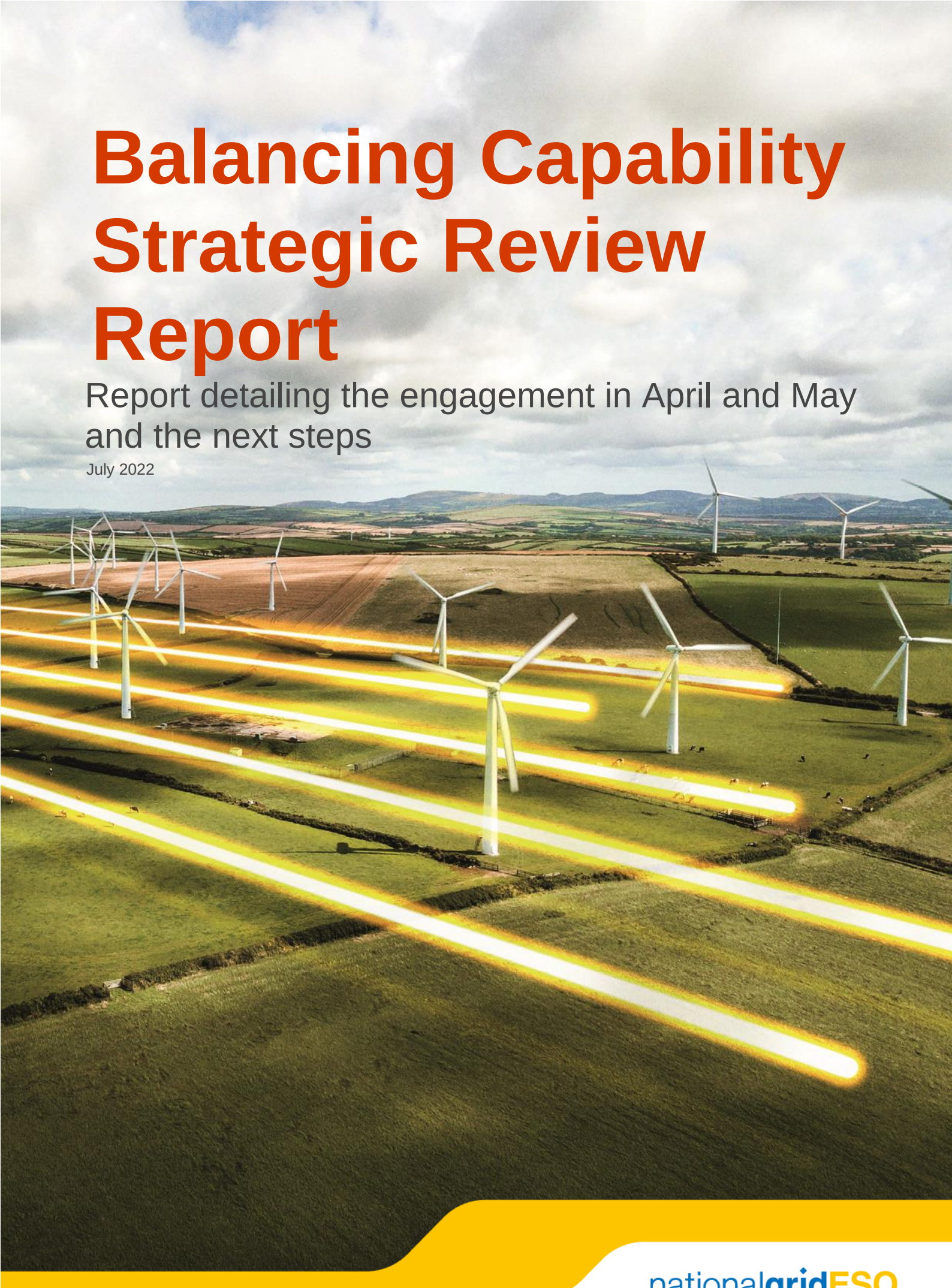
Balancing Capability Strategic Review Report

Report detailing the engagement in April and May and the next steps

July 2022



nationalgridESO

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Introduction

In April and May 2022, National Grid Electricity System Operator (ESO) undertook a strategic review, with industry, of the systems used to support our balancing capability. This review was undertaken collaboratively with industry to ensure that our plans and delivery roadmaps meet our RIIO-2 strategic objectives, minimise balancing costs, deliver consumer benefits and create a foundation for future market changes and reform.

We were keen to receive views and input from a wide range of stakeholders, to ensure that further investment will enable us to:

- Meet our net-zero carbon operability ambition.
- Continue to remove barriers to entry for providers and encourage participation in the market.
- Operate within increasingly challenging system conditions.
- Efficiently and effectively transition between our current and future balancing capability.

Background

Under the RIIO-2 business plan, the ESO has transformational ambitions which deliver significant benefits, many of which are dependent on enhanced balancing capabilities in our Electricity National Control Centre (ENCC). With the rapid pace of change across the energy industry, we must ensure that our approach to planning and delivery of our balancing capability is flexible and can adapt in future to the evolving needs of our customers.

The Balancing Programme was established to develop the balancing capabilities that the ENCC needs to deliver reliable and secure system operation, facilitate competition everywhere and meet our ambition for net-zero carbon operability. The programme had done extensive work to modify our existing capabilities to meet changing market conditions and customer requirements. However, in their current form, our existing capabilities will not be able to meet all future challenges. Additional investment is required to develop new capabilities that can meet changing requirements. We need to modernise and transform our balancing capabilities and associated platforms. This will ensure that we have the vital flexibility to facilitate future changes, both expected and emerging, across the industry.

