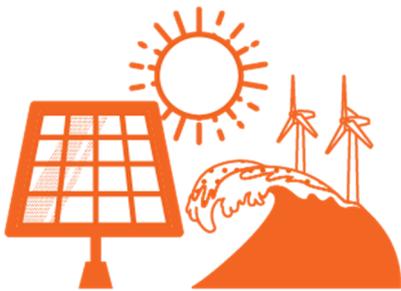


Facilitating the transition to a flexible, low carbon energy system

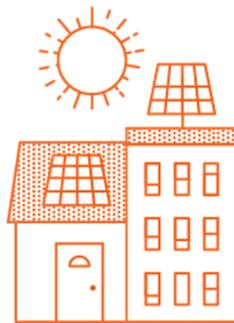
The ESO RIIO-2 Business Plan 2021-23 Executive Summary

9 December 2019

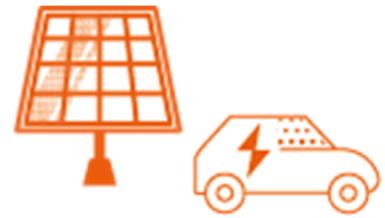
Facilitating the transition to a net zero energy system...



May 2019: Great Britain had its first fortnight without using electricity from coal since the 1880s. **Over 3,500 coal free hours this year.**



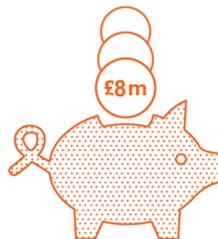
Peak solar generation record. **9.55 GW power generated from solar.**



Embedded generation: in 2012 the industry predicted 12% in 2020, levels hit 27% in 2017.



60% increase in active Balancing Mechanism Units in the system and a **42% increase in balancing service providers** since the beginning of RIIO-1.



£8 million annual efficiency savings in RIIO-2.



2025 when we will be able to operate a carbon free electricity system.

...while providing value for consumers



£2 billion net present value of consumer benefits to be delivered in RIIO-2.



£257 million annual cost of the ESO.



Consumer bills around £3 lower.

Executive Summary

1. The ESO at the heart of the energy system transition

Energy is the lifeblood of our economy and society. As the Electricity System Operator (ESO) for Great Britain, we hold a unique position at the heart of the nation's energy system. Our actions influence investment decisions and markets worth billions of pounds. Our role is critical for the transformation of the energy system.

Supported by a new, bespoke regulatory model designed to drive the right behaviours and outcomes, we will facilitate the transition to a zero carbon power system, helping to achieve the UK's recent commitment to net zero emissions by 2050.



We understand the ESO's duty to meet the current and future needs of the energy industry and its wider stakeholders, and its role in the achievement of net zero emissions by 2050, along with the continued provision of a reliable energy supply at an efficient cost to consumers.

ESO Board

The energy landscape is undergoing a revolution – and change will continue at an even greater pace. The ESO sits at the heart of a complex, multi-directional system of electricity flows. Coal and first-generation nuclear power are being replaced by renewables, storage and demand-side participation. This makes operating the system more challenging than ever before. We are rising to this challenge and have a clear vision for how we and the industry must change, including developing new capabilities and culture within our business. Supported by a new, bespoke regulatory model designed to drive the right behaviours and outcomes, we will facilitate the transition to a zero carbon power system, helping to achieve the UK's recent commitment to net zero emissions by 2050. Alongside this, we will continue to deliver energy safely and reliably and provide value for consumers in everything we do. Our Business Plan identifies the necessary actions and investments to achieve this goal.

Our System Operator (SO) mission¹ is to enable the transformation to a sustainable energy system and ensure the delivery of reliable, affordable energy for all consumers.

Success in 2025 includes:

- an electricity system that can operate carbon free
- a strategy for clean heat and progress against that plan
- competition everywhere
- the System Operator is a trusted partner.

Delivering an electricity system that helps the UK meet its net zero commitments by 2050 is central to our mission.

The development of this Business Plan for RIIO-2 has been an unprecedented and exciting opportunity for the ESO to engage extensively with stakeholders to define and develop our role during a time of significant change. We published two draft versions of our plan, in July and October, and this is our final version.

