IT, innovation). 	<ul style="list-style-type: none"> With such huge challenges ahead, we are now turning more of our attention to the energy leaders of the future. To ensure our colleagues have the resources they need to give talks to primary and secondary school students – who we want to aspire to work in the ESO in the future – we are collating STEM for schools materials and making them accessible in a central portal. ESO Brand Ambassadors are being identified across the business to go into schools and highlight the variety of career paths & choices available in ESO. We will also be developing a set of materials (options being explored include presentations, videos on YouTube, and ESO-specific materials) that can cover: <ul style="list-style-type: none"> the energy transition and net zero; careers and routes into STEM; and CV and interview techniques. We are also beginning to work more with external partners, e.g. Engineering UK and supporting their Code to work with education to build engineering and technology skills needed for the UK to be a leader in innovation and improve societal and economic resilience, and environmental sustainability. 	<ul style="list-style-type: none"> We have put in place a Strategic Workforce Planning process which seeks to understand the future capability needs of all departments around the ESO and enables us to develop the appropriate sourcing strategies. We want to be the net zero employer of choice. Employee expectations are changing post-pandemic and the labour market in general is seeing significant churn – this is a challenging environment in which to be recruiting skills which are in short supply. This is why we are: <ul style="list-style-type: none"> revisiting the ESO's Employee Value Proposition (EVP); running sprint projects to focus on the sourcing of key capabilities, starting with Power System Engineers – this sprint has identified 30 key recommendations which we are now working through; and considering additional entry routes such as a 'STEM returners' programme and industry placements with BEIS. Over the last 12 months since the start of RII02, we have recruited 121 external hires, and facilitated 195 internal development moves for our ESO people and 67 moves into ESO from other parts of National Grid. We have also taken 198 people through our refreshed and improved induction programme and onboarding process, which has received great feedback.

Acting on feedback from mid-year

We published our mid-year incentives report in October 2021, and subsequently received detailed feedback from the Performance Panel and Ofgem. We have found this feedback helpful and sought to act on it over the past 6 months, as detailed below.

Role	Feedback	Action taken	Relevant section of this report
All	Prioritisation: ESO should set out the key priorities for each role, provide evidence of the prioritisation process, and explain how/why projects have been prioritised.	Prioritisation process & deep dives on prioritisation decisions	<ul style="list-style-type: none"> • Exec summary
All	Capability: ESO should ensure it has the capabilities needed to deliver technically challenging new outputs, and continue to build its resource and capabilities.	Section in exec sum	<ul style="list-style-type: none"> • Exec summary
All	Balancing costs: the ESO should provide evidence of considering proactive action (beyond business-as-usual) to drive down balancing costs, address the causes of very high balancing costs, and address the impact of high costs on the wider market. This includes prioritising role 2 activities which contribute towards reducing balancing costs.	Our strategy for managing balancing costs Market monitoring & review of balancing market Metric 1A narrative incl. balancing costs benchmark and regular engagement with panel Design of market reforms Deferring BSUoS charges	<ul style="list-style-type: none"> • Evidence chapters: plan delivery • Evidence chapters: plan delivery • Evidence chapters: role 1 metrics • Evidence chapters: role 2 plan delivery • Evidence chapters: role 2 plan delivery
All	Plan delivery and consumer benefit: ESO should provide confidence that overall delivery of key reforms will be achieved by the end of BP1, and that the realisation of benefits will not be delayed.	Include clear milestone delivery data New CBA template- details when benefits are realised	<ul style="list-style-type: none"> • Exec Summary • Evidence chapters: plan delivery • Evidence chapters: plan benefits
All	IT projects: More justification is required from the ESO that IT project cost and scope is being effectively managed. Where spending more than the cost benchmark, the ESO should provide evidence to demonstrate that it is still delivering value for money- for example, what is driving the cost increase, how additional activities are delivering additional consumer benefit, why costs were not in the BP1 cost benchmark, and what additional functionality is delivered by the joint Settlements and Charging and Billing Replacement project.	Greater detail provided on key cost deviations and updated CBAs Independent Assurance work undertaken	<ul style="list-style-type: none"> • Evidence chapters: value for money and CBAs

Acting on feedback from mid-year (continued)

