Our business plan for 2023-28: a draft for consultation

July 2021
Who we are

At Northern Powergrid we are proud to provide an essential service to eight million people in our region. We take that responsibility seriously and believe that our customers should get a service that is second to none. In short, our aim is to be the best at what we do.

Where we are in the process

This is our draft business plan for the RIIO-ED2 price control period, which runs from 2023 to 2028.

We have been building our plan through an extensive programme of engagement with our stakeholders over the past two years. As part of this we released our Emerging Thinking consultation in August 2020 and have been engaging on a range of costed options and refining our plans with stakeholders.

This feedback has shaped the outputs that we plan to deliver in RIIO-ED2. Our draft plan sets these out along with how much they will cost, the benefits they will provide and how we will measure our success. We will continue to engage on our plan through to final submission to Ofgem in December 2021.

October 2019
Our DSO v1.1 publication

August 2020
Our Emerging Thinking publication

July 2021
Initial business plan submission

December 2021
Final business plan submission

June 2022
Draft determinations

December 2022
Final determinations

Start of the 2023-28 price control

Developing our plan with you

Refining our plan with you

Ofgem determinations

WE ARE HERE

8m people served

63,000 substations

3.9m homes and businesses

96,000 km of overhead lines and underground cables

25,000 sq km of network

2,450 people in our workforce

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Supporting documents:

+46 Annexes
+61 Engineering Justification Papers (EJPs)
+46 Cost benefit analyses (CBAs)

To see our list of annexes, EJPs and CBAs, visit ed2plan.northernpowergrid.com
We are proud to lead the Northern Powergrid team that provides the North East, Yorkshire and northern Lincolnshire with the electricity network that powers everyday life for more than eight million people across 3.9m homes and businesses.

Efficiently delivering a top-class service where the lights stay on, the network stays healthy and our customers enjoy outstanding, ever-improving levels of personal service has always been both a rewarding challenge and a considerable responsibility. Living up to those demands already makes us one of the biggest investors in our region. Those challenges and responsibilities have become even more significant given the importance of energy to the global, national and regional challenge of decarbonisation.

The future presents an opportunity to power our region with sustainable, long-term investments that unleash the potential of innovation, digitalisation, our people and collaboration to:

- lead the drive towards decarbonisation;
- operate a highly reliable and resilient network;
- delight our customers with outstanding service;
- provide remarkable value for money;
- ensure world-class levels of safety and security; and
- be a force for good throughout our region and beyond.

The plan we have put together, with our stakeholders’ help, for the 2023-28 regulatory period means changing the way we run our business. We must take a leading role in enabling our region to play its part in meeting the UK’s target of reducing carbon emissions by almost 80 per cent by 2035. Our network will be instrumental in facilitating this change, as it sits at the heart of a decentralised, low carbon energy system, and we will be working across that whole system to find innovative ways to deliver on that target. That will be enabled by a 36 per cent increase in investment, centred on enabling customers to participate in finding flexible solutions that make for a more efficient transition to the lower carbon world.

There are also a whole host of other improvements we are going to make for our customers across every area of our business. These include higher levels of reliability and resilience, more targeted support for those members of our community who need it the most, and even better levels of customer satisfaction than the 9/10 rating we already deliver.

Our stakeholders have made it clear to us that all of these priorities matter to them, but decarbonisation is the biggest and most important challenge. Although we know what the end result must be, and the broad changes that will have to be made to achieve it, the specific pathway to net zero is inevitably uncertain.

We believe that our task is to embrace that uncertainty and chart an optimised course through it. We will do that by building on a track record of being among the industry leaders on efficiency, ensuring that we develop an increasingly flexible and innovative approach to running and investing in the network that opens up all the credible pathways to decarbonisation as affordably as possible.

Although this is a five-year plan, it has to begin to solve problems where the answers will manifest themselves over the next 25 years. In that respect, the long-term horizon of our owner – Berkshire Hathaway Energy – has been a real strength. We have been able to take decisions to make investments now that will make the overall transition both more likely to succeed and cheaper in the long run. They will also help to power the economy in the region as, together, we work to drive economic growth, supporting the government’s ambitions to spread prosperity across the country and repair the damage done by the pandemic.

Phil Jones
Chief executive
The future presents an opportunity to power our region with sustainable, long-term investments that unleash the potential of innovation, digitalisation, our people and collaboration to:

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- Ensure world-class levels of safety and security
- Be a force for good throughout our region and beyond
Building a business plan that responds to your choices

Big levels of ambition and big changes

Our extensive stakeholder engagement programme explored a full range of costed plan options, with five different levels of service across 12 output areas for our business. After engaging with more than 52,000 stakeholders at hundreds of events, you have been very clear that we have to balance ambition with affordability.

Decarbonisation is the most significant change our industry has faced in decades. Certainly it is the biggest driving force that has shaped our plans. We know decarbonisation is the top priority. You’ve also told us that overall reliability and resilience of the network is very important and will remain so, strengthened by increased reliance on electricity as we decarbonise. You want us to meet these priorities while keeping bills low.

Building on our track record of delivery

Our track record of delivery so far in the eight-year regulatory period that runs from April 2015 to March 2023 is strong. We promised to give you ‘more for less’ – and we have made good on that. We are on track to deliver our 53 business plan commitments and in many cases we expect to significantly exceed our targets, while investing more than £3.2bn into our business.

Our investment has also helped prepare us for the challenge ahead in the next period, which will take us from April 2023 to March 2028. By the end of the existing period we will have delivered our flagship smart grid enablers programme, increasing our ability to control and analyse how the network is operating in real time and target our investment efficiently.
12 output areas

Balancing ambition with affordability

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Shaped by our engagement with you

- >52,000 stakeholder interactions
- >325 events
- >55 panels
- 89% stakeholder acceptance (domestic customers)
Ensuring our region can decarbonise is the top priority

Our stakeholders have been clear that ensuring our region can decarbonise is paramount. Our network has to be geared up to service new demands for electricity, and it is going to have to meet those requirements in an increasingly sophisticated way.

We believe that the best way to do that will be through a decentralised energy system based around locally connected renewable generation, electricity storage solutions and demand that can flex to help keep overall costs down, facilitated by a network that is smarter and more flexible than ever.

We have optimised our investment strategy for a network that can serve our region as it decarbonises by planning for one of the steeper pathways to decarbonisation from the 2030s and onwards, opening up all the credible pathways to decarbonisation.

Our plan reflects our expectation that customers will change their consumption patterns in response to price signals in the energy market, reducing the strain on our network at times of peak demand, and potentially saving customers over £113m during the period.

Although we have built a detailed plan based on the projections that tie to the government’s current 10-point plan for decarbonisation, the reality is that nobody really knows yet how the journey will unfold. That’s partly what makes it an opportunity as well as a challenge.

We think that by embracing and managing uncertainty we can efficiently open up credible pathways to decarbonisation and allow our customers to make many of the choices that shape the future. That means keeping pace with the growth we can already see emerging and making sure we do not leave too much to do in the 2030s. In doing so we will make that transition as efficient and therefore as affordable as possible and ensure no one is left behind, by maximising both the use of flexibility and synergies between the investments we need to make for decarbonisation and for asset resilience.

Our flexibility-first approach is key to enabling us to manage this uncertainty.

To do all this efficiently, we will operate an even smarter and more flexible energy system for our customers. We will advance the optimisation of the costs, functionality and performance of energy services for customers through widespread collaboration to improve the whole energy system.

Delivering substantial decarbonisation savings through our asset resilience investments...

The long-term condition and performance of our asset base will be efficiently managed so it is safe, reliable, environmentally friendly and resilient, all with a long-term view on the capacity needs of the potential decarbonisation pathways. Our plans continue to provide what is needed to maintain the long-term health of the asset base. We intend to make the most of the benefits from our asset replacement investments to deliver long-term value for our customers by factoring in ‘two-for-one’ outcomes where we can create overlap between our decarbonisation and asset replacement investment. Doing this will not only open up accelerated pathways to net zero, but it will also drive significant synergy savings, potentially of up to £471m.

...and a more reliable network for our customers

You’ve told us that the overall reliability of our network is also very important. We need to install significantly higher volumes of remote switching and network automation so that our customers get the service they deserve.

We will deliver a step change in the deployment of automation onto our network by investing £64m on the high voltage (HV) network, doubling our rate of installation, coupled with operational improvements and use of innovative technology to manage our low voltage (LV) network.
The big questions about the future:

- How electrical?
- How local?
- How flexible?
- How fast?

We have planned for a world where there are:

- 941k electric vehicles by 2028
- 309k heat pumps by 2028

Making the most of flexibility:

1. Monitor
2. Manage
3. Reinforce

- Network flexibility: Deploying smart grid solutions
- Customer flexibility: Contracted and energy price-driven flexibility
In all other areas of our business, we will — again — do more for less

You told us that you expected us to improve in all the other areas of our plan, which is what we expect of ourselves. In fact, wherever possible, we seek to go beyond our stakeholders’ expectations.

**An outstanding level of customer service**

— Provide a service that is personalised, proactive and provides choice in how and when to do business with us.
— Backed by the latest customer-facing systems and use of data, we will use our interactions with customers to support their journey to decarbonisation and deliver a service that is second to none.
— Planned service improvements that we believe will increase our customer satisfaction rating to 93.5 per cent or more (by the end of 2028).

**Vulnerable customers will be at the centre of our thinking**

— Use data and strong partnerships to provide tailored services.
— Support customers in fuel poverty and support a socially inclusive transition to net zero by minimising barriers to enter the energy market so that no one is left behind.
— To support this, our customer-facing and front-line staff will have the ability to update our Priority Services Membership (PSM) in real time.

**A cost-effective, efficient and personalised connections service**

— Our connections service will be smarter, with more flexible solutions that support the connection of low carbon technologies (LCTs) onto our network in support of the transition to net zero.
— The development of our AutoDesign tool will enable customers to self-serve and generate quotations for LV demand and load increases, and budget estimates for new generation connections.

**We will be energy industry leaders in safety**

— Our number one priority will continue to be to keep our colleagues and members of the public safe so that they can return home safely at the end of the day.
— We will achieve this through being proactive in assessing and mitigating emerging safety risks, collaborating with others and exploring potential innovation and technologies that offer opportunities to make our network and operations safer, focussing on leading causes of injuries, and continuing to reduce exposure to high-risk activities.

**Proactively protecting the environment**

— Through our investments and operations, we will work collaboratively with partners and our supply chain to deliver innovative, cost-effective solutions that reduce or eliminate environmental risk exposure.
— Minimise carbon emissions, pollution and waste and, where possible, seek to enhance the local environments in which we operate.
— Reduce SF₆,¹ and increase the proportion of ultra-low emission vehicles/zero emission vehicles (ULEVs/ZEVs) in our fleet to 40 per cent.
— We also intend to work with regional partners to implement biodiversity improvements across 200 sites to enrich and conserve the wider environment.

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1. Sulphur hexafluoride, a greenhouse gas.
Adapting our network and operations to increase resilience against the effects of climate change

— Work collaboratively and use innovation to develop new solutions to address the range of potential climate change pathways and consider wider system interdependencies.
— Maintain flood defence resilience at all major substations.

Strengthening our cyber and physical security

— Keep our network, assets, data and customer information safe from evolving threats by further strengthening our cyber and physical security.
— Our plans to open up our network and data for the benefit of our customers will be matched by a focus on high levels of security enabled by the deployment of the latest technologies.
— Protect our systems from cyber and physical breaches.

A force for good in our communities

— Our position in the regional economy creates the opportunity and responsibility for our business to be a force for good in our communities.
— By March 2028, we will deliver tailored social impact programmes at 50 per cent of major schemes when we are undertaking major investment works.

Remain open and transparent in how we operate

— Earn the trust of our stakeholders in delivering Distribution System Operation (DSO) in our region.
— Continue to report on the delivery of our commitments, open ourselves up to scrutiny and support new and existing markets by providing open data, taking a flexibility-first approach and facilitating competition.

Support for our plan

“I am greatly supportive of Northern Powergrid’s business plan, which helps support the drive to decarbonisation and offers the right balance between cost and investment. I urge Ofgem to approve the investment.”

Alexander Stafford MP
Rother Valley
Unleashing the potential of...

### Data and Digitalisation
- **61** initiatives underpinning our plan
- **70%** increase in no. data products and services
- **45%** of data products and services refreshed in real time

- **Open and transparent**
  Enabling innovation and development of new markets while delivering net zero at the lowest cost

- **Whole energy efficiency**
  Preparing for both a cost- and carbon-optimised whole energy system

- **Service excellence**
  Delivering seamless, efficient service with more choice and personalisation

- **Cyber secure**
  Responding to and mitigating the cyber threats of increased digitalisation

- **Reduced cost**
  Driving lower cost, efficient operations, front and back office

### Innovation
- **65** initiatives underpinning our plan
- **£278m** of totex savings from innovation

- **Charting the best course to net zero**
  Developing and deploying technologies and creative solutions that enable faster, lower cost pathways to decarbonisation

- **Collaboratively unlocking the value of open data**
  Working with partners to open up new channels that significantly, efficiently and effectively increase the exploitation of data flows across the whole energy system

- **Achieving next-level energy system dependability**
  Increasing the reliability, resilience and security of the power grid to improve not only its own dependability, but also that of the overall energy system

- **Ensuring all customers benefit**
  Promoting and safeguarding the interests of customers, particularly those who may otherwise be significantly disadvantaged or left behind in the energy system transition

### Our People
- **>1,000** new job opportunities
- **>40** new roles created to linked DSO

- **Creating more than 1,000 jobs**
  Renewing and growing our workforce with high-quality job opportunities to meet the significant increase in work volumes driven by decarbonisation and to meet future energy needs

- **Upskilling and multiskilling**
  Increasing our skills capacity and capabilities through investment in upskilling and multiskilling to provide rewarding career paths and develop the new capabilities required for DSO

- **Increasingly diverse and inclusive**
  Service excellence delivering seamless, efficient service with more choice and personalisation

- **Increasing engagement, partnerships and satisfaction**
  Enhancing how we engage with our colleagues and trade unions to continually improve our safe workplaces and operations

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To deliver the ambitions we are setting out requires some very significant changes in the way we operate. We have identified three cross-cutting capabilities that will be essential: cutting-edge innovation, transformational use of data and digital technology, and a highly skilled, diverse team.

We know that we must take our use of digital platforms to the next level to play our part in optimising the whole energy system, providing a resilient and efficient service for our region. As part of this we will deliver an online platform which will bring together the data and tools customers require to self-serve their requirements. We will provide high-quality open data to enable customers to self-serve, while upgrading our technology to improve network management, planning and investment to increase efficiencies in operating the power network.

In our innovation programme, a particular focus will be to accelerate the creation of next-generation energy systems that balance the targeted development and deployment of solutions. We will explore potentially transformational technologies to unlock as yet unimagined benefits for next-generation energy system customers.

Everything we plan to do relies on us having a team of skilled, dedicated colleagues. The demand for new skills that are greater in number and more diverse is key to our success. We are proud of the team we have now – but we are aiming to build on that and create a bigger, stronger pool of talent to serve our customers. Our approach to attracting, engaging and managing people will create an increasingly diverse workforce and a great place to work, allowing us to deliver the commitments we’ve made in this plan.
Our ambitious plan means we will need to attract even more talented people – many of whom don’t know us yet or may think we’re not for them. We will continue to strengthen our approach to attract and retain a diverse range of talented people, so we can deliver for our customers and provide rewarding careers in an inclusive workplace where everyone can thrive.

Angie Patterson
Director of organisation development

As someone who joined the industry as an apprentice in my teens, I'm passionate about investing in the growth and development of our future workforce. It’s an exciting time for the power industry as we play an increasingly important role in our region’s transition to net zero, which will bring new challenges and opportunities for our people.

Andy Bilclough
Director of field operations
Major investment in decarbonisation and improved reliability

### Decarbonisation

- **All credible decarbonisation pathways supported**
  - On track for net zero by 2050 or sooner
  - Network positioned for mass uptake of LCTs – by 2028:
    - 831k more electric vehicles
    - 251k more heat pumps

### Open energy system data

- **70% increase** in the number of available data products and services
- **45%** refreshed in real time via automated processes
- **Data portal** – new analysis and self-serve tools
- **Support for local authorities** on the development of local area energy plans

### Reliability

- **£169m of flexibility and smart grid savings**
  - Flexibility-first approach – monitor, manage, reinforce
  - 50% ground-mounted substation-fed
  - LV networks covered by monitoring
  - Online flexibility platform
  - Dedicated team to support green market development

### Asset Resilience

- **>£253m of whole system value from optimising network voltage to improve energy efficiency to consumer in 2023-28 and beyond**
  - C. **£20** reduction in customer energy bills and lower carbon emissions by dynamically managing voltage for customers on our LV network

- **12% fewer and 25% shorter power cuts by 2028**
  - **£64m** automation programme targeting the worst-performing parts of our network
  - **£2.5m** investment for 2,400 worst-served customers
  - Bespoke commitments to reduce multiple and long-duration power cuts

- **Up to **£471m** of synergy savings between asset renewal and decarbonisation investment in the period to 2050**
Delivering more for less

### Environmental Action Plan
- 20% reduction in internal business carbon footprint
- On a path to carbon net neutral operations by 2040
- Science-based targets to measure our overall impact
- 15% less oil lost to ground
- Compliance with PCB legislation
- >60km of undergrounding cables to improve visual amenity
- 200 sites with biodiversity improvements
- 90% of waste diverted from landfill

### Safety
- Maintain industry-leading safety performance
  - 50% reduction in workforce accident rate
  - 50% reduction in contractor accident rate
- Improve health and mental wellbeing in our workforce
- 55,000 school children engaged on electrical safety per annum
- Fleet vehicles equipped with defibrillators

### Climate Resilience
- Maintain all high-risk major substation flood defences to ETR138 standard
- Collaborative work with regional infrastructure providers on interdependences

### Physical and Cyber Resilience
- Continued investment to maintain high levels of protection for our network and customer information

### Customer Service
- >93% customer satisfaction
- New contact channels, greater on-site support and choice in booking slots for planned services
- >90% complaint resolution within one day
- Support for flexibility providers and data users

### Vulnerable Customers
- Provide enhanced support during power cuts
- Support 100,000 customers in fuel poverty with affordability services unlocking up to £40m of benefits

### Our Communities
- 50% of our major investment schemes with tailored social impact programmes
- Support for science, technology, engineering and maths (STEM) subjects and careers
- Community energy advice for local stakeholders

### Connections
- 20% reduction in small works lead times
- More self-service options, greater support and more flexibility over delivery
- Expanded capacity heat maps
- Support for smarter solutions and expanded range of flexible connections

### Openness and Transparency
- Openly report on investment appraisal processes — demonstrating flexibility first
- Retain our Customer Engagement Group (CEG) to scrutinise the delivery of our plan and on-going engagement
- Drive sustainability standards throughout our supply chain

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1. Polychlorinated biphenyls.
A 36% step up in investment

Total expenditure (+170.9m) per annum

Investment in the network to add digitalisation and smart grid solutions and provide significant amounts of new capacity to cater for growth in LCTs

Includes £16.9m of investment to efficiently add extra capacity required for the future decarbonisation pathways

Includes £5.2m of investment in decarbonisation-enabling activities in other areas of our plan

471.2

3 step-up investment areas

148.1

10.9

14.2

2.3

642.1

2015-23 costs

Decarbonisation plan

Asset Resilience

Reliability and Availability

Remaining costs for other service improvements

2023-28 costs

Significant efficiencies

£396m (12%) of totex efficiency savings embedded in our plan

Building on our efficient cost base, which benchmarks upper quartile in the industry, we have embedded sizeable efficiency benefits in our plan, 70 per cent of which are driven by innovation.

Volume efficiencies £m

111

Unit cost efficiencies

19

Flexibility and smart grid solutions

169

Core asset plan synergies

66

Service improvements offset by efficiencies

31

Embedded efficiency % of ED2 totex

396

12%

£471m of decarbonisation synergy savings beyond 2028

We will optimise our asset renewal investments to deliver capacity for decarbonisation pathways; investing an additional £84m in the 2023-28 period to save an estimated £555m in the period from 2028 to 2050

£136m of financing savings

The key financial parameters for 2023-28, including cost of debt and cost of equity, will reduce allowed revenue compared to the current period

1. Figures include real price effects (RPEs) and ongoing efficiency.
2. Excludes ongoing efficiencies.
3. Assuming 2.09 per cent cost of debt and 5.80 per cent cost of equity at 60 per cent gearing.
Great value for our customers

The increase in investment we need to make is driven by the additional £148.1m p.a. we are expecting to invest in enabling the decarbonisation transition. We will spend an extra £10.9m p.a. to keep our network in good condition and maintain its resilience. This increase is primarily driven by ‘two for one’ synergistic investment opportunities, where we will efficiently add extra capacity required for the future as we replace or refurbish degraded parts of the network. There is also an increase of £14.2m p.a. relating to the investment needed to deliver the significant reliability improvements our stakeholders are looking for.

Set against that, the cost of delivering the material service improvements in all nine other areas of our business will fall by £2.3m p.a. compared to the current period, as we make the same promise in that respect: we will deliver more for less. The cost of financing our business has also fallen significantly. When that is added to the more efficient ways we’ve found of delivering our outputs, we take pressure off our customers’ bills, which helps keep them affordable at a time where a significant increase in investment is needed.

