

May 2023

RIO-2 Business Plan 1 (2021-23)

# 2021-23 End of Scheme Report Executive Summary

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

# BP1 on a page

Achieved an overall BP1 milestone completion rate of

~94%\*

We expect our original RIIO-2 business plan activities to deliver more than the forecasted net present value benefit of

>£2bn

Delivery of the innovative and world-leading Demand Flexibility Service (DFS) with the number of customer signups exceeding more than

1.7 million

Delivery of balancing costs initiatives over BP1 have resulted in benefits of around

£5.6bn

## BP1 Key Messages

We have delivered on our critical BP1 commitments and gone above and beyond

We have enabled the operation of a secure, reliable electricity system through unexpected and unprecedented conditions

We are on-track to achieve our ambition of operating at zero carbon in 2025

We continue to deliver value for money for consumers and we always ensure our activities are cost beneficial

We are leading and innovating to create new solutions which enable a secure, zero carbon electricity system

We are learning and applying those lessons as we transition to become the Future System Operator

Continued to break records with a new zero carbon generation maximum of around

90%

...and a wind generation maximum of over

21GW

Successful execution of 5 Pathfinder procurement exercises which will save consumers more than

£15bn

Delivery of the world's first Holistic Network Design which will connect 23GW of offshore wind, and over a 40-year asset life period (starting in 2030) will save consumers approximately

£5.5bn

\*excludes milestones no longer valid (removed from BP1 delivery schedule as agreed with Ofgem), delayed for reasons outside of ESO's control, and delayed for consumer benefit

# Welcome

## Welcome to our RIIO-2 2021-23 End of Scheme Incentives Report.

**In this report we set out how we've performed against the commitments in our first RIIO-2 Business Plan (BP) and what we've learnt in the process.**

## Foreword

The last two years have been challenging for all, with the Covid-19 pandemic and Russia's illegal invasion of Ukraine causing appalling human devastation and suffering. Consumers have also been under real pressure as a result of escalating energy prices and a cost-of-living crisis.

When we first submitted our ambitious RIIO-2 plan in 2019, we couldn't have predicted the scale of the external challenges we would face in delivering it.

I'm incredibly proud of how our teams have risen to the challenge, responding to the circumstances decisively and keeping the electricity system operating reliably and securely. Our colleagues have also used their skill and expertise to quickly adapt our plans, deliver the majority of our BP1 milestones and go the extra mile by taking on new activity not originally in our plans.

Over the past year, we've been particularly conscious of the rising cost of energy and the impact on consumer bills. Across all of our activities, we've looked for ways to be more efficient and save money for consumers – we've increased the expected benefit to consumers by delivering on our critical RIIO-2 commitments and taking on new activity during BP1.

We remain committed to doing everything we can to manage the costs of operating the system for the benefit of consumers.

What we've delivered in BP1 means we are on track to meet our ambition of operating the electricity system at zero carbon in 2025. We've already seen what is possible, breaking many renewable generation records over the past two years and delivering world-first initiatives. And we are excited by the opportunities to continue learning, innovating and leading net zero solutions as we enter our second RIIO-2 Business Plan (BP2) delivery period and look to transition to the Future System Operator (FSO).

I look forward to continuing to work with our customers and stakeholders, and in the best interests of consumers, as we create the zero carbon electricity system of the future.



**Fintan Slye**  
Director, Electricity System Operator

# BP1 key messages

1

## We have delivered on our critical BP1 commitments and gone above and beyond

At the Electricity System Operator (ESO), and as we transition to become the Future System Operator (FSO), we are proud to be at the heart of Great Britain's energy system. This report outlines how we have delivered on almost all of our BP1 commitments. We have also gone above and beyond and delivered much more by responding to the challenging environment of the last two years to ensure a secure, reliable electricity system. Furthermore, new projects have been taken on where we have seen opportunity to deliver additional benefits to consumers. We provide many examples of activities that are incremental to our BP1 plan throughout this report including the Holistic Network Design and Early Competition.

This outcome demonstrates not only the flexibility and adaptability of the teams involved but also of the regulatory framework.

2

## We have enabled the operation of a secure, reliable electricity system through unexpected and unprecedented conditions

Over the last two years, we have all been impacted by the COVID-19 pandemic, the devastating war in Ukraine and the cost-of-living crisis. Throughout, we have taken action to ensure consumers have access to the electricity needed while maintaining progress to achieve net zero. Our work to prepare for winter 2022/23 helped maintain Britain's energy security in the face of unprecedented challenges. As well as negotiating contracts to extend the life of Britain's remaining coal plants, we created a world-leading Demand Flexibility Service (DFS). This saw more than 1.7million homes and businesses sign-up to take advantage of payments to reduce their usage at times of system need.

3

## We are on track to achieve our ambition of operating at net zero carbon in 2025

Despite the challenges faced, we have continued to plan and execute changes which will help ensure the electricity system is capable of zero carbon operations in 2025. Achieving this goal will keep the UK at the leading-edge of global efforts to decarbonise the world's energy systems. As of January 2023, we operated the electricity system with a maximum of 90% zero carbon sources, aided by record levels of wind generation, at 21.6GW.

There are certainly still challenges to overcome to achieve the 2025 zero carbon ambition, not least in operating the electricity system with ever lower levels of inertia as we retire larger, fossil-fuelled generators. These challenges will therefore be a critical area of focus for our teams as we move into BP2 and we remain confident of hitting our goal.



## BP1 key messages

# 4

**We continue to deliver value for money for consumers and we always ensure our activities are cost beneficial**

Managing the costs of the system has always been a priority for us but this has obviously increased in importance as a result of the cost-of-living crisis. Our own costs make up a very small percentage of total energy system costs. However, we are always focused on the efficiency of our activities and make sure our plans deliver net benefits to consumers. At the same time, we seek to drive down the costs of managing the overall system, whether or not we have direct control over these costs. We have delivered a Constraint Management Intertrip Service (CMIS) which has resulted in £80million of cost savings. In addition, we implemented our Frequency Strategy which includes the first ever Frequency Risk and Control Report (FRCR) as well as other activities – combined savings from this strategy are expected to be approximately £1.8bn in 2023.

# 5

**We are leading and innovating to create new solutions which enable a secure, zero carbon electricity system**

Over the past two years we have witnessed enormous changes to the electricity system; in particular, significant shifts in demand as well as the increased penetration of renewable generation and other new technologies. These changes have given us increased insight into the growing complexity of the system's operation and revealed opportunities presented by new entrants into our markets. We have been able to respond to these challenges, for example through the introduction of a five-point-plan to speed up new connections onto the grid. We have also looked at how to achieve the more challenging targets of full electricity decarbonisation by 2035 and net zero across the whole economy by 2050. For example, our Net Zero Market Reform (NZMR) work was used to stimulate and lead discussions on how markets need to change to help achieve net zero.

# 6

**We are learning and applying those lessons as we transition to become the FSO**

We are continually learning and developing as an organisation to ensure we can build on our successes and be ready to deliver even more as the FSO. This includes evolving our culture and capabilities so we can take a whole-system view across the business. Being viewed as a 'net zero employer of choice' will help us build the future skills we will need and exploring new technologies and ways of working will keep us at the forefront of the energy transition.



# BP1 performance on a page



## Plan delivery

We have completed 432 out of the 540 milestones planned for the two-year period.

Of the 108 milestones which are not complete, 8 are delayed in order to deliver an improved outcome for consumers, 24 are no longer valid, 46 are delayed for reasons outside of ESO control, and 30 are ESO-related delays.

To support our delivery, we have grown or invested in our people and capabilities with 420 external hires, and 467 internal ESO moves since the start of RIIO-2.



## Metric performance

### Over the two-year period:

- 2 metrics meeting expectations
- 3 metrics below expectations



## Stakeholder evidence

### Stakeholder survey (March 2023):

18% exceeding expectations  
59% meeting expectations  
22% below expectations  
(percentages may not add to 100% due to rounding)

### Feedback themes over BP1:

- Communication and engagement
- Coordination with industry partners
- Transparency
- Speed of delivery
- Data and analytics
- Thought leadership
- Balancing decisions
- Innovation and transformation

Please see our evidence chapters for more detail on these themes and how we've addressed them across the roles.



## Demonstration of plan benefits

The activities in our original RIIO-2 Business Plan were forecasted to deliver net present value (NPV) benefits of around £2 billion for consumers over the five-year RIIO-2 period. We now expect these to deliver more as evidenced in the evidence chapters.

We also expect to deliver additional benefits within the five-year period and beyond from activities not included in the original plan including:

- The Holistic Network Design which will deliver overall net consumer savings of approximately £5.5bn. These cost savings are calculated over a 40-year asset life period, starting in 2030.
- The B6 Constraint Management Intertrip Service which will deliver a total estimated benefit of £226-£256m between Apr-22 and Sep-25.
- Implementation of our Frequency Strategy which will drive at least £1.8bn of savings in 2023. This includes some activities within our original business plan.



## Value for money

Our total expenditure across all three roles in BP1 was £490.6m, which was 3.0% lower than the benchmark of £506.0m.

Key drivers of the deviation are lower spend in BP1 investments relating to National Grid shared IT projects, property and cyber as well as lower IT support costs. Drivers of reduced investment costs across the roles include Enhanced Frequency Control, NOA enhancements, and EU and GB regulatory changes.

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

# Role 1: Control centre operations

In Role 1 we play a vital role every second of every day, ensuring we operate a safe and reliable supply of electricity to Great Britain. The unprecedented Global conditions mean this role has been more challenging than it has ever been. We have successfully operated a secure, reliable electricity system while continuously breaking zero carbon generation records. This gives us confidence that we are on track to achieve our ambition of zero carbon operation in 2025.