Role	Feedback	Action taken	Relevant section of this report
All	Playing a wider role: ESO should consider the wider role it could play within the electricity sector. For example, by considering developments in the wider energy market, including the decline of smaller players, and the potential impact this has on balancing, settlement, and system operations and whether there are market interventions the ESO could spearhead.	Our market strategy and reform work considers increasing competition, impacts on balancing costs and how we can work towards net zero through new initiatives.	<ul style="list-style-type: none"> Evidence chapters: Role 2 plan delivery/ stakeholder
1	System operability: The Panel expressed concern over the system disturbance events in Scotland over this regulatory period and there was some concern about system operability going forward over the Winter months, especially with tighter margins.	Describe whether there were any occurrences (ref security of supply metrics) Additional PSCAD software licences for improved modelling, brought forward from next year	<ul style="list-style-type: none"> Evidence chapters: role 1 RREs Evidence chapters: role 1 plan delivery
1	Energy Forecasting Roadmap: the ESO should deliver the commitments outlined in its Energy Forecasting Roadmap, in addition to the commitments outlined in its updated Delivery Schedule.	Operational version of PEF deployed into the Control Room in 2021-22	<ul style="list-style-type: none"> Evidence chapters: role 1 plan delivery
1	Data Analytics Platform (DAP): the ESO should design the Data Platform to interoperate with the energy data ecosystem and beyond, and demonstrate that it is treating its data processing methods and algorithms as presumed open.	The DAP architecture supports the requirements listed in the Feedback	<ul style="list-style-type: none"> Evidence chapters: role 1 plan delivery
2	Market Reforms: the ESO should consider market design options to address high balancing costs. It should address design issues with Dynamic Containment and STOR products, and apply the lessons learned to future products. The ESO should improve transparency and explanation around its decision making. ESO should demonstrate how it is proactively shaping wider market arrangements (such as balancing, wholesale and capacity markets) and industry frameworks, particularly when it comes to the development of distribution-level operational frameworks.	Markets Roadmap published Our response and reserve reform work has had a number of significant changes, such as the launch of DC low frequency, consulting on DM and DR and updated Day Ahead STOR. Markets advisory council now includes stakeholders.	<ul style="list-style-type: none"> Executive summary Evidence chapters: role 2 plan delivery/ stakeholder/ consumer benefits
2	Work with GB stakeholders and connected TSOs: The ESO could also go further than just ensuring compliance with EU regulations, and bring together GB stakeholders to develop and implement strategic plans for ensuring efficient trading relationships with connected TSOs.	Following EU Exit, we have worked closely with UK TOs, BEIS, Ofgem, EU TSOs and ENTSO-E	<ul style="list-style-type: none"> Evidence chapters: role 2 stakeholder
2	Electricity Market Reform (EMR): the ESO should address issues with the existing portal (for example, through providing better support and assistance for users of the portal), show a step change improvement in user experience and deliver the new portal in a collaborative manner. We also note that there have been issues relating to licence breaches or CM Rules breaches and that some still need to be addressed.	Stakeholders have acknowledged improvements made to the current portal and in developing the new portal. CM rule breaches have been addressed.	<ul style="list-style-type: none"> Evidence chapters: role 2 plan delivery/ stakeholder

Acting on feedback from mid-year (continued)

Role	Feedback	Action taken	Relevant section of this report
2	Co-ordinate procurement with DNOs: the ESO should develop plans for coordinated, competitive markets that cover all system services and align with distribution-level flexibility markets. It could also work with DNOs to ensure that service providers have a single, consistent set of procurement requirements when looking to provide services to the ESO or DNOs.	Market reforms are continuing and we are monitoring the analysis of the outcomes to help us identify further improvements. We have commenced new work investigating how we can better facilitate access for DER to ESO markets.	<ul style="list-style-type: none"> Executive summary Evidence chapters: role 2 plan delivery/ stakeholder Role 3 plan delivery
2/3	<p>Pathfinders: the ESO should ensure that lessons learned from previous pathfinders (e.g. stability phase 1 and 2) are applied to future pathfinders (e.g. stability phase 3). The further delays and uncertainty regarding Stability phase 2 was a key concern. The Panel would like to see evidence of the ESO responding to and addressing negative stakeholder feedback.</p> <p>The ESO should use lessons learned from pathfinders to demonstrate clear progress in implementing enduring markets for solutions to stability, voltage and thermal constraints.</p>	<p>Following Stability Pathfinder phase 2 delays, we have shared the lessons learnt for subsequent pathfinders and this has been implemented for Stability Pathfinder phase 3</p> <p>Several innovation projects underway</p>	<ul style="list-style-type: none"> Evidence chapters: role 2 plan delivery/ stakeholder Evidence chapters: role 3 plan delivery/ stakeholder
3	Constraints: the ESO should progress its 5-point plan, and remove barriers non traditional parties face providing thermal constraint solutions.	<p>5-point plan progressed</p> <p>Improvements in NOA diversity- see RRE 3B</p> <p>Interested persons</p>	<ul style="list-style-type: none"> Evidence chapters: role 3 plan delivery/ stakeholder/ Regularly Reported Evidence
3	Connections: the ESO should explain how it is improving the connections process. It should provide more details on the functionality of the proposed connections platform, including the extent it will align or integrate with TO and DNO systems.	Team has grown to address growth and is working with TO's to find improved ways of working.	<ul style="list-style-type: none"> Evidence chapters: role 3 plan delivery/ stakeholder/ consumer benefits
3	Whole system: the ESO should provide more details on what it will cover through its deeper whole system insights, as well as more specific recommendations on how existing frameworks need to be aligned to deliver whole system outcomes.	We have collaborated closely with DNOs to develop future regional constraint markets and solutions.	<ul style="list-style-type: none"> Evidence chapters: role 3 stakeholder
3	Bigger picture: the ESO should remain mindful of the bigger picture and wider priorities that cut across the Role 3 activities. ESO should consider how the use of the NOA and FES could evolve in the near future, develop a vision for an optimal network assessment process to address zero carbon operability challenges, and explain how all of role 3's activities fit together to facilitate a level playing field for all types of solutions to compete to solve all types of network needs. ESO should reflect all wider work being undertaken in Role 3 in its next iteration of the business plan for 2023-25 (BP2). The ESO should continue to consider the impact of future policy changes on Role 3 activities.	Explanation of how the range of role 3 activities have considered the bigger picture	<ul style="list-style-type: none"> Exec Summary



Thank you for reading our 2021-23 Mid-Scheme Report
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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>