There’s no getting away from the reality that the increased investment has an impact on your energy bills. Taken in isolation, that additional investment would increase an average domestic customer’s bill by around nine per cent, which is 64 pence per month, or £8 a year. But the other savings help offset this. The overall impact on the bill depends on some important decisions our regulator needs to make about how to bring forth the investment that is needed for decarbonisation and how the responsibility to pay for that investment should be shared between this generation of customers and the ones that follow.

Under Ofgem’s current working assumptions, our charges in 2023-24 would actually be about £5 lower than in 2022-23, falling from about £90 to around £85 p.a.

We don’t believe Ofgem’s approach is sustainable. It’s important that Ofgem does not risk underinvestment when upgrading the network is more important than ever. And Ofgem must resist the temptation to push too much of the costs onto our children’s generation just to keep current bills artificially low.

Under our proposed approach – with an appropriate return on investment and where costs are fairly shared between current and future customers – our charges would increase by about £4.60 in 2023-24, from £89.80 to £94.40. That’s a 36 per cent increase in investment for a five per cent increase on the bill.

We think this represents great value.

We will keep on listening

We have built this plan on an engagement programme that dwarfs anything we have done previously in that respect. And that process will never end. As we strike out on this journey, we will continue to work hard to engage with our stakeholders and let them shape our plans as they adapt. We will:

— ensure that our engagement reaches and includes a diverse range of individuals, groups, experts and locations that represent the communities we serve;
— increase the use of new communications channels, remove engagement barriers, and increase cooperation with a wide range of local organisations so innovative thinkers and future customers access and contribute to our engagement;
— provide additional ways to discuss complex topics and tailor communication approaches so that we deliver engagement that promotes an understanding of priority topics such as decarbonisation and an inclusive energy transition; and
— continue to mature the skills, processes, infrastructure, and capacity of communities, customers and our own teams to ensure engagement is two-way, measurable and transparent.

Support for our plan

“I have been delighted to be involved in the very broad and all-encompassing engagement process that Northern Powergrid has undertaken, which has been extremely impressive and inclusive.”

Maggie Bosanquet
Low carbon economic development team leader, Durham County Council

1. Under our proposed financial parameters – see page 196.
Our track record underpins the credibility of our plan.

We believe our track record in 2015-23 and prior regulatory periods provides confidence in our business plan for 2023-28. Given our responsibility to our customers, and the importance of the next decade in society’s transition to net zero, it is key that we deliver on our promises to support the needs of our customers and local economies on this journey.

You can count on Northern Powergrid as a company with...

— a reputation for making robust plans and delivering on them;
— demonstrable adaptation to the changing energy landscape and progress to Distribution System Operation (DSO);
— a proven track record of innovation and collaboration;
— evidence of strong financial management and efficiency; and
— committed and responsible investors with a long-term outlook.

Our plan involves a step change in activity levels relative to today to enable decarbonisation. Details of our delivery plans to support this are set out in the Delivery section.

We have a demonstrable track record of making robust plans.

We take a long-term outlook to our planning. Distribution Network Operators (DNOs) have a responsibility to appropriately manage risks on behalf of their customers and we believe in incentive regulation as the most effective way to ensure this occurs.

The business plan we developed back in 2012-13 and are delivering for the current eight-year period has proven to be robust. Our costs have tracked closely to our forecasts year-on-year and we have effectively managed risks that have emerged in the period.
We are on track to deliver our current business plan

We will fulfil our promise to customers to deliver ‘more for less’.

We made 53 commitments in our 2015-23 business plan and we are on track to deliver these, and in a number of cases go significantly further, keeping costs low and delivering our asset health targets (see figure 1 and 2).

Our output performance is strong, in many cases ahead of Ofgem targets.

Safety is, and will always be a priority. We are proud to be exceeding our commitment to halve our accident rate, most recently achieving 690 days without a lost time accident. Another highlight for us has been our Reliability and Availability performance. So far we have achieved reductions of 27 per cent and 37 per cent in customers interrupted (CI) and customer minutes lost (CML), substantially outperforming what we committed to in our 2015-23 business plan (eight per cent and 20 per cent respectively).

We have achieved significant improvements in Customer Service performance over the current regulatory period, securing an eight percentage point improvement that means we are now consistently delivering satisfaction of over 90 per cent. We have achieved this through a significant expansion of our digital service offerings, investment in our front-line services and responding to customer feedback. Despite this improvement, we rank fifth in a tightly grouped industry, two percentage points behind the industry leaders and we are targeting further improvement for the remainder of the period to close the remaining gap.

We have improved our Connections small works lead times by 18 per cent since the start of the period, and satisfaction levels with our services have increased by 10 percentage points to 88.9 per cent. Our primary focus is on delivering a personalised service to maximise customer satisfaction. As part of this we offer on-site visits for customers where required, which can extend lead times for quotations. Our lead times in 2020-21 (shown in figure 3) were impacted by COVID-19 lockdowns, in particular where non-domestic customer sites were closed. We have been working to recover the backlogs during 2021 and we are targeting significant improvements in our delivery lead times in the remainder of the period. For major works connections, we have delivered on our incentive on connections engagement (ICE) plans and received no penalties. Continuing and strengthening this performance is central to our approach for the next planning period as we accommodate more low carbon technologies (LCTs) onto our network, as is prioritising a personalised service to meet customers’ specific needs.

Our Social Obligations performance has been consistently high performing, ranking in the top three companies in Ofgem’s stakeholder engagement and customer vulnerability (SECV) assessment for the past three years. Our SECV score of 6.71 out of 10 in 2019-20, placed third out of five DNOs in the assessment and fifth out of the wider 13 network companies.

1. All costs shown in the track record section are stated in 2012-23 prices.
2. Based on 2020-21 performance.
3. Based on our 2015-23 average reduction versus our business plan baseline.
In a similar vein, we have exceeded the Environmental commitments in our current business plan and have set stretch targets to go further. We have achieved significant reductions in our business carbon footprint (BCF) and sulphur hexafluoride (SF6) losses, by 48 per cent and 23 per cent respectively. We have continued to effectively manage losses on our network by implementing our losses strategy. Our action plan has reduced annual losses by about 1 gigawatt-hour (GWh), and we have undertaken a number of initiatives to further our understanding and management of losses including trialling innovative amorphous core transformer technology, which we plan to roll out as business as usual during 2023-28. We committed to reducing oil and fluid leakage by 15 per cent and we have already surpassed this, achieving a 47 per cent reduction to date. We also committed to removing about 100km of overhead lines from Areas of Outstanding Natural Beauty (AONB) and, following engagement with our stakeholders, we have committed a further £2.1m for an additional 20km, which has been funded from efficiencies in other parts of our plan.

Figure 3: 2015-23 output performance

<table>
<thead>
<tr>
<th>NPg</th>
<th>Unit</th>
<th>2020-21 actual</th>
<th>2020-21 target</th>
<th>Status</th>
<th>2022-23 target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety</strong></td>
<td>Occupational Safety and Health Act (OHSA) accidents</td>
<td>Rate</td>
<td>0.18</td>
<td>0.27&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Health and Safety Executive (HSE) compliance</td>
<td>Hit/miss</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td><strong>Reliability</strong>&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Customer Interruptions (CI)</td>
<td>Northeast CI</td>
<td>44.10</td>
<td>58.60</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Yorkshire CI</td>
<td>51.70</td>
<td>61.30</td>
<td>Green</td>
<td>50.00</td>
</tr>
<tr>
<td></td>
<td>Customer Minutes Lost (CML)</td>
<td>Northeast CML</td>
<td>35.00</td>
<td>49.20</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Yorkshire CML</td>
<td>38.80</td>
<td>53.40</td>
<td>Green</td>
<td>35.40</td>
</tr>
<tr>
<td><strong>Customer Service</strong></td>
<td>Overall survey</td>
<td>Score</td>
<td>9.05</td>
<td>8.20</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Complaints metric</td>
<td>2.80</td>
<td>8.33</td>
<td>Green</td>
<td>1.80</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Time to quote (LVSSA)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Days</td>
<td>6.70</td>
<td>4.80</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Time to quote (LVSSB)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Days</td>
<td>14.20</td>
<td>7.80</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Time to connect (LVSSA)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Days</td>
<td>48.70</td>
<td>39.30</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Time to connect (LVSSB)&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Days</td>
<td>78.50</td>
<td>47.90</td>
<td>Green</td>
</tr>
<tr>
<td><strong>ICE penalty</strong>&lt;sup&gt;7&lt;/sup&gt;</td>
<td>£m</td>
<td>Nil</td>
<td>N/A</td>
<td>Green</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>Social Obligations</strong></td>
<td>SECV Rank</td>
<td>3&lt;sup&gt;47&lt;/sup&gt;</td>
<td>N/A</td>
<td>Green</td>
<td>2&lt;sup&gt;47&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>Oil leakage</td>
<td>Litres</td>
<td>28,055</td>
<td>47,540&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>BCF&lt;sup&gt;8&lt;/sup&gt;</td>
<td>tCO₂e</td>
<td>31,241</td>
<td>55,975&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>SF₆ emissions</td>
<td>kg</td>
<td>73.10</td>
<td>112.00&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>Fluid-filled cable replaced</td>
<td>km (cum)</td>
<td>176.5</td>
<td>122.8&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td><strong>Visual amenity investment</strong></td>
<td>(versus allowance)</td>
<td>£m</td>
<td>11.6</td>
<td>9.2&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>94%</td>
<td>75%</td>
<td>Green</td>
<td>(111%)</td>
</tr>
</tbody>
</table>

For more information on our delivery of our 2015-23 business plan commitments, see our SLC50 Stakeholder Report.

2. Ofgem targets unless otherwise stated.
3. Northern Powergrid ED1 business plan target.
4. All figures are unplanned, excluding exceptional events.
5. LVSSA customers are those seeking single domestic connections requiring no mains work at low voltage.
6. LVSSB customers are those seeking between two and four domestic connections or one-off commercial connections at low voltage.
7. 2019-20 actual, 2020-21 result not available at time of submission.
8. Figures include contractor emissions and exclude losses.
9. Cost allowances for visual amenity.
We are evolving with the changing energy system

Our transition to DSO has been in progress for some time. As the only DNO to submit and receive funding for a specific smart grid enabling plan at the start of the current price control period, we are confident that we are well on the way to laying the foundations of a more active, flexible and dynamic digitalised energy network. We have also kept pace with reinforcement requirements on our network, putting us in a particularly strong position with higher voltage headroom on our network.

We set out our vision for DSO in our development plan in 2018. This was revised following dialogue with stakeholders and our updated DSO development plan, DSO v1.1, was released in October 2019 as the basis for further engagement in the period leading up to our business plan DSO v1.1.

Accommodated by 2023:

5.8GW of distributed generation (including both generators and storage)

c. 110,000 electric vehicles (EVs)

c. 58,000 heat pumps

Preparing our network.

Our flagship smart grid enablers programme is transforming our ability to monitor, control and communicate with more than 860 major substations and 5,500 distribution substations. We are upgrading the control units in our substations to make the network compatible with modern digital communications along with establishing the communications network from our control centres to those units. This includes:

- upgrading or replacing remote terminal units (RTU) control points at our substations;
- upgrading or replacing automatic voltage control points and transformer relays at all of our supply points and primary substations;
- upgrading our telecoms communications network from our control centres to our substations (both primary and secondary supervisory control and data acquisition (SCADA) networks); and
- installing low voltage (LV) monitoring across our network (2,700 units by 2023).

This investment is giving us greater ability to control and analyse how our network is operating in real time, enabling us to respond to the uptake in LCTs.

We have also been replacing looped-service cables (the cable used when two properties share a single electricity supply). During the first half of the 2015-23 period we replaced more than 13,000 of these at a cost of over £12m.

5.8GW of distributed generation (including both generators and storage)

c. 110,000 electric vehicles (EVs)

c. 58,000 heat pumps

We have made good progress with active network management (ANM) with four zones providing 433MW of contracted flexibility. We have developed an approach that can be rolled out to further areas and we have accepted customer connections for six further suitable areas, three of which are progressing through the engineering phase. In addition, building on learnings from our customer-led network revolution (CLNR) project, we are actively managing voltages at major substations using automatic controllers. This has released 3.2GW of capacity in the period to date for multiple small-scale generators to connect to our local network.

We have been a key player in working with other DNOs and Ofgem to mobilise the Green Recovery scheme that is providing economic stimulus and accelerating investment for decarbonisation. In phase one we committed £30m of investment within our existing allowances to enable domestic customers to more easily adopt LCTs, and in phase two, we will be delivering incremental investment across a portfolio of 14 projects with a combined value of £53m.

Case study

Our innovation portfolio has also been focussed on targeting DSO-enabling capabilities. For example our Boston Spa energy efficiency trial (BEET) has been developing capabilities to optimise voltage at customers’ meters to reduce energy consumption while maintaining reliability. Customer Value Propositions (CVP) Voltage Optimisation.
Engaging flexibility markets.

In close collaboration with the Energy Networks Association’s Open Networks project and flexibility providers, we have been seeking opportunities to deploy customer flexibility to maximise efficient use of the network for three key use cases: deferral of traditional reinforcement, planned maintenance, and emergency support.

Our flexibility work to date has provided meaningful lessons about the still-emerging flexibility market that are informing our plans, although in our region the widespread need for flexibility has not yet been present. We have experienced a reduction in peak demand and units distributed as a result of the economic impacts on heavy industrial demand, increased energy efficiency, and increasing embedded electricity generation. While this has limited reinforcement requirements (and therefore flexibility) to date, in specific areas and at lower voltages, clustering of LCTs is creating constraints that require ongoing intervention either through flexibility or reinforcement.

And as LCT uptake continues to accelerate, so too will the need for flexibility services.

During 2019-20 we ran our first e-auction for 100MW of emergency support customer flexibility. This resulted in no services being procured as the market feedback was that there was insufficient value in this product where the use is uncertain. Instead, it is being viewed by flexibility providers as an add-on product that could be provided alongside the reinforcement deferral product that would provide a more certain revenue stream.

In late 2020 we ran a flexibility expression of interest exercise for 15 substations where we saw a potential need for intervention in the 2023-28 period. We identified larger customers that could engage in providing the required flexibility in 20 per cent of the locations tested. Further, we are in discussions with national aggregators of local network (LV) flexibility about the role that they could play.

Alongside developing the market for flexibility we are developing our people, processes and systems to enable us to promote and operate flexibility services in a standardised manner that benefits our customers. An example of this is our partnership with other DNOs on the flexible power project, a system that gives flexibility providers a direct path to participate in flexibility on multiple networks.

Data and digitalisation.

Over the course of this business plan period we have made significant improvements in our systems and data-handling capabilities. This has laid solid foundations for our Data and Digitalisation plans for 2023-28.

We have made strategic investments in transitioning to a digital and fully vectorised set of asset records. This multi-year programme has transitioned 40m asset records and 400m attributes providing a platform for future digitalisation initiatives. We have also delivered projects to make use of smart meter data and implemented an end-to-end customer relationship management (CRM) system. This has given us better access to customer and network information and enabled more seamless outbound and inbound communications with our customers, which has been reflected in our customer satisfaction scores.

In developing our business plan we have been engaging with the local authorities and other stakeholders in our region on our Distribution Future Energy Scenarios (DFES) on an open data platform enabling them to interact and exchange data with us in a way that suits them.

Our plan for 2023-28 builds on the smart grid enablers we are putting in place in the current period.

Alex Jones
Director of performance and planning

Examples of data and tools available for our customers

Power cuts:
- live maps and tabular views of planned and unplanned powers cuts by postcode.

Connections:
- live network information offering views of available capacity (heat maps), asset positioning for public safety and self-service for small works budget quotations (AutoDesign).

System planning and investment:
- technical information that enables the security and safety of our GB transmission network and views of investment plans and load growth by substation and local authority (DFES open data).
A proven track record of collaboration and innovation

Innovation is embedded throughout our business, consistently driving benefits in our business-as-usual activities.

Our 2015-23 business plan promise of ‘more for less’ meant improving outputs and reducing costs. In order to achieve this, we have been finding and deploying innovation across our business. Regulatory-funded innovation has generated an estimated £23m of cost savings so far in the period, including the managed connections offered to generators, which have saved our customers £14m in connection costs. This is based on a narrow definition of innovation in line with regulatory reporting to Ofgem, with wider benefits being significantly more.

Our CLNR project was one of the most significant UK smart grid projects ever undertaken; it was a £31m four-year project that generated learnings, which we are using to evolve into DSO. Learning from this project enabled us to develop a smart grid route map for our 2015-23 business plan, and as a direct result we made changes to our business, and recommendations to other network operators to do the same, so that they and their customers could benefit.

Collaboration is now more important than ever, and we intend to build on and expand our existing strong relationships with partners.

We are proud of the role we play in delivering essential services to those we serve across the region. Collaboration is integral to how we deliver for our customers and, without our partners, we would not be able to achieve the same level of impact. Some of our key relationships include:

- Northern Gas Networks, Yorkshire Water and Northumbrian Water as fellow active members of the Infrastructure North collaboration established in 2013.
- Academic partners, including universities – Bath, Durham, Hull, Newcastle, Sheffield and Strathclyde – and the Centre for Energy Systems Integration, all of whom underpin and contribute to our innovation activities.
- Local partners such as NHS Trust Yorkshire, Affordable Warmth Hull and the British Red Cross, with whom we work to deliver our social programmes that support customers who need us the most.
- Citizens Advice and local authorities – we have strong, long-standing relationships to identify and offer support to those in areas of social deprivation.
- ODI Leeds, a pioneer node of the Open Data Institute, with which we collaborate to deliver open-source DFES data, encouraging data-driven stakeholder engagement and supporting future net zero planning.
- the Federation of Small Businesses and a wide range of local businesses, with whom we have joined forces to develop the Zero Carbon Business partnership, which provides information to support small and medium-sized enterprises (SMEs) that are starting their net zero journey.
- North East Energy Catalyst, which we are supporting as a key partner as it helps interested groups and SMEs develop solutions to resolve energy issues in the North East.

Innovation driving benefits throughout our business-as-usual activities:

- Safety – vehicle telematics is improving driver safety in our fleet and helping us to incur fewer accidents. We registered 33 preventable vehicle accidents in 2020-21 in a fleet covering about 14m miles.
- Reliability and Availability – our Foresight fault-prediction project has made hundreds of thousands of pre-fault identifications prior to them becoming permanent faults. This, along with our network automation programmes of automated power restoration system (APRS) and LV smart fuses are making our network more reliable for all customers.
- Environment – the use of perfluorocarbon tracer (PFT) additives has sped up cable oil leak detection, contributing to a 47 per cent reduction in fluid/oil losses in the current price control period so far.
- Customer satisfaction – SilentPower, our mobile battery generator vehicles, has proven useful during the COVID-19 pandemic, helping us get customers’ electricity supply back more quickly and cleanly than a traditional diesel generator.
- Social obligations – our ‘powergrid cares’ programme includes a number of initiatives, including our data project in collaboration with Experian that combines existing priority service information with regional demographic mapping. This programme has delivered £2.9m in financial benefits so far.
- Connections – our award-winning AutoDesign project has created a web-based self-service design tool, offering those looking to connect EV chargers and other LCTs access to high-quality designs in real time, at a lower cost. The system provides information in 10 minutes, as opposed to up to 10 working days previously.
Our delivery has been consistent throughout the period, with our expenditure in the period to date tracking closely to allowances at 99 per cent. At a cost category level there are offsetting variances:

**Network reinforcement** is forecast to be £30.0m (11 per cent) lower than allowances driven by lower requirement for fault-level reinforcement and deferral of a major scheme (£11m) in the Northeast due to generation projects not progressing. This is partially offset by the Green Investment ‘net zero ready homes’ initiative accelerating low voltage reinforcement to support decarbonisation.

Replacing and refurbishing equipment is broadly in line with allowances (£8.6m higher; within one per cent). Within our programme we have increased investment in fluid-filled cable (FFC) replacement and LV switchgear to maintain asset health and manage environmental risks. Higher expenditure on service and cut out replacements driven by the smart meter roll-out and greater refurbishment to manage network safety risks has been partially offset by unit cost improvements through procurement, particularly in relation to LV work. Cost allocation changes in line with the Ofgem guidance has also seen certain costs in this area reclassified as maintenance.

Other non-load expenditure is forecast to be £35.3m (12 per cent) lower than allowances driven by efficiencies. We have re-engineered our flood defence programme enabling us to expand our programme and reduce costs. We have also delivered efficiencies in visual amenity projects and asbestos abatement whilst we have experienced lower levels of metal theft on our network supported by enhanced security measures.

Network faults expenditure is forecast to be £64.2m (12 per cent) higher than allowances. Allowances set for faults were insufficient for this cost category across the entire sector. Expenditure relating to extreme weather events has been higher than expected due to increased frequency of events and we have increased our use of generators to meet 12-hour restoration standards. We have experienced lower than predicted levels of faults volumes on LV underground cables with the remaining costs offset by efficiencies in other plan areas.

**Tree-cutting expenditure** is expected to be £12.1m (16 per cent) lower than the allowances due to efficiency savings from renewing our tree-cutting contract and realising synergies with our inspections programme.

**Inspections, repair and maintenance** expenditure is forecast to be £25.5m (24 per cent) higher than allowances largely as a result of the cost definition changes by Ofgem realocating costs from network investment alongside savings from unit cost efficiencies.

Other network operating costs (NOCs) are £2.8m (13 per cent) lower than allowances due to lower substation electricity costs and contract efficiencies.

**Operational support and business support** expenditure is £18.1m (two per cent) lower than allowances. Increased expenditure to support customer service improvements has been more than offset by lower business support costs including energy efficiency savings at our properties, lower insurance claims and reduced fuel costs.