In Role 1, we are on track for zero carbon system operation for a few hours in 2025; and in 2035 we will run the system, all of the time, with 100% clean, green energy. We are continuing to lead the development of new control centre and network control capabilities. We are also enablers of many of the activities and strategic thinking across the other roles.

We have achieved a milestone completion rate in excess of 95%\* over the course of BP1. We have also delivered above and beyond our duties in key areas. We have led industry, government and European counterparts in our response to COVID-19 and managing the winter 2022/2023 to ensure the best outcome for consumers. This winter saw us support our Role 2 colleagues in implementing our world-leading innovative Demand Flexibility Service and delivering Winter Contingency Contracts.

The cost of operating the electricity system has increased, driven in particular by increases in wholesale prices of electricity and

gas as a result of the illegal Ukraine conflict. One of our aims is to deliver value for money for our consumers so we are always looking at ways to mitigate these price rises and to minimise our costs. In BP1, we have taken measures to reduce the volume of actions we take by a third; the actions from our balancing cost strategy across all three roles have delivered balancing costs benefits of £5.6bn.

We continue to develop our thinking and approach. For example, in our Balancing Programme to transform the balancing capabilities of our control centre, we have seen costs higher than we forecasted in BP1 due to increased scale and complexity. We strategically reviewed the programme in early 2022 to establish our priorities, engaging with industry stakeholders to ensure we deliver the required capabilities, adaptability and flexibility while managing our costs effectively. We now have full confidence in our costs and delivery timeline and have full industry support of the process.



**Craig Dyke**  
Head of National Control

## Where are we now and what's been delivered?

We are two years into our five-year plan and while our spend is higher than expected, the benefits of our activities have grown significantly. We have achieved a milestone completion rate in excess of 95%\* over the course of BP1 including:

- Successful implementation of changes to the Balancing Mechanism, the primary tool to balance supply and demand under Release R0 (renewables obligation). This is fundamentally important for maintaining safe, secure and economic system operation while we develop and transition to new tools.
- Delivery of energy forecasting improvements with an estimated overall year-on-year benefit in balancing and reserve costs savings of ~£192m (National Demand and GSP forecasting products).
- Delivery of the first successful Distributed ReStart project in Galloway, south-west Scotland. This world first trial brought renewables one step closer to restarting GB's electricity grid. During the trial a hydro generator connected to the distribution network was able to self-start, energising the local transmission and distribution network, and powering up wind turbines on two wind farms within an isolated test network.
- Leading the solution to a Global engineering challenge by developing world first 'green inertia' tools which mimic the effect of a power station but without using fossil fuels. These tools deliver consumer value and enable our net zero ambition.

\* excludes milestones no longer valid (removed from BP1 delivery schedule as agreed with Ofgem), delayed for reasons outside of ESO's control, and delayed for consumer benefit

# Control centre operations

## What have we delivered over and above in BP1?

**Winter 22/23** - Across ESO we developed a suite of preparedness activities and actions to help mitigate these impacts including delivery of winter contingency contracts.

Our world-leading innovative Demand Flexibility Service was launched through the Role 2 winter programme. The launch followed only five months after the end of our pioneering domestic demand flexibility trials, which also included successfully testing the viability of Vehicle to Grid (V2G).

**Managing inertia** – As the UK moves to net zero, we need to plan and operate the system with lower levels of inertia. Through BP1 we have delivered projects which have shifted how we manage frequency. This has been achieved through a clear, long running strategy, comprising of the first ever Frequency Risk and Control Report (FRCR), continuation of our Accelerated Loss of Mains Change Programme (ALoMCP), our stability pathfinder project, and growth of Dynamic Containment. Combined savings from these are expected to be approximately £1.8bn in 2023. This year we are also recommending we reduce our minimum inertia requirements from 140 GVAs to 120 GVAs, which will save £65m of balancing costs per annum. To operate a zero carbon system by 2025, minimum system inertia could be as low as 96 GVAs, so we are successfully on this journey.

**Monitoring market data** - Ensuring fair and effective functioning of Balancing Markets continues to be vital as household budgets are under strain and the cost of energy continues to increase. Since July 2021, the Market Monitoring function has developed automated processes to monitor and analyse a vast spectrum of market data. The team's surveillance work covers all services we procure and we continue to report potential suspicious market abuse activity to Ofgem for further investigation.

**Improving transparency of decision making** - The Operational Transparency Forum (OTF) has been consistently successful in BP1, with weekly attendance numbers in the hundreds. The OTF provides an opportunity for the wider market to understand and challenge the actions we take and for us to seek feedback from stakeholders and customers.

## Challenges including where we have not delivered what we expected and why?

The cost of operating the electricity system during BP1 has been more than we forecasted. This was a result of the unprecedented increases in wholesale prices of electricity, coupled with extreme peaks in prices submitted in the Balancing Mechanism during periods of tight system margins, particularly over the two winter periods.

We continually take action to reduce balancing costs and have reduced the volume of actions taken to balance the system by a third through long-term initiatives to improve our system operation. The actions from our balancing cost strategy across all three roles have delivered balancing costs benefits of £5.6bn.

Our forecast total expenditure for Role 1 in BP1 is £226m, which is 8.6% higher than the BP1 forecasted cost benchmark of £208m. The main driver of this difference is a £33m increase in expenditure on the Balancing Programme.

Since the original plan was completed in 2019, we have seen the requirements of our stakeholders evolve substantially for the Balancing Programme. The increased scale and complexity of change required has resulted in a significant increase in the efforts and costs required to deliver our plans. As a result of these increased costs, we carried out a strategic review which has been well supported by industry with lots of positive feedback on our approach. We will continue to build on the fantastic engagement in a transparent and clear way with plenty

of opportunity for our stakeholders to have visibility of what and how we are delivering.

We now have full confidence in delivery to cost and timeline, with industry fully supportive of the process. This has been validated with a number of third party assurance and audits to ensure that we gain rounded feedback and confidence in plans, scope, technology and benefits.

## Looking forward into BP2

Our RIIO-2 strategy for Role 1 remains focused on the safe, reliable and economic operation of today's electricity system. We've evolved our RIIO-2 plans to respond to the changes taking place in our industry. Examples of our BP2 activity include:

- Developing a range of competitive market services to meet the accelerated drive to zero carbon operation.
- A new suite of systems and tools to equip the Control Centre of the future, including the Open Balancing Platform.
- Throughout our BP2 activities we will keep a focus on the efficiency of our activities and plan to deliver balancing cost savings of around £12bn through our activities.

We look forward to continuing our journey with industry and our stakeholders in leading the development of new control centre and network control capabilities to operate a carbon free system whilst ensuring a safe and reliable supply of electricity to Great Britain.

# Role 1 performance on a page



## Plan delivery

We have completed 178 out of the 198 milestones planned for the two-year period. Of the 20 milestones which are not complete, 1 is delayed in order to deliver an improved outcome for consumers, 10 are delayed for reasons outside of ESO control, and 9 are ESO-related delays.

We have:

- Successfully operated a secure reliable electricity system through unprecedented conditions.
- Developed a suite of preparedness activities for winter 22/23.
- Improved transparency of decision making through our Operational Transparency Forum (OTF).
- Driven consumer benefit through our market monitoring function.
- Delivered the first successful Distributed ReStart project.
- Delivered energy forecasting improvements.



## Metric performance

**Over the 2-year period:**

- *1A Balancing costs:* £6,967m vs benchmark of £3,020m (below expectations)
- *1B Demand forecasting:* 2.3% vs benchmark of 2.1% (below expectations)
- *1C Wind generation forecasting:* 4.66% vs benchmark of 4.75% (meeting expectations)
- *1D Short notice changes to planned outages:* 1.8 per 1000 outages vs benchmark of 1 to 2.5 per 1000 (meeting expectations)



## Stakeholder evidence

**Role 1 survey (March 2023):**

31% exceeding expectations  
62% meeting expectations  
8% below expectations

**Highlights:**

- Strong skew towards 'exceeding expectations' in our March 2023 survey.
- Positive feedback regarding the OTF which has become a valuable information source for our stakeholders.
- Engagement from our colleagues is seen as very good with very clear processes.
- Open, transparent and good quality information was noted by some stakeholders.



## Demonstration of plan benefits

- Control centre architecture and systems (A1) to deliver £1.5bn consumer benefit over RIIO-2 with £417m already delivered in BP1.
- Control centre training and simulation (A2) to deliver £25m consumer benefit over RIIO-2 with most of the benefit to be delivered from BP2.
- Restoration (A3) to deliver £115m of net benefit from 2025 to 2050.
- Implementation of our Frequency Strategy will drive at least £1.8bn of savings in 2023.

**RREs (2-year view):**

- *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 90% zero carbon generation
- *1G Carbon intensity of ESO actions:* Monthly average of 4.7gCO<sub>2</sub>/kWh of actions taken by the ESO
- *1H Constraints cost savings from collaboration with TOs:* £4,182m
- *1I Security of Supply reporting:* 0 frequency excursions and 4 incidents where frequency was 0.3 – 0.5 Hz away from 50Hz for more than 60 seconds
- *1J CNI outages:* 6 planned and 0 unplanned BM outages



## Value for money

Our total expenditure for role 1 in BP1 was £226.0m, which was 8.6% higher than the benchmark of £208.0m.