We provide an overview, at the start, of the feedback we heard from stakeholders and how this has shaped our Business Plan. We also set out, in each chapter of the plan, the specific stakeholder feedback that has influenced our detailed proposals. The broad consensus of stakeholders is that the ESO needs to have a stretching ambition that will facilitate the transition to a net zero economy by 2050 and that investment will be needed in RIIO-2 to achieve this. Accompanying this document is a RIIO-2 Stakeholder Report, where you can find all the feedback we received and how we have responded to it.

¹ Our mission applies to both our Electricity System Operator and our Gas System Operator businesses.

£3

The net reduction in annual consumer bills that we will deliver in RIIO-2.

2. Consumer benefits of £2 billion in RIIO-2

Our Business Plan includes ambitious new outputs to facilitate the transition to a zero carbon energy system. We estimate that these proposed new activities will generate net benefits of around £2 billion for consumers over the five-year RIIO-2 period². Our actions mean that industry costs will be lower than would otherwise be the case through lower balancing costs, avoided network investment, and industry efficiencies. We will deliver our part in the energy transition while at the same time benefiting consumers; **in RIIO-2 we will deliver a net annual saving of around £3 per bill.**³

Some of the major components of these benefits are:

- Investment in our control centre architecture and systems, so we can operate a zero carbon system by 2025. Direct benefits come from reduced emissions and lower consumer bills through reduced balancing costs – delivering consumers a **net present value benefit of £210 million.**
- Working more closely across transmission and distribution networks to take a whole-system view of zero carbon operability. This will reduce consumer bills through avoided network costs and constraint cost savings – delivering consumers a **net present value benefit of £466 million.**
- Transforming network planning by introducing competition between network and commercial solutions. This will promote innovation in ‘non-build’ solutions and reduce bills through avoided asset investment and lower constraint costs – delivering consumers a **net present value benefit of £663 million.**

Types of benefit we deliver



Improved safety and reliability



Improved quality of service



Lower bills



Reduced environmental damage



Benefits for society as a whole

²Net benefits in the document refers the Net Present Value (NPV) of an activity or group of activities. See Annex 2 - Cost-benefit analysis report for more details on how we have calculated NPV

³This is a net saving that includes the £1.80 ESO annual cost per consumer bill in the first two years of RIIO-2 (2018-19 prices). This saving is as a result of our new and transformational proposals only. The ESO's core ongoing role also delivers consumer savings that have not been quantified, so the £3 is likely to be an underestimate.

The financial benefit figure we have estimated for consumers is likely to significantly understate the total benefits that the ESO will drive. This is because it only includes the benefits that are able to be quantified, and does not consider wider environmental improvements or the wider benefits of our core role – providing a safe and reliable supply of electricity to society and the economy.

Key Outputs in RIIO-2



In RIIO-2 we will deliver:

- new Control Centre architecture and systems to operate a zero carbon network by 2025
- new area monitoring and control systems, to ensure power system stability in a low carbon world
- new market and auction platforms to promote competition and enable participants as small as 1MW to participate
- a digital engagement platform to provide a single point of contact for all ESO data and services, enabling a step change in data use and sharing across the industry
- new competitive processes, so that asset and non-asset solutions can compete to meet future transmission network needs
- a streamlined network connection process across the whole electricity system.



We will also continue to:

- operate the electricity system so there is a minute-by-minute balance of supply and demand of electricity
- manage balancing and constraints to minimise costs to consumers
- manage existing balancing service markets, develop future markets and make improvements to facilitate greater transparency, participation and competition
- manage industry revenue flows through playing a leading role in setting charging methodologies
- collect charges for use of the transmission network and balancing services
- continue our electricity market reform (EMR) delivery body role
- manage connection applications for the transmission network, and continue acting as the contractual counterparty for these connections
- plan for the future of the electricity system, including network planning and the *Network Options Assessment (NOA)* process, as well as how this interacts with the whole energy system
- publish a variety of insights and data, including our annual *Future Energy Scenarios*
- deliver IT system changes required by our customers, and those mandated by Great Britain and European Union regulations.