We have identified £281m of efficiencies across the business in the current planning period.

To ensure we could deliver our business plan efficiently, we mobilised a significant cost efficiency programme across all areas of our business and as a result we significantly rephased our capital programme.

— A key element of our programme was re-engineering of solutions. This involved changing the scope of our activities and identifying resource efficiencies, which has delivered savings of £128.4m in the period. An example of this is our modular high voltage (HV) primary switchgear rebuild programme which enables works to be completed 12 weeks quicker at 10 per cent lower costs.

— We have driven £60.5m of efficiencies across the period through the application of technology such as targeting cable repairs using innovative fault-sensing equipment, voltage regulation and deployment of automatic power restoration systems.

— Finally, we have delivered £92.2m of procurement and productivity efficiencies including the renegotiation of service contracts and internal resource efficiencies.

These efficiencies have been built into baseline costs in our plan for 2023-28.

**Figure 4: eight-year plan period totex cost category split – 2022-23 forecast**

<table>
<thead>
<tr>
<th>Current business plan totex to 2022-23 (£m/2012-13 prices, £m)</th>
<th>Forecast</th>
<th>Allowances</th>
<th>Variance</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Network reinforcement</td>
<td>239.3</td>
<td>269.3</td>
<td>(30.0)</td>
<td>(11%)</td>
</tr>
<tr>
<td>2 Replacing and refurbishing equipment</td>
<td>761.1</td>
<td>752.5</td>
<td>8.6</td>
<td>1%</td>
</tr>
<tr>
<td>3 Other non-load</td>
<td>261.5</td>
<td>296.8</td>
<td>(35.3)</td>
<td>(12%)</td>
</tr>
<tr>
<td>4 Network faults</td>
<td>581.4</td>
<td>517.2</td>
<td>64.2</td>
<td>12%</td>
</tr>
<tr>
<td>5 Tree cutting</td>
<td>62.1</td>
<td>74.2</td>
<td>(12.1)</td>
<td>(16%)</td>
</tr>
<tr>
<td>6 Inspections, repair and maintenance</td>
<td>133.1</td>
<td>107.6</td>
<td>25.5</td>
<td>24%</td>
</tr>
<tr>
<td>7 Other NOCs</td>
<td>19.3</td>
<td>22.1</td>
<td>(2.8)</td>
<td>(13%)</td>
</tr>
<tr>
<td>8 Operational support and business support</td>
<td>979.1</td>
<td>997.2</td>
<td>(18.1)</td>
<td>(2%)</td>
</tr>
<tr>
<td>Totex</td>
<td>3,036.9</td>
<td>3,036.9</td>
<td>(0.0)</td>
<td>0%</td>
</tr>
</tbody>
</table>

Northern Powergrid: our business plan for 2023-28 – 23
Our cost efficiencies have enabled us to accommodate additional investment to drive benefits for customers in the period and offset cost pressures.

We have accommodated £92.1m of additional investment in the period while absorbing cost pressures to hold our costs steady. We have done this where efficient and required by the asset base, responding to key stakeholder priorities. In a number of key areas this means that we can reduce costs in the 2023-28 period. These benefits are reflected in our plan, most notably in relation to flood defence investment, extra high voltage (EHV) cable replacement and cyber security.

Our owners are committed investors with a long-term outlook.

Berkshire Hathaway Energy (BHE), our parent company, is committed to our business and our region. In the current regulatory period more than £996m has been reinvested into the business — see our Financing section.

There has been significant scrutiny on network company returns in recent years. Our returns are at the lower end of the range of UK network companies with our forecast return on regulatory equity (RoRE) for the regulatory period at 6.5 per cent based on our actual debt to equity (gearing) ratio (see figure 6). The primary contributor to this is incentive revenue from the interruptions incentive scheme (IIS) which generates a 1.5 per cent return. We are also forecasting to achieve around 69 per cent of the available broad measure of customer service (BMCS) reward, generating a return of 0.4 per cent. This is offset by 0.5 per cent lower returns as a result of debt financing as the debt that we took out many years ago at prevailing rates is more costly than Ofgem allows.

### Additional investments in 2015-23

- **£63.8m** network resilience, including:
  - 59 additional flood defences;
  - replacement of an additional 90km of EHV/132kv fluid-filled cables; and
  - investment to address safety risks on our network such as fire suppression blankets in link boxes.

- **£15.8m** cyber resilience — to significantly upgrade our cyber defences against the evolving threat of online and software attacks.

- **£12.5m** customer service improvements, including:
  - upgrading our contact centre telephone platform to latest technology;
  - modernisation of our web interfaces; and
  - enhancing our enterprise asset management (eAM) spatial asset system and underlying data.

---

**Track Record and Business Plan Commitment**

### Track Record

<table>
<thead>
<tr>
<th>Year</th>
<th>Business Plan</th>
<th>Re-engineering</th>
<th>Smartgrid Solutions</th>
<th>Procurement and Productivity</th>
<th>Network Resilience</th>
<th>Cyber Resilience</th>
<th>Customer Service Improvements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-23</td>
<td>3,225.9</td>
<td>128.4</td>
<td>60.5</td>
<td>92.2</td>
<td>63.8</td>
<td>15.8</td>
<td>12.5</td>
<td>3,036.9</td>
</tr>
</tbody>
</table>

---

1. Excluding incremental investment committed as part of Ofgem’s national Green Recovery scheme.
Business plan commitment and assurance

We have well-established pay, reward and incentive frameworks that are coupled to the delivery of business plan commitments and our overall company performance. We will continue with this approach in 2023-28.

For our management team, rewards and incentives are determined by both the company’s and their own performance against the Company Scorecard. Our Company Scorecard is calibrated annually with our shareholder BHE. It sets out targeted, measurable and stretching key performance indicators that are directly linked to the commitments in our plan.

Our collectively bargained pay deals all feature arrangements that link recognition and reward to our targets, and particularly the outcomes that customers value. We work with our colleagues and their trade union representatives to focus those incentives on the areas that those employees can impact most directly. For example, our technical group’s rewards are set in part by our Gainshare incentive. This links a component of that group’s pay directly to improvements in the reliability of the network. We will continue to review and improve these incentive mechanisms in consultation with our colleagues and their trade unions throughout the period.

We explain our approach to remuneration in more detail in annex 5.2 Workforce Resilience strategy.

Assurance statement for the business planning period 2023-23:

The boards of Northern Powergrid (Northeast) plc and Northern Powergrid (Yorkshire) plc, including the sufficiently independent directors, confirm that the licensees would meet Ofgem’s financeability assessment criteria on both a notional and actual capital structure basis (using the Ofgem working assumptions for cost of capital allowances and expected incentive outperformance) and the plan and associated costs have been tested for accuracy, ambition and efficiency.

Board members

Northern Powergrid (Northeast) plc

- Phil Jones
  President and CEO, Northern Powergrid

Northern Powergrid (Yorkshire) plc

- Tom France
  General counsel, Northern Powergrid

- Andrew MacIlnnan
  Commercial director, Northern Powergrid

- Alison Marshall
  Non-executive director chair – Gateshead Health NHS Foundation Trust

- Phil Taylor
  Non-executive director, pro vice-chancellor for research and enterprise, Bristol University

Assuring our plan

Technical panel

- Independent panel of industry experts to scrutinise and challenge the technical aspects of our plan
  - See annex 2.2 Technical Panel letter

Social issues expert group

- Independent group of six experts to provide feedback on how well our plan addresses social issues in our region
  - See our CEG website

Plan development and engagement

- Plan development and stakeholder engagement led by business unit executives and their teams

Board of directors

- Regular reviews
- Scrutiny and sign-off
- Sub-committees chaired by non-executive directors for innovation and risk

Assurance plans

- Structured assurance plans in line with Data Assurance Guidance
  - See annex 2.1 Data Assurance

External challenge

- Targeted use of external consultants to challenge our plans
- External benchmarking
Outputs and incentives

We are committed to delivering on our promises. Throughout our plan we clearly set out the outcomes we will deliver for our customers, with the associated benefits, deliverables and measures we will use to track our performance. In each section of our plan we show how our customer outcomes link to the range of outputs and incentives in Ofgem’s RIIO-ED2 price control framework.1

Output categories

Deliver an environmentally sustainable network
Maintain a safe and resilient network
Meet the needs of consumers and network users

Overarching framework for outputs and incentives

1 Licence obligations (LOs) Set minimum standards of performance that Ofgem will impose
2 Price control deliverables (PCDs) Capture outputs directly associated with baseline finding
3 Output delivery incentives (ODIs) Where these may be in the interest of customers and other network users

Common: outputs and incentives arrangements that apply to all DNOs

Bespoke: outputs and incentives arrangements that are proposed by the DNOs

Output delivery incentive – financial (ODI-F): outputs and incentives that have associated payments/penalties
Output delivery incentive – reputational (ODI-R): outputs and incentives of a reputational nature

A summary of outputs and incentives in our plan.

In addition to the common outputs and incentives in Ofgem’s framework, our plan contains one bespoke PCD and three bespoke ODI-Rs.

— Our bespoke PCD covers our commitment to deliver £64m of investment in HV network automation to deliver the substantial improvement in network reliability required to meet Ofgem’s ILS targets, see Reliability.

— Our three bespoke ODI-Rs cover performance reporting commitments for our DSO, Vulnerable Customers and Major Connections strategies to supplement Ofgem’s strategy delivery ODI-F. We propose this as a sector-wide mechanism to ensure we account for our performance in areas that cannot be easily measured by quantitative metrics. Where robust metrics are available we have proposed performance scorecards in our strategies, through the common ODI-F mechanism, to further incentivise our delivery in the period.

Our targets and proposed incentives support the ambitious customer outcomes in our plan. Our proposed incentive framework demonstrates how we will hold ourselves accountable to stakeholders for how well we deliver those outcomes.

Dave Wilkins
Policy manager

1. Unless specified otherwise, target dates for delivery throughout our plan are the end of March 2028. For phasing of the performance metrics, see annex 1.4.
## Our proposal for outputs and incentives

<table>
<thead>
<tr>
<th>Output category</th>
<th>Plan section</th>
<th>Output/incentive</th>
<th>Type</th>
<th>Target/mechanism</th>
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<tr>
<td><strong>Delivering an environmentally sustainable network</strong></td>
<td>Decarbonisation</td>
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<td>Scenarios and Investment</td>
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<td>DSO Strategy</td>
<td>DSO Strategy delivery incentive</td>
<td>Common ODI-F</td>
<td>Performance scorecard proposed in our plan in annex 4.2 DSO strategy</td>
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<td>DSO Strategy delivery report</td>
<td>Bespoke ODI-R</td>
<td>Annual reporting</td>
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<td></td>
<td>Enabling Whole System Solutions</td>
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<tr>
<td></td>
<td>Environmental Action Plan</td>
<td>Environmental action plans</td>
<td>Common LO</td>
<td>Included in our plan</td>
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<tr>
<td></td>
<td></td>
<td>Annual environmental report</td>
<td>Common ODI-R</td>
<td>Annual reporting</td>
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<td>Environmental scorecard</td>
<td>Common ODI-F</td>
<td>Performance scorecard proposed in annex 4.4 Environmental Action Plan</td>
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<td><strong>Maintaining a safe and resilient network</strong></td>
<td>Safety</td>
<td>Interruptions incentive scheme (IIS)</td>
<td>Common ODI-F</td>
<td>Provisional targets for our plan. Final targets to be set by Ofgem</td>
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<tr>
<td></td>
<td></td>
<td>Guaranteed standards of performance</td>
<td>Common LO</td>
<td>Meet standards</td>
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<tr>
<td></td>
<td></td>
<td>Worst-served customers (WSC)</td>
<td>Common PCD</td>
<td>£2.5m investment included in our plan to address 2,400 customers</td>
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<td>HV automation</td>
<td>Bespoke PCD</td>
<td>£64.2m investment included in our plan to deliver substantial improvements in network reliability, see annex 4.8 investment in HV automation</td>
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<td>Asset Resilience</td>
<td>Network asset risk metric</td>
<td>PCD, ODI-F</td>
<td>Included in our plan</td>
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<td></td>
<td>Climate Resilience</td>
<td>Environmental resilience plan</td>
<td>Common LO</td>
<td>Strategy included in our plan</td>
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<td>Physical and Cyber Resilience</td>
<td>Cyber resilience information technology (IT) plan</td>
<td>Common LO</td>
<td>Included in our plan</td>
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<tr>
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<td>Cyber resilience IT</td>
<td>Common PCD</td>
<td>£4.5m investment included in our plan to reduce risk by 35 per cent</td>
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<td></td>
<td></td>
<td>Cyber resilience operational technology (OT) plan</td>
<td>Common LO</td>
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<td>Cyber resilience OT</td>
<td>Common PCD</td>
<td>£5.1m investment included in our plan to reduce risk by 30 per cent</td>
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<td><strong>Meet the needs of network users</strong></td>
<td>Customer Service</td>
<td>Customer satisfaction survey</td>
<td>Common ODI-F</td>
<td>Targets to be determined by Ofgem</td>
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<td>Complaints metric</td>
<td>Common ODI-F</td>
<td>Targets to be determined by Ofgem</td>
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<td>Vulnerable Customers</td>
<td>Obligation to treat customers fairly, including those in vulnerable situations</td>
<td>Common LO</td>
<td>Meet standards</td>
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<tr>
<td></td>
<td></td>
<td>Improving service standards for vulnerable customers</td>
<td>Common ODI-F</td>
<td>Performance scorecard proposed in annex 4.11 Vulnerability strategy</td>
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<td></td>
<td>Vulnerable customers delivery report</td>
<td>Bespoke ODI-R</td>
<td>Annual reporting</td>
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<td></td>
<td>Our Communities</td>
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<tr>
<td><strong>Connections</strong></td>
<td>Time to connect</td>
<td>Common ODI-F</td>
<td>Targets to be determined by Ofgem</td>
<td></td>
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<td></td>
<td>Connections guaranteed standards of performance</td>
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<td>Meet standards</td>
<td></td>
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<td>Improving service standards for major connection customers</td>
<td>Common ODI-F</td>
<td>Performance scorecard proposed in annex 4.12 Major connections strategy</td>
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<tr>
<td>Major connections delivery report</td>
<td>Bespoke ODI-R</td>
<td>Annual reporting</td>
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<td></td>
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<tr>
<td><strong>Openness and Transparency</strong></td>
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<td><strong>Enablers</strong></td>
<td>Innovation</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Data and Digitalisation</strong></td>
<td>Digitalisation Strategy and Action Plan (DSAP)</td>
<td>Common LO</td>
<td>Included in our plan</td>
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<tr>
<td></td>
<td>Data best practice</td>
<td>Common LO</td>
<td>Requirements reflected in our plans</td>
<td></td>
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<tr>
<td><strong>Workforce Resilience</strong></td>
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</table>
Our approach to setting out our proposals

In the following sections of our plan we unpack our stakeholder engagement approach, our plans for the 12 output areas of our business and the three supporting enablers (Innovation, Data and Digitalisation and Workforce Resilience). In each of our output sections we set out the commitments we are making in the form of customer outcomes, supported by benefits, deliverables and measures to track our progress. We also show how the feedback you have given us has directly shaped our plans and the impact on costs.

1 Our plan

How the output area contributes to our overall vision

Outcomes ➔ Our commitments for the 2023-28 period

Benefits ➔ How these outcomes benefit our customers

Deliverables2 ➔ What we plan to do to support the delivery of our outcomes

Metrics3 ➔ How we plan to measure our success, including:

— Output measures to track the delivery of our outcomes – shown as LOs, PCDs, ODIs (where applicable)
— Indicative input measures showing underlying input/volume assumptions (where relevant)

We will report on progress against our plan in the 2023-28 period

2 How engagement with you has shaped our plans

Who we have engaged

How we have engaged

Wave 1 ➔ Open and formative engagement findings

Wave 2 ➔ Outcomes of testing our emerging thinking with costed levels of ambition

Wave 3 ➔ Refining and finalising; and how findings have been addressed in our plan, linked to customer outcomes

3 How much it will cost

How much it will cost1

<table>
<thead>
<tr>
<th>2023-2028 expenditure (annual)</th>
<th>£m</th>
<th>% of totex</th>
</tr>
</thead>
<tbody>
<tr>
<td>versus 2015-2023</td>
<td>+/-£m</td>
<td>+/- %</td>
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</tbody>
</table>

Stakeholders have provided valuable input throughout our plan development, shaping the customer outcomes we are committing to deliver.

Philippa Williamson
Planning manager

For mapping of our plan to Ofgem’s Business Plan Guidance please see annex 1.3 Mapping to Ofgem Business Plan Guidance

1. All ED2 costs are in 2020-21 prices and include real price effects and ongoing efficiencies unless otherwise stated. All 2015-23 costs are shown in 2012-13 prices.
2. Target dates for all deliverables are the end of the period (March 2028), unless otherwise stated.
3. See annex 1.4 Key measures in our plan for the phased profile of our targets and forecasts over the 2023-28 period.
GIVING CONSUMERS A STRONGER VOICE

Our enhanced engagement process is central to the development of our plan.

Our plan has been developed with our customers and stakeholders. In building our plan, we have conducted our most ambitious, comprehensive and representative engagement programme ever. We have provided multiple opportunities for our customers and stakeholders to engage, shape and challenge our proposals.

We have taken on board feedback from over 52,000 interactions with stakeholders, customers and future customers. We held more than 325 events, including 68 focus groups, 57 panels, and seven regional conferences and delivered engagement at flexible and varied times to enable the greatest participation from the broadest group of stakeholders. We established six new, targeted challenge panels to gain key insights with a particular focus on ensuring good representation from all stakeholders in our region. We conducted 46 surveys, published two consultation drafts of our business plan, and ran extensive communication campaigns reaching 1.4m consumers to ensure that a high proportion of our customers and broader stakeholders were aware of our engagement and could have a voice in developing our plan for 2023-28.

Co-creating this plan with our stakeholders started with early engagement. We held deliberative sessions with an open dialogue to discuss what our priorities should be; this shaped our thinking from the very start. This led to the publication of our Emerging Thinking in summer of 2020 supported by a dedicated microsite and the ability to ‘build your own plan’ based on costed plan options with five levels of ambition to consider across each of our business plan areas. This enabled our customers and wider stakeholders to design the plan they would like to see delivered in 2023-28. We then tested this insight and the emerging options through further qualitative engagement. Wide-ranging efforts such as consumer panels, customer research and co-creation focus groups helped to evaluate our thinking as our plans progressed, including the setting of stretching targets. We believe this approach has resulted in a plan that has been truly stakeholder-led.
We carried out our engagement in accordance with our stakeholder charter.

To ensure we fully integrated stakeholder and customer views into our plan, we carried out all our engagement according to the principles set out in our stakeholder charter and this was used as a yardstick by our Customer Engagement Group (CEG) to assess the effectiveness of our engagement.

We built our enhanced engagement approach on the solid foundations developed from 2013 onwards, while becoming more responsive, agile and innovative to meet the ambitions of our region’s stakeholders.

The COVID-19 pandemic created a unique and challenging situation for our stakeholders, customers and communities during the business plan development period. In response, much of our engagement activity moved online – changing the pace and dynamic of our interactions. Where possible, we took action to engage with the digitally excluded as far as we could.

We structured our plan into four broad waves of engagement activity. A comprehensive stakeholder segmentation model supported this, ensuring our engagement was fully representative of the customers and stakeholders we serve. This was supported by an ambitious communications and outreach strategy to ensure that our engagement programme was accessible and would boost areas of low representation or participation.

As an important aspect of our engagement programme, during wave three we conducted further research with a representative sample of our customers to provide assurance that our business plan is both acceptable and is supported by our customers including vulnerable customers, small and medium-sized enterprises (SMEs) and stakeholders. This followed on from our ‘willingness to pay’ research, where our customers placed a value on our proposals of £21.46 p.a. above their current bill.

We undertook a robust and comprehensive acceptance research stage including 1,272 customers, of whom 528 were vulnerable and 194 were fuel poor. This measured our customers’ acceptance of each of the plan areas, our enablers, and the plan in its entirety.

Domestic customers gave an 89 per cent acceptance score for the plan. Further information about the research and acceptance levels by plan area is available in annex 2.1 Data assurance.

As we finalise our plan, our wave four engagement will include a further stage of research and acceptability testing to gather particular insight on areas where customers have asked for further information or clarification to better understand the benefits of particular areas of the business plan. This will also test the actual impact on annual bills for our customers for 2023-28 and beyond.

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We are flexible, proactive and responsive. Early deliberative engagement informs our plans and allows for testing with stakeholders.

We will not leave anyone behind. We hear all voices from across the diverse region we serve.

Explaining what, why and how we work. Encouraging active participation from customers and stakeholders to aid planning and decision making.

Employing a range of engagement methods designed to engage all ages and capabilities. Educating stakeholders, so they understand our business, make better-informed decisions and provide a richer input.