The main driver of the overall increase in investment costs for BP1 is the Balancing Programme, where we have spent £33.0m more than our BP1 benchmark.

The cost included in our RIIO-2 business plan which was developed in 2019, was a high-level estimation underpinned by key market, operational and technology assumptions, some of which did not materialise.

During BP1, through engagement with and support from industry, we have developed a Roadmap to deliver a new Open balancing Platform (OBP) which deliver our operational capability to support our zero carbon operability requirements.

## Role 2: Market development and transactions

In Role 2 we design, deliver and operate electricity markets to ensure that we can operate an efficient zero carbon energy system. We have a comprehensive programme underway to transform markets, reform our charging frameworks and digitise the industry codes so they are fit for the future, removing barriers to entry and driving efficiencies. We also administer charging arrangements on behalf of the energy system, handling £8-9bn of revenue per year and we are the Electricity Market Reform (EMR) delivery body.

We have achieved a milestone completion rate in excess of 83%\* over the course of BP1. We've also completed additional activity providing wider benefits, such as ensuring security of supply over a challenging winter.

We are creating innovative solutions to reform our balancing services procurement, reducing and removing barriers to entry and ensuring our markets are adaptable and flexible. In BP1, we developed and delivered a suite of new frequency response products to manage increased frequency deviations as more variable renewables come online. We stimulated competitive procurement in new areas, such as a Constraint Management Intertrip Service (CMIS) which has delivered £80m of consumer savings by reducing constraint costs on the Scotland/ England border.

We have played a crucial role in securing green energy through the successful delivery of the record-breaking Contracts for Difference Round 4, contracting 11GW of new renewable capacity for the UK. We have also run four Capacity Market Auctions over the BP1 period, ensuring medium term security of supply.

We have made sure we can operate a secure and reliable electricity system. We re-prioritised our activities and worked at pace to deliver a comprehensive programme of solutions

to tackle the challenges caused by the illegal Russian invasion of Ukraine. This included our Early View Winter Outlook that provided information to stimulate a market response, facilitating the delivery of £250 million of financial relief for Generators and Suppliers and developing and communicating comprehensive operating protocols and procedures for market participants.

We also delivered the innovative and world leading Demand Flexibility Service (DFS). This has been an enormous success, with more than 1.7 million households and businesses signing up. This was an important tool to ensure security of supply but also signals the value of flexibility – a critical factor in operating at zero carbon in 2025.

We launched our Net Zero Market Reform programme in early 2021 to holistically examine the changes needed to GB electricity market design to achieve net zero. This has shaped debate across the industry and we will continue to work on this with input from our Market Advisory Council and other stakeholders.

As we go into BP2 it is important to highlight we are sharing best practice with many of our European counterparts to ensure consistency of the power network across the continent.



**Claire Dykta**  
Head of Markets

### Where are we now and what's been delivered?

We are now two years into our five-year plan. We have delayed or deferred some of our original commitments to deliver other higher priority areas for consumers but have achieved a milestone completion rate in excess of 83%\*, and includes:

- Development and delivery of a new suite of response products, procured day-ahead on a pay-as-clear auction platform. This allows us to manage increasing frequency deviations associated with the rise of renewable generation output.
- Increased participation in market auctions through our new Single Markets Platform (SMP) interface.
- Progressing roll-out of a Local Constraints Market (LCM), specifically targeted at reducing constraint costs on the B6 transmission boundary between Scotland and England.
- Facilitation of the record-breaking Contracts for Difference round, procuring 11GW green capacity that promotes low carbon generation to meet Government targets.
- Delivery of recommendations from the BSUoS Task Force to reduce BSUoS forecasting volatility and reduce costs through a fixed BSUoS charge.

\* excludes milestones no longer valid (removed from BP1 delivery schedule as agreed with Ofgem), delayed for reasons outside of ESO's control, and delayed for consumer benefit

## Market development and transactions

### What have we delivered over and above in BP1?

**Leading the discussion on market reform** - Through our Net Zero Market Reform (NZMR) work we have taken a leadership role and used our expertise and insight to explore issues, promote debate and provide insight and recommendations. These are activities that go beyond our traditional remit.

**Providing insights for effective markets** - In preparation for winter 2022/23 we focused on providing information and mechanisms so that the market would be able to function effectively. This included the modelling of our Early View of Winter Outlook to stimulate a market response and responding to the cost of living crisis by delivering £250m worth of financial relief for Generators and Suppliers. We also developed and communicated comprehensive operating protocols and procedures to provide clarity and certainty to market participants of the market mechanisms and their parameters in use for the winter.

**Delivery of the innovative Demand Flexibility Service** - As well as businesses engaging with demand flexibility events, we have also seen households benefit from taking part. Our innovative DFS has been a great success for participants, with the volume of signups showing there are over 1.7 million households and businesses that want to become more efficient – a critical factor in achieving net zero.

**Supporting resilience and security of supply** - At the request of the Secretary of State, we undertook the challenging task of negotiating with three separate organisations to extend the life of near to closure coal fired power plants. Multiple factors had to be overcome in these complex negotiations to deliver the critical contracts that supported resilience and security of supply, promoted the integrity of existing power markets and delivered consumer value.

Our capacity adequacy study, published in December 2022, shared our views on the likely future resilience of the power system (between 2025 and 2040), how the current Reliability Standard may need to evolve and what may be required in terms of an 'optimal' capacity mix.

Finally, we developed a new product, Balancing Reserve. This will allow us to secure our reserve requirements day ahead, reduce exposure to within day volatility and reduce costs for consumers at an expected level of £300m per year. We are working with Ofgem and stakeholders to introduce this in the BP2 period.

### Challenges including where haven't we delivered what we expected and why.

To deliver our critical activities for winter 2022/23, we decided how to focus our efforts based on benefits, external/internal dependencies, and availability of capability/resources.

This meant we decided to delay some of our committed deliverables including the phasing out of Firm Frequency Response and delivery of our enduring plan for procuring reactive power. These deliverables remain an important part of our reform programme and will be delivered in BP2.

In our Electricity Market Reform (EMR) activities, our planned delivery of a new IT portal within the BP1 period has been partially delayed into BP2 so that the deployment and cutover of the new system does not detrimentally impact customers. We are developing the new system in conjunction with our user group. This system will address customer pain points, improve the experience for users, reduce future costs and ensure the EMR delivery body obligations can be delivered.

### Looking forward into BP2

Looking forward into BP2, we will be focusing on:

- Continuing to break down barriers to access and developing our balancing services to ensure liquid markets that are easy to participate in. This will deliver value for consumers through lower costs and greener power.
- Building on the success of the DFS by working across the industry to ensure the rapid development of a flexibility market.
- Shaping our post-Brexit relationship with Europe.
- Continuing our NZMR programme to shape and focus the debate about the market mechanisms for the future. We will identify and drive forward quick wins that will deliver net zero at an efficient cost to consumers.
- Using our Balancing Market reform workshops, Market Forum, Power Responsive and Market Advisory Council to shape debate and deliver the transformation needed in our electricity markets to set us on the trajectory for full decarbonisation by 2035.

And finally, as we transition to the FSO we will be building our skills and capability so that we can shape the debate and identify and deliver change across the whole energy system required to achieve net zero.

# Role 2 performance on a page



## Plan delivery

We have completed 69 out of the 108 milestones planned for the two-year period. Of the 39 milestones which are not complete, 3 are delayed in order to deliver an improved outcome for consumers, 5 are no longer valid, 17 are delayed for reasons outside of our control, and 14 are ESO-related delays. We have:

- Developed and delivered a new suite of response products.
- Successfully delivered the record-breaking Contracts for Difference Round 4.
- Delivered the innovative and world leading DFS.
- Launched our NZMR programme.
- Facilitated the delivery of £250 million of financial relief for Generators and Suppliers.
- Published our Early View Winter Outlook.



## Metric performance

### Over the two-year period:

- *2A Competitive Procurement*: 48% of all services procured through competitive means (below expectations)



## Stakeholder evidence

### Role 2 survey (March 2023):

16% exceeding expectations  
65% meeting expectations  
19% below expectations

### Highlights:

- Stakeholders commented that the DFS was a great introduction and were impressed with its design and the pace of implementation.
- A number of stakeholders commented on our great communication, engagement and feedback on product development.



## Demonstration of plan benefits

- Build the future balancing service and wholesale markets (A4) to deliver £81m consumer benefit over RIIO-2 with benefits being delivered from BP2.
- Transform access to the Capacity Market (A5) to deliver £132m consumer benefit over RIIO-2 with £60m already delivered in BP1.
- Work with all stakeholders to create a fully digitalised, whole system Grid Code by 2025 (A6.5) to deliver £10m consumer benefit over RIIO-2 with benefits being delivered from BP2.
- Reforming Balancing Services Use of System (BSUoS) charges (A6.6) to deliver net present value benefits of £68m over RIIO-2 with benefits being delivered from BP2.
- The B6 Constraint Management Intertrip Service will deliver a total estimated benefit of £226-£256m between Apr-22 and Sep-25.

### RREs (2-year view):

- *2B Diversity of service providers*: Varying diversity across the different markets
- *2C EMR decision quality*: 0.8 overturned themes per 1,000 Capacity Market applications (exceeding expectations)
- *2D EMR demand forecasting accuracy*: peak demand accuracy 3.5% for T-1 (below expectations), 3.0% for T-4 (exceeding expectations)
- *2E Accuracy of forecasts for charge setting*: Absolute Percentage Error of 27% (BSUoS) and of -4% (TNUoS)



## Value for money

Our total expenditure for role 2 in BP1 was £143.5m, which was 9.5% lower than the benchmark of £158.6m.