**Consumer bills around
£3 lower**



**Net present value of benefits to
consumers: £2 billion**

3. RIIO-2 is a crucial period to invest in the low carbon energy system of the future

The proposals in our plan have been designed as a coherent suite.

Each individual proposal plays a critical part in supporting the future energy landscape and delivering for stakeholders, customers and consumers.

We propose a set of outputs across four themes that are innovative and ambitious, yet crucial, if we are to achieve Great Britain's policy objective of net zero emissions by 2050. This is in line with stakeholders' ambition for us, and the imperative to rapidly decarbonise the energy system.

Theme 1: Reliable, secure system operation to deliver electricity when consumers need it

As we move to a low carbon energy system, our operating environment continues to change dramatically. We will innovate, invest and adapt to maintain reliable and secure system operation, and realise the benefits for consumers of a decarbonised energy system.

Our proposals focus around three areas of transformational activity:

- expand and transform our Control Centre architecture and systems, so we can operate a zero carbon electricity system by 2025
- training and simulation, to build our capability to operate the system under a range of future decarbonised scenarios, in partnership with the wider energy industry
- innovative ways to restore the system, so we can ensure the future decentralised electricity system is resilient and reliable, at an appropriate and affordable cost.



ESO's core role should move beyond keeping the lights on, to also include facilitating the energy transition.

Flexibility provider

Theme 2: Transforming participation in smart and sustainable markets

Smart and sustainable new markets will be essential for operating a carbon free electricity system. We will need to attract higher volumes of flexibility, such as demand-side response and storage. Our balancing products, markets, processes and IT infrastructure need to be transformed to effectively facilitate decarbonisation and the consumer benefits that follow.

Our proposals focus on three areas of transformational activity:

- build the future balancing service and wholesale markets to attract the volume of flexibility we will need in the future, to achieve the UK's commitment to net zero emissions by 2050
- transform access to the capacity market to deliver security of supply with a plant mix that supports the UK's 2050 carbon target at an appropriate and affordable cost to consumers
- develop code and charging arrangements that will facilitate the rapid change required to achieve the low carbon energy system of the future.

Theme 3: Unlocking consumer value through competition

One of the success criteria for our SO mission is 'competition everywhere'. Theme 2, above, focuses on smart and sustainable markets. Under Theme 3 we propose ways to facilitate greater competition in solutions to network problems, so we can unlock significant consumer value.

During RIIO-2 we propose to:

- deliver new competitive processes, so asset and non-asset based solutions can compete to meet future system needs

extend and enhance the *Network Options Assessment (NOA)* approach, bringing the significant cost savings the *NOA* has already achieved for consumers to other areas, such as end of life asset replacement decisions

- undertake, with industry, a review of the Security and Quality of Supply standard (SQSS) to ensure it is appropriate for the decarbonised energy system of the future
- support Ofgem to develop its thinking on competitively appointed transmission owners, bringing the benefits of competition to a wider range of consumers.



We welcome proposals to build on the Network Options Assessment (NOA) process and facilitate competition in delivery of solutions to network challenges, including through market solutions and non-network assets. Supplier, in response to Our RIIO-2 Ambition consultation

Theme 4: Driving towards a sustainable whole energy future

We need to take a whole system view of the changing energy landscape so we can optimise total costs and facilitate the transition to a low-carbon energy system in a way that maximises benefits to consumers. Our proposals focus on:

- leading the debate on decarbonisation of Great Britain's energy industry, harnessing our significant expertise to identify ways to achieve the 2050 net zero target, and informing policy decisions to support it
- working more closely with Distribution Network Operators (DNOs) and Transmission Owners (TOs) to streamline the connection process, enabling parties to take a more efficient, whole electricity system view
- working with DNOs to explore and deliver innovative ways to achieve zero carbon, whole energy system operability
- developing a whole electricity system approach to outage planning, therefore tackling an area of significant consumer cost.

A coherent set of proposals

These outputs combine to present a coherent whole that meets the needs of our stakeholders, customers and consumers.