Best practice leads us. Experience shapes us. Our programme is continuously evolving as we learn more about the needs of others.
Building our plan with you

WAVE 1 – open engagement...
- Regional model of representation and inclusivity
- Key themes and priorities from ongoing engagement
- Tailored engagement plans
- Initial open consultation – early views and areas for further exploration

...provided us with very clear messages that helped us shape our plan options
1. **Decarbonisation** is top priority – facilitate the transition to net zero and provide access to energy system data
2. Safety, reliability and resilience remain highly important, increasingly so as more reliance is placed on electricity in day-to-day life
3. Show leadership on environmental protection, including reducing the carbon footprint of our operations
4. Support vulnerable customers and facilitate a socially inclusive transition to net zero
5. Keep bills low

WAVE 2 – optioneering...
- Emerging Thinking (ET) consultation launched in August 2020
- Ambitious stakeholder optioneering exercise – ‘build your plan’
- Five fully costed service levels for our nine output areas

Stakeholder feedback used to balance ambition with affordability
1. High levels of stakeholder ambition
   - Most ambitious option (level E) was the preferred choice in 75 per cent of our output areas
2. Decarbonisation reinforced as the clear imperative and top stakeholder priority...
3. ...but affordability remained at the forefront

WAVE 3 – refinement and finalising...
Draft plans shared and tested for support, adapting where required

89% acceptance score

1. Domestic customers.

WAVE 4 – refreshing
Further research and acceptability testing

>52,000 stakeholders engaged

>325 events

1st DNO to publish costed plan options

250m Permutations in our interactive optioneering tool

10 Challenge panels

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Northern Powergrid: our business plan for 2023-28 – 31
We have robust processes, planning, governance and assurance in place to make sure that our business plan decisions are clearly responding to customers’ and stakeholders’ feedback and that our plans adapt to meet their needs.

— We commission an annual audit that assesses our work to the stakeholder engagement standard AA1000 and ensures that we continue to build and develop our engagement processes. We commissioned additional audits through the plan development period. This approach will continue as an integral part of our process throughout 2023-28.

— We developed a weighting methodology to measure engagement and insight based on multiple factors. The methodology helps us plan engagement and is particularly useful for any tension or contradictory opinions between different stakeholder groups. This approach provides an indication of where further testing or discussion is required and with which groups of stakeholders. For further detail of our methodology and examples of how it has been applied see annex 3.4 Our stakeholder engagement methodology.

— Where opinions were changing or still unclear throughout the first two waves of engagement, our citizens panel was convened over 12 sessions to discuss, debate and vote on some of the more complex issues. The panel was made up of 50 customers from the consumer, future consumer, rural and SME panels. They looked at the issues within the wider context of the overall plan and helped us to reach consensus on our customer outcomes moving forward.

— Our assuring partners, Sia Partners, completed independent quality assurance reports to assess engagement at the close of wave two and wave three to ensure that it was representative and aligned with the emerging propositions, with feedback we received and with the emerging customer outcomes. See annex 3.3 Detailed engagement findings.

Stakeholder priorities formed from early, deliberative engagement and became richer in detail as the engagement programme progressed. These have shaped our business plan outcomes and ambition levels throughout our plan.

— Decarbonisation is an urgent priority for most of our stakeholders and customers, reflecting heightened concern about the impact of climate change. As a result, we will play a significant role in facilitating the transition to net zero, including providing access to energy system data.

— The safety, reliability and resilience of our network remains a top priority, as day-to-day life comes to rely more and more on electricity.

— Stakeholders expect us to show leadership in environmental protection, including reducing the carbon footprint of our operations.

— Stakeholders want us to continue supporting vulnerable customers and to go further, including facilitating a socially inclusive transition to net zero.

— Stakeholders want us to consider affordability and continue to focus on keeping bills low.

Our governance approach is robust. It includes senior management accountability and responsibility in each area of the business for engagement planning and delivery, coupled with regular reporting to the board and clear escalation processes in place.

We have long-standing external expert groups who hold us to account, such as our enduring stakeholder panel and social issues expert group. Within the plan development period we have established four additional panels representing vulnerable customers, community energy, future consumers, and a collective consumer group including SMEs and domestic customers. These have now become an essential part of our enduring engagement approach.

Building on our established engagement programme with annual stakeholder priorities research, we found a series of prominent priorities stakeholders would like us to focus on.

Giving Consumers a Stronger Voice – Our Enhanced Engagement Process
Strengthening governance and challenge

The establishment of our Customer Engagement Group (CEG) in September 2019 has further strengthened our governance approach.

The CEG, our independent scrutiny panel, has played a crucial role in ensuring that stakeholder and customer needs have been considered and reflected within the business plan.

Following a robust appointment process, ratified by Ofgem and conducted openly by an independent agency, Justin McCracken was appointed chair of the CEG in July 2019. Justin then led the recruitment of the wider CEG members with the group first meeting in December 2019. We established an independent secretariat function to provide dedicated support for the CEG, manage their induction and provide intensive training to assist with navigating the energy industry.

The CEG held both full group meetings and additional sub-group sessions each month to ensure sufficient focus and scrutiny on each plan area aligned to the expertise of the different group members. All CEG members assessed the planning and execution of engagement by directly observing activities and reporting back to the full group.

In support of the CEG’s scrutiny roles, our subject matter experts and members of our leadership team joined the CEG to discuss emerging plans at every stage of the development process. We shared plans at the outline stage to facilitate early challenges through to full plan development. To ensure a robust process, subject matter experts took the CEG through the underpinning justification, supporting data, engagement feedback and benchmarking materials and responded directly to CEG challenges. Supporting information was provided in an agreed format and at appropriate time frames before discussion to enable the CEG to prepare for plan section reviews.

The CEG has reviewed, observed and raised six challenges and 120 issues in the developing business plan and the engagement that underpins the plan. We have fully resolved three of these challenges and 112 of these issues to date. We will continue to work with the CEG in the period through to final submission. The group observed the broadest range of engagement activities across our four waves of engagement, feeding back its experience of 102 events, highlighting areas of good practice and areas for improvement. This included scaling up our engagement with future consumers, challenging how we ensured propositions were understandable for stakeholders and clearly describing how bills would be impacted and over what time period. The group held us to account against the stakeholder charter and the scope and scale of engagement necessary to develop a considered business plan that reflects customers’ needs and preferences.

Ofgem’s RIIO-ED2 challenge group has also engaged as our plan develops.

We met with the RIIO-ED2 challenge group as part of their formal engagement process.

— In March 2021 members of our executive, including our chief executive officer (CEO), met with the challenge group to discuss our delivery track record and historical performance.
— In April 2021 the executive representatives met with the challenge group again to discuss our plan. The challenge group sought to understand our approach, planning assumptions and levels of ambition.

Our Customer Engagement Group:

10 independent experts

102 formal interactions
Delivering best practice engagement

Action required to decarbonise our economy and society, coupled with the impact of the COVID-19 pandemic, means it has never been more critical to ensure that nobody is left behind in the energy transition. We, therefore, use the UN-approved ‘no one will be left behind’ framework approach of ‘examine, empower, enact’ as the bedrock for our enhanced strategic approach (see annex 3.2 Our strategy for engagement 2023-28) to support hard-to-reach and seldom-heard stakeholders.

We continually challenged ourselves to deliver a ‘best in class’ engagement programme for our region. We were never satisfied, reflecting on what could be better and making improvements after every interaction, supported by feedback from the CEG. Customer and stakeholder feedback on the effectiveness of engagement was routinely gathered and analysed, shaping areas of focus to optimise all engagements.

— **Education:** a central focus throughout our engagement programme was providing tailored and targeted educational material for customers to ensure they could navigate the energy industry and our plan to help them feel confident in giving feedback on and challenging our plan assumptions. We commissioned 13 ‘What is’ animations to explain complex terms and topics. We also held introductory sessions and webinars in complex subjects to help with participants’ understanding. Breakout groups were organised based on participants’ levels of understanding. We took feedback from stakeholders at the end of each engagement to check on understanding and satisfaction with the event. We sought to continually learn and listen to our stakeholders’ needs.

— **Communication:** the development of our dedicated microsite for engagement, Engage, provided a hub for all business plan materials, with event recordings as well as future events registration information. Our ET document was published on Engage providing an interactive ‘build your own bill’ and dashboard for further digital engagement with customers and stakeholders. Stakeholders were able to vote on the plan priorities and on our engagement approach. We provided a further update to our plan in April 2021 to feedback to stakeholders on how their views have shaped our priorities and to test their acceptance and satisfaction.

— **Future bill payers** played an important role in shaping our plan. We set up four university panels to gather in-depth insights about decarbonisation from their perspective. We also developed an innovative future consumer online panel of 16-21 year olds recruited from across our region, who reviewed the developing plan, and whether it aligned with their ambitions and priorities for future generations.

With some 52,000 interactions with our customers and stakeholders to date, our extensive engagement programme has ensured that our consumers have a strong voice in the development of our plan.

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**Support for our plan**

“I’ve been both surprised and impressed by the level of stakeholder engagement that Northern Powergrid has undertaken in developing their future business plans, and the business plan reflects this; it is easy to understand, and provides a good balance between investment in the service, and cost-effectiveness for the consumer.”

Amy Dixon
Foresight North East
Lincolnshire, member of Northern Powergrid
Future Fairness Panel

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Siobhan Barton
Head of stakeholder relations
Giving Consumers a Stronger Voice – Our Enhanced Engagement Process

— **Citizens panel:** as we refined our plans, we established our enduring citizens panel, bringing together existing members of the SME panel, rural panel and consumer panels to build a more diverse, collective body with 50 representative members. This amalgamation of panels brought together customers with very differing experiences and alternative perspectives, which enabled more in-depth discussion and robust challenge to our plans. Over 17 deliberative sessions held during wave three, the panel helped our engagement leads refine their customer outcomes. Particular areas of challenge from this panel were plan ambition, the bill impact of the proposed plan over 45 years, and how can we balance affordability with proactivity in support of network decarbonisation.

— **Energy champions:** hand in hand with our citizens panel and coupled with our focus on ensuring stakeholders understand the materials and topics we were sharing with them, we recruited 12 individuals – our energy champions – including domestic customers (urban and rural), SME customers, representatives of vulnerable groups and our colleagues to improve how we are educating our customers on the energy transition. In meeting 12 times and reviewing 22 topics, the focus for our champions was to improve complex customer communications, helping us see it through their eyes. The champions helped us to explain our most complex topics by coaching engagement leads and improving our materials by adding accessible language and imagery, enabling our customers to make informed decisions based on increased understanding.

— **Responding to regional needs:** we serve a diverse region, taking in large cities, post-industrial and historic towns, coastal communities and vast swathes of rural England across Yorkshire, the North East and northern Lincolnshire.

— Recognising that engagement is everyone’s responsibility and that we serve our communities better when we are closer to them, we restructured our business around six geographic regions, with a greater focus on local accountability.

— Our engagement programme has also sought to uncover localised need through our membership of regional leadership groupings such as the North East England Climate Coalition and Yorkshire and Humber Climate Commission and regular engagement with experts and stakeholder leaders in a series of localised workshops and panels.

— Recognising that elected leaders within our region represent localised interests, we conducted an extensive engagement programme with councillors, MPs and elected mayors. We spoke directly with over 100 councillors representing a diverse range of communities, 15 MPs attended our dedicated briefing sessions, and we have, to date, briefed 70 per cent of council leadership teams on our plans. At each stage, elected stakeholders have been given the opportunity to ask questions, express their views and challenge our plans.

— As an industrial region of the UK, our area contains a diversity of different business interests, from steel and glass making, to shipping, logistics and manufacturing. We also have a large financial sector and a wide range of SME businesses. To ensure our plan continues to meet their diverse needs, we have engaged with both sectoral groups and industrial customers, through bilateral sessions, and set up an SME panel to give a representative group of small business owners a chance to shape our plans.
Our enduring stakeholder engagement approach

The pace of change in today’s world means customer and stakeholder engagement is becoming even more critical, especially as our customers will be living through the formative stages of the energy transition during the next business plan period.

Our plans must therefore reflect what we know but also have the capacity to adapt quickly to emerging priorities. Our engagement must support and enable ambitious economic development for our stakeholders involved in net zero and local area energy planning (LAEP).

For hard-to-reach and vulnerable stakeholders, it must facilitate access to available support through a growing partnership network, to ensure a just and inclusive transition.

Working in an agile and efficient way, we will continuously improve how we collaborate with individuals, communities and wider society, and strive to include diverse voices in our planning. Building strong engagement with individuals, communities, and broader society helps us make better decisions, and it also helps us better prepare to meet their needs and aspirations. Our engagement plan for 2023-28 reflects these priorities.

During 2015-23, we have developed a strong core of engagement to build upon in the future.

Our plan’s foundations are the successes of our existing engagement programme. The advisory panels, in place for more than eight years now, sit alongside new groups established as part of the planning process, ensuring we reflect the diverse interests and needs of all stakeholder voices in our regions.

We will further strengthen the customer voice in our work, and make sure that our organisation remains externally focused and accountable. Our engagement strategy for 2023-28 is set out in annex 3.2 Our strategy for engagement (2023-28) and more detail around our stakeholder processes and governance is set out in annex 3.4 Our stakeholder engagement methodology.

To further strengthen our robust governance approach, we will maintain the scrutiny of the annual AA1000 audit, publish our commitments annually, report progress on our Engage microsite and establish our CEG as a standing body to scrutinise stakeholder engagement activities and delivery against our promises – see our Openness and Transparency section.

Throughout our organisation, our decision-making processes encompass the insights gathered from well-planned stakeholder engagement and can track these key decisions and actions back to clearly defined stakeholder insight.

Alongside our understanding of our customers’ priorities and needs drawn from engagement and research, we also conduct extensive benchmarking to identify and utilise best practice to ensure our plan is robust and future-proofed.

Technology and new ways of working have dramatically changed the way we engage over this last year. We will build from this, creating new channels, engagement mechanisms, and communications assets to enable our stakeholders to better interact with us and empower them to shape the future of our services. This will be sensitively balanced with an understanding of and provision for the digitally excluded or hard to reach.

Echoing our customers’ ambition, we will accelerate and expand our regional approach, doing even more to understand the granular differences that make up the communities we serve so that we can better and more swiftly respond to their specific needs.

The majority of stakeholders we heard from wanted to discuss strategic priorities more regularly. We are therefore proposing to expand our teams to provide the time and expertise sought – this is a key part of our stakeholders’ commitments.

Anda Baumerte
Sustainability manager
We will build on our established engagement channels.

Our engagement approach during 2023-28 will combine the engagement building blocks currently in place, along with the extended engagement channels we have established in developing our business plan. We will ensure that that we do not lose our current momentum and continue to build mature relationships with our existing stakeholders and customers while further extending our reach.

Our approach will be inclusive, accessible, relevant, and continuously improving, bringing customers’ voices forward and actively enabling stakeholders to influence our plans.

Our engagement strategy sets out how we will engage with more than 20,000 stakeholders every year utilising our engagement channels, panels, co-creation groups, qualitative and quantitative research and with a published annual engagement schedule. This forms the core of our coordinated annual programme of engagement, with the agility to respond to new, emerging customer priorities or an acceleration in decarbonisation activity during this period.

Our engagement priorities and ambition, underpinned by our enhanced engagement approach, give consumers a stronger voice.

The outcomes table on page 40 sets out how we will deliver our strategy.

We will continue to build and adapt our engagement on current and emerging best practice, including the areas of focus for developing our plan. This includes our practical approaches such as the development of our no one left behind framework, introduction of energy champions, future consumer panels, future fairness panel, SME panel and engagement tailored to diverse regional needs and targets.

Figure 1: our engagement approach

<table>
<thead>
<tr>
<th>Engagement planning</th>
<th>Continuous feedback</th>
<th>Stakeholder-based decision making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand and adapt</td>
<td>Identifying stakeholders, their needs and knowledge</td>
<td>Feedback and analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision making and action</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurable progress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Learning and refining</td>
</tr>
<tr>
<td></td>
<td>Engagement is optimised</td>
<td></td>
</tr>
</tbody>
</table>

Full details of our engagement approach and methodology are available in annex 3.2 Our strategy for engagement (2023-28)

— Identifying stakeholders, their needs and knowledge
Our stakeholder database maps over 6,000 stakeholders against our segmentation model with an annual database audit to ensure diversity of representation.

— Understand and adapt
We engage with hard-to-reach, vulnerable and time-poor individuals adapting our approach accordingly to meet their needs.

— Feedback and analysis
We record and review all feedback in an accurate and timely manner, tracking feedback, satisfaction and actions.

— Decision making and action
Our stakeholder engagement leads management group (ELMG) review feedback and develop action plans. These are reviewed by the executive, CEG and stakeholder panels.

— Measurable progress
Through robust project management, we report and measure progress including stakeholder return on investment (ROI), benefits and satisfaction; and report back outcomes to our stakeholders.

— Learning and refining
We operate a cycle of continuous improvement for all engagement and continually refine our processes.

— Engagement is optimised
The ongoing feedback and insights gathered are fundamental to our decision-making processes and our success as a business, keeping us accountable for delivery.
Giving consumers a voice in the energy transition

To prepare for a fully decarbonised future, we will deliver a sector-leading programme of ambitious, innovative and effective engagement for our customers and stakeholders right across our region. Working together, we will improve our existing services and innovate, developing new, inclusive markets to meet customer needs better, now and in the future, while ensuring no one is left behind.

We will work collaboratively with our region’s stakeholders recognising their differing levels of ambition and understanding of decarbonisation. We will be best in class in providing education, guidance and data to help support their decision making and planning.

Throughout our engagement process customers and stakeholders have told us that we need to be much more ambitious and visible to them in order to effectively fulfil this enhanced support role and provide independent, impartial advice. They want us to raise our profile and general awareness as an anchor organisation in the region.

To respond to these challenges and the accelerated pace of change as our region decarbonises, we will spend an additional £0.5m p.a. to increase the ambition, impact and scale of engagement initiatives, marketing outreach campaigns and dynamic external communications materials that will promote, support and advise on what changes are required.

Our channels for engagement (core pathways) are tailored and targeted to meet our stakeholders’ levels of knowledge:

<table>
<thead>
<tr>
<th>Level of knowledge</th>
<th>Expert</th>
<th>Interested</th>
<th>Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement type</td>
<td>Expert panels</td>
<td>Conferences</td>
<td>Direct customer engagement</td>
</tr>
<tr>
<td></td>
<td>Sector forums</td>
<td>Deliberative engagement</td>
<td>Research</td>
</tr>
<tr>
<td></td>
<td>Capacity-building workshops</td>
<td>Proactive communications campaigns</td>
<td></td>
</tr>
<tr>
<td>Reach</td>
<td>500+</td>
<td>2,000+</td>
<td>50,000+</td>
</tr>
</tbody>
</table>

Consumers

- **70+** customers represented in two panels
- **64** young people on our panels

Community energy

- **20** Community energy representatives take part from across the region

Future consumers

- **64** young people on our panels

Future fairness

- **20** small to medium-sized business representatives

Social issues

- **6** leading experts at our independently chaired session

Rural

- **30** rural domestic customers contribute to our panel

Stakeholders

- **40+** stakeholders on our representative panel to share their views
Robust governance, accountability and reporting

Our engagement strategy and approach sets out our robust methodology for effective engagement and ensures that stakeholder voices feed strategic and day-to-day decision making. Our central stakeholder team will continue to oversee this process, with colleagues throughout the business responsible and accountable for leading and delivering engagement and acting on stakeholder feedback in their plans.

We have a comprehensive project management and benefit quantification approach in place to measure our impact and the effectiveness of our programmes in order to deliver value for money for our customers and stakeholders. Our performance targets have been defined based on stakeholder feedback and built on our strong track record. We define different metrics dependent on the engagement activity objectives or intended impact of projects. These will be shaped, challenged and delivered with stakeholders and scrutinised alongside our engagement.

To demonstrate our accountability, in addition to our established governance processes of reporting monthly to our executive team, our engagement commitment delivery will be reported on and published annually. This will be scrutinised regularly by the CEG and our citizens panel, which will receive quarterly updates against commitments, performance targets and the impact of our work from our engagement leadership team. This will hold us to account for delivering our commitments and ensure we continue to reflect a strong customer voice throughout our plan delivery.