The main variances are decreases in both EU and GB regulatory changes. EU changes underspend is driven by a change in relationship with our European counterparts due to Brexit. GB changes underspend has been largely due to the fluid nature of regulatory change with some of the original changes included in the benchmark number being withdrawn.

These decreases are offset by increases with major IT programmes (Settlements, Charging and Billing and EMR). These are driven by a range of factors including re-scoping, improved understanding of complexity driven by greater regulatory change, and delays to delivery.

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

We are leading the world in our thinking across our Role 3 activities. Our aim is to deliver a long-term strategic view of electricity network development to support the decarbonisation of generation and demand. As the electricity system decarbonises, we are solving many technical challenges that need to be overcome and creating a blueprint for other system operators to follow.

During BP1, our Role 3 work has allowed several GB records to be broken. We've seen a peak of over 21GW of wind generation and a period with ~90% zero carbon electricity generation.

We have been flexible and adapted to achieve a milestone completion rate in excess of 96%\* over the course of BP1. We have also taken on new projects, such as the Holistic Network Design and Early Competition. Through BP1, we've run five Pathfinder projects, opening up new ways for the industry to help us meet system needs. This work will deliver savings over £15bn from 2025 to 2035.

We are leading the way and innovating to create new solutions to enable a secure, zero carbon electricity system. In June 2022 we published the world's first Holistic Network Design (HND) connecting 23GW of electricity generated from offshore wind. This will save 2million tonnes of CO2 between 2030 and 2032 and will save consumers £5.5 billion over a 40-year asset life period (starting in 2030).

We are applying our knowledge and lessons learnt as we transition to the FSO. Our Electricity Ten Year Statement continues to inform industry thinking about electricity power transfer and system requirements. Through the Network Options

Assessment (NOA) we then recommend which options for reinforcing the network, identified by TOs, should receive investment. Over BP1 we've been evolving NOA workstreams into a single Centralised Strategic Network Plan for the onshore and offshore electricity transmission network. This will take effect during BP2.

We have accelerated our connections reform work to manage the unprecedented levels of connection applications driven by decarbonisation targets. As part of this reform work we have launched a five point connections plan to resolve some of the shorter term issues, ahead of a full industry connections reform. For example, the 5 Point Plan for connections will result in earlier connection dates for many projects through changing our planning assumptions and different contracting strategies. We have also delivered on a new customer engagement strategy and a new customer portal that brings the team closer to customers and stakeholders and enables more information to be shared more easily. This will ensure we continue to deliver value for money for our customers and for consumers.



**Julian Leslie**  
Head of Networks

### Where are we now and what's been delivered?

We are now two years into our five-year plan and are on track with our spend and plan benefits. We have achieved a milestone completion rate in excess of 96%\* over the course of BP1 including:

- Delivery of lower cost, innovative solutions to solve voltage and stability issues on the transmission system caused by an increase in renewable generation. Through BP1, we've run five Pathfinder projects, opening up new ways for the industry to help us meet system needs. This work will deliver savings over £15bn from 2025 to 2035.
- A further >£300m saving over a two-year period via the SO:TO Optimisation Incentive Scheme. Key initiatives include: enhanced circuit ratings in the Southeast by increased line clearances to street lighting (£100m saving), enhanced post fault switching actions agreed with a TO (£40m saving), a Run Back scheme implemented on the Western High Voltage Direct Current (HVDC) interconnector (£200m per year saving expected from January 2023).
- Collaboration with TOs to plan system access which has released over 46,000GWh of generation capacity (mainly renewable generation) on to the network. We estimate this has avoided constraint costs of over £3.9 billion over the two year period.

\* excludes milestones no longer valid (removed from BP1 delivery schedule as agreed with Ofgem), delayed for reasons outside of ESO's control, and delayed for consumer benefit

## System insight, planning and network development

### What have we delivered over and above in BP1?

**Connections reform** - To respond to the unprecedented increase in licenced connection applications (an average increase of 72% per year over BP2 versus a forecast of 8% per year) we have accelerated our connections reform work.

We have also grown and restructured our teams, introduced several connections process improvements through the Connections Five Point Plan including Transmission Entry Capacity (TEC) amnesty, two-step offer process, non-firm offers, treatment of storage, and compliance process improvements. We began initiating this plan from 1 March 2023. For applications received in England and Wales we have implemented a new two-step process - this will reduce uncertainty for developers in the longer term as we apply our new modelling and storage assumptions. In Scotland, these changes will be applied without the need to implement a new two-step process.

**Network planning** - We have delivered the world's first HND to connect 23 GW of offshore wind. This will save 2 million tonnes of CO2 between 2030 and 2032 (equivalent to grounding every UK domestic flight for a year) and will save consumers £5.5 billion over a 40-year asset life period (starting in 2030). A second HND exercise then provided connection solutions for at least a further 20GW of offshore wind projects. The implementation of the FSO will facilitate a more strategic network planning approach, building on the HND and updated NOA. These initiatives will merge into a single Centralised Strategic Network Plan (CSNP) for both the onshore and offshore electricity transmission network, with the FSO taking on the central strategic network planner role. This will take effect during the BP2 period.

**Evolving GB Grid Code** - In January 2022, we included a Grid Forming capability specification in the GB Grid Code. This is the first Grid Code in the world to include such a specification and helps manage the complex power system electronics that need to be installed for renewable and battery storage connections. We've also set up a GB Grid Forming best practice group to help us continue to evolve Grid Code. The Grid Code will facilitate market arrangements for a wider short term stability market and will run alongside our Stability Pathfinder, Dynamic Containment and other Balancing Services.

**Introducing competition to onshore electricity networks** - Our Early Competition work plays a key role in improving efficiency in network investment and driving innovative solutions to network needs. We are continuing to work closely with Ofgem on implementation.

### Challenges including where haven't we delivered what we expected and why.

In connections, the growth in application volumes and therefore connection offers created challenges with the connections process. As already mentioned above we have responded with whole host of actions to resolve within the current framework and we have brought forward the reform work from BP2.

One of our five-year strategy commitments was to roll out the Enhanced Frequency Control (EFC) service in our National Control Centre. Following an internal study, we identified that our Dynamic Containment product already provides the EFC frequency response requirements. We made the decision to stop the project after the initial phases and avoided costs of £21m.

We have delayed some of our Regional Development Programmes from their original delivery date to ensure they are better aligned with other programmes and connections initiatives.

### Looking forward into BP2

The scope and scale of activities related to system planning and coordination have grown significantly. Our planned activities for BP2 in Role 3 mean we are well placed to deliver on our zero carbon goals. This activity includes:

- Continuing our connections reform work.
- Increasing coordination with Distribution Network Operator (DNO) markets and enabling the removal of blockers to allow increasing volumes of distributed energy resources (DER) to participate in markets.
- Targeted reduction of constraint costs in the short- to medium-term through the continuation of our 'Constraints five-point plan'.
- Facilitating more system access to allow unprecedented levels of system growth.
- Continuing to evolve our strategic approach to network planning.

We look forward to continuing our journey with industry and our stakeholders in leading the transformational changes needed to ensure the network is an enabler for the net zero transition.

# Role 3 performance on a page



## Plan delivery

We have completed 185 out of the 234 milestones planned for the two-year period. Of the 49 milestones which are not complete, 4 are delayed in order to deliver an improved outcome for consumers, 19 are no longer valid, 19 are delayed for reasons outside of ESO control, and 7 are ESO-related delays. We have:

- Taken on new projects, such as the Holistic Network Design and Early Competition.
- Delivered >£300m of savings via the SO:TO Optimisation Incentive Scheme.
- Run five Pathfinder projects, opening up new ways for the industry to help us meet system needs.
- Accelerated our connections reform work.
- Included a Grid Forming capability specification in the GB Grid Code.
- Collaborated with TOs to plan system access which has released over 33,000GWh of generation capacity on to the network.



## Stakeholder evidence

### Role 3 survey:

17% exceeding expectations  
54% meeting expectations  
29% below expectations

### Highlights:

- Positive comments around our work in Connections namely our approach to the two-step offer process.
- Feedback on how well we effectively collaborate, share information and have open dialogue with our stakeholders.
- Positive comments related to our work on innovation with the support provided by innovation team, planning around the Virtual Energy System and our general openness to innovation all being singled out.
- Positive feedback on our extensive engagement regarding the Future Energy Scenarios.



## Demonstration of plan benefits

- Network Options Assessment (NOA) enhancements (A8-A11) to deliver net present value benefits of £728m over RIIO-2 with £80m already delivered in BP1.
- Taking a whole electricity system approach to connections (A14) to deliver £18m consumer benefit over RIIO-2 with £3.7m already delivered in BP1.
- Taking a whole energy system approach to promote zero carbon operability (A15) to deliver £1bn consumer benefit over RIIO-2 with £759m already delivered in BP1.
- Delivering consumer benefits from improved network access planning (A16) to deliver £368m consumer benefit over RIIO-2 with £219m already delivered in BP1.
- The Holistic Network Design will deliver overall net consumer savings of approximately £5.5bn. These cost savings are calculated over a 40-year asset life period, starting in 2030.