This challenge led us to the decision to step-back and review our strategy, roadmaps, and delivery plans, through the strategic review.

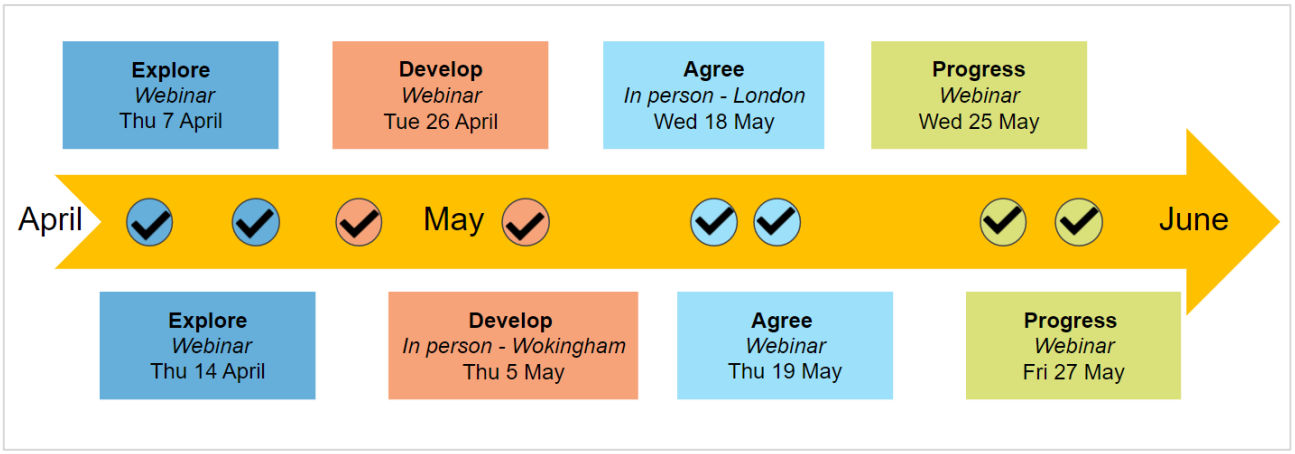
Our approach

We wanted to work with industry to ensure that we are making the right choices to meet our goals, the needs of the market, and that we do so in a cost-efficient, transparent and effective way. Our approach has been to provide a transparent and engaging experience involving the whole industry. This has been achieved through a series of engagement events taking participants on a journey to build and co-create a roadmap which can achieve the following:

- Ensure that we meet our RIIO-2 objectives.
- Minimise balancing costs.
- Deliver consumer benefits.
- Create a foundation for future market changes and reform.

The engagement covered four key phases:

- **Explore** – Which outlined our understanding of the existing capabilities and customer challenges.
- **Develop** – Which reviewed the new capabilities that we need to develop and including capabilities which stakeholders wanted us to consider.
- **Agree** – Sharing our initial proposal for the roadmap, considering the cost of development and prioritisation.
- **Progress** – Feeding back on our engagement and then looking at the next steps for engagement.



We undertook a series of engagement events: 6 webinars and 2 in person events. Alongside this we conducted one-to-one meetings, attended stakeholder group meetings and responded to questions throughout the engagement.

We have also shared information regularly through ESO newsletters and on our website.

As the diagram shows, the engagement covered four key phases:

Phase 1: Explore (setting the scene) – we outlined our understanding of the existing capabilities and customer challenges

Following our open letter, we established our scope, focused on:

- Understanding current capabilities, market participation challenges, pain points and future requirements.
- Reviewing the transformation and new capabilities to be developed.
- Challenging original assumptions.

Phase 2: Develop (co-creating a new plan) – we reviewed the new capabilities that we need to develop, alongside capabilities which stakeholders wanted us to consider

On 5 May, we prioritised a new Balancing Capabilities Roadmap with industry members, enabling us to:

- Capture further industry requirements.
- Validate control capabilities required.
- Identify technology changes required to achieve transformation.

Phase 3: Agree (reviewing the plan) – we shared our initial proposal for the roadmap, considering the cost of development and prioritisation

- We played back the outputs from the 5 May workshop.
- We shared the proposed balancing capability roadmap, which we co-created with industry stakeholders, alongside the supporting benefits and costs.
- We corroborated and sought agreement of the initial roadmap with associated risks and assumptions.
- We captured the confidence level of industry of the joint proposed approach.

Phase 4: Progress (agreeing next steps) – we played back the findings from our stakeholder engagement programme and then looked at the next steps for engagement going forward