Figure 3: stakeholder-led decision making process

- Insights and feedback captured through our engagement process
- Stakeholder engagement leads management group
- Senior and executive team
- Action plan
- Assign executive sponsors
- Stakeholder panel
- Business changes
- New implementation
- Measure return on investment and stakeholder satisfaction
- Report back to stakeholders on actions and outcomes from their feedback
- Feedback
- Challenge
- Business-as-usual insights
- Proven data insights
  - Insights and feedback from customer service and engagement teams
- Regulator and government
- Internal and external research
- Best practice

Northern Powergrid: our business plan for 2023-28 – 39
## Giving Consumers a Stronger Voice

<table>
<thead>
<tr>
<th>Customer outcomes</th>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SE1</strong> Inclusive: ensure that our engagement reaches and includes a diverse range of individuals, groups, experts and locations that represents the communities we serve</td>
<td>Tailored support for community groups</td>
<td>SE1.1) Attend regional/municipal assemblies, panels, surgeries, across our region</td>
<td>Independent assessment of inclusion and reach</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Accelerate decarbonisation efforts</td>
<td>SE1.2) Expand our community energy engagement offering</td>
<td>No. regional engagement events p.a.</td>
<td>6</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Support early understanding of sector-specific barriers and enablers for decarbonisation</td>
<td>SE1.3) Support individual communities with their decarbonisation efforts</td>
<td>Community energy engagement p.a.</td>
<td>7</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Greater level of understanding of the energy transition journey</td>
<td>SE1.4) Continue to develop educational resources to raise awareness of the energy transition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved resources and reach focussing on emerging, hard-to-reach and seldom-heard customers</td>
<td>SE1.5) Dedicated resources for local energy groups to develop plans and access expertise across our region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SE2</strong> Accessible: increase the use of new communications channels, remove engagement barriers, and increase cooperation with a wide range of local organisations so innovative thinkers and future customers access and contribute to our engagement</td>
<td>Targeted advice/support for community and customers on low carbon technologies (LCTs) and flexible energy services</td>
<td>SE2.1) Facilitate community and customer training programmes and surgeries</td>
<td>Community and customer capacity programmes</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Improved collaboration and cooperation in engagement (reducing stakeholder fatigue)</td>
<td>SE2.2) Host three crossUTILITY forums p.a.</td>
<td>Cross-utility forums p.a.</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Increased social media interactions, agile engagement and digital reach</td>
<td>SE2.3) Expand to host more industrial representative meetings p.a.</td>
<td>Industrial representative meetings p.a.</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE2.4) Coordinate with DNOs/GDNs to consolidate events/forums, reducing stakeholder fatigue and improving outputs</td>
<td>Cross DNO/GDN forums p.a.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE2.5) Enhance digital channels to increase presence on social media, SMS/text communications, and website</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>SE3</strong> Relevant: provide additional ways to discuss complex topics and tailor communication approaches so that we deliver engagement that promotes an understanding of priority topics such as decarbonisation and an inclusive energy transition</td>
<td>Provide a convening role for local area energy planning (LAEIP)</td>
<td>SE3.1) Host four local energy planning forums p.a.</td>
<td>Local energy planning forums p.a.</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Regional decarbonisation roadmap supporting the energy transition</td>
<td>SE3.2) Meet annually with each local authority, local enterprise partnership (LEP), and combined authority on the energy transition</td>
<td>Formal local authority consultation p.a.</td>
<td>-</td>
<td>-</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>A regular forum for local authorities to share good practice, problem solve and co-create to support their decarbonisation plans</td>
<td>SE3.3) Host and coordinate quarterly regional decarbonisation working groups</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Building more accurate, detailed scenarios with customer input to deliver an efficient and economic network</td>
<td>SE3.4) Host local authority forums to discuss decarbonisation plans and progress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Support vulnerable customers, community leaders and customers to better understand decarbonisation and practical steps to take</td>
<td>SE3.5) Run an annual programme to engage on energy scenario planning</td>
<td>Annual Distribution Future Energy Scenarios (DFES) refresh</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE3.6) Deliver tailored communications for hard-to-reach and vulnerable customers explaining the benefits of energy transition</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>SE3.7) Introduce a digital ‘ideas board’ to improve energy services and transition planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SE4</strong> Continuously improving: continue to mature the skills, processes, infrastructure and capacity of communities, customers and our own teams to ensure engagement is two-way, measurable and transparent</td>
<td>Longitudinal insight mapping of stakeholder needs, priorities and their satisfaction</td>
<td>SE4.1) Undertake economic and social insight analysis to understand changing needs</td>
<td>Stakeholder satisfaction survey</td>
<td>85%</td>
<td>85%</td>
<td>&gt;90%</td>
</tr>
<tr>
<td></td>
<td>Impact-driven analysis delivering increased benefits for stakeholders</td>
<td>SE4.2) Respond to innovative thinkers in engagement, ensuring we aren’t satisfied with the traditional ways of doing things</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Build an innovative, best in class engagement programme based on insight from experts</td>
<td>SE4.3) Annually review our communications assets to increase visual impact and simplify language for all community needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communications and engagement materials meeting the needs of all communities</td>
<td>SE4.4) Introduce a digital performance scorecard to report progress and impact of our engagement</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. See annex 1.4 – Key targets & measures for profiled 2023-28 targets and further supporting measures
By 2028 the energy system will need to be ready to serve a different world.

Our network is set to play an even more crucial part in the life and wellbeing of our region.

In one of the most ambitious national responses to the threat of climate change, the UK government enshrined the net zero by 2050 target in law in 2019 and accelerated it again to 2035 in response to the advice of the Climate Change Committee (CCC) in setting the Sixth Carbon Budget. By the end of the 2023-28 period, the country needs to be well on the way to a decarbonised energy system to achieve this – and our network is at the heart of how it will be delivered. To support these targets, the government’s 10-point plan for a green industrial revolution, published in November 2020, outlines significant policy ambitions, including:


— bringing forward the ban on the sale of new fossil fuel cars and large goods vehicles (LGVs) from 2040 to 2030;
— a ban on the sale of hybrid electric vehicles (HEVs) by 2035; and
— 600,000 heat pump (HP) installations annually by 2028 across the UK.

How much it will cost

<table>
<thead>
<tr>
<th>2023-28 expenditure (annual)</th>
<th>£189.3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>versus 2015-23</td>
<td>+£148.1m</td>
</tr>
<tr>
<td>29.5% of totex</td>
<td>+359.5%</td>
</tr>
</tbody>
</table>

Our plan delivers on the call for action from our stakeholders with an ambitious £1bn of investment to support our communities on the way to net zero emissions.
Setting the scene

Decarbonising the energy system

It is clear that other government policies are set to drive rapid change in the rate of low carbon technology (LCT) uptake during our next price control period. The Future Homes and Future Buildings Standards set out proposals to future-proof homes and businesses for net zero which are scheduled to be implemented from 2025; and subsidies such as the Clean Heat Grant Scheme to support improving energy efficiency and low carbon alternatives will work in conjunction with the ‘plug-in grant’ to incentivise the take-up of new low-emissions vehicles. The precise blend of what technologies will emerge and at what pace is not known, but the outcome is clear: there will a major shift in energy use, and our network will be instrumental in that being possible. It is also clear that, whatever pathway ultimately emerges, this next decarbonisation phase is focussed on the growth in low carbon electricity at the local, lower voltage end of our network – be that HPs, electric vehicles (EVs) or community energy.

Local authorities across the UK, including those in our region, have declared climate emergencies and set their own targets for establishing Clean Air Zones and building efficiency standards. These are in many instances more ambitious than the nationwide target and can increase the pace of decarbonisation by further incentivising the uptake of LCTs.

Climate emergency declarations and dates for net zero ambitions for local authorities

Around three quarters of our region’s local authorities and combined authorities have declared climate emergencies – with around 60 per cent having their own net zero targets sooner than 2050, some as early as 2030.

In 2020 Newcastle became one of 88 cities to make the Carbon Disclosure Project’s ‘A List’ of global cities leading on climate adaptation following plans to reduce energy use in homes by 30 per cent, and install solar panels on 30 per cent of homes and 60 per cent of non-domestic properties.2

Newcastle City Council is also installing 250 HPs in homes across the city.3 The industrial cluster of Humberside is pioneering leading green innovation through the Zero Carbon Humber partnership, which plans to create 49,000 green jobs by 2027, and Associated British Ports’ completion of the UK’s largest rooftop solar array at 6.5MW atop the Port of Hull.4

1. Tonnes (t) of carbon dioxide (CO2) equivalent (tCO2e).
Decarbonisation

Four key questions

The answer to these questions will largely be driven by consumer choices and government policy around decarbonisation. Here we are setting out our plans to ensure that we manage and build our network to be ready to deliver decarbonisation and embrace the uncertainty surrounding these choices.

**How electrical?**

— Electricity today is increasingly generated from low carbon sources. The UK’s renewable electricity outpaced its fossil fuel generation for the first time in 2020 with 41 per cent of electricity generated from renewable sources, and a new record of 67 consecutive coal-free days was reached.

— The electrification of some sectors of the economy is a relatively straightforward way to use low carbon energy. We will all rely on electricity more to provide energy, but we don’t yet know to what extent.

— This depends on policy decisions that are made by the government about the energy system as a whole, for example whether heat is provided by electric HPs and/or hydrogen boilers. This will be uncertain for some time.

**How local?**

— In a local, decentralised energy system, engaged users and producers of electricity promote efficient use of every kilowatt hour of green energy generated. Overall, this means that electricity should be more affordable for all.

— We are connecting more locally distributed renewable generation to our network and connecting local buyers and sellers of electricity to each other. In the next price control period, we expect the amount of connected generation and storage to more than double.

**How flexible?**

— More intermittent energy generation sources such as solar and wind, and more flexible customer demand for power, means that our role is increasingly about controlling and optimising the bidirectional flow of low carbon energy through our network.

— The amount of customer flexibility will drive how much additional capacity we need to add to our network, and how big the whole energy system needs to be (for example, the number and type of power stations), by flattening peaks in demand and generation.

— We have a flexibility-first mindset. This entails prioritising flexibility solutions where we can and only implementing network solutions where flexibility is not viable.

**How fast?**

— How quickly we reduce carbon emissions will be heavily dependent on the rate at which renewables displace energy generation from fossil fuels, and how quickly customers take up LCTs for transport and heat.

— Different parts of our region will transition at different speeds based on a range of factors, including the location of carbon intensive industries and population demographics which are likely to affect people’s willingness and ability to adopt new technologies.

— Total greenhouse gas emissions – the ‘area under the curve’ – are more important than the point in time when net zero is achieved.
To optimise our investment to 2050, we are taking a flexibility-first approach to our investment strategy for decarbonisation.

The next five-year period marks a key phase of the low carbon transition. Our overall objective is to deliver efficient investment in our network to set us on the right track for achieving the UK government’s net zero goals, while remaining able to adapt our plan to changing requirements in the longer term. Our challenge is to make rapid progress but remain able to adapt to an evolving decarbonisation landscape.

As we shared with our stakeholders in our Emerging Thinking report published in August 2020, flexibility first means that, wherever it is possible and cost-effective, we will prioritise investment in activities to facilitate and optimise customer and network flexibility ahead of more costly traditional reinforcement. All routes to decarbonisation require significant investment in our network. Taking a flexibility-first approach is a means to ensuring that this investment is targeted where our network needs it most and delivered efficiently to maximise value for customers.

To ensure we are equipped to continue to keep all options open on the decarbonisation pathway to 2028 and beyond, we are also planning investment to enable our region to go further, faster.

In our decarbonisation plan...
- This means spending to stimulate the flexibility market for future price controls to optimise how much traditional reinforcement we can defer or avoid.
- Investing in the development of a deep and liquid market for flexibility today will ensure efficient investment and option value in managing our network as decarbonisation accelerates into the 2030s.
- This is described in more detail in the Scenarios and Investment and DSO Strategy sections that follow.

In our plans to maintain our assets...
- This means upsizing our equipment to fit larger cables when we are already intervening to make repairs or replace our assets.
- This ensures that our assets are ‘net zero ready’. Where possible, we plan to only intervene with our assets once between now and 2050. For further details see our Asset Resilience strategy plan section.
Our investment plans for 2023-28 are geared to facilitate our region’s plans to decarbonise.

To respond to the four key questions (how fast, flexible, electrical and local will the energy transition be?), we need to invest in our network, our people and our systems to revolutionise the service that we offer our customers as we transition to a low carbon energy system. In order to do this, we have created a plan with three key elements of decarbonisation investment: for further detail see our decarbonisation scenarios and investment.

Decarbonisation Scenarios and Investment:
£589m
2023-28

Consideration of the possible energy pathways that could unfold in our region
In response to these pathways, we set out what investment we need to make on our network to keep all pathways open to ensure our network is ready for LCTs being connected in the future

We have also made provision for costs to support decarbonisation across our plan, including in Asset Resilience to fit ‘net zero ready’ equipment when we are already intervening on our network; Connections to support the uptake of low carbon technologies (LCTs) being connected to our network; Customer Service; and indirect support costs. This additional investment, totalling £110.5m in 2023-28, is essential for preparing our business for transformational change in order to facilitate decarbonisation.

Our plans to prepare our network for decarbonisation have been devised through working with a wide range of customers and stakeholders, building on our DSO v1.1 development plan published in October 2019, Emerging Thinking in August 2020, and Distribution Future Energy Scenarios (DFES) in December 2020.

Figure 1: decarbonisation investment summary per annum, 2023-28

<table>
<thead>
<tr>
<th>£m annual</th>
<th>Scenarios and Investment</th>
<th>DSO Strategy</th>
<th>Whole System</th>
<th>Total decarb.</th>
<th>Indirect costs associated with decarbonisation</th>
<th>Decarbonisation plan</th>
<th>Other output areas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility first: monitor and manage</td>
<td>2.3</td>
<td>17.5</td>
<td>3.2</td>
<td>22.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforce</td>
<td>114.8</td>
<td>-</td>
<td>-</td>
<td>114.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go further faster</td>
<td>0.6</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>117.7</td>
<td>17.5</td>
<td>3.2</td>
<td>138.4</td>
<td>50.9</td>
<td>189.3</td>
<td>22.1</td>
<td>211.4</td>
</tr>
</tbody>
</table>
Scenarios and Investment

We will embrace and manage uncertainty to enable all credible pathways to decarbonisation by taking a flexibility-first approach and staying ahead of the decarbonisation curve through a blend of smart grid and Distribution System Operation (DSO) enablers, smart grid solutions, customer flexibility and targeted network reinforcement.

Our role in the energy transition.

We will efficiently open up all credible pathways to decarbonisation in 2023-28 and beyond by embracing uncertainty and remaining adaptable to change, helping our customers realise the best value from their assets while optimising value across the whole energy system.

Our network is key to facilitating the country and region’s efforts to decarbonise, regardless of the decarbonisation pathway that materialises. All forms of the low carbon transition see an increase in the number of people who actively manage their energy use and generation. Moreover, all decarbonisation pathways also see varying levels of more electric vehicles (EVs) and heat pumps (HPs) on our local, low voltage (LV) network, resulting in an increase in demand and potential for network constraints, requiring more capacity to be made available.

To respond to these changing demands on our network, the objective of our investment strategy over 2023-28 is to set us on the right track for achieving the UK government’s net zero by 2050 goal while remaining flexible to the unfolding uncertainty of the ongoing energy transition.

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A comprehensive response to the transition

Our response to the transition has been developed through comprehensive engagement with our customers and other stakeholders.

To deliver a business plan that meets the wide-ranging needs of our stakeholders we have engaged with as broad a range of stakeholders as possible, including not only those in the energy sector (regulator, Electricity System Operator (ESO), other Distribution Network Operators (DNOs)) but also the heat and transport sectors, local authorities, and a range of industrial, commercial and residential customers. We recognise that the transition will be customer-driven and we have, therefore, sought feedback from our customers in particular to ensure that our strategy will empower them to lead the change. In planning our investment, we will continue our effective coordination across stakeholders to ensure efficient investment from a whole system perspective. You can read in more detail about our plans in this area in the DSO Strategy and Enabling Whole System Solutions sections.

Our stakeholder engagement has revealed a high level of ambition for decarbonisation. A significant majority of our customers support that we should pursue an accelerated decarbonisation pathway, reaching net zero by 2050 at the latest. Given the uncertainty of national and local energy developments, as well as diversity in local net zero targets, stakeholders are overwhelmingly in favour of us choosing a scenario in our investment planning that would facilitate any decarbonisation pathway that emerges. They have conveyed an appetite for us to be ambitious in our net zero planning to enable a faster transition to net zero that is socially equitable and does not put vulnerable and fuel-poor customers at a disadvantage.

We have incorporated our stakeholders’ feedback when considering possible future scenarios for our region, in determining our assumptions around customer flexibility, and in designing sensitivities to test the robustness of our investment plan.

Putting a flexibility-first mindset into practice.

We’ve already made it clear that we see the use of flexibility as a fundamental means to efficiently manage well-targeted network utilisation and reinforcement needs. Optimising flexibility enables us to manage peaks in generation and demand on our network, which means we can get the best value out of our existing network and the investments we make, maximising cost efficiency for all customers.

Flexibility will manifest itself in different forms – and we need to be ready to harness them all.

We want all of our customers to be able to financially benefit from offering flexibility to the energy system. From a whole energy system perspective, effective use of network and customer flexibility will also enable customers’ energy bills to be kept as low as possible on the low carbon transition by optimising the use of existing infrastructure and driving efficient investment across the whole energy system.

Ongoing stakeholder engagement will help develop our understanding of market needs and help us provide targeted support to stimulate deep and liquid local markets for flexibility. Effectively adapting our business and driving this market development is at the heart of our DSO Strategy.

### Types of flexibility

**Price-driven customer flexibility:**

customers respond to price signals in their energy tariffs to flex their usage patterns. For example, time-of-use tariffs for domestic and commercial customers will incentivise energy usage to off-peak periods when demand is lower, or the use of smart charging for EVs to shift consumption patterns to when there is a surplus of green electricity available.

**Network flexibility:**

we will continue to invest in smart grid solutions and field-based equipment that will allow us to operate the local network in a more active manner, allowing us to use near real-time data to automatically reconfigure or adjust settings to optimise the power flows on our network and release capacity where needed.

**DNO-contracted customer flexibility – flexible connections:**

we offer customers a cheaper, faster connection in a constrained area of the network using techniques such as active network management (ANM), which enables us to curtail generation at peak times. We will have four ANM zones in operation by 2025 with an estimated 540MW of flexibility.

**DNO-contracted customer flexibility – flexibility services:**

customers contract with us and we pay them to turn up or down their demand or generation at specific times or under particular circumstances.
Our progress so far

We have already taken significant steps in preparing for this transition.

A number of our current initiatives are supporting the transition to net zero. In the current price control period we are investing in our flagship smart grid enablers programme, creating the backbone of a smart grid, which is transforming our ability to monitor, control and communicate with our field-based equipment. It allows us to operate the local network in a more active manner and to use near real-time data to automatically reconfigure or adjust settings to release capacity to where it is needed. This has improved our ability to respond to the take-up of low carbon technologies (LCTs) and allowed us to operate our network more flexibly with smarter, more efficient and cost-effective practices and technologies.

Through this increased monitoring we have improved data capture about our network and improved processes for using this data in our decision making, enabling us to target network investment efficiently. We are committed to further modernising our data management practices and sharing information about our network with stakeholders, building on what we share today through our embedded capacity register and our open data platform for our Distribution Future Energy Scenarios (DFES), which are published annually through ODI Leeds.\(^1\) You can read more about our plans to share and combine our data with external sources (such as smart meters) in the DSO Strategy and Data and Digitalisation strategy.

Since 2015 we have facilitated more than 45,000 LCT connections including HPs, EVs, solar and other distributed generation across our primary and secondary networks, totalling at least 1.5GW, and ensured that our network is ready for this additional demand and generation load.

In May 2021 we published our Green Recovery plans to invest a further £300m available for investment in vital electricity networks across the country following the economic impact of the COVID-19 pandemic and will enable the region to accelerate a number of projects, including regeneration and development at the Humber Freeports, large scale solar and wind generation, and rapid EV charging on our motorway network.

**Network utilisation is increasing as consumption and generation patterns evolve.**

Net maximum demand has dropped by around 24 per cent since its peak in 2005-06. This trend has been driven by increased energy efficiency and a series of economic events such as the global financial crisis, which affected heavy industrial demand, and increasing amounts of domestic generation such as solar photovoltaics (PV) embedded within our network.

Commercial generation on our network that operates at times of peak demand has also increased each year, which has contributed to the widening difference between net and gross peak demands year-on-year. This has not, however happened in a uniform fashion across our network. We still have challenges to address, particularly with notable load growth occurring in some of our metropolitan areas and (where embedded generation patterns have changed) an increase in net demand. For this reason, we need to understand and manage the changing nature of demand and generation at a more local level.

Network utilisation, measured at a more granular level than network-wide peak demand, has remained relatively stable throughout the current price control period. We monitor this using large data sets on Load Index (LI) utilisation bands, which assess peak demand versus firm capacity at major substations. Our strategy has been to maintain our overall risk position, dealing with highest risk substations (those closest to capacity). Our forecast for the end of 2015-23 has been updated to align with our new planning scenario and the latest network impact assessment done as part of this plan.

Our forecast LI position at our major substations is:

- 88 per cent are less than 80 per cent utilised;
- 10 per cent are 80-99 per cent utilised; and
- two per cent are >99 per cent utilised.

You can find further detail in the **Scenarios and Investment annex**. Looking ahead, the projected increase in EVs and heat pumps discussed below are expected to increase the utilisation quite significantly.

For generation, we provide information to customers setting out the network utilisation for our major substations. We currently have the capacity to connect a typical smaller (5MW) generator to 88 per cent of our primary substations (this would only be possible at 39 per cent without customer flexibility solutions such as ANM. Ninety-five per cent of our largest substations could accommodate a typical generation connection of 25MW when customer flexibility is used (51 per cent without). This means that capacity exists for cost-effective new generation connections on around 90 per cent of our extra high voltage (EHV) and high voltage (HV) network.

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\(^1\) ODI Leeds is a pioneer node of the Open Data Institute. Our DFES are published on its site here: [https://odileeds.github.io/northern-powergrid/](https://odileeds.github.io/northern-powergrid/)
Planning the journey towards a low carbon future

1. The potential needs: Scenarios and pathways

A set of credible future pathways to enable us to picture possible energy futures and explore the issues they raise, including:

- Three National Grid Future Energy Scenarios (FES), and our DFES.\(^1\) (Note: one of the FES does not meet net zero by 2050 and, therefore, is discounted.)

- Three pathways described in the Climate Change Committee (CCC)’s Sixth Carbon Budget.\(^2\)

Each scenario is made up of a range of inputs about variables in the energy system including low carbon technology (LCT) uptake, generation, energy efficiency, etc.

Input assumptions are informed by government policy, stakeholder engagement, regional knowledge and market information.

From this range of inputs identified, we create a hypothesis about the set of input assumptions that we believe represent our best view based on a set of principles (described below). This is our Planning Scenario.

We are able to design this hypothesis as a result of the iterative ongoing feedback loop process of DFES and stakeholder engagement over a number of years, refining and updating our range of assumptions regularly.