### RREs (2-year view):

- *3A Future savings from operability solutions:* i) Saved balancing costs: £726m in the period 2021-26 from new operability measures. ii) Saved infrastructure costs: RDP avoided asset build estimated at £12.9m as per RIIO2 Business Plan. iii) Monetised carbon reductions: Pathfinders: Estimated £5.2bn (2021-22 to 2025-26). RDPs: Estimated £260m (2023-24 to 2025-26).
- *3B Consumer value from the Network Options Assessment (NOA):* £1.6bn from ad-hoc CBAs (2021-22 to 2022-23), £1.7bn from LOTI CBAs (2021-22 to 2022-23), NOA consumer benefit £212m (over RIIO-2 period).
- *3C Diversity of technologies considered in NOA processes:* 29 asset-based solutions (including 21 new options) and 8 commercial solutions submitted to NOA 2021/22. A wide range of solutions were considered in NOA pathfinder.



## Value for money

Our total expenditure for role 3 in BP1 was £121.2m, which was 13.1% lower than the benchmark of £139.4m.

The main variance is a decrease in spend for Enhanced Frequency Control where we identified that our Dynamic Containment product already provided the necessary requirements. Our NOA enhancements project also saw a decrease in spend due to efficiencies in our modelling.

These decreases were offset by increases associated with delivering new activities that were not included in our BP1 such as Offshore Coordination, Early Competition and Centralised Strategic Network Plan.

# Digital, Data and Technology



**Shubhi Rajnish**  
Chief Information Officer

Digital, Data and Technology is central to driving our mission and underpins all our core activities and services. In the RIIO-2 period, we have shared an ambitious digital, data and technology plan focused on driving consumer value, meeting net zero expectations, building towards the Future System Operator and stronger engagement with our customers.

During BP1, the focus has been on strong design of our digital products, delivering foundational platforms, building the right skills and people capability, shifting our ways of working and establishing frameworks to drive effectiveness.

We have delivered new platforms that focus on creating customer engagement and increase the ease of working with us. Examples include the Single Market Platform (Role 2) which creates a single place for customers to interact with us, and the Connections Portal (Role 3) which makes the connections process more visible to our customers. We have also created robust designs for our major functional platforms such as the Open Balancing Platform (Role 1) through regular industry engagement.

Our ability to share data openly with industry participants is critical for us and we have successfully built the Data Analytics Platform. This is a foundational data platform which will eventually replace our current open data platform and accelerate our ambition to create strong collaboration and sharing of data across the industry to benefit all. Finally, we have shifted towards improving consumer experience with the launch of the new digital engagement platform. During BP2 we will use this as a single place for accessing our services and information, including data.

We have built a strong DD&T team by appointing individuals with cross-industry experience in roles such as CIO, CISO, Head of Data, Head of Ways of working, bringing expertise from inside and outside of the Utilities industry.

We run a successful Technology Advisory Committee composed of industry and technology experts. This committee has been instrumental in providing us with feedback, and advice in achieving our BP1 commitments and we will continue to engage with them as we deliver our BP2 commitments.

We have focused on implementing Technology Business Management (TBM) across all the investments and will be fully embedding it through the BP2 period to allow a holistic granular view of all the investments.

As we progress towards BP2, we have reviewed lessons learned during the BP1 period. Along with making significant improvements to ways of working we want to drive focus in four other areas: our flexibility to incorporate growing customer expectations into our products, developing a deeper understanding of the interdependency between our investments, strengthening cyber security architecture to ensure secure, reliable systems by focusing on secure by design and enhancing capability in modern software engineering practices.

In summary, during the BP1 period, we delivered multiple platforms, set out the detailed scope and design for BP2, and created enduring frameworks and capabilities to unlock value at pace. In BP2, we will continue to accelerate our pace and quality of delivery, focus on the delivery of our core platforms and products and ensure we maintain value for money through regular cost-monitoring interactions with Ofgem. We are confident that we have embedded lessons from our BP1 journey into our BP2 plans and will continue to proactively seek feedback from our stakeholders and customers to meet our mission and ambitions as we transition to the FSO.

# 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 twelve months.

ESO ambition for 2025	Progress towards this ambition (April 2022 - March 2023)
 <p><b>An electricity system that can operate carbon free</b></p>	<p><b>Zero carbon operability indicator:</b> The maximum ZCO figure that the system can accommodate has been rising steadily and new records have been set every year. Our new highest figure is now ~90%. This was achieved on 26 December 2022 Settlement Period (SP) 34 and beaten marginally on 7 January 2023, SP40. We expect this to continue increasing and we are on course for carbon free operation in 2025.</p> <p><b>Deliverables:</b> There are 80 milestones that are critical to our zero-carbon ambition. 68 have been completed within the BP1 period and the remaining will be completed within the BP2 period. Of the 12 that are delayed, 8 of these relate to the inertia monitoring deliverable.</p> <p>Our progress is shown by our Zero Carbon Dashboard (see page 20).</p>
 <p><b>A whole system strategy that supports net zero by 2050</b></p>	<p><b>Distribution System Operation (DSO) co-ordination:</b> Our work through the ENA Open Networks project continues to facilitate DSO policies and procedures such as primacy rules. In addition, through our whole electricity system joint forum, we have discussed a wide range of initiatives from connections reform through to virtual energy system to ensure they are developed in a whole system manner.</p> <p><b>Regional Development Programmes:</b> We continue to work with DNOs to develop new ways to connect DER to the system. This includes through the ENA's Strategic Connections Group, which we now chair.</p> <p><b>Leading the debate:</b> The publication of FES 2022 included key messages and recommendations around whole system thinking. Further, through our Bridging the Gap work and key messages, we 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 lead the debate by taking a whole system view within our FES analysis for 2023 and lead the FES Network Forum with brings together both gas and electricity distribution network operators .</p> <p><b>Co-ordinated market development:</b> Our NZMR programme is supporting the Department for Energy Security and Net Zero's (DESNZ) Review of Electricity Market Arrangements (REMA) to understand how to design markets and policies that deliver the most efficient electricity markets across the whole GB system.</p> <p><b>Network Design:</b> We have been a key contributor to DESNZ's Offshore Transmission Network Review and as part of that have delivered the first HND, which was additional activity to our BP1 milestones. We are now developing the second HND to recommend network for a further 20GW of offshore wind. Through this work we are leading the development of an enduring, centralised approach to centralised strategic network planning as part of Ofgem's Electricity Transmission Network Planning Review.</p>

# Progress towards our ESO mission

ESO ambition for 2025	Progress towards this ambition (April 2022 - March 2023)
 <p><b>Competition Everywhere</b></p>	<p><b>Market reforms:</b> Following the successful delivery of the three new frequency response services, Dynamic Containment (DC), Dynamic Regulation (DR) and Dynamic Moderation (DM), our focus moved to further developing these services; upgrading the supporting IT infrastructure, increasing participation by removing barriers to entry and improving the user experience across the end-to-end process.</p> <p><b>Net Zero Market Reform work:</b> Since June 2022 we've been in phase 4 of the NZMR programme. We are currently assessing how investment policies could evolve to better complement a stronger role for the wholesale market, as recommended in our Phase 3 report. Throughout this process we have conducted various stakeholder engagement activities to ensure our approach, assessment and findings are sound, well-evidenced and coherent.</p> <p><b>Competition in networks:</b> The Stability Pathfinder Phase 2 tender completed in May 2022. Phase 2 sought to procure additional volumes of inertia, short circuit level and fast acting dynamic voltage support across Scotland between 2024 and 2034. In November 2022, we concluded the tender for the Stability 3 Pathfinder. In June 2022, we published an addition NOA Refresh, as part of the suite to documents which for the first time produced a HND for connecting 50GW of offshore wind by 2030, in line with the government ambition.</p> <p><b>Industry governance:</b> We have achieved a world-first in successfully procuring long term service contracts with Grid Forming converter technologies in our Stability Pathfinder in Scotland. In April 2022, at the end of a competitive tender process we signed contracts with five Grid Forming solutions (around £60m investment in total over 10 years) across multiple locations in Scotland to boost our stability needs with delivery from 2024.</p>
 <p><b>The Electricity System Operator (ESO) is a trusted partner</b></p>	<p><b>Operational Transparency Forum (OTF):</b> The OTF continues to give customers an opportunity to engage with us on our control room activities and our decision-making process. Customers provide improvement feedback and benefit from getting questions answered in real time.</p> <p><b>Stakeholder engagement:</b> Our stakeholder engagement activities support all our key deliverables and we have engaged widely through webinars and workshops on strategic programmes such as DEP, SMP, Connections Reform, Balancing Programme and the new first of its kind DFS. These programmes have felt truly collaborative and are enabling us to build towards our net zero ambition with our customers on board.</p> <p><b>Key stakeholder events:</b> Key events throughout the year also help to bring our existing and new customers together and are an important opportunity for us to give regular updates and get feedback on how we are delivering. Some examples of providing regular updates this year are at Markets Forums, FES and Bridging the Gap (BtG) programmes, Connections forums and Operating Code 2 (OC2) for outage planning</p> <p><b>Stakeholder groups:</b> The use of groups such as the ESO RIIO-2 Stakeholder Group, Markets Advisory Council and Technical Advisory Council, continue to be a great way for us to test our plans and get constructive challenge on how well we are performing against our business plans throughout the year.</p> <p>All these forums have given us a great opportunity to increase our transparency, levels of collaboration and get regular feedback to analyse and act on for our customers so we can truly be a Trusted Partner to them.</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 we 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. 85% of the milestones are now complete with delayed items to be delivered within the BP2 period.