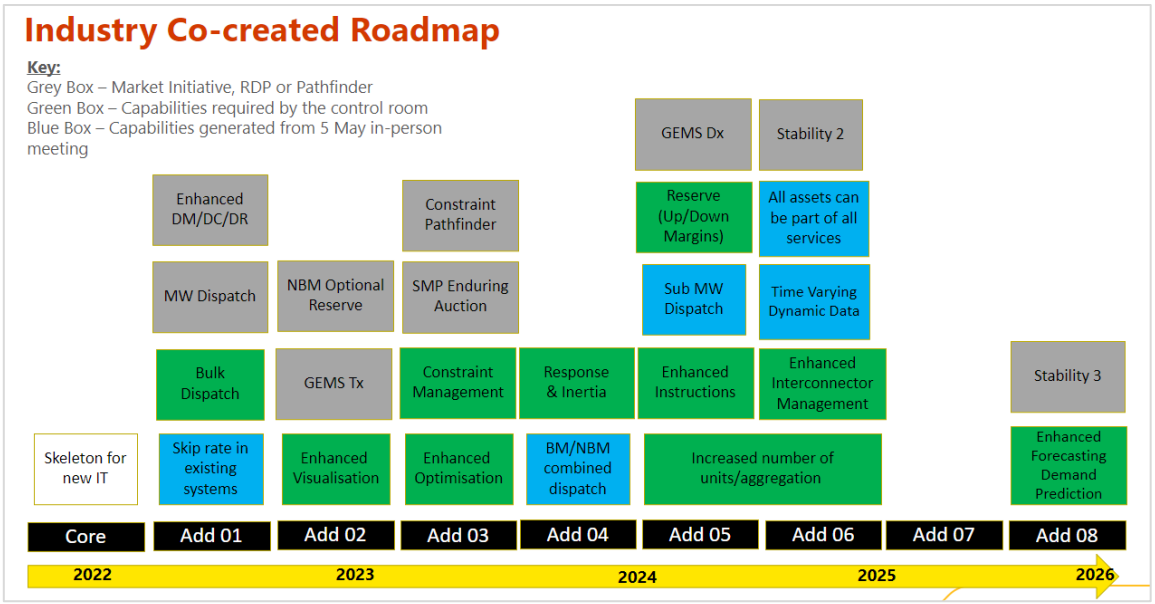
- We recapped the balancing capability review.
- We offered stakeholders the opportunity to ask further questions regarding the proposed roadmap, benefits, costs and delivery plan.
- We discussed how we can continue to build confidence in our roadmap and approach.
- We validated whether we have successfully included stakeholder input and whether there was anything additional to include.
- We discussed plans for future engagement going forward.

Proposed Balancing Capability Roadmap

The following section describes the outputs from the Balancing Capability Strategic Review, which includes the industry co-created transformation roadmap, alongside the associated benefits and costs.

Roadmap

The following shows when functionality will be delivered in our systems. This will be the point at which this functionality is fully operational and delivering value.



CORE

- “Skeleton for new IT” – In this release we will deliver the core services needed for the development of our new IT system called the Open Balancing Platform (OBP). This release does not deliver new capabilities to the control room, but it does create the foundation upon which new capabilities will be built.

Additive Release 01

- “Enhanced DM/DC/DR” – our colleagues in Markets have already implemented new response products for Dynamic Moderation, Dynamic Containment and Dynamic Regulation. We expect further enhancements after go-live and have made allowance for this.
- “MW Dispatch” – this is an initiative from our Regional Development Programme (RDP). It allows the dispatch of distribution connected resources to alleviate constraints on the transmission system. Because of the timing of this work, it will initially be implemented in our existing systems and will later be implemented again in OBP.
- “Bulk Dispatch” – this is a key new capability for our control room. It will allow us to send multiple instructions at the same time so alleviating control room workload.
- “Skip rate in existing systems” – we were told by industry that we should look for interim solutions to the skip rate issue. As part of this work, we are investigating if there are changes, we can make to existing systems before we get new facilities in OBP. We will engage with the industry on our findings once we have completed our investigation.

Additive Release 02

- “NBM Optional Reserve” – Non-BMU Optional Reserve is a new service being introduced by our colleagues from Markets. This will be implemented in existing systems first and then moved to OBP.
- “GEMS Tx” – Generation Export Management Scheme at Transmission is another RDP which will be used to manage constraints in south of Scotland. Again, because of the timescales, this will be implemented in existing systems first and then again in OBP.
- “Enhanced Visualisation” – this important new capability will allow our control room to see information across multiple entities (e.g. BMUs and non-BMUs) in an integrated way so aiding decision making across different services. It will deliver visualisation that is “human centric” giving control engineers complex information in a way that is easier to act upon.

Additive Release 03

- “Constraint Pathfinder” – these are new inter-trip schemes being delivered as part of our Pathfinder initiatives. This will be delivered in existing systems before being implemented again in ODP.
- “SMP Enduring Auction” – our colleagues in Markets are enhancing the auction platform used for the procurement of services. This will simplify business processes for providers and make access to markets easier.
- “Constraint Management” – this new capability will give the control room new decision-making tools to optimise the management of constraints on the transmission system. This will be achieved by bringing together the different services available to do this and advising the control room on the best way to alleviate constraints.
- “Enhanced Optimisation” – this will co-optimise energy balancing taking into account other services, such as response and reserve, while respecting transmission system constraints.

Additive Release 04

- “Response and Inertia” – new decision-making tools to advise on the levels of DM/DC/DR and primary, secondary and high response required to keep the transmission system within operational limits after a fault. In addition, ways to manage low inertia scenarios in the most economic fashion.
- “BM/NBM combined dispatch” – as suggested by industry, dispatch to be combined for BMUs and non-BMUs in an integrated fashion so that the control room can instruct multiple services from one place.

Additive Release 05

- “GEMS Dx” – similar to “GEMS Tx” (see above) but for resources distribution level.
- “Reserve Up/Down Margins” – enhanced optimisation of reserve services.
- “Sub MW dispatch” – as suggested by industry, the capability to dispatch at less 1 MW and in real number values instead of integers.
- “Enhanced Instructions” – the capability to issue innovative instruction types (e.g. other than Bid-Offer Acceptances etc).
- “Increased number of units/aggregation” – decision making tools designed to handle large numbers of units and to automate the management of aggregated units over GSP Groups.

Additive Release 06

- “Stability 2” – this is a Pathfinder initiative developing innovative ways to manage fault levels etc. (please note – Stability 1 has gone live and was implemented in existing systems).
- “All assets can be part of all services” – as identified by industry, it is sometimes difficult to go-live with a new service with all asset types. The new service may go-live with a minimum viable product which will be enhanced at a later time. This capability will mean that our new Balancing systems are flexible enough to handle all asset types from Day 1 of a new service.
- “Time Varying Dynamic Data” – enhancement to allow industry partners to provide additional time varying dynamic data to be used within our systems.
- “Enhanced interconnector management” – new decision tools to support the increased number of interconnectors and new interconnector arrangements.