- By expanding and transforming our Control Centre architecture and systems, we enable smaller players to participate at scale in our balancing services. This will promote competition and efficient costs.
- The information and insight our Control Centre systems provide will enable us to better understand our requirements for a range of balancing services. This will support better market design, more efficient procurement and system operation.
- As well as developing IT systems and processes to transform access to the capacity market, the same systems will support our balancing services procurement. This will make it easy for parties to engage with our balancing services and to participate in our procurement events.
- The improved modelling and analytical capabilities that result from these activities will facilitate effective competition to meet transmission system needs. This will provide further evidence to support our *NOA* recommendations, delivering greater value for consumers.

We will collaborate widely to ensure the IT systems, market designs and processes described above take a whole system view. This will help ensure compatibility and efficiency across transmission and distribution networks for the benefit of our customers, market participants and consumers.

Delivering our plan

As requested by our stakeholders, we have put together an ambitious set of proposals. We recognise the challenges for delivery and have incorporated strong programme management and specific risk mitigations into our plan. Our strategies, outlined in section 7, for people, culture and capability as well as IT delivery will increase the capability of the ESO to deliver this ambitious plan. Our cost-benefit analysis has shown that for our proposed new outputs, the benefits significantly outweigh the costs of implementation. We will continue to monitor and manage the risks to delivery, bearing in mind the significant value that our actions can provide for consumers in RIIO-2.

4. The ESO is crucial to the transition to a low carbon energy future



An effective ESO can play a crucial and positive role in ensuring that the UK has the ultra-low carbon, affordable, reliable and efficient power system it needs in the near future.

Wider Interest Group

The future is already here

The “three Ds” of the energy transition – decentralisation, decarbonisation and digitalisation – are well known. We are now operating in this future. The “new normal” is an energy system where:

- **renewable and low-carbon technology** dominates how we generate electricity, the way we travel and how we heat our homes
- this technology will be more **decentralised** with significant distributed and local generation, supported by energy storage and demand-side solutions
- consumers **produce, store and sell energy** in response to market signals, based on cost and carbon-intensity, through peer-to-peer trading, smart homes, and participation in our balancing and ancillary service markets
- **advanced data and analytics** change the way market participants interact with us and each other, and enable them to make more informed choices.

The ESO of 2025 will therefore be an organisation that operates the electricity system using new technologies. These will harness the power of **automation, artificial intelligence and machine learning** to efficiently manage tomorrow’s complex energy system. We will **lead changes to markets** so new sources of flexibility, including innovative providers and disruptive technologies, can participate in the low carbon energy mix of the future. We will pave the way for **sharing data** across the industry, which will help improve decision-making and increase transparency. It will be essential for us to work across **transmission and distribution boundaries**, collaborating with network and market companies to solve local and national constraint and balancing challenges together.

To achieve this, we need to invest in new systems and market platforms that will lay the foundation for the decarbonisation of Great Britain’s energy system and help to achieve the government’s recent commitment to net zero emissions by 2050. Importantly, we must also change as a business. Our capabilities and culture must evolve as we become an organisation at the cutting-edge of technology, trusted by the industry and consumers to drive the energy transition.

40

The number of innovation projects undertaken by the ESO since 2013, working with partners across industry and academia.

Innovation

Innovation is at the core of our operating model. It is a key enabler for delivering our Business Plan, driving efficiency, and helping us to lead the transition to a low carbon energy system. The innovation projects we have delivered in RIIO-1 are lowering industry costs, and therefore consumer bills. For example our Samuel Inertia Element project⁴, which aimed to reduce inaccuracies in estimating inertia, will deliver £6 to £10 million of savings for consumers per year. We will continue our strong focus on innovation in RIIO-2 with an expanded core capability and bespoke funding stream with a clear link to the delivery of consumer benefits. We develop our innovation priorities based on major energy system trends, our SO mission, and specific challenges identified by the business. We test these priorities with stakeholders each year, a process which also helps to identify new collaboration opportunities. Our current priorities include tackling issues such as electricity system stability, whole electricity system issues, future markets and the digital transformation.

5. Our proposed investment is efficient and provides value for money

£1.80

the cost of the ESO in RIIO-2 on a consumer's annual energy bill.