2. The baseline need: Planning Scenario

We model our Planning Scenario to test our hypothesis against the principles that we have identified for what constitutes our best view.

It is aligned to latest government policy and adopts a balanced approach over the 2023-28 period in line with recommendations from the CCC.

3. Solutions: Investment plan

Network impact assessment driven by the assumptions in the Planning Scenario about network load growth in the 2023-28 period and customer-connected LCTs.

Optioneering around solving network constraints by a mix of price-driven and DNO-contracted customer flexibility, network flexibility and conventional network reinforcement, to determine network investment required in 2023-28.

Testing of investment across range of potential scenarios and capturing synergies with other investment drivers.

OUTPUT: a set of network intervention costs required to address network needs presented by the Planning Scenario in the 2023-28 period

OUTPUT: a set of input assumptions, LCT projections and gross maximum network demand for a Planning Scenario

- Sensitivity testing to help us understand the impact of uncertainties around key scenario input assumptions, and how they drive different LCT projections and gross peak demand
- Testing helps refine and iterate our input assumptions as we test our Planning Scenario hypothesis

OUTPUT: a set of input assumptions LCT projections and gross maximum network demand for a range of scenarios

- Sensitivity testing to determine the cost impact of changing scenario input assumptions
- Analysis to cost up the reference scenarios
- Deliverability assessment

We have developed a range of scenarios to forecast possible decarbonisation pathways to net zero. These scenarios range from high electrification in the heat and transport sectors to other possible states of the world where alternatives to natural gas such as hydrogen are expected to play a greater role.

Our range of scenarios includes:

- Four DFES scenarios, covering three regional scenarios based on the National Grid FES developed at the national GB level, and one scenario developed by us.

- Three additional scenarios based on pathways identified in the CCC’s Sixth Carbon Budget (Balanced Net Zero, Widespread Engagement and Headwinds). Three of the CCC scenarios are very similar so we have modelled the ends of the CCC range, therefore covering all five scenarios.

### Speed of decarbonisation against level of societal change

**CONSUMER TRANSFORMATION**
- Electrified heating
- Consumers willing to change behaviour
- High energy efficiency
- Demand side flexibility

**SYSTEM TRANSFORMATION**
- Hydrogen for heating
- Consumers less inclined to change behaviour
- Lower energy efficiency
- Supply side flexibility

**NET ZERO EARLY**
- Fastest regional net zero scenario (approx. 2040-45)
- Highly accelerated electric heat and transport
- Highly decentralised and distributed renewable generation

**LEADING THE WAY**
- Fastest (national) credible decarbonisation
- Significant lifestyle change
- Mixture of hydrogen and electrification for heating

Three of National Grid’s Future Energy Scenarios. The fourth scenario, Steady Progression, does not meet net zero by 2050 and, therefore, is discounted.
These seven scenarios have helped inform our Planning Scenario and together comprise the set of future energy pathways that we have considered as part of our business planning process.

Our scenarios are built by considering assumptions about a range of building blocks, including EVs, HPs and energy efficiency and applying them to our electricity network between now and 2050, to create a scenario-based load growth model.

The DFES scenarios use inputs from National Grid’s FES in conjunction with regional knowledge and bottom-up assumptions to build a regionalised view of the scenarios. The range of CCC scenarios has been translated from national pathways to our region. As part of this process, we scaled down the CCC’s nationwide EV and HP uptake scenarios to our licence areas to create scenarios applicable for our region.

You can read in more detail about the approach we took to modelling the scenarios, the assumptions used and outputs of the range in the Scenarios and Investment annex (4.1).

Our scenario development has been influenced by regional knowledge, stakeholder input and other published data.

We have worked with industry partners and undertaken extensive customer engagement and industry consultation to ensure that the scenarios meet local aspirations. To ensure national coordination in the delivery of the decarbonisation agenda, we engage regularly with the ESO, in particular through the annual FES and DFES feedback loop, which ensures national and regional projections are iterated and aligned regularly. Additionally, feedback from regional stakeholders, including local authorities and industrial customers on our assumptions, informs our scenario modelling.
Refining our view through stakeholder engagement

Establishing our scenarios and pathways

The results of our modelling present a range for the expected load growth on our network from now to 2050. The uptake of EVs and HPs are the primary drivers across the range of scenarios.

Figure 1: gross peak demand without customer flexibility

Figure 2: EVs trajectory to 2050

Figure 3: heat pumps trajectory to 2050

The Planning Scenario is at the higher end of the range during the 2023-28 period, ensuring we are prepared for an accelerated pathway and minimising deliverability risks in the 2030s.

Internal combustion engine (ICE) ban: the Planning Scenario takes into account the government’s 10-point plan policy decision to ban the sale of new ICE vehicles from 2030, with a ban on hybrids from 2035. None of the National Grid FES account for this policy as the scenarios were published prior to this announcement.

The Planning Scenario follows the CCC’s Balanced Pathway for heat pump assumptions, the CCC’s recommended path to achieve net zero.
Next, based on the range of possible future pathways and the assumptions used to build them, we have developed a single Planning Scenario that aligns with our stakeholder feedback and helps achieve their aspirations and plans for decarbonisation across our region. This chosen scenario enables a predominantly electrification-driven decarbonisation strategy, and is based on targets set by the government’s 10-point plan to reach net zero by 2050. We have ensured that this Planning Scenario meets the following criteria:

- it keeps all future credible pathways open, ensuring that we are not an obstacle to any decarbonisation pathways;
- it is within the range of Ofgem’s reference scenarios, the three net zero compliant FES scenarios by National Grid and the CCC’s Sixth Carbon Budget scenarios;
- it is aligned with the latest government policy; and
- it reflects what we have heard from local stakeholders about the desire to facilitate an accelerated electrification-heavy pathway to decarbonisation.

Our Planning Scenario is at the higher end of the range of pathways since it accounts for government targets that were set after the 2020 FES were published. It assumes that we will connect about a further 830,000 EVs and 251,000 HPs to our network over the course of the next price control period. It is also in line with our stakeholder vision of an accelerated electrification-heavy pathway to decarbonisation.

The Planning Scenario has been informed by sensitivity analysis and stress testing to see how changes in assumptions impact demand levels and corresponding investment requirements. While this results in the Planning Scenario coming close to providing a ‘best view’ envisioned in Ofgem’s business plan guidance, it is important to emphasise that it is not the most likely scenario, rather the one best optimised for the inherent uncertainty in planning for all decarbonisation pathways. It ensures that our network will be in a position to effectively keep pace with any pathway that emerges by 2028 and, therefore, represents the most efficient way of keeping all pathways open.

If we were to plan for a slower transition in 2023-28 we would risk not being able to keep up with an acceleration in future periods and, therefore, becoming an obstacle to our stakeholders achieving their decarbonisation ambitions. Additionally, we would risk not being able to deliver on new policy developments from the government in the coming years.

The 2023-28 period provides an opportunity to focus on making a high proportion of low-regrets investments, i.e. investments that are needed in any of the scenarios over the next two regulatory periods (i.e. to 2033). The grouping of pathways is tighter in the early years which reduces the level of uncertainty around the investment we are planning today for the 2023-28 period. Developed in this manner, our Planning Scenario ensures that we are an enabler of effective decarbonisation in the 2023-28 period, keeping all options open to achieve net zero. As revealed by sensitivity testing, it is sensibly robust against a wide range of assumptions and possible decarbonisation pathways.

We can enable our region to save 255.3 tCO₂ by 2028 by investing to facilitate the LCT uptake assumed in our Planning Scenario. Planning for a pathway that meets the requirements of the CCC’s Sixth Carbon Budget means we are making our essential contribution to tackling global climate change.

### Key building blocks

<table>
<thead>
<tr>
<th>Electric vehicles</th>
<th>Our Planning Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>— In line with the government’s 10-point plan, it assumes a ban on ICEs by 2030 and hybrids by 2035</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heat pumps</th>
<th>Our Planning Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>— In line with the CCC’s Balance Pathway scenario, it meets the government’s 10-point plan targets of 600,000 heat pumps being installed annually by 2028</td>
<td></td>
</tr>
<tr>
<td>— It assumes a ban on the sale of new gas boilers from 2025</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4: overview of our planning scenario**

<table>
<thead>
<tr>
<th>Category</th>
<th>End of ED2 period (2028)</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total electricity demand (TWh)¹</td>
<td>37.9</td>
<td>64.2</td>
</tr>
<tr>
<td>Total demand from HPs (TWh)</td>
<td>1.4</td>
<td>19.1</td>
</tr>
<tr>
<td>Total demand from EVs (TWh)</td>
<td>2.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Peak demand (GW)</td>
<td>6.8</td>
<td>12.4</td>
</tr>
<tr>
<td>Number of HPs (thousands)</td>
<td>309.0</td>
<td>3,572.0</td>
</tr>
<tr>
<td>Number of EVs (thousands)</td>
<td>941.0</td>
<td>5,015.0</td>
</tr>
<tr>
<td>CO₂ emission savings facilitated (tCO₂e)</td>
<td>255.3</td>
<td>447.0</td>
</tr>
</tbody>
</table>

**Figure 5: carbon emissions enabled by our Planning Scenario (tCO₂e)**

1. Terrawatt hour (TWh).
Step 3
Investment plan

We have developed an investment strategy and plan that presents our assessment of costs, driven by assumptions on the uptake of LCTs and network load growth in our Planning Scenario. Our investment plan takes a flexibility-first approach, first investing in and optimising the use of network monitoring to identify where constraints may arise; then managing potential constraints through network and customer flexibility; and deploying traditional reinforcement where economic and efficient, aiming to maximise the rate at which we can facilitate decarbonisation. It also prepares for us to go further, faster, stimulating flexibility markets for future price control periods, and factoring in synergies with other investment drivers in our Asset Resilience section. Overall this ensures our investment plan is well targeted and efficiently delivered.

To manage the data from the increase in sensors we will invest in new ingestion, storage and analysis tools that provide enhanced insight and decision-making capability. This monitoring – in conjunction with operational technology platforms – then forms the infrastructure necessary to implement customer and network flexibility. Monitoring also provides the ability to assess whether customer price-driven flexibility is having the impact we predicted and provides the basis for better informed investment decisions. This all has the effect of improving our management of network risk.

We see a clear maturity progression in how we will increase digitalisation on our network. Our 2015-23 activity is delivering the building blocks of a digital network with more sensors, advanced control devices in substations, and centralised data stores combined with data analytics for both planning and operational decision making. This progression will take us through increasingly sophisticated stages of data management and digitalisation through 2023-28 and on into the 2030s. The pace of change will be determined by the need and the availability and cost of the technology. The investments we are making now are extensible in functionality, scalable in volume and capable of integration with the investment to follow on later as we manage increased levels of low carbon electrification in local energy systems.

Notwithstanding the £87.4m investment in flexibility enablers described in the DSO Strategy, significant investment is required across four key areas of network reinforcement, namely:

- load-related reinforcement at EHV level;
- load-related reinforcement at HV/LV level;
- fault level-related reinforcement; and
- looped services.

Our approach:

Load-related reinforcement EHV: at EHV, we assess the impact on our network from the load growth in our Planning Scenario and across the range of potential decarbonisation pathways. Our load growth model provides future demand profiles that we use in conjunction with equipment ratings to determine the nature and magnitude of network constraints. We then undertake detailed options analysis to establish the optimal solution for the network area.

Load-related reinforcement HV/LV: at HV/LV, we use our LCT planning tool (developed by engineering consultancy WSP) to model, using a techno-economic approach, the network impacts and optimal solutions for resolving constraints across the network. This has been used to inform our investment plan assumptions on solutions and costs for developing this part of the network.

We see more constraints appearing on our LV circuits and to a lesser extent on our distribution HV to LV transformers over the next price control period. This outcome is a consistent theme across a range of the potential pathways. Although there is a range of possible future scenarios, we can say with a high degree of confidence that demand at the lower voltage end of the network is set to increase significantly as the national programme of transition towards electrification of heat and transport proceeds.

This is an extremely important – and valuable – feature of the outlook. It means that digitalising and strengthening the network infrastructure at this local level is a low-regret investment because it has a high probability of requiring additional capacity regardless of the pathway. Delivering these improvements for our customers allows them to maximise their use of LCTs and provide them with the ability to provide flexibility services to the wider energy system. Investments in monitoring the low voltage networks will provide us greater visibility of evolving network conditions and allow us to modify our investment strategy accordingly.

Fault level-driven reinforcement: we conduct a network analysis of the fault-level duty and capability across all our substations sites to identify constraints. Traditionally we have applied operational routines or alternative network running arrangements to manage these constraints. Our plan going forward is to target the removal of operational restrictions on the network to increase fault-level headroom and network flexibility, thereby removing barriers for the connection of low carbon generation.

Looped services: we assess the impact of LCT take-up specifically on the low voltage services to properties that are shared between customers. These are known as looped services and they can be a barrier to the connection of LCTs due to the limited capacity on these shared cables. Approximately 25 per cent of our domestic customers’ services are looped or shared between premises and we have assessed the coincidence of this type of connection with the installation of LCTs over the 2023-28 period. The optimal solution for these situations is to de-loop the services with new cables. This activity can be disruptive for our customers and our experience is that this is best done when a customer wishes to connect an LCT.

Our flexibility-first approach drives our investment plan, which comprises a blend of smart solutions, price-driven and DNO-contracted flexibility, and conventional network reinforcement.
Our flexibility-first approach

<table>
<thead>
<tr>
<th>Intervention category</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor</td>
<td></td>
</tr>
<tr>
<td>DSO Strategy – people and systems</td>
<td>We plan to invest £87m (of which £21m relates to LV monitoring, below) in skills and systems to enable us to optimally harness data and flexibility on the network, ensuring reinforcement investment is efficient and well-targeted <a href="#">See DSO Strategy, annex 4.2</a></td>
</tr>
<tr>
<td>LV monitoring</td>
<td>By using LV monitoring on our ground-mounted secondary distribution substations, we will have much more data to analyse demand and demand-growth, thus enabling investment decisions on confirmed data, as well as the ability to re-rate assets based on the nature of the load observed</td>
</tr>
<tr>
<td></td>
<td>We plan to install LV monitoring on a further 10,000 ground-mounted distribution substations by 2028 <a href="#">See DSO Strategy, annex 4.2</a></td>
</tr>
<tr>
<td>Manage</td>
<td></td>
</tr>
<tr>
<td>Price-driven customer flexibility¹</td>
<td>Based on findings from our Customer Led Distribution System (CLDS) innovation project and other market intelligence, we assume that customer price-driven flexibility will reduce demand by about six per cent and five per cent at EHV and HV/LV respectively during peak hours on the network from 2025 at no cost to our customers</td>
</tr>
<tr>
<td></td>
<td>Price-driven customer flexibility is dependent on time of use tariffs being offered by suppliers, expected to be driven by half-hourly settlement</td>
</tr>
<tr>
<td></td>
<td>We assume that customer price-driven flexibility will reduce the required investment by up to £113m at all voltages over 2023-28</td>
</tr>
<tr>
<td>DNO-contracted flexibility</td>
<td>We assume that we will spend £2m to procure customer flexibility at 25 per cent of our EHV substations that are expected to be constrained in 2023-28, driving net savings of £12m in conventional reinforcement</td>
</tr>
<tr>
<td></td>
<td>We also plan to invest £3m in flex procurement to stimulate the flexibility market, seeking to prepare sites expected to be constrained in the 2028-32 period for flexibility deployment in the future</td>
</tr>
<tr>
<td></td>
<td>Our use of ANM as a form of flexible connection is described in the Connections section of this plan</td>
</tr>
<tr>
<td>Smart grid solutions</td>
<td>Our smart solutions involve us deploying innovative solutions to use more of the inherent capacity in our network. By investing £10m in our smart solutions, we expect to deliver net benefits of £22m (compared to conventional reinforcement)</td>
</tr>
<tr>
<td>Reinforce</td>
<td></td>
</tr>
<tr>
<td>132kV and EHV load-related reinforcement</td>
<td>Once all customer flexibility and smart grid solutions have been considered, we turn to asset-based interventions to install new assets of higher capacity. Our projections show that we will need to invest £65m at EHV</td>
</tr>
<tr>
<td>HV/LV load-related reinforcement</td>
<td>We will install additional circuits to provide capacity and network flexibility and prioritise the replacement and upgrade of assets in areas where we also have a need for condition-related investment</td>
</tr>
<tr>
<td></td>
<td>A significant proportion of this investment is expected to be low regrets given the greater likelihood for reinforcement needs at the lower voltage levels to provide for the increasing penetration of LCTs</td>
</tr>
<tr>
<td></td>
<td>We expect to invest £406m at HV/LV in 2023-28</td>
</tr>
<tr>
<td>Fault-level reinforcement</td>
<td>We are targeting the removal of operational restrictions on the network to increase fault level headroom and network flexibility, removing barriers for the connection of low carbon generation</td>
</tr>
<tr>
<td></td>
<td>We expect that our investment in this area will be £74m</td>
</tr>
<tr>
<td>Looped service unbundling</td>
<td>Driven by LCT volumes assumed in our Planning Scenario, we plan to invest £34m to target the replacement of 21,600 looped services to customer properties</td>
</tr>
<tr>
<td></td>
<td>This assumes that two per cent of the properties where LCT connections are deployed will require the service to be de-looped to minimise customer disruption</td>
</tr>
<tr>
<td>Go further, faster</td>
<td></td>
</tr>
<tr>
<td>DNO-contracted flexibility</td>
<td>We also plan to invest £3m in flexibility procurement to stimulate the flexibility market, seeking to prepare sites expected to be constrained in the 2028-33 period for flexibility deployment in the future</td>
</tr>
<tr>
<td>Asset upsizing and synergies</td>
<td>We have revised our investment strategy to deliver capacity for future periods, installing assets sized to take into account load growth through to 2050, therefore ensuring we touch assets once where possible between now and 2050</td>
</tr>
<tr>
<td></td>
<td>We will invest £12m EHV and 132kV of load-related and £21m of fault level-related expenditure, which will provide synergistic benefits, where the investment for decarbonisation also addresses other issues such as equipment condition</td>
</tr>
</tbody>
</table>

¹ Ofgem and energy suppliers are in the process of implementing market-wide half-hourly settlement. Enabled by smart meters, it will provide the means for more cost-reflective pricing to encourage and reward customers for using power when it is cheap and plentiful from low carbon sources such as the wind and the sun.
Investment of £87.4m in flexibility-enabling actions drives potential net benefits of £169.2m in conventional reinforcement over the course of 2023-28. These net benefits are described in figure 9.

Our investment to enable decarbonisation, as well as innovation spend, yields synergies across a number of areas of our plan. These are detailed further in the Costs section and the Scenarios and Investment annex (annex 4.1).

Our planned investment will provide extra capacity on our network to meet the needs of the additional demand. Figure 8 shows that our network utilisation would be significantly higher by 2028 without our planned interventions at both our major and distribution substations. Further, we will mitigate the need for further reinforcement with 35 projects to create fault-level headroom at our major substation sites for generation and 15 projects to combat fault level constraints on the HV network. Our DSO Strategy and Major Connections Strategy detail our intent to increase our capability to accommodate more flexible customer connections of generation or demand via solutions such as ANM.

![Figure 6: the impact of customer flexibility on gross peak demand in our Planning Scenario](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast range</td>
<td>4,000</td>
<td>7,000</td>
<td>10,000</td>
<td>13,000</td>
<td></td>
</tr>
<tr>
<td>NPg DFES Planning Scenario 2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPg DFES Planning Scenario 2021 (TouT+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Note: TouT = time of use tariff, i.e. customer flexibility

![Figure 7: network intervention costs and volumes](image)

<table>
<thead>
<tr>
<th></th>
<th>132/EHV</th>
<th>HV/LV</th>
<th>Fault level</th>
<th>Looped services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNO-contracted flexibility</td>
<td>1.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.8</td>
</tr>
<tr>
<td>Smart solutions</td>
<td>2.8</td>
<td>0.7</td>
<td>6.0</td>
<td>-</td>
<td>9.5</td>
</tr>
<tr>
<td>Traditional reinforcement</td>
<td>65.2</td>
<td>406.1</td>
<td>68.2</td>
<td>34.4</td>
<td>573.9</td>
</tr>
<tr>
<td>Total</td>
<td>69.8</td>
<td>406.8</td>
<td>74.3</td>
<td>34.4</td>
<td>585.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>132/EHV</th>
<th>HV/LV</th>
<th>Fault level</th>
<th>Looped services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNO-contracted flexibility</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Smart solutions</td>
<td>4</td>
<td>1,433</td>
<td>7</td>
<td>-</td>
<td>1,444</td>
</tr>
<tr>
<td>Traditional reinforcement</td>
<td>13</td>
<td>12,000</td>
<td>43</td>
<td>21,637</td>
<td>33,693</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>13,433</td>
<td>50</td>
<td>21,637</td>
<td>35,142</td>
</tr>
</tbody>
</table>

![Figure 8: network utilisation – forecast 2023-28](image)

<table>
<thead>
<tr>
<th>% substations</th>
<th>2023</th>
<th>2028 Without Investment</th>
<th>2028 With Investment</th>
<th>Difference (% points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>132kV and EHV substations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;80% utilised</td>
<td>87.9</td>
<td>82.7</td>
<td>84.8</td>
<td>2.1</td>
</tr>
<tr>
<td>80-99% utilised</td>
<td>9.6</td>
<td>14.4</td>
<td>14.5</td>
<td>0.1</td>
</tr>
<tr>
<td>&gt;99% utilised</td>
<td>2.5</td>
<td>2.9</td>
<td>0.7</td>
<td>-2.2</td>
</tr>
<tr>
<td>HV/LV substations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;80% utilised</td>
<td>94.1</td>
<td>82.4</td>
<td>87.1</td>
<td>4.7</td>
</tr>
<tr>
<td>80-100% utilised</td>
<td>2.9</td>
<td>8.4</td>
<td>8.9</td>
<td>0.5</td>
</tr>
<tr>
<td>&gt;100% utilised</td>
<td>3.0</td>
<td>9.2</td>
<td>4.0</td>
<td>-5.2</td>
</tr>
</tbody>
</table>

1. Excludes £3.2m of flex procurement to prepare for the 2028-33 period.
We have considered the total investment that would be required for each of the reference scenarios we have modelled both with and without flexibility solutions. Our Planning Scenario is relatively central to the full range of possible costs of all scenarios, taking into account the impact of all flexibility solutions on the range of pathways. Several of the electrification scenarios are closely clustered together during 2022-28, and our Planning Scenario is at the lower end of that group. The lowest cost scenario for our network is the System Transformation scenario, which assumes high level of decarbonisation from hydrogen and lower uptake of EVs being connected, giving rise to a lower impact on the electricity network. It is also important to recognise that some of these DFES scenarios created from the ESO FES 2020 do not align with the 10-point plan and are therefore less ambitious.