Additive Release 07

- In this additive we expect to be switching over the “master” system so that OBP takes full control. It has also been left as an additive where we might have to handle new services and capabilities that we will identify from our learning in earlier additives.

Additive Release 08

- “Stability 3” – the next round on tendered services similar to “Stability 2”.
- “Enhanced Forecasting/ Demand Prediction” – there will be a continuous process of improving our forecasting capabilities up to this additive. This is the point where we expect to have fully implemented all of the enhancements planned (new machine learning, real-time prediction etc).

Key assumptions of the proposed roadmap:

- The transformation is fully supported, and the approach is agreed by the ESO Executive and Ofgem.
- CNI Data centres are ready to support additive release 1.
- There is adequate internal resources and expertise to support the roadmap.
- A minimum of 2-3 years until major market reform occurs. However, the Open Balancing Programme (OBP) can adapt.
- Market initiatives are as per current RIIO-2 plan.
- Optimisers and models can be developed in parallel to the OBP.
- We need to retain a viable capability within existing systems during transformation.
- The support for current systems, including the Balancing Mechanism (BM) system, cannot be extended beyond 2030.

Industry made some suggestions that we have not included in the roadmap at this time. We fed back the reasons for this in our final sessions:

Industry suggestion	Reason for not including in the plan
Carbon intensity should be a factor in control room decision making.	This is not allowed as part of our licence. However, delivery of new balancing capabilities will allow us to make better use of all technologies, including low carbon.
Allow decreasing prices in the BM. Currently, only increasing prices are allowed.	This is not allowed under the current Grid Code. We do not think we could accommodate such a change in our current systems because it would be difficult to modify the optimisers. We will consider alternatives, such as including start-up prices. The new system will be flexible and configurable for this type of change by design.
Show BM prices outside of gate closure.	This requires code changes and agreement with Elexon. We will keep this on our backlog and investigate.

Benefits

Balancing Transformation Benefits:

Our reviewed benefits assessment estimates that Balancing Transformation will deliver direct consumer benefits of up to £191m over the RIIO-2 period. Our Forecasting capability is also estimated to deliver just over £1bn benefits through improvements in the accuracy of energy forecasts. The Balancing Programme is also a key enabler to the £3.5bn benefits delivered by the wider ESO RIIO-2 business plan.

Benefits and the case for change

Direct benefits delivered by Balancing Transformation

Submission	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Dec 2019 [1]	£9.4m	£12.1m	£30.7m	£44.5m	£55.7m	**£152m**
July 2022 [2]	£0m	£0.5m	£11.6m	£55.0m	£123.8m	**£191m**

Other programme benefits

Capability	RIIO-2 benefits
Platform for Energy Forecasting	£1,048m
Balancing Asset Health	£23m (for FY23)

Net present value (NPV) delivered by RIIO-2 plan (enabled by Balancing and Network Control)

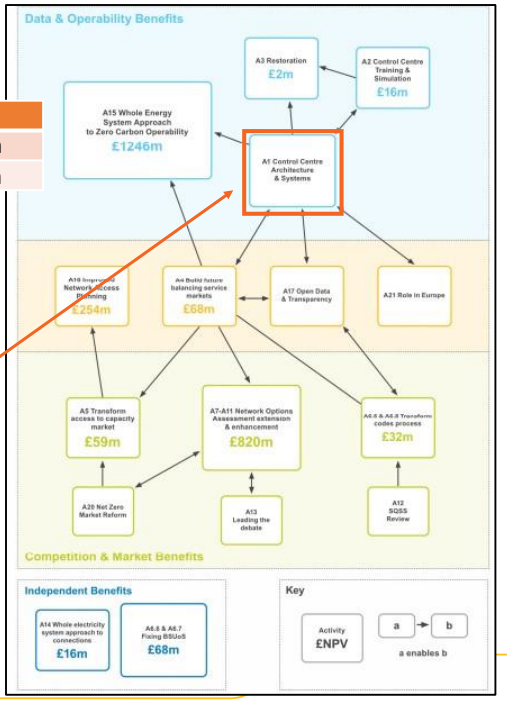
Submission	5 year NPV
December 2019	£1,754m
April 2022 [4]	£2,581m

1 – half of the A1 CBA as submitted in the December 2019 RIIO-2 plan

2 – provisional figure for engagement only. Subject to change in final BP2 submission

3 – figure for FY23 only as scope of work for remaining years has not been confirmed. Work will be delivered in an agile way, responding to requirements

4 – based on the draft RIIO-2 BP-2 cost-benefit analysis report, published 29 April 2022. Subject to change in the final BP-2 submission



The estimated direct benefits delivered by Balancing Transformation will be achieved through lower carbon emissions and balancing costs than would otherwise be the case. Balancing Transformation enables this by allowing us to make better use of all technologies and services that we expect to be participating in the market over the RIIO-2 period. Our current tools are not designed to deal with the size and volume of current and future participants. The benefits have increased from the BP1 submission due to increases in the carbon price and constraint costs. This highlights the importance of this work in enabling our zero-carbon operation ambition and net-zero.

The Platform for Energy Forecasting will deliver benefits of over £1bn in RIIO-2. This is through improved demand forecasting feeding through to lower balancing costs as the control room take fewer actions. Balancing Asset Health will deliver benefits of at least £21m in cost avoidance of a serious unplanned outage. As this work will be delivered in an agile way depending on requirements, this figure is likely to increase. Currently, this figure only accounts for the benefits during FY23 and the societal costs of a serious outage are likely to be significantly greater.