Investment in the ESO in RIIO-2

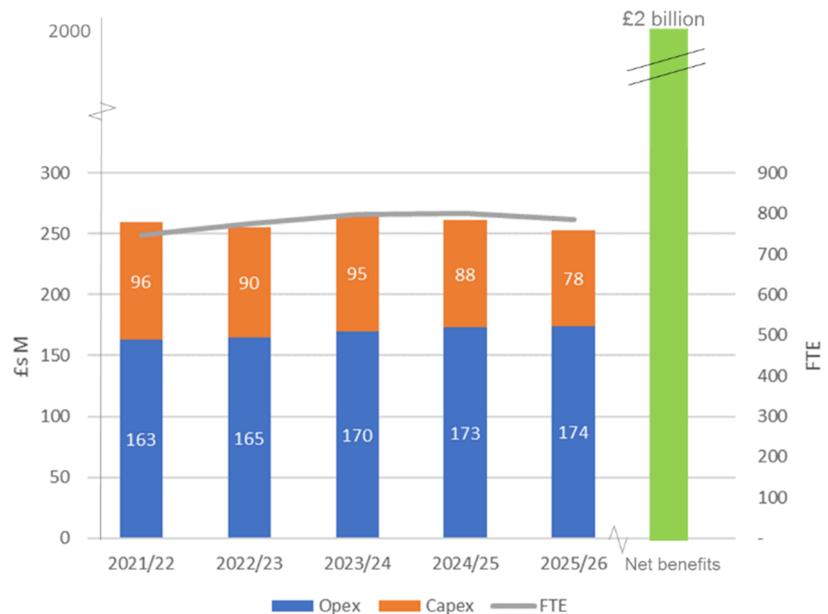
In RIIO-2 the ESO has a two year business planning cycle and our spending will be approved on a two-year basis. The ESO's proposed spending in the first two years of RIIO-2 is on average £257 million per year. This includes £60 million of proposed new investment as well as continued delivery, and enhancements to, the processes and systems we use to carry out our core role. The increase on our £182 million⁵ RIIO-1 annual average spending is mainly due to this £60 million new proposed investment.

Due to the longer-term nature of our investments, we also provide a five-year view of costs in this document. These will be updated in our next Business Plan in 2023.

£2 billion

Net present value benefit for consumers over RIIO-2.

Average annual costs and net benefits



⁴ <https://www.nationalgrid.com/sites/default/files/documents/National%20Grid%20Electricity%20Transmission%20NIA%20Annual%20Summary%202016-17.pdf>, page 17

⁵ This figure has been updated since our October draft plan, based on the updated RIIO-1 cost forecasts in our 2018/19 regulatory reporting pack submissions.

Efficiency

We are committed to making sure we run our business at an efficient cost to consumers. In RIIO-2 we will represent £1.80 on an annual consumer bill⁶. This equates to around 0.3% of the total electricity bill and less than <0.2% of the dual fuel bill. For this we will deliver benefits of around £4.70 – a net reduction of around £3 on each consumer bill.

We conducted an international benchmarking exercise to examine our overall proposed £257 million average annual investment. We also subjected all components of our proposed costs to further efficiency challenge involving cross sector benchmarking. Where our initial proposed costs were higher than benchmarks, we reviewed our delivery plans and challenged our costs so that they fell within benchmarked ranges. All of our proposed spending on new outputs has been subject to cost-benefit analysis to ensure we are focusing on the solutions that provide the most benefit for consumers. As a result, we are confident that we will begin RIIO-2 with a set of costs at the efficiency frontier.