Figure 9: the impact of flexibility-based solutions on reinforcement costs

<table>
<thead>
<tr>
<th>Reference point</th>
<th>LV monitoring</th>
<th>Price-driven flexibility</th>
<th>Smart solutions spend</th>
<th>DNO-contracted flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network costs before flexibility savings include DSO Strategy fixed flex enabling costs of £66.6m</td>
<td>As part of the DSO Strategy, the roll-out of 10,000 LV monitors enables price-driven and DNO-contracted flexibility savings to be harnessed, as well as contributing to £74.1m of smart solution savings</td>
<td>At no cost to us, time-of-use tariffs are assumed to enable £113m of traditional reinforcement savings</td>
<td>£9.5m investment in smart solutions alongside £20.8m in LV monitoring roll-out facilitates reinforcement cost deferral of £74.1m</td>
<td>£3.2m of ‘go further faster’ investment is spent to stimulate market development and prepare for the significant uptick in extra high voltage (EHV) sites that will require intervention in 2028-33 from a deliverability perspective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>£m</th>
<th>Without flexibility solutions</th>
<th>With flexibility solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED2 network intervention costs reference point</td>
<td>66.6</td>
<td>66.6</td>
</tr>
<tr>
<td>LV monitoring investment</td>
<td>775.3</td>
<td>606.1</td>
</tr>
<tr>
<td>Price-driven flexibility saving</td>
<td>-113.2</td>
<td>-74.1</td>
</tr>
<tr>
<td>DNO-contracted flexibility spend</td>
<td>20.8</td>
<td>3.2</td>
</tr>
<tr>
<td>DNO-contracted flexibility saving</td>
<td>1.8</td>
<td>609.3</td>
</tr>
<tr>
<td>Smart solutions spend</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Smart solutions saving</td>
<td>-14.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>£672.7m</td>
<td>£675.9m</td>
</tr>
<tr>
<td>Net benefit</td>
<td>-£169.2m</td>
<td>-£169.2m</td>
</tr>
</tbody>
</table>

Figure 10: sensitivity testing: total network costs 2023-2028 by scenario

1. Total for network investment costs and DSO Strategy only; does not include Whole System.
2. Excludes £3.2m of flex procurement to prepare for 2028-33 period.
Embracing uncertainty

We recognise the need to manage uncertainty.

It is clear that our network is at the heart of the UK’s net zero journey, but the extent of the impact on the network will remain unclear for some time. There are many considerable uncertainties in the pathway towards decarbonisation:

- The extent of electrification of heat and transport versus other alternatives such as hydrogen – how electrical?
- The amount of locally distributed renewable generation connected to our network – how local?
- The speed at which renewables and LCTs will be adopted – how fast?
- The extent to which customer flexibility will be taken up – how flexible?

The answers to these questions will affect how we manage the network. For instance, we are aware of the possibility that there might be significantly less electrification of the heat sector than is currently assumed in our Planning Scenario in a world where hydrogen and existing gas networks play a greater role in decarbonising space heating.

It is, therefore, essential that we continue to monitor the policy landscape and modify our planning assumptions at least annually to reflect the most recent developments. Although the scenarios we have considered are tightly bunched in the 2023-28 period, greater divergence is likely in the 2030s as uncertainty around policy and the uptake of LCTs increases. The commercial viability of LCTs, technological progress and challenges, regional characteristics such as building stock, and customer behaviour will continue to drive uncertainties in the adoption of LCTs. As more LCTs are taken up and more data is gathered, this uncertainty will reduce.

We embrace this uncertainty by building an investment plan that is designed to be flexible to an evolving landscape.

- By adopting a flexibility-first approach to planning network intervention we defer the need for reinforcement and give option value for the decarbonisation pathway that emerges.
- At EHV level where interventions and upgrades are the most costly, we will assess the need for intervention across multiple future energy pathways to minimise the risk of stranded assets.
- At the HV/LV levels, the infrastructure has a high probability of need regardless of the pathway, providing customers with the infrastructure necessary to maximise use of low carbon energy and provide flexibility for management of the whole energy system. The foundation of this approach is an investment in 10,000 additional LV monitoring units (as part of the DSO Strategy, annex 2.4). This will enable us to monitor the emergence of flexibility response among our customers and see when and where the need arises for investment on our network.
- Installing extra capacity on our network has the added benefit of improving energy efficiency by reducing electrical losses, which delivers economic benefits for customers from the perspective of the total cost of their energy, by reducing the need to install additional generation assets.
- In addition to harnessing synergies with asset replacement, our decarbonisation investment plan is underpinned by our principle to take the opportunity to upsize assets when we are investing in them. This adds additional capacity at low marginal cost, ensuring that wherever possible we are installing ‘net zero ready’ assets in order to minimise the likelihood of the need to intervene at the same location again before 2050.
- If the pathway that unfolds during 2023-28 is not as steep as we anticipate, we still have the option to invest to prepare for the faster pathway, enabling us to efficiently reduce delivery risks in the early 2030s.

Should price-driven flexibility not materialise at the levels forecast, or load growth be greater than forecast, we will need to increase our investment in DNO-contracted flexibility, smart network solutions and conventional reinforcement, in that order.

The projections and cost forecasts in our plan are based on the existing national connection charging framework whereby the customer requesting a connection pays for a share of the system reinforcement required to accommodate their new demand or generation. In summer 2021, Ofgem is expected to publish its draft decision on changes to these charging rules. There is potential for a shallower charging regime whereby more of the costs of changing the network to accommodate new uses will fall on the general customer base rather than the connectee. If this were to occur, it would likely lead to an upturn in connection requests and system reinforcement.

This is also explored in the connections section of our initial plan and the impact of Ofgem’s draft decision will be re-evaluated for the final version of this plan.

Support for our plan

“Collaboration between business, industry and local government is crucial for York to meet its zero carbon ambitions. As a traditionally carbon intensive sector, energy has a huge role to play in enabling a more sustainable future that we as a city are actively working towards. Northern Powergrid’s ambitious plans would not only support our local decarbonisation work, but would also tackle such urgent issues as fuel poverty, prioritising a socially inclusive transition to a carbon zero future.”

Cllr Paula Widdowson
Executive member for environment and climate change, City of York Council
We are mindful of the impact of changes in the energy system on customers. We will create opportunities for customers to be active participants and will ensure a just transition towards net zero.

As a key facilitator in the net zero transition, we will enable our customers to become active participants in the energy system, allowing them to maximise the financial value of their energy resources. Our plans for building our own capabilities to harness flexibility and stimulate flexibility markets are set out in our DSO Strategy (annex 4.2).

It is also important that we develop a clear view of what is needed to ensure that the transition not only happens but that it happens in a fair way for customers. We will ensure a just transition by:

— ensuring we keep our investment as efficient as possible to minimise increases in customer energy bills;
— embracing digitalisation and open data to enable transparency in our decision making, giving customers the information they need to support their own decarbonisation agendas and benefit from the opportunities that the low carbon energy transition brings;
— actively finding ways to ensure that the less wealthy and less well-engaged are able to access benefits from the energy transition as well as being particularly mindful of the impact on Vulnerable Customers; and
— harnessing talent by creating green jobs and developing skills in our region. (See Workforce Resilience.)

We will ensure a continuous dialogue with stakeholders as part of our annual planning process.

We expect our plan to keep evolving as part of our annual planning process as society continues on the low carbon energy transition. We will use this annual process to capture broad developments in the policy environment, insights from system monitoring and data capture, and discussions with a broad range of stakeholders. This will enable us to ensure that our plan reflects the latest developments and stays relevant in the context of the national decarbonisation agenda. In particular, we will continue to engage with local and combined authorities in our region on their local area energy plan (LAEP) development (for further detail see our DSO Strategy).

As part of this, we will also continue participating in the National Grid FES process, engage with local authorities and other stakeholders, and reflect their feedback in the development of our DFES and investment Planning Scenario. We will also undertake activities highlighted in our DSO Strategy and Enabling Whole Systems plans to ensure that our forecasts are continually updated based on stakeholder input.

Support for our plan

“We look forward to working closely with Northern Powergrid on the many challenges that we face together. The promise of increased collaborative working and early, strategic engagement is exactly what we need in order to support our carbon reduction work as, without Northern Powergrid on board and actively supporting our work, we will not be able to achieve our net zero targets.”

Maggie Bosanquet
Low carbon economic development team leader, Durham County Council

Northern Powergrid: our business plan for 2023-28 – 59
Decarbonisation – Scenarios and Investment

Customer outcomes

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/* indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI1</td>
<td>Efficiently put the network in a position to support LCT uptake and ensure all credible decarbonisation scenarios in our region remain open for delivering net zero by 2050 or sooner&lt;sup&gt;2,3&lt;/sup&gt;</td>
<td>All pathways to decarbonisation will be kept open</td>
<td>✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased capacity for customers to connect LCTs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure capacity is available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment in creating capacity p.a.</td>
<td>£17.5m</td>
<td>£19.5m</td>
<td>£117.7m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Network utilisation</td>
<td>0.5%</td>
<td>2.5%</td>
<td>0.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EVs accommodated (cumulative)</td>
<td>31,000</td>
<td>110,000</td>
<td>941,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HPs accommodated (cumulative)</td>
<td>34,000</td>
<td>58,000</td>
<td>309,000</td>
</tr>
</tbody>
</table>

SI2 Deploy a flexibility-first approach, always choosing network and customer flexibility solutions where cost-effective and viable ahead of network reinforcement<sup>4,5,6,7</sup>

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/* indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increased capacity</td>
<td>SI2.1) Run flexibility tender exercises where we will seek to use flexibility to defer reinforcement at our major substations and continue to seek to harness flexibility to defer reinforcement across all voltage levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficient decarbonisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quicker decarbonisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased customer and network flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customers and stakeholders more actively engaged with the energy system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SI2.2) Invest in market development to stimulate the use of flexibility so that we can defer future reinforcement costs across various network areas that will require intervention in the 2028-33 period</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SI2.3) Invest in smart grid solutions including LV monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SI2.4) Deploy DNO-contracted flexibility to shift peaks in demand on our network to enable deferment of traditional reinforcement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See annex 1.4 key measures for profiled targets.
2. Cross-reference Asset Resilience AR1) Enable an efficient long-term transition to net zero through maximisation of synergies between load-related and asset renewal expenditure.
3. Cross-reference Whole Systems WS2) Ensure our customers’ future needs are met through cross-sector and cross-vector planning.
4. Cross-reference DSO Strategy DS04) Enhance processes and systems for network operations to enable a step change in our capability to optimise a system with increasing customer and network flexibility.
5. Cross-reference DSO Strategy DS05) Enable significant uptake of customer flexibility and facilitate development of new markets for customers providing services to networks.
6. Cross-reference DSO Strategy DS03) Unlock new capabilities and benefits for customers through provision of open energy system data and engaging in joint planning with our stakeholders.
7. Cross-reference Whole System WS2) Ensure our customers’ future needs are met through cross-sector and cross-vector planning.

Northern Powergrid: our business plan for 2023-28 – 60
How engagement with you has shaped our plan

Wave 1

Events: 103 total – 54 dedicated events
Stakeholders engaged: 4,762 total – 1,300 unique interactions

Wave 1 findings

**Different net zero targets have been set locally and should link with FES modelling**

— Stakeholders were interested in understanding the emissions impact of the different DFES energy pathways and how local developments are reflected in the modelling. More decentralised pathways were preferred.

**Existing and future network capacity was a key area of interest for stakeholders**

— Stakeholders wanted to share decarbonisation plans and exchange the relevant data, and to understand where capacity is available for low carbon projects.

**Stakeholders believed we have a key leadership role in the net zero transition**

— Stakeholders believed we have a leadership role in decarbonisation and should enable net zero targets to be met. Any movement towards net zero should be socially equitable and not put vulnerable and fuel-poor customers at a disadvantage.

Wave 2

Events: 135 total – 75 dedicated events
Stakeholders engaged: 15,475 total – 10,765 unique interactions

Wave 2 options

A: Delivering the same service but at a lower cost (Not on track for net zero by 2050)
B: Enhanced performance for the same spend (Not on track for net zero by 2050)
C: Net zero by 2050 driven by largely network solutions, assuming only low levels of customer flexibility are available
D: Net zero by 2050 or earlier with increased customer flexibility, reducing network reinforcement costs
E: Net zero by 2050 or earlier – high customer flexibility means lower reinforcement costs

**Customer ambition and broader findings**

A significant majority of customers supported us pursuing an accelerated decarbonisation pathway, reaching net zero by 2050 at the latest. Stakeholders’ ambitions were somewhat tempered by the need to balance the pace of decarbonisation with the associated bill impact and the need for the net zero transition to be fair. Overall, 75% of our customers supported option C – ‘Major upgrade’ to option E – ‘A new world’; and 88% of respondents in the ‘have your say’ survey believed we should seek to achieve net zero before 2050.

Wave 3

Events: 91 total – 33 dedicated events
Stakeholders engaged: 32,500 total – 2,154 unique interactions

Wave 3 tested our draft initiatives for balancing ambition to meet the net zero target as early as possible with the need to minimise the bill impact, guiding and refining the development of our planning scenario.

Wave 3 findings

--- Need to prepare for net zero with a planning approach that is responsive to deal with an uncertain future

Majority of customers recognised the climate emergency and were comfortable to spend more to accelerate decarbonisation. Given the uncertainty of national and local energy developments, as well as diversity in local net zero targets, stakeholders were in favour of a planning scenario that would enable any decarbonisation pathway that emerges

--- Support for a flexibility-first approach to support LCT uptake

Stakeholders supported our flexibility-first approach. Most of them would be willing to be flexible in using their energy as a response to time-of-use tariffs. Stakeholders recognised this might be limited where customers' schedules are fixed and that the region requires additional investment in network capacity to enable widespread use of LCTs

--- Scenarios and Investment acceptance score: 72%

Overall acceptability was high for Scenario and Investment delivery with trust equally important to customers at 72%

How this has been addressed in our plans

Outcome Ref | Annex
--- | ---
We will prepare for net zero and the differing levels of decarbonisation ambition across our region through collaboration and proactive network planning to enable the emerging pace of LCT uptake | SI1 | Link
We will actively prepare and manage the decarbonisation of the energy network by developing our flexibility capabilities and approach | SI2 | Link
Overall acceptability was high for Scenario and Investment delivery with trust equally important to customers at 72% | - | Link
We are expanding our capabilities and taking on the functions of Distribution System Operation (DSO) to actively manage the increasingly complex power flows on our network that result from decarbonisation, reduce the need for conventional reinforcement, and ensure the transition to net zero is efficient and affordable.

We face the challenge of facilitating an overall increase in demand for electricity as well as managing greater volumes of intermittent generation connecting directly to our network. To decarbonise efficiently and make the transition affordable, we have to enable a smart, flexible energy system where Distribution Network Operators (DNOs) actively manage the more complex power flows on the distribution grids to optimise the value of the system by taking on the functions of DSO.

We are now looking towards the future and have developed our DSO Strategy for 2023-28 by engaging with our customers and stakeholders, and ensuring alignment with regulatory requirements.

Our DSO Strategy has been informed by the needs of our customers and stakeholders. Since publishing our 2023-28 Emerging Thinking document in August 2020, we have been engaging on our further developed DSO transition plans through stakeholder panels, industry forums, and bilateral discussions with industry and experts. Our stakeholders have told us that two-way sharing of network data through self-service tools is crucial to helping them with their own decarbonisation plans, understanding our network and managing flexibility. Stakeholders have also emphasised the need for transparency and standardisation of flexibility products to stimulate participation in new energy markets.

These priorities have informed our DSO Strategy which has a twin focus on data and the use of flexibility.

We recognise that we need to develop our DSO functions and capabilities in a manner that is coherent with other stakeholders in the energy system, and have hence sought to align our DSO Strategy with recommendations coming out of the Energy Networks Association (ENA)’s Open Networks project, particularly the work streams focussed on flexibility services and the DSO transition. For example, the metrics we will use to measure our progress are being developed in collaboration with other DNOs and Ofgem.

Finally, Ofgem has set a clear direction for the transition to DSO with a view to reducing uncertainty and ensuring consistency in approach across the sector. Our strategy has been developed to ensure we meet regulatory requirements.

Our DSO Strategy sets out our plans to upgrade our data capture, analytics and data sharing with stakeholders and invest in our systems and processes to develop customer flexibility markets.

Our plan is set to get the best out of our existing assets through improved visibility of low voltage network by deploying more monitoring.

**Mark Nicholson**
Head of smart grid implementation

**Aisha Ahmad**
Smartgrid development engineer
The DSO transition

The transition to DSO requires us to operate our network for the evolving needs of our customers on the low carbon transition, ensuring we are a trusted and neutral platform through open, transparent and technology-neutral decision making. To deliver reliable electricity supply to our customers, we must manage increasingly complex power flows on our network through whole system engagement and optimisation, and proactively share data and insights about our network to facilitate effective decision making across the energy supply chain.

We must incentivise customers to be flexible in their energy generation and consumption, and enable them to play a more active role in supporting the network, including by facilitating their participation in existing and new market-based solutions, such as flexibility markets and local energy markets. In performing role of DSO we will strive to ensure that customers are empowered to participate in a smarter and more flexible energy system, and adverse impacts on vulnerable customer groups are mitigated to make sure that no one is left behind in the ongoing energy transition.

Figure 1: our energy system is changing

Traditional energy system
A centralised system where the network is designed around single-direction power flowing from large (often fossil fuel) generators into homes and businesses. Here generation has to meet peak demand.

The energy system of the future
A decentralised system where small-scale energy generation units deliver energy to local customers. Customers utilise renewable energy when the wind is blowing and the sun is shining. Electric vehicles (EVs) and community energy storage are charged up at favourable rates, based on real-time supply and demand data. Users flex their demand and the network facilitates this.

Figure 2: what DSO means for our customers

<table>
<thead>
<tr>
<th>DSO – today</th>
<th>DSO – future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data and information provision</td>
<td>Data and information provision</td>
</tr>
<tr>
<td>Keeping the lights on</td>
<td>Keeping the lights on</td>
</tr>
<tr>
<td>Providing connections</td>
<td>Providing connections</td>
</tr>
<tr>
<td>Customers pay for receiving a service</td>
<td>Customers pay for receiving a service – less than without DSO</td>
</tr>
<tr>
<td>Competitive market providers deliver new services to customers</td>
<td>Customers are paid to provide a service</td>
</tr>
</tbody>
</table>

‘Fit and forget’ passive network assets

Active customers and network
We have already embarked on the transition to DSO and have made progress over 2018-23, working with our customers and stakeholders to develop our thinking, and investing in our capabilities.

While we have laid solid foundations for the transition to DSO in recent years, it is crucial that we build on this to meet the challenges and needs of the changing energy system. To do this we are setting out our plan here to invest £87m across 2023-28 in developing the functions and capabilities required for DSO. This will unlock benefits for customers and the community by allowing us to decarbonise our network at lower cost. By taking a flexibility-first approach to our network investment strategy we will reduce the need for conventional network reinforcement and ensure that every kilowatt hour (KWh) of renewable energy is utilised. As described in the scenarios and investment section, net benefits of up to £169m could be delivered by avoiding conventional reinforcement costs over the course of 2023-28. The DSO transition will also enable system benefits that go beyond our network and will continue to enable us to optimise the value of the system to deliver savings into the period 2028-33 and beyond.

Since 2017, we have been explicitly exploring the DSO transition with a broad set of stakeholders in the context of addressing decarbonisation. Following an extensive programme of stakeholder engagement we published our first DSO v1.0 thinking in 2018, with 84 per cent of our stakeholders supporting that plan. We then updated this with our development plan (DSO v1.1) in October 2019, and again with our 2023-28 Emerging Thinking (ET) document in August 2020.

We have made significant investments in our DSO capabilities in the current period to date (see figure 3), which have laid the foundations to enable the transition to DSO over the next price control period (2023-28).