The dependency diagram shows that a substantial proportion of the benefits delivered by our RIIO-2 plan are dependent on delivery of the Balancing Transformation work (and our sister Network Control programme). Without investment in Balancing Transformation and delivery of the OBP, we will be unable to realise many of the benefits delivered in other areas such as Ancillary Services Reform, Pathfinders and RDPs. This is because our control room tools will not be able to manage the technology, volume and behaviour of market participants that these services will enable.

Further details of the benefits stakeholders raised during the workshop on 18 May, can be found in the Appendix of this document.

Industry Engagement

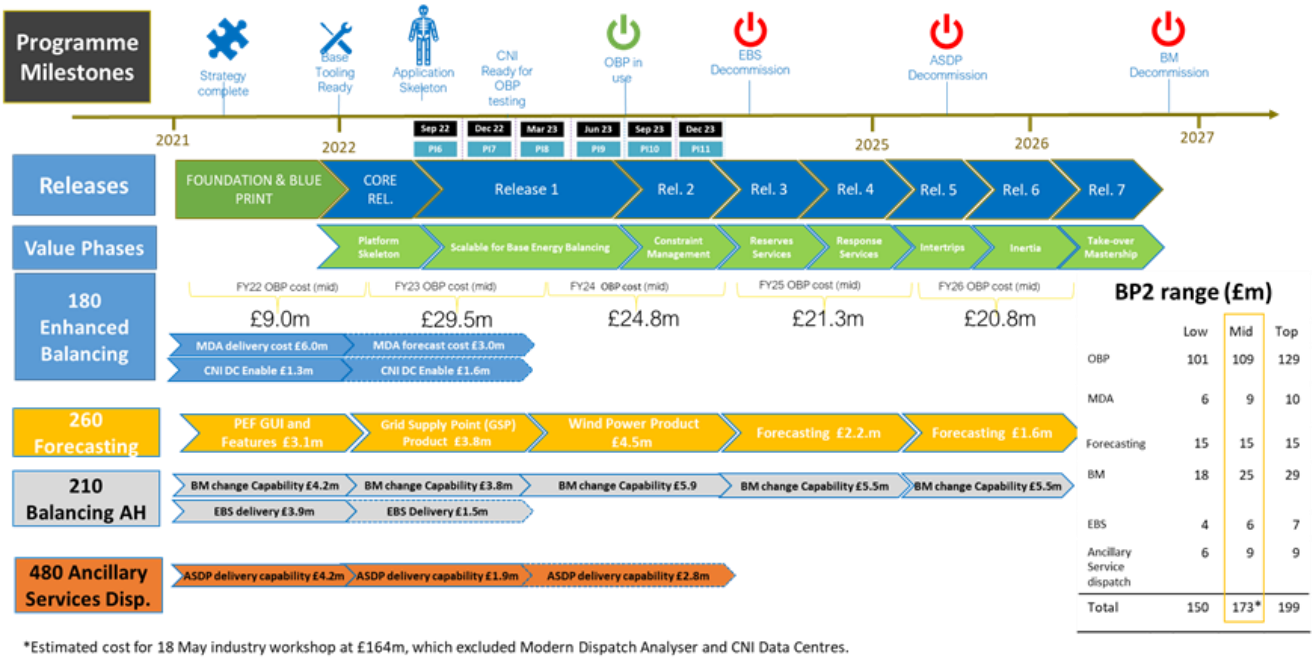
We took extensive feedback and input from industry and jointly developed a delivery roadmap that combines industry needs and the needs of the ESO control room.

- **73 companies** represented in the whole process.
- **110 individual** attendees across the engagement process.
- **200 questions** received throughout process (see Q&A document).
- **34 stakeholders** provided confidence votes on key areas of proposal.
- Very positive feedback around **transparency** and **collaboration**.

In our approach, we were fully transparent on benefits, costs, risks, assumptions and dependencies associated with the roadmap. This was evidenced in the extremely positive feedback received from industry during our sessions.

Costs

Balancing Programme Roadmap Totex Overview



*Estimated cost for 18 May industry workshop at £164m, which excluded Modern Dispatch Analyser and CNI Data Centres.

Risks

Risk / Uncertainty	Response
There is a risk that the ESO underestimate the complexity of the Transformation objective.	The ESO has delivered the blueprint for the transformation and has built product teams which include Product Owners and SMEs with industry and operational expertise. We have completed an external assurance audit on the programme and are now implementing the recommendations.
There is an uncertainty that the Balancing Transformation plan does not industry and regulatory requirements.	The programme has undertaken an external engagement initiative with industry and Ofgem with the objective of co-creating a jointly agreed plan. We will continue to regularly engage with industry on the plan over the coming years.
Energy system optimisation does not meet requirements.	We are building a specialist Optimisation team with internal and external specialists, who are working on solving the complex engineering and scientific problems.
There is a risk that critical changes will be required to existing balancing systems before Transformation is complete.	Existing systems development capability is expected to be retained to ensure critical changes can be made during transformation, particularly in BM.
There is a risk to the timeline if industry engagement changes the direction of the transformation	We will ensure that the roadmap aligns to industry needs. Delays or changes may delay the zero-carbon objective and related benefits case. The service life of existing systems can be extended to maximum 2030.
There is a risk that the Open Balancing Platform will not satisfy the requirements of a changing energy market	The Open Balancing Platform has been built on highly resilient, highly flexible (RedHat OpenShift) technology that is easy to change and deploy. The system is designed to adapt to changing energy market and operational conditions.
There is a risk that, in the future, costs increase or that costs are not approved by Ofgem.	Robust stakeholder engagement to get support for delivery roadmap and associated costs. Developing costs in bottom-up way to give greater confidence. Robust reporting, assurance and governance in place.
There are challenges in completing the ESO components of the Critical National Infrastructure Data Centre (CNI-DC).	We are working with the National Grid Digital Platforms and Infrastructure Technology team to complete the CNI-DC base infrastructure.