Our proposed annual investment consists of:

- **£71 million direct operating costs, incorporating 10% annual efficiency savings** for the ongoing services we have delivered in RIIO-1 and will continue to deliver in RIIO-2. These reflect the efficiency gains from process improvements, automation and offshoring that we invested in over RIIO-1. Where activity costs have gone up, we have described the external factors that have led to this increase. In RIIO-2 we're committing to a further **1% efficiency stretch target** on these costs, based on international, cross-sector productivity trends, so we stay at the efficiency frontier.
- **£20 million shared service costs** have been benchmarked for efficiency using cross-sectoral data. This benchmarking showed that our forecast costs for RIIO-2 are equivalent to the most efficient companies, after adjusting for costs of being a regulated network and the additional security measures we take to protect our operations from threat. In RIIO-2 we're committing to a further **1% efficiency stretch target** on these costs, based on international, cross-sector productivity trends, so we stay at the efficiency frontier.
- **£106 million ongoing IT costs** to run and grow our core services have been benchmarked for efficiency using cross-sectoral data by Gartner. We conducted a further review of these costs with our application development and maintenance partners. As a result, we can demonstrate that our proposed IT costs are efficient.
- **£60 million investment in new and transformational outputs** has been subject to cost-benefit analysis to assess the consumer benefit case for this investment, and which options should be taken forward. Furthermore, all proposed new capital expenditure has been benchmarked for efficiency by Gartner and our application development partners, as above.

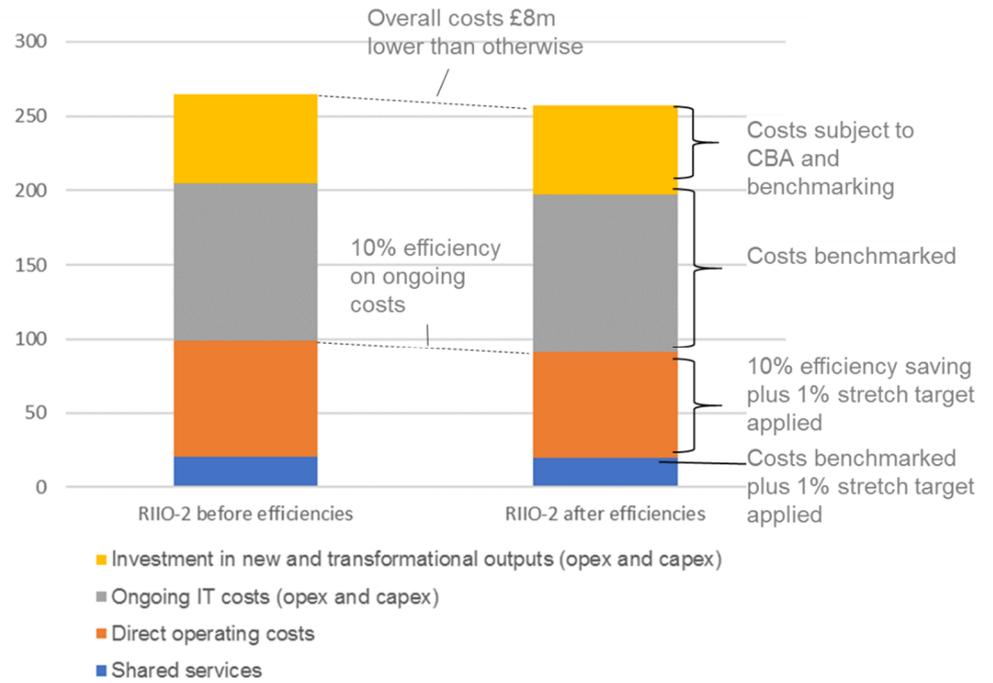
£8 million

Embedded annual efficiency savings.

All components of our proposed spending are benchmarked for efficiency and/or subject to cost-benefit analysis, or subject to an efficiency stretch target.

⁶ This is the annual cost in the first two years of RIIO-2, 2018-19 prices

Annual average spending before and after efficiencies, £ million



All components of our proposed spending have therefore been benchmarked for efficiency and/or subject to cost-benefit analysis, or subject to an efficiency stretch target.



6. A funding model to underpin an ambitious, financeable plan

We want a regulatory framework that enables an innovative, proactive and agile ESO.

RIIO-2 represents a rare opportunity to design a tailored regulatory framework for the ESO: a unique enabling business that provides specialist services and manages significant risk. We deliver, and encourage others to deliver, real value for consumers across the energy system.

In April 2019, the ESO was legally separated from National Grid Electricity Transmission (NGET). This new price control is critical to the success of legal separation. It should encourage the ESO to be ambitious and innovative, and take appropriate risks on behalf of industry and consumers. It should also ensure that the ESO is a financeable, resilient, credit-worthy and sustainable business.