Role	Deliverable reference	Deliverable name	Milestones in BP1	Milestones completed
1	D1.2.2	Inertia Monitoring	22	14
	D1.3.1	Improve situational awareness	25	24
	D1.3.4	Increased operational liaison with DNOs	3	3
2	D4.6.1	Competitive procurement of stability	9	7
	D4.6.2	Competitive procurement of reactive power	7	6
3	D8.1	New areas of need identified, and 3-6 tenders run	10	10
	D8.2	Improved tender approaches	2	2
	D15.1.1	System Operability Framework (SOF)	1	1
	D15.1.2	Innovation projects for new operability solutions	1	1

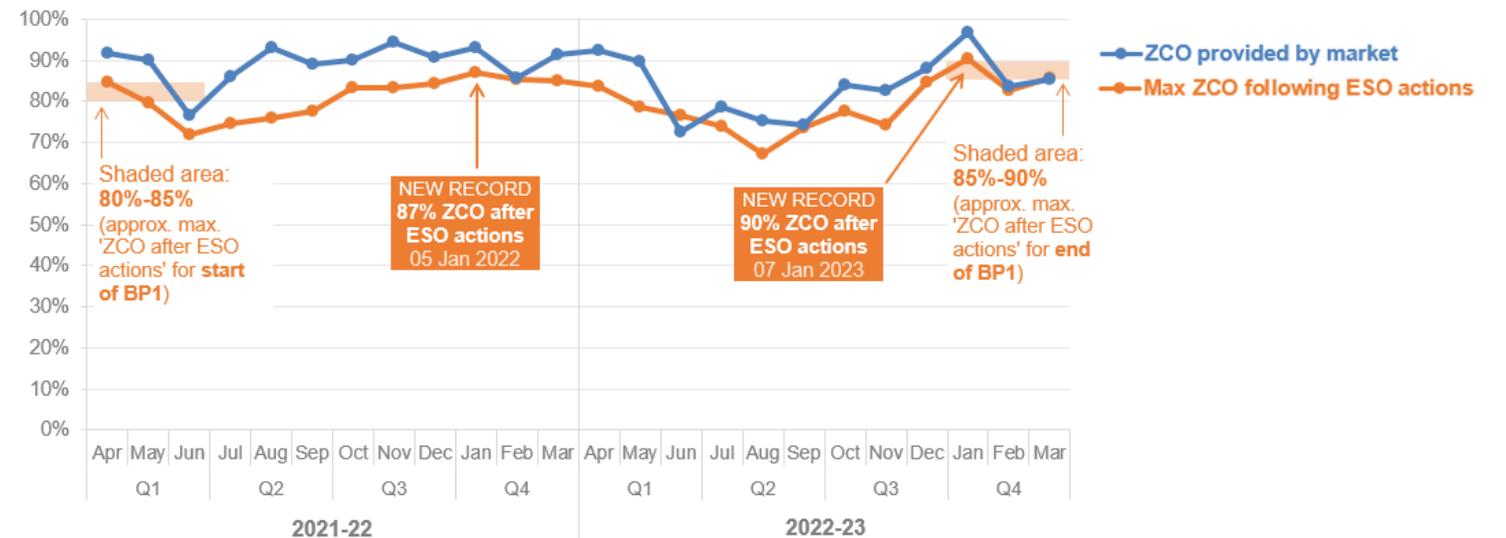
## Reduced carbon impact of ESO actions in 2022-23

Since April 2021, the maximum ZCO figure that the system can accommodate has been rising steadily and new records have been set every year. Our new highest figure is now ~90%. This was achieved on 26 December 2022 Settlement Period (SP) 34 and beaten marginally on 7 January 2023, SP40. This increase is due to the successful implementation of our operability strategy. We are pushing forward innovative, world-first approaches to transform how the power system operates. We are delivering frequency services that are fit for operating a zero-carbon network where system frequency will, at times, be more variable. Our stability and voltage pathfinders reduce our reliance on dispatchable generation for critical transmission system services.

### RRE 1G Carbon intensity of ESO actions (2022-23)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carbon intensity (gCO2/kWh)	3.2	2.2	4.2	0.3	0.4	2.4	7.4	6.0	4.7	8.8	6.2	4.9

### RRE 1F Zero Carbon Operability Indicator (2021-23)



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

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](#).

# Acting on feedback and focus areas

It is critical that we act on feedback provided to us by Ofgem and the Performance Panel throughout the BP1 period.

Please refer to the separate [Acting on feedback annex](#) for details of the feedback we have received as part of the mid-scheme review, how we've acted on it, and where to find further detail across our end-scheme reports.

For the 18-month incentives review process we agreed with Ofgem an alternative approach as set out in the BP1 ESOR Guidance Document. This new approach included a more streamlined report and a lighter touch assessment process which involved targeted feedback via deep dive discussions with Ofgem and the Performance Panel rather than detailed feedback reports. This approach will be used in BP2 at the 6 and 18-month review stages.

Deep dive sessions with Ofgem and the Performance Panel took place between November 2022 and March 2023 and focused on key performance areas across the three roles with targeted feedback provided by the Performance Panel. These areas were agreed with Ofgem and the Performance Panel based on feedback we received at mid-scheme. These are covered extensively across the evidence chapters and we've included further information on some of the topics ("Focus Areas") within this document. The key performance areas are listed on the right with detail on where to find further information. Although customer and stakeholder wasn't a standalone topic for the deep dive sessions, this was a vital component across them all.

We have also provided an update on our People and Capability activities in **Focus Area 6**.

Deep dive topic	Role(s)	Relevant sections of the report
<b>Balancing Programme</b>	1	A full narrative for the Balancing Programme is included in the Plan Delivery section of the evidence chapters with further information on benefits, costs and stakeholder engagement across the Demonstration of Plan Benefits, Value for Money and Stakeholder Evidence sections respectively.
<b>Balancing Costs Strategy</b>	1	We have included a full narrative against our Metric 1A Balancing Costs performance measure in the evidence chapters. A high-level overview of our strategy for managing balancing costs is found in <b>Focus Area 1</b> .
<b>Prioritisation and Winter Preparedness</b>	1/2	Prioritisation has been a feedback theme from BP1 and we have provided further evidence of this as part of our winter preparedness programme in <b>Focus Area 2</b> along with an overview of our prioritisation framework. Our winter preparedness activities are covered in the evidence chapters.
<b>Role 2 IT Delivery and Costs</b>	2	There a number of critical IT deliverables in Role 2; EMR Portal, STAR and Single Markets Platform. Progress of these deliverables are covered in the Plan Delivery and Value for Money sections within the Role 2 evidence chapters.
<b>Market Reforms</b>	2	Within the Role 2 evidence chapters we provide an overview of our BP1 activity which aligns to our Market Reform Strategic Framework. We provide an overview of this framework in <b>Focus Area 3</b> .
<b>Connections</b>	3	A full narrative for connections is included in the Plan Delivery section of the evidence chapters with further information on benefits, costs and stakeholder engagement across the Demonstration of Plan Benefits, Value for Money and Stakeholder Evidence sections respectively.
<b>Leadership</b>	3	Our ability to evidence leadership in our Role 3 activities in covered in <b>Focus Area 4</b> with progress on specific activities included in the Role 3 evidence chapters.
<b>Customer and Stakeholder</b>	All	Stakeholder survey insight and stakeholder evidence is included in the evidence chapters across all roles. We introduce the feedback themes and highlight some of the activities to address these in <b>Focus Area 5</b> .

# Focus Area 1: Balancing Costs Strategy

Our Balancing Costs Strategy is focused on mitigating the impact of the forecast increases to balancing costs as we progress to achieving key power system outcomes in the next 15 years as part of the GB transition to a net zero economy.

We use four levers to deliver balancing costs savings that sit across all of our roles:

<b>Network planning &amp; optimisation</b>	Designing the GB network and managing delivery of changes to optimise availability, provide connections and reduce constraints.
<b>Commercial mechanisms</b>	Optimising the design and procurement methods of our balancing services.
<b>Control room actions</b>	Using enhanced products and services provided to the Control Room, optimising security, supply and cost.
<b>Innovation and technology</b>	Experimenting with first in sector approaches and technologies, collaborating with Industry and academia.

The levers are applied to three time horizons in the short, medium and long term, aligned with key GB power system outcomes:

- Achieving zero carbon operability in 2025
- Enabling 50GW of offshore wind by 2030
- Enabling a net zero power system in 2035

We use these levers to identify initiatives that we can deliver to mitigate forecast rise of balancing costs. The Balancing Costs Strategy brings together and provides that narrative on how these initiatives are progressing and how we are optimising across all our activities.

## SHORT TERM: Zero Carbon Operability in 2025

Our increased ability to operate a zero-carbon system will deliver balancing costs savings. This is achieved through mitigating/eliminating frequency risks, alleviating constraints, reducing our need to curtail renewable generation and competitively procuring services in advance to reduce the need for expensive interventions in the Balancing Mechanism (BM).

The most significant activities are the Accelerated Loss of mains Change Programme, new response services and the Frequency Risk and Control Report. The combined impact of these actions is to significantly reduce the volume of bids for stability required to manage largest losses and increase system inertia. If we hadn't delivered all three programmes, it is estimated that in 2023/24 we would need to take actions at a cost of £1.8bn to ensure system security.

## MEDIUM TERM: Enabling 50GW of offshore wind by 2030

Over the medium term, our focus is on mitigating forecast rises to constraint costs as we enable 50 GW of offshore wind capacity to be connected to the grid by 2030. Under one FES scenario 'Leading the way', constraint costs are projected to rise to up to c£3bn/ year by 2028 as offshore wind capacity ramps up from ~10 GW in 2023. We are mitigating these forecast balancing cost rises with network planning & optimisation activities.