Feedback

Questions

Thank you to everyone who has asked us questions throughout entire engagement process, we have welcomed these and where possible given time to answer these in the sessions. We have been capturing all questions we have received and publishing them along with our answers in our Q&A document on our website.

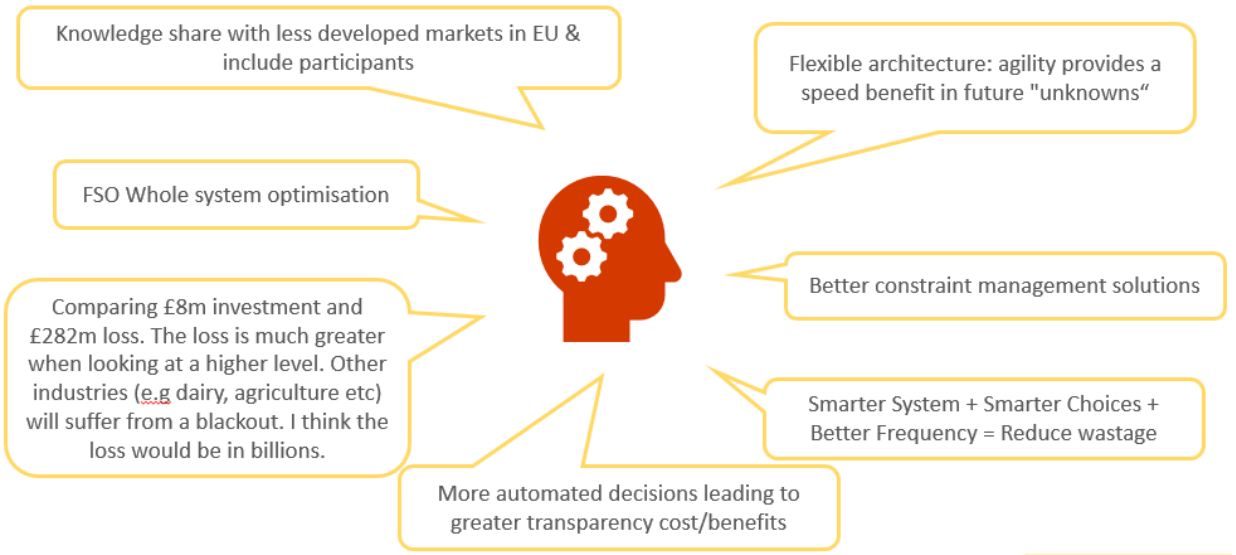
Stakeholder feedback on transformation roadmap and approach

Throughout the whole engagement, feedback and input from stakeholders has been crucial to developing our co-created roadmap and ensuring our approach covers a broad range of industry requirements and concerns.

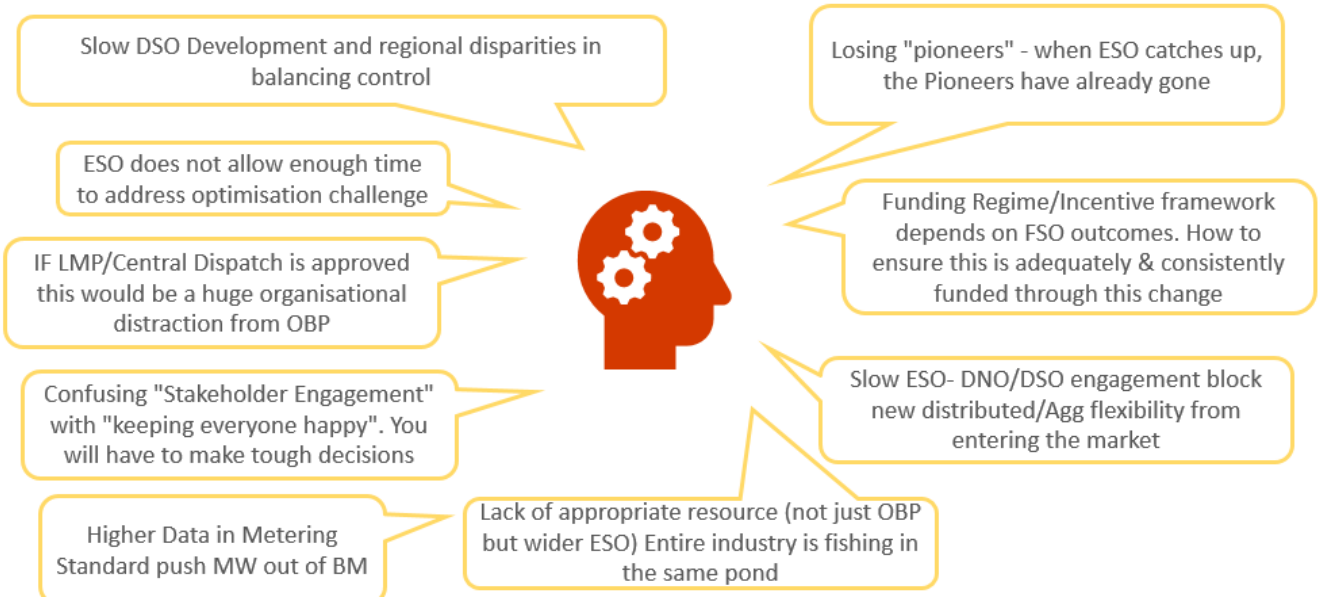
On 5 May we welcomed stakeholders to our control rooms in Wokingham for an interactive day that would help us understand the priorities and concerns of industry, therefore allowing us to develop a roadmap that captures the key requirements. Throughout the day we asked for input and feedback on the key areas we are aiming to deliver through the balancing programme; new market initiatives, improved control room capabilities and adopting new technologies. Stakeholders were asked to prioritise initiatives, provide feedback, and suggest other areas that they believe we needed to include in our plans, all of which would help shape our co-created roadmap. The outputs of the session were captured on a mural board that has been published on our website alongside a voice over of the day's activities.