The ESO is a different business from the network companies that are regulated under RIIO. We are an asset-light business that provides a range of services to the industry. These services are not necessarily correlated to our Regulatory Asset Value (RAV) and result in cash flow and revenue volatility at a scale many times greater than the ESO's size. For example, we transact £4 billion of industry revenue every year, which is 20 times larger than our internal revenues. The calibration of our funding model needs to reflect these unique characteristics and incentivise the ESO to deliver first and foremost for consumers.

We believe that the funding model outlined by Ofgem has the potential to achieve this if there are amendments to some of Ofgem's financial working assumptions for the ESO. We have undertaken a financeability assessment in this Business Plan based on Ofgem's working assumptions. Unless changes are made, we do not believe they support a financeable business, or encourage the ambitious and proactive behaviours that are desired by our stakeholders and required to deliver value to consumers. Ofgem's working assumptions do not remunerate some of the services we provide and the risks we hold.

We believe that the appropriate funding model for the ESO includes a weighted average cost of capital against our RAV ($RAV \times WACC$), alongside the additional remuneration needed to recognise the services we provide and the risks we hold. This will enable us to take appropriate risk on behalf of industry and consumers – to be ambitious, innovative and facilitate the transition to a zero carbon energy system. This reflects the views of stakeholders and aligns with what is required to drive a focus on consumer value.



We would be supportive of the ESO's proposal, which will allow for profit margin to be applied and encourage the ESO to be much more service-driven and innovative.

Trade Association

A flexible model to respond to uncertainty

As the energy landscape is constantly evolving, we need a robust process to continue to manage changes and update our activities as appropriate. Our regulatory framework is designed to enable this in two ways:

- Our Business Plan focuses on our activities for the first two years of RIIO-2, in the context of our five-year strategy. In subsequent two-year cycles, we will review the energy landscape as we update our proposed spending and activities.
- Pass-through funding for our costs gives us flexibility to adjust our spending within two-year Business Plan cycles in response to changes to the energy landscape and/or stakeholder needs.

We therefore do not believe we need separate formal uncertainty mechanisms as part of our regulatory framework.

Our capabilities and culture must evolve as we become an organisation at the cutting-edge of technology.

7. The ESO will transform in RIIO-2

We recognise that delivering the ambitious outputs that stakeholders want will require significant change within the ESO. Our capabilities and culture must evolve as we become an organisation at the cutting-edge of technology, trusted by the industry, consumers and citizens to facilitate the energy transition.

We will:

- build on our existing, technical understanding of power engineering to enhance our capabilities in **advanced analytics and data management**
- enhance **IT delivery capability** so we can progress projects in an agile, iterative and fail-fast manner, realising value for consumers as soon as possible from the energy transition
- invest in the **innovation** capability at the core of our operating model, making sure we are maximising the potential of technological change to deliver our Business Plan commitments and decarbonise the energy system
- develop a workforce that operates in a **culture of leading by empowering**, with a collaborative mindset striving to achieve a shared ambition of net zero by 2050. ESO colleagues will respond to business and customer needs in an agile manner, within a supportive environment that encourages innovation and balanced risk-taking.

Our ESO culture will continue to be supported by strong core leadership values to drive collaboration, create the future, take bold and brave actions, tell compelling stories that inspire belief, and lead with influence and presence.



Strongly welcome the ESO's efforts to put forward an ambitious plan that sets clear goals and reflects stakeholder feedback.

Trade association

8. Investing to create an ESO for our shared, low carbon future

We are excited by the opportunity that RIIO-2 presents for us to step up and be the ambitious, consumer-focused ESO that our stakeholders want us to be. Our proposed new activities will facilitate the transition to net zero emissions by 2050 and provide net benefits of £2 billion over the RIIO-2 period. This translates to a saving of around £3 on every consumer's annual bill. Climate change is the challenge of a generation, and the time to act is now. Supported by an appropriate funding model, we will work with stakeholders to innovate and deliver benefits for consumers as we transition to the zero carbon energy system of the future.

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