One key initiative is our collaboration with Ofgem on Acceleration of Strategic Transmission Investment (ASTI) framework. During BP1 we have worked with Ofgem and TOs to agree acceleration of 26 projects. These will deliver additional balancing costs savings of up to £2.1bn and enable benefits of decarbonisation through increased offshore wind capacity.

## LONG TERM: Enabling a net zero power system in 2035

During BP1, we have made fundamental changes to the way we deliver network infrastructure solutions via the HND. We are progressing towards developing a CSNP to plan onshore and offshore more holistically and as the FSO takes on new roles as a whole energy system planner. These changes are supported by our Connections Reform programme and our NZMR programme. These critical initiatives being delivered during BP1 are setting us on the path to the production of a holistic, whole energy system network plan, coupled with holistic market reform. This is the key to driving down balancing costs in the longer term.

## Focus Area 2: Prioritisation

As a result of a rapidly evolving energy landscape, and an ambitious RII0-2 delivery plan we need to ensure we are delivering the most benefit for our consumers all the time. Prioritisation is critical to this and throughout BP1 we have continuously prioritised our efforts. Stakeholders have told us that they would like more transparency around our prioritisation process and how we adapt our plans.

As you will see throughout this report, we have delivered on important and critical BP1 milestones and have gone over and above to take on additional activities and new roles. Prioritisation has inevitably had to take place resulting in the de-prioritisation of some BP1 activities, however we feel this is minimal in comparison to what has been delivered.

We have developed a prioritisation approach based on a set of principles as shown in the diagram below. This new prioritisation decision support framework will allow us to dynamically respond to external or internal environmental changes to the baselined business plan, help support our narrative behind any deviations to the plan, and identify any support requirements in the interim.



### Prioritisation Case Study: Winter 22/23 Preparedness

In May 2022, the BEIS Secretary of State wrote to us requesting that we engage with industry to explore ways to enhance security of supply in light of increased risk to gas supplies as a consequence of the illegal Russian invasion of Ukraine.

As a result, we developed a programme of activities and actions for this winter to minimise the potential impacts on electricity customers in Great Britain. At the same time we were in the midst of an energy price crisis so had to manage overall costs to consumers, while ensuring safe, reliable electricity supply. These new winter activities did not form part of our BP1 activities.

To accommodate the work and resource required in Role 2 for the Winter Contingency Contracts and Demand Flexibility Service we used the prioritisation framework, which resulted in the de-prioritisation of four activities. Activities were assessed against risk to security of supply, legal/regulatory requirements, benefits and alignment with delivery priorities. This decision was logged and ratified at our monthly Portfolio Review Board.

Activities	Security of supply	Legal/Reg requirements	Benefits	Alignment with delivery priorities
	Score (L/M/H)	Score (L/M/H)	Score (L/M/H)	Score (L/M/H)
Winter Contingency Contracts	H - Very high risk to Security of Supply if initiative not started	H - High degree of alignment	H - Significant benefits or realised almost instantly	H - Strong alignment to delivery priorities
Demand Flexibility Service				
Further development of FRCR 2023 (D4.1.1)	n/a – no risk	L - Low degree of alignment	L - Benefits realised in long-term or minimal	L - Weak alignment to delivery priorities
Power Responsive (D4.2.2)				
Reserve Reform (D4.3.3)				
Response Reform (D4.3.2)				

# Focus Area 3: Market Reform Strategic Framework

During BP1 we have fundamentally shifted how we have undertaken market reform, moving from standalone tactical interventions to a more holistic and strategic approach.

The energy landscape has been volatile and unpredictable through this period. This has significantly impacted the energy markets and we have needed to act fast to make interventions in the interests of consumers.

At the same time, the framework of electricity markets and policy in Great Britain is about to undergo the most significant reform in a generation. It is critical that we do everything we can to shape this market and policy reform to deliver the most efficient, secure and affordable system for net zero.

## Our Market Reform Strategic Framework

As ESO markets are significantly impacted by wider markets and policy, it is vital that we:

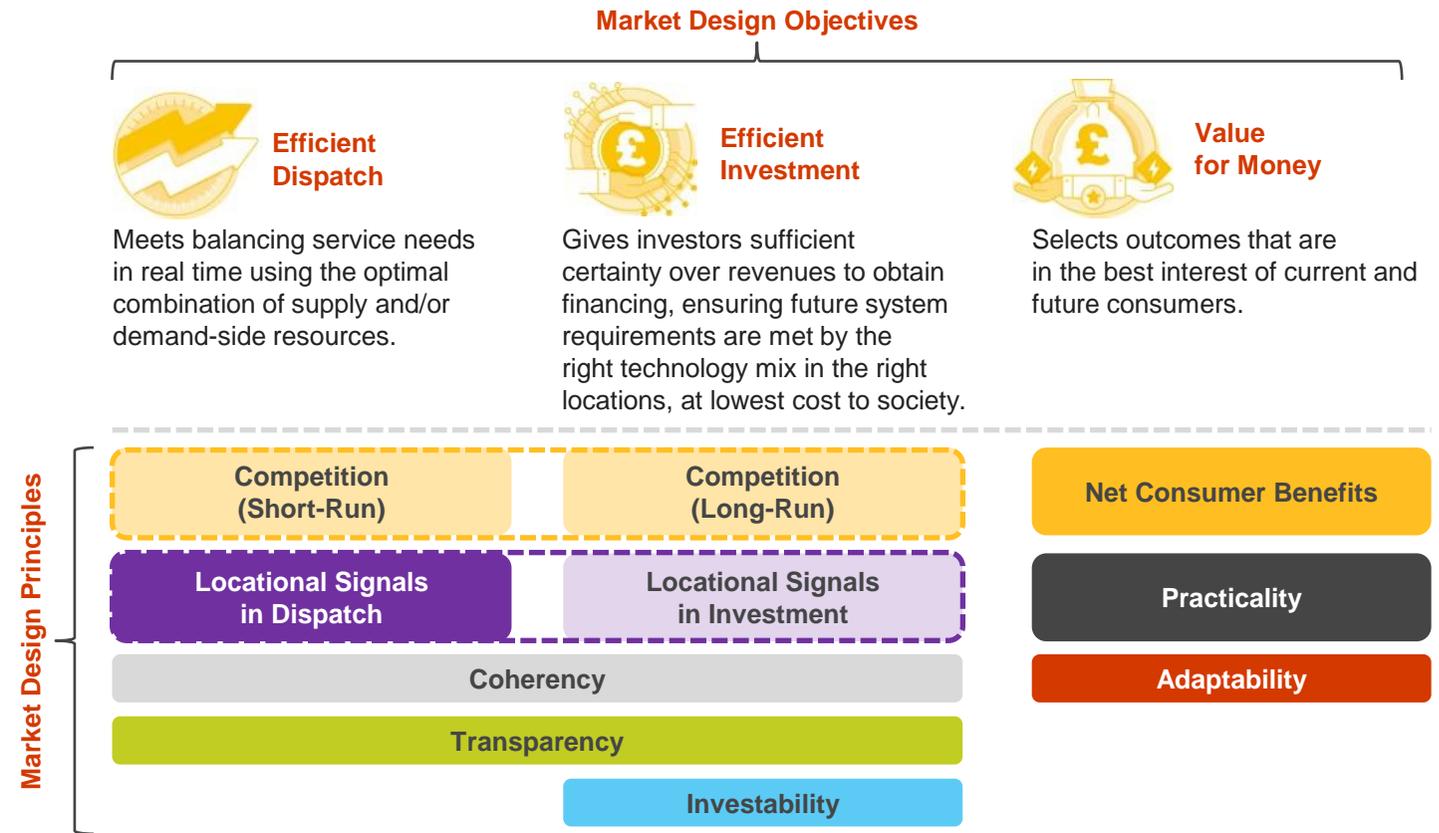
1. Carefully monitor and assess the efficiency of existing and new markets, intervening where necessary to protect consumers from shocks and address market failures
2. Set a long-term vision for net zero markets and policy in collaboration with government and industry, as well as achievable pathways to getting there
3. Continue to develop and review our medium-term Markets Roadmap to adapt to the changing short- and long-term landscape – reprioritising as needed.

### To do this we:

- Apply horizon scanning for longer-term trends; medium-term forecasting and analysis to understand impacts of new markets and reforms on broader markets (e.g. wholesale liquidity); as well as post-implementation monitoring to make continuous improvements.
- Engage stakeholders via a series of formal channels where we listen to commentary and feedback on market efficacy and also present and collaborate on our market developments.

## Our Market Design Framework

Our strategic framework for market development is underpinned by our Market Design Framework which was developed in the first year of BP1 (see below). This framework was developed to ensure we are designing markets in a robust, comprehensive and transparent way.



Within our evidence chapters we provide an overview of our BP1 activity which aligns to our Market Reform Strategic Framework including:

- Our **short-term** interventions such as DFS
- The delivery of our **medium-term** Markets Roadmap including reform of our response and reserve markets
- Our **long-term** vision as set out in our NZMR programme

## Focus Area 4: ESO Leadership

In Role 3 we are leading the world in our thinking and implementation across a number of projects and initiatives. Our aim is to deliver a long-term strategic view as to how the electricity network needs to develop to enable and support the decarbonisation of generation and demand. As the electricity system decarbonises, many technical challenges need to be overcome. We are solving these technical operability challenges and creating a blueprint for other system operators to follow.

On the right are areas where we have shown leadership in Role 3. More detail on the specific activities can be found in the evidence chapters section.

There are other examples of leadership across other roles including our world-leading DFS and our thought leadership through our NZMR programme.