At the session on 18 May, we asked stakeholders to provide feedback and input to the risks, benefits that underpin the roadmap we developed, below are the comments we received back and will be incorporating into our plans. All comments and feedback from the day were once again captured on a mural board and published on our website.

Additional benefits captured



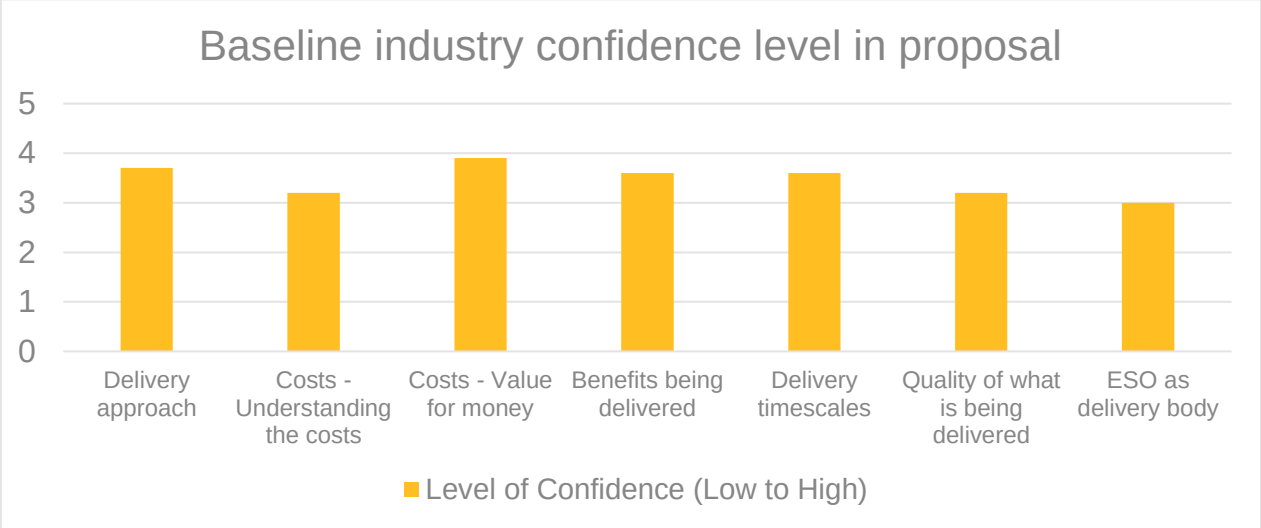
Additional risks captured



Towards the end of the BCSR, we asked stakeholders to take part in a poll to gauge their confidence on the following areas of the transformation roadmap:

- The delivery approach.
- Their understanding of the costs.
- Whether the plan represents value for money.
- Delivery of the benefits.
- Whether the delivery will be completed within the timescales set out.
- The quality of what is being delivered.
- The ESO as a delivery body.

The graph below shows the voting results on a scale of 0-5. This will be used as our baseline confidence levels in our roadmap and what is being delivered, we will look to revisit this at future sessions with industry.



Feedback on Balancing Strategy Review process

The balancing strategy capability review was an intensive couple of months of industry engagement that was crucial in ensuring a future roadmap of delivery was developed with all stakeholders' views considered. The approach for the review was a new approach for the Balancing Programme, and therefore feedback on the engagement piece was important for us to feed into future reviews, not just in the programme but across National Grid ESO.

At both of our in-person sessions, we asked stakeholders to provide feedback on the sessions and our overall approach in addressing this subject with them. Below are some of comments we had back, the openness and transparency of the sessions was welcomed by attendees, something which has been fed back across internal teams at National Grid ESO.

Comment
Thought provoking, engaging day, objective achieved, well done
Good attempt to explain a very complex issue. This whole area is key to making net-zero possible. The investment should be appropriate to implement
Great facilitation and preparation
Engaging and interactive open and honest
Good collaboration and insights from the market participants
Admirable openness. I think more of a framework for how things fit together and the outcomes would have helped
Well organised and great engagement
Been very enjoyable and well facilitated - thanks
Nice pre-read, fun, engaging, good balance.
Very useful discussion and insightful on the degree of change required
Really useful and productive day - thank you
Very transparent presentation of the current status of things. Would have liked to hear more on NG ESO's roadmap.
Great transparent day
Great transparency / very good collaboration / enjoyed seeing control room in action
Session is very important to do, thanks for organising. Would have been good to focus on big themes as well as the detailed points. ESO/DSO coordination, time frame of balancing, bundling vs unbundling
Good energy and open discussion. Lots of grid staff on hand. Could have used separate rooms for groups - noisy and crowded, bit hot. Sausage rolls and maple syrup a winner
Thank you it was great to interact with wider industry and NGESO team. Glad to be part of this transformation journey. All the best
A lot of topics covered, follow up focused sessions would be useful
Good collaborative environment created. Appeared keen to listen to feedback
Lots to unpack from this. Now to breakdown the roadmap by priority areas for focus groups on how these could be scoped/ delivered. Appreciated the transparency and the ability to ask questions.