### Network planning for the future

New low carbon infrastructure is connecting to the network faster than the required reinforcement of the network itself, and it is being connected far from where it is needed. There is no blueprint for addressing this challenge, and historically there has never been a holistic, long-term strategy for network development.

The NOA provides our recommendation for which network reinforcement projects should receive investment - and when. Other SOs around the world are only recently adopting their own NOA-equivalent process, again showcasing our world-leading strategic thinking in this area. We are continuing to lead the world by developing a network planning process, CSNP, for the future that will allow cross-vector (hydrogen, gas etc) trade-offs in network planning. We have also delivered the world's first HND to unlock the UK Government's ambition for 50 GW of offshore wind by 2030. For the first time it brings together both the connection of the offshore wind and the network needed to transport it to where it's needed, rather than considering them separately and potentially increasing constraint costs.

### Innovative solutions to operability challenges

Through embracing the new technologies on the system, we have developed first in the world dynamic frequency management products, taking advantage of the unique technical performance of batteries. Further, through development of our Pathfinder products we allow for world-first innovative solutions to the emerging technical challenges of operating a low carbon power system and the requirements to find other sources of inertia and short circuit infeed. Our work in this space has led to the first ever Grid Code specification of grid forming invertors and commercial contracts to procure batteries with grid forming invertors. Britain is the first country to have achieved this step.

### Smart Whole Electricity System Planning

The electricity system can no longer be thought of and operated as separate distribution and transmission systems and needs to be planned and operated as one. Through our lead role in the ENA Open Networks Project we have created common approaches to market structures and through the development of the Regional Development Programmes,

we have, for the first time, distributed energy resource being able to help manage both flows on the distribution and transmission networks.

The MW Dispatch projects are world-leading systems which by the end of 2023 will have potentially facilitated the connection of around 2GW of DER. We have been working with SPEN to deliver two pioneering breakthroughs in the way we operate the system. The Distributed ReStart project is a world-first initiative. The project has explored how DER such as solar, wind and hydro, can be used to restore power to the transmission network in the unlikely event of a blackout – a process known as electricity system restoration or black start. The Generation Export Management Scheme is GB's first automated transmission constraint management system which will allow us to manage a region with high penetrations of transmission and distribution connected generation.



## Focus Area 5: Customer and Stakeholder

### Engaging as a trusted partner throughout BP1

As we work to deliver our net zero commitments and play our part in leading the energy transition, it is important that we listen to and respond to the views of our stakeholders. Our BP1 plans were developed working with stakeholders to make sure we deliver maximum benefits for consumers and customers.

During the BP1 period, we have evolved our engagement strategy to an ‘always on’ approach which has increased the opportunities for all customers to engage through robust business as usual (BAU) routes. We now have many forums and touchpoints to engage with stakeholders as part of this BAU engagement. For example, we’ve set up both the Technology Advisory Council and the Markets Advisory Council during BP1. The industry experts on these councils provide guidance on our digital, data and technology transformation and inform our approach to strategic market design and delivery.

### What we’ve heard from stakeholders in BP1

Some themes for improvement in how we engage and work with our stakeholders have emerged from feedback gathered throughout BP1, with stakeholders telling us that we need to:

- 1) Improve communications and engagement across many of our BP1 activities
- 2) Develop better coordination with TOs and all industry partners
- 3) Provide greater transparency across a range of areas
- 4) Improve speed of delivery of some of our BP1 milestones
- 5) Improve data and analytical information so it supports industry knowledge and decision making
- 6) Provide thought leadership and a more holistic view on the future of energy
- 7) Improve balancing decisions and transparency of those decisions
- 8) Be more innovative and transformational in our activities

### What we’ve done to address this feedback

Our teams have worked hard to improve. We’ve engaged extensively across all of our BP1 activities, co-creating new products and services, keeping stakeholders updated on changes or delays to our activities and re-prioritising work where needed. More detailed examples against the improvement themes are provided in the stakeholder evidence section of the evidence chapters for each of our roles, but some notable highlights include:

- Co-creating a Balancing Programme roadmap
- Improving transparency of our decision making through the OTF
- Improving access to data
- Communicating through the BSUoS taskforce
- Leading the debate on market reform through the NZMR programme
- Improving the connections experience for stakeholders
- Improving coordination with TOs on Early Competition delivery

During BP1, we’ve also engaged with stakeholders to help us quickly adapt our plans to emerging external challenges including Covid-19 and the devastating war in Ukraine. We’ve worked closely with stakeholders to develop security of supply solutions like the DFS, which was developed at pace and communicated extensively to industry and the public. We’ve also addressed stakeholder concerns over rising balancing costs by introducing a balancing costs strategy including our five point plan to manage constraint costs.

### How will we keep improving?

As we look to BP2 and continue on our path to transition to the FSO, our activities will build on the progress we’ve made meeting stakeholder needs in BP1. We are committed to working collaboratively across the energy industry so that together we can deliver a fully decarbonised electricity system which is reliable, affordable.

# Focus Area 6: People and Capability

Capability Build	University Strategy	STEM Approach	Workforce planning, recruitment, onboarding & induction	Diversity, Equity, Inclusion and Belonging
<ul style="list-style-type: none"> <li>As part of our people strategy we continue to develop our culture as a learning organisation. Our colleagues are critical to what we do and we want them to flourish during their entire employee journey.</li> <li>In the first half of BP1, we developed a central People &amp; Capability Hub, enabling access to resources and training for the eight identified ESO specific capabilities. We have continued to publicise and embed this, with monthly Learning and Development themes in employee communications and leadership channels.</li> <li>Following a review of our business capability requirements to deliver on our commitments, we have developed a 'decision tree' to enable managers to identify the best approach to filling capability gaps. We will be rolling this out to leaders during the first quarter of FY24.</li> <li>We are building on our Career maps work to showcase the diversity of careers in the ESO, by considering technical leadership career pathways for those who don't necessarily wish to become leaders of people.</li> <li>The Capability Lead Network continues to share best practise and expertise in ESO capabilities to ensure we are working together to build capabilities needed in the future.</li> </ul>	<ul style="list-style-type: none"> <li>Following our review of all university engagements, we have developed and approved a University Strategy which ensures a coordinated approach to working with universities.</li> <li>We have established a University Strategy Steering Group to give direction, and a University Strategy Working Group to deliver a focused and targeted approach and gain momentum with our university relationships.</li> <li>The strategy focuses on three time horizons:             <ul style="list-style-type: none"> <li>Short term - we will develop improved and targeted relationships and put academic frameworks in place.</li> <li>Medium term - we will establish strategic projects to support our deliverables and increase brand awareness in order to attract new talent.</li> <li>Long term - we want to increase our impact to influence academic syllabuses and advise more broadly around education on decarbonisation topics.</li> </ul> </li> <li>Simultaneously, we are broadening our efforts on a wider range of degree disciplines - continuing to focus on the established engineering disciplines we require in increasing volumes, but also looking to the future markets (e.g. hydrogen), expanding our focus to new and emerging capabilities required for us to drive the energy transition (e.g. data science, AI, IT, innovation).</li> </ul>	<ul style="list-style-type: none"> <li>With such huge challenges ahead, we are now turning more of our attention to the energy leaders of the future.</li> <li>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 for us in the future – we have collated STEM for schools materials and made them accessible in a central portal.</li> <li>ESO Brand Ambassadors have been identified across the business to go into schools and highlight the variety of career paths &amp; choices available.</li> <li>We are working with the IET to develop a set of materials that can be used to inspire and engage the next generation.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>We have refreshed our Strategic Workforce Planning data to understand the future capability needs of all our departments.</li> <li>We want to be the net zero employer of choice. We have reviewed people trends in the labour market, guidance from the CIPD, and our own Employee Engagement survey and used this to articulate what a Net Zero Employer of Choice needs to look like.</li> <li>At the same time we have undertaken focus groups and surveys to establish our current state Employee Value Proposition and set up the next phase of the project where we will consider how to evolve this as we transition to the FSO.</li> <li>Following a sprint to identify improvements to our attraction and retention of Power System Engineers, 30 key recommendations have been reviewed and delivered.</li> <li>Over the last 12 months, we have recruited to 555 roles, including 260 external hires and 295 internal moves, of which 190 were internal promotions.</li> </ul>	<ul style="list-style-type: none"> <li>The importance of our DEI initiatives and Employee Resource Groups (ERGs) is clear from our internal surveys. Colleagues have told us that they want to see what we have planned for the future to ensure DEI remains a key focus. Since last year we have:             <ul style="list-style-type: none"> <li>Formed a team from across the business who have an interest, passion and skill set in DEI.</li> <li>Kicked off with an initial meeting to discuss our future DEI strategy.</li> <li>Brainstormed what currently exists and we'd like to keep, what we should stop doing and what we want to do more of or introduce in the future.</li> <li>Created a draft DEI strategy document that will help us to convey our principles, governance, approach and ambitions that we are currently building out.</li> </ul> </li> <li>Part of our ongoing work to build out the strategy, will be to go analyse more of the detail behind our internal survey (Grid Voice) by engaging with our Grid Voice lead as well as utilising the latest diversity stats.</li> <li>We will also have a deep dive into our current ERG and DEI governance structures.</li> </ul>



Thank you for reading our 2021-23 End-of-Scheme Report  
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For further details on the ESO incentive scheme, please visit our website at [www.nationalgrideso.com/our-strategy/riio/how-were-performing-under-riio-2](http://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/what-we-do/our-strategy/our-riio-2-business-plan>