This also shows a few verbatim comments we received from stakeholders regarding our approach throughout our BCSR

Engaging and interactive, open and honest

This kind of openness is something that I think will really help enable industry stakeholders to 'get inside the heads' of the challenges you see, and help us to be more creative about potential solutions

It is so good the balancing program attracts so much attention. You have changed the image completely for ESO... so much transparency, well done

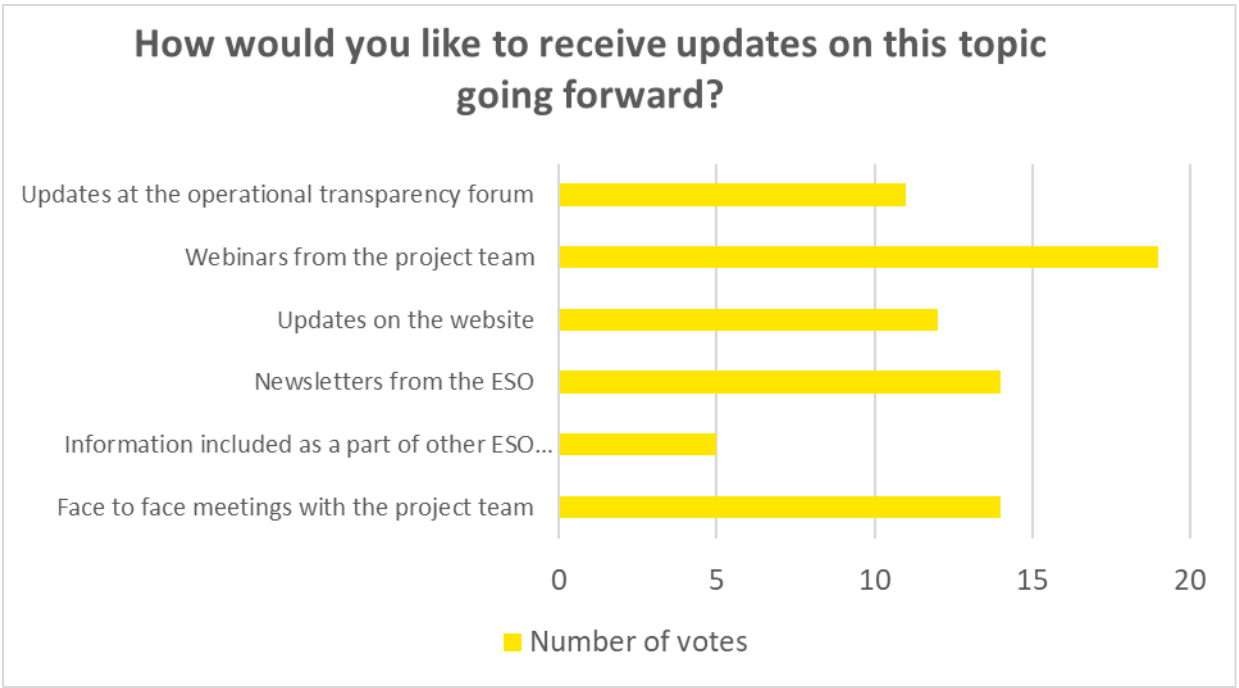
The openness and honesty to which you revealed the challenges facing the control room is very refreshing

Costs need to be measured on scale of industry + society, not ESO Turnover

Building on the review

We have now created a baseline understanding from which to continue to engage with the industry. We understand that this has been an intense series of engagements in a short space of time, and it is imperative that we continue to engage in a transparent and collaborative way to build on success which has been achieved through these events.

We have asked for feedback on our approach for ongoing engagement and the following was received:



Following the feedback through the events, we committed to provide **monthly** progress updates on our website and to have **quarterly** webinars/in-person events which are aligned with our 3 monthly development cycles.

Through this ongoing engagement we will look to provide:

- Transparency on changes to the roadmap, costs and benefits.
- A review of the previous quarter and plans for the upcoming quarter.
- Demos of key functionality.
- Consideration of wider issues and agreeing how they should be incorporated into our roadmap.
- The opportunity for stakeholders to ask questions and provide feedback on our plans.
- A view of dependencies and impacts on market participants.
- Continual review of engagement.

It is our desire that throughout this engagement we can continue to build confidence across industry of the approach, costs and benefits, whilst ensuring that they are kept informed as to the how the delivery of the roadmap impacts them. This will include timely detail for relevant developments, including requirements for interfacing with our technology, for example.

This approach will provide an ongoing route for the industry to understand how the balancing programme is progressing and will offer them the opportunity to shape and contribute in a transparent way.

Conclusion

Working with the industry, we have co-created a proposed roadmap. This plan will deliver at least £1.2bn of direct benefits and enable a significant proportion of the overall benefits our RIIO-2 plan delivers. We plan to continually review progress against the plan via monthly and quarterly updates to industry. This will ensure we can meet our ongoing obligations and deliver value to the end consumer

Useful Links

Event	Description	Link
Strategic Capability Review website	Contains content that has been shared as part of the review	click here
Our Letter to Industry	The letter issues to industry to announce the review and its purpose and our open invitation for people to be involved	click here
Introducing our Strategic Review webinar	Recording of event on the 7 April	click here
Strategic Review workshop	Walk through of the 5 May workshop and mural containing outputs from the day	click here
Strategic Review workshop outputs	First set of outputs from the 5 May workshop presented within a mural board.	click here
Developing the proposed roadmap	Second set of outputs from the 5 May workshop presented within a mural board.	click here
Strategic Review feedback webinar	Recording of event on the 27 May	click here