### Figure 3: investments in our DSO capabilities in 2015-23

<table>
<thead>
<tr>
<th>Modernising and digitalising our network and operations</th>
<th>Our smart grid enablers project is the UK’s most comprehensive network upgrade programme. It is transforming our ability to monitor, control and communicate with more than 860 substations, giving us the ability to respond to real-time information about power flows on our network.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focussing on preparing our network for the future</td>
<td>We have advanced our internal readiness for the smart meter roll-out programme, which has continued to face delays at the national level. We have been preparing our internal systems to integrate smart meter data with our customer, network and operational data so that we can proactively respond to outage alerts and enhance demand forecasting on our low voltage (LV) network.</td>
</tr>
<tr>
<td>Exploring and preparing for flexibility</td>
<td>Our £1.8m customer-led distribution system innovation programme is exploring how to accommodate large volumes of new technologies, such as local generation and electric vehicles (EVs), at least cost, while enabling customers to earn income by selling energy or services to balance the network.</td>
</tr>
<tr>
<td>Working with our peers, other industry parties and stakeholders</td>
<td>We are participating in the ENA’s Open Networks project, including work streams pertaining to flexibility services and DSO transition, to collaborate with other DNOs, as well as the energy system operator (ESO), the market and policy makers, to standardise customer experiences and align processes.</td>
</tr>
</tbody>
</table>


Northern Powergrid: our business plan for 2023-28 – 64
A smarter and more flexible network

Our region will need to be well on the way to a fully decarbonised energy system by 2028. We, therefore, need to make significant investment in the DSO transition over 2023-28 to ensure that we are able to facilitate potential decarbonisation pathways at the most efficient cost to customers. As outlined in the Scenarios and Investment section, we are aiming to open up all credible pathways to decarbonisation in the next five-year period and beyond, and implementing more DSO functions is fundamental to achieving this.

Our strategy links our vision for the future with the tangible DSO actions we will undertake to get there and sets out the investment required to deliver these actions, and the benefits that will flow from this. It is geared around our flexibility-first approach, ensuring we are able to identify and deploy flexible solutions instead of conventional reinforcement when it is efficient to do so. To do this, we will need to invest in updating our systems and skills as well as enhancing our data capture, use and sharing to enable optimal use of our assets and facilitate the most cost-effective route to decarbonisation.

We have five strategic objectives – guiding principles that have shaped the development of our DSO Strategy and will continue to guide our decision making as we transition to DSO.

Our strategy will deliver on five strategic objectives (see figure 4) that have been informed by the needs of our customers and stakeholders and by regulatory requirements. These were tested, reviewed and refined through numerous engagements we had with customer and stakeholder groups, particularly over the past six months.

These strategic objectives are linked to and supported by other parts of our 2023-28 business plan. They have shaped the development of our DSO Strategy outcomes and the tangible activities we are committing to undertaking in 2023-28.

**Figure 4: our five strategic objectives**

1. **Flexibility first**
   - Develop and deploy agnostic flexible solutions as an alternative to network reinforcement where it is economic and efficient to do so, ranging from energy efficiency solutions to dispatchable generation and demand turn-down. Promote and establish markets for deep and liquid flexibility with investment in systems and processes that enable growth in our use of flexibility as the markets mature.
   - This strategic objective links to and supports the Decarbonisation Scenarios and Investment section of our business plan.

2. **Whole system collaboration**
   - Enable whole energy system solutions by engaging with the wider market on our network investment, system management, and flexibility requirements and capabilities.
   - This strategic objective links to and is supported by the Enabling Whole System Solutions section of our business plan.

3. **Data and digitalisation**
   - Facilitate fast, efficient and optimised decarbonisation through open data, insight capability and digital tools, without losing sight of data safety and security. Invest in software and hardware that allows us to closely monitor the network, capture more relevant data and execute solutions to constraints as they materialise.
   - This strategic objective links to and is supported by the Data and Digitalisation section of our business plan.

4. **Openness and transparency**
   - Earn trust through open and transparent decision making by publishing our investment decisions, flexibility needs and procurement results, and collaborating in joint planning with our local stakeholders.
   - This strategic objective links to and is supported by the Openness and Transparency section of our business plan.

5. **Workplace and workforce fit for the future**
   - Build regional and national skills and value through developing knowledge, transferable skills and an innovative culture.
   - This strategic objective links to and is supported by the Workforce Resilience section of our business plan.
The five objectives lead to five groups of outcomes that will deliver benefits to customers in 2023-28 and beyond.

Our DSO Strategy (annex 4.2) will deliver outcomes in five areas (see figure 5), focussed on how we gather and use data, and how we prepare for and deploy flexibility. These build on our significant progress to date in embedding data and flexibility at the heart of how we operate today. We will invest in each of these outcomes over 2023-28. Each outcome enables us to deliver across a number of the strategic objectives, as indicated by the symbols (see overleaf). ● indicates that an outcome is directly applicable to the strategic objective, while ○ indicates that the outcome is an enabler of the objective.

Figure 5: the outcomes

**DSO 1**
**DATA CAPTURE**
Significantly expand our network and market data capture

**DSO 2**
**ANALYSIS CAPABILITIES**
Transform our analysis capabilities

**DSO 3**
**OPEN DATA AND JOINT PLANNING**
Enable open energy system data sharing and joint planning with stakeholders

**DSO 4**
**SYSTEM OPERATION AND OPTIMISATION**
Enable a step change in our capability to operate and optimise a system with increasing customer and network flexibility

**DSO 5**
**CUSTOMER FLEXIBILITY**
Enable a significant uptake of customer flexibility and facilitate development of new markets for customers providing services to networks
To successfully deliver the DSO transition, we will need to invest £87m in 2023-28, which will unlock benefits for our customers and our region.

Transitioning to DSO will ensure that we are equipped to facilitate potential decarbonisation pathways at the most efficient cost. We plan to invest £87m in DSO activities across our five outcome areas over the next five-year period, as shown in figure 6.

We will enable total energy costs to be kept as low as possible as our region decarbonises by unlocking cost savings for customers as we build a smart system that is more efficient, reliable and cost-effective. It is estimated that up to £201m of conventional reinforcement costs would be avoided over the course of 2023-28, delivering net benefits of £169m, as we embed a flexibility-first approach to network investment. In addition, where we do have to invest to repair and upgrade our network, better data and analytics will drive more efficiency as we are better able to identify and predict areas in need of investment, ensuring we spend customers’ money efficiently.

We will maximise the value of existing infrastructure and enable every low carbon kilowatt hour of electricity that is generated to be used. Our approach will allow our customers to earn revenue through participating in flexibility markets facilitated by our DSO activities.

The DSO transition will also enable system benefits that go beyond our network, as data and analytics made available for other participants in the energy and related sectors unlock further whole system value in the future by optimising regional planning. In addition, by enabling the efficient decarbonisation of our network, our DSO Strategy will help to achieve emissions reductions across our network.
Our total planned investment of £87.4m in DSO activities is described below and described in full in our DSO Strategy annex (annex 4.2). Our DSO outcomes are underpinned by significant investment in the cross-cutting enablers of our business plan:

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**Digitalisation** – we plan to invest £49.1m over five years to upgrade and install new information technology and operational technology systems, as outlined in the Data and Digitalisation section, which is key to delivering our data and flexibility outcomes (see figure 7).

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**Workforce** – we plan to spend £17.5m over five years for training, upskilling and recruitment in order to arm our workforce with data science and commercial skills, alongside enhanced engineering expertise, as outlined in the Workforce Resilience section.

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**Innovation** – we will build on successful innovation activities in the current price control period to continue to find new approaches to how we and other energy sector parties operate. For example, we are planning to build on our Boston Spa energy efficiency trial (BEET) project to rollout voltage optimisation technology on a larger scale, as outlined in the Enabling Whole System Solutions section and our Customer Value Propositions (CVP) section. We will also use innovation funding allowances to explore flexibility product development and procurement and to harness flexibility at low voltage to resolve constraints on our LV network.

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*Figure 6: investment in DSO Strategy outcomes – 2023-28 (£m)*

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Area</th>
<th>Outcome</th>
<th>Data and digitalisation</th>
<th>Network costs</th>
<th>Workforce</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSO1</td>
<td>Data</td>
<td>Network and market data capture</td>
<td>7.2</td>
<td>20.8</td>
<td>1.2</td>
<td>29.2</td>
</tr>
<tr>
<td>DSO2</td>
<td>Transform analysis capabilities</td>
<td>18.7</td>
<td>-</td>
<td>2.7</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>DSO3</td>
<td>Enable open energy system data sharing and joint planning</td>
<td>7.9</td>
<td>-</td>
<td>3.7</td>
<td>11.7</td>
<td></td>
</tr>
<tr>
<td>DSO4</td>
<td>Flexibility</td>
<td>Operate and optimise a system with increasing customer and network flexibility</td>
<td>12.7</td>
<td>-</td>
<td>5.5</td>
<td>18.1</td>
</tr>
<tr>
<td>DSO5</td>
<td>Flexibility</td>
<td>Enable significant uptake of customer flexibility</td>
<td>2.6</td>
<td>-</td>
<td>4.5</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>49.1</strong></td>
<td><strong>20.8</strong></td>
<td><strong>17.5</strong></td>
<td><strong>87.4</strong></td>
</tr>
</tbody>
</table>

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Our DSO Strategy defines how we will use the systems that will be delivered by the data and digitalisation strategy to deliver our DSO outcomes.

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*Figure 7: interaction of data and digitalisation (D&D) strategy with DSO*
Our investment will enable 28 DSO deliverables and initiatives.

We will undertake deliverables and initiatives over the next five-year period. These are tangible actions that will help us to achieve the five outcomes of our DSO Strategy and unlock benefits for customers and our region. While deliverables are measurable activities, initiatives cannot be measured but are integral to delivering our strategy and meeting Ofgem’s regulatory requirements.

In figure 8 we outline eight of our most significant deliverables that demonstrate the scope and scale of our ambition. In our DSO Strategy annex we detail a complete account of all 28 deliverables and initiatives we are planning to undertake in 2023-28, including cost and benefits, and how they will allow us to meet Ofgem’s requirement for us to fulfil the three roles of a DSO:

— Role one: planning and network development.
— Role two: network operations.
— Role three: market development.

In figure 8 we outline eight of our most significant deliverables that demonstrate the scope and scale of our ambition. In our DSO Strategy annex we detail a complete account of all 28 deliverables and initiatives we are planning to undertake in 2023-28, including cost and benefits, and how they will allow us to meet Ofgem’s requirement for us to fulfil the three roles of a DSO:

— Role one: planning and network development.
— Role two: network operations.
— Role three: market development.

**Figure 8: examples of key deliverables**

**DSO1.3 Install targeted LV monitoring**
We will invest £21m over 2023-28 to install 10,000 LV monitors across our network, prioritised based on sites anticipated to require intervention first, allowing us to monitor power flows and network performance and enhancing visibility of our LV network. This will enable us to use our existing network assets more efficiently (by identifying and releasing capacity) and target investment in asset condition and reducing network losses, as well as provide network data that we will share externally and use internally to facilitate the development of flexibility services and markets.

**DSO2.1 Build low voltage datasets using analytics and machine learning**
We will invest £4.6m to upgrade our data analytics capabilities, by investing in software and data scientists, so we can make forecasts and undertake scenario analysis on our low voltage network which is changing rapidly with increased penetration of low carbon technologies (LCTs) and distributed energy resource (DERs). We will develop statistical analyses for different types of data (e.g. smart meters and data captured through DSO1.3 LV monitoring roll-out), which will help us plan for reinforcement needs and identify and size flexible connections and flexibility service requirements.

**DSO2.4 Create a ‘digital twin’ of our network for strategic planning**
We will invest £7.2m to create LV and HV planning models of the network which integrate historical and real time data. These ‘digital twins’ will enable extensive analytics on network data, allowing us to test connection of anticipated volumes of LCTs and DERs, providing insights to identify where and when we should target investment in flexibility or reinforcement so that it is timely and efficient.

**DSO3.1 Open insights data portal**
We will invest £6.6m to develop a free online portal, which will allow customers and stakeholders to access network data and analytical tools through a centralised, spatial platform. The portal will be an application layer that gives public access to network datasets and our ‘digital twin’ strategic planning tool DSO2.4. It will be aimed at customers and stakeholders who do not have electrical engineering expertise, supporting them to make investment decisions about demand and generation and connections.

**DSO3.2 Recruit local area energy plan (LAEP) advisors**
We will invest £2.3m to recruit six LAEP advisors who will work in collaboration with local authorities and the wider energy sector – using knowledge of the network, customers and the wider environment – to provide useful input and feedback to local authorities on their plans. These advisors will also support our network planning by generating better and more comprehensive local insights. To ensure a level of granularity and local knowledge, we will employ one advisor in each of our six operating regions.

**DSO3.3 Recruit local area energy plan (LAEP) advisors**
We will invest £2.3m to recruit six LAEP advisors who will work in collaboration with local authorities and the wider energy sector – using knowledge of the network, customers and the wider environment – to provide useful input and feedback to local authorities on their plans. These advisors will also support our network planning by generating better and more comprehensive local insights. To ensure a level of granularity and local knowledge, we will employ one advisor in each of our six operating regions.

**DSO4.2 Enhanced enterprise active network management (ANM)**
We plan to invest £5.1m to enhance our use of ANM to manage constraints on the network by integrating our enterprise solution and allow ANM to become a core function that is integrated with our network management and customer flexibility dispatch systems. This will allow real-time data exchange and enable a more secure and resilient system with efficient and cost-effective scalability of ANM where there is high customer interest in connecting to the network, limited capacity and high reinforcement or flexibility costs.

**DSO4.3 Develop a flexibility information provision and engagement platform**
We aim to spend £2.1m to develop an external-facing platform that gives third parties such as flexibility providers and aggregators single-point access to flexibility services related information. Users will also be able to express interest in providing flexibility services and register assets or meterable units. This will support the procurement of flexibility services and flexibility market development.

**DSO5.3 Develop a flexibility information provision and engagement platform**
We aim to spend £2.1m to develop an external-facing platform that gives third parties such as flexibility providers and aggregators single-point access to flexibility services related information. Users will also be able to express interest in providing flexibility services and register assets or meterable units. This will support the procurement of flexibility services and flexibility market development.
We will need to measure and evaluate our performance against our DSO outcomes and deliverables in order to continuously improve.

A clear set of metrics will allow us to transparently measure progress against the deliverables and outcomes of our DSO Strategy. We have worked with other DNOs and Ofgem to produce an outline of relevant metrics for 2023-28, which will ensure there is a level of comparability across the sector. A long list of metrics has been developed, from which we have adopted a subset tailored to our strategy. These are shown at the outcome level in the summary table overleaf. Further information on the metrics can be found in the DSO Strategy annex. We will use these metrics, alongside stakeholder engagement, to evaluate our progress against our DSO Strategy and foster continuous improvement. They will also be used by Ofgem on behalf of customers to financially incentivise the delivery of our plan – see DSO Strategy (annex 4.2) for more details.

<table>
<thead>
<tr>
<th>DSO1</th>
<th>Significantly expand our capture of network and market data to establish a vital building block for a smarter and more active energy system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Increased data availability</td>
</tr>
<tr>
<td>Deliverables</td>
<td>DSO1.1) Build on existing information management capabilities to expand network data and integrate datasets delivering capabilities by the end of 2025-26. Capture more detailed data more regularly, purchase data to enhance network visibility, and cleanse, structure and store data more effectively</td>
</tr>
<tr>
<td>Output measure/indicative input measure</td>
<td>LV ground-mounted substation networks directly monitored (ODI-F)</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>4%</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>10%</td>
</tr>
<tr>
<td>ED2 target</td>
<td>50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSO2</th>
<th>Transform our analysis capabilities to enable data-driven decision making in planning and operational timescales to drive value for customers while working in collaboration with others in the industry to improve the format and consistency of energy system data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Increased network knowledge</td>
</tr>
<tr>
<td>Deliverables</td>
<td>DSO2.1) Use analytics and machine learning to emulate high quality and granular time-series datasets for HV networks</td>
</tr>
<tr>
<td>Output measure/indicative input measure</td>
<td>Standardised DFES inputs</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>-</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>DFES</td>
</tr>
<tr>
<td>ED2 target</td>
<td>DFES and annual report</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSO3</th>
<th>Unlock new capabilities and benefits for customers through provision of open energy system data and engaging in joint planning with our stakeholders, including providing support for local authorities on the development of LAEPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Increased open data</td>
</tr>
<tr>
<td>Deliverables</td>
<td>DSO3.1) Build enhanced functionality on top of our open data platform to unlock additional customer benefits. This will include a set of free analytical tools to help processing data and enhance self-service delivering capabilities by the end of 2026-27 CVP</td>
</tr>
<tr>
<td>Output measure/indicative input measure</td>
<td>Availability of energy system data products (ODI-F)</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>-</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>+70%</td>
</tr>
<tr>
<td>ED2 target</td>
<td>Annual survey and report</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSO4</th>
<th>Cross-reference Openness and Transparency – OT1.1) Publish and report on our internal processes for investment appraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Improved data quality</td>
</tr>
<tr>
<td>Deliverables</td>
<td>DSO4.1) Create a static strategic planning model of the network which integrates historical and real-time data from various OT/IT systems delivering a complete set of capabilities by the end of 2025-26</td>
</tr>
<tr>
<td>Output measure/indicative input measure</td>
<td>Accurate forecasting of network needs (reconciliation of actual vs. forecast)</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>DFES</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>DFES</td>
</tr>
<tr>
<td>ED2 target</td>
<td>&gt;90%</td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See annex 1.4 key measures for profiled targets.
2. Cross-reference Openness and Transparency – OT1.1) Publish and report on our internal processes for investment appraisal of flexibility solutions and network reinforcement in such a way that demonstrates our flexibility-first approach and ensures the best outcome for the long-term planning of the network.

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### EXEC SUMMARY

<table>
<thead>
<tr>
<th>TRACK RECORD</th>
<th>ENGAGEMENT</th>
<th>OUTPUTS</th>
<th>ENABLERS</th>
<th>COSTS</th>
<th>DELIVERY</th>
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</table>

<table>
<thead>
<tr>
<th><strong>Customer outcomes</strong></th>
<th><strong>Benefits</strong></th>
<th><strong>Deliverables</strong></th>
<th><strong>Output measure</strong></th>
<th><strong>ED1 to date</strong></th>
<th><strong>ED1 forecast</strong></th>
<th><strong>ED2 target</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DSO4</strong></td>
<td>Enhance processes and systems for network operations to enable a step change in our capability to optimise a system with increasing customer and network flexibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased network flexibility</td>
<td>DSO4.1</td>
<td>Create a customer flexibility system with network operation processes that enables us to automatically dispatch flexibility services by integrating systems (such as Power on Fusion) with our flexibility platform (Flexible Power Platform). Planned to deliver capabilities by the end of 2025-26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effective dispatch of flexibility services</td>
<td></td>
<td>Error corrections issued for dispatch (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>&lt;10%</td>
</tr>
<tr>
<td></td>
<td>Improved flexibility services processes</td>
<td>DSO4.2</td>
<td>Enhance our ANM coordination and control to manage thermal, voltage and fault level constraints using a central and/or local management system to control flexible customer assets. Planned to deliver capabilities by the end of 2025-26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DSO4.3</td>
<td>Establish network flexibility and customer flexibility solutions enabled by control systems to manage thermal, voltage and fault level constraints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Constrained data exchange ESO-DSO (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>&gt;90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Operational data exchange ESO-DSO (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>&gt;90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Common flexibility dispatch principles</td>
<td>-</td>
<td>-</td>
<td>2025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DSO4.4</td>
<td>Collaborate with the wider energy industry (via the ENA) to establish flexibility processes, communication and architecture to avoid conflicting operations</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>No. EHV substation areas in flexibility market evaluation (ODI-F)</td>
<td>23</td>
<td>25</td>
<td>80</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>Common registration processes</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Flexibility provider registration acceptance time &lt;30 days (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>&gt;95%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Procurement events response time &lt;3 months (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>&gt;95%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Local flexibility stakeholder engagements (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DSO4.5</td>
<td>Upskill and recruit engineers to use whole energy system thinking to provide increasingly complex solutions to address decarbonisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See annex 1.4 key measures for profiled targets.

2. Cross-reference WS2) Ensure customers’ future needs are met through cross-sector and cross-vector. Planning; cross-reference WS3) Develop the blueprint for the next-generation network.
# How engagement with you has shaped our plan

## Wave 1

**Events:** 103 total – 54 dedicated events  
**Stakeholders engaged:** 4,762 total – 1,300 unique interactions

### Wave 1 findings

#### Effective communication and education is important because DSO was seen as a complex topic for customers to understand

- The transition from DNO to DSO was believed to demand more proactive communication of increasingly complex information, framing conversations around individual topics instead of the broad subject of DSO

#### Transition to net zero needs to be socially inclusive

- Customers believed that the transition to DSO roles must be socially inclusive in terms of protecting vulnerable, fuel-poor and rural customers

#### Stakeholders supported our future role and our DSO vision

- Stakeholders supported our vision for delivering DSO and believed we could be well-placed to act as the neutral and trusted facilitator to optimise the energy system

## Stakeholder engagement

**Who we engage...**  
- Domestic  
- Vulnerable Communities  
- Communities  
- Experts  
- Employees  
- Regulators

**How we engage...**  
- Face-to-face interview  
- Focus groups  
- Workshop  
- Survey  
- Online

## Wave 2

**Events:** 135 total – 75 dedicated events  
**Stakeholders engaged:** 15,475 total – 10,765 unique interactions

### Wave 2 options

<table>
<thead>
<tr>
<th>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
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<tr>
<td>C</td>
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<td>D</td>
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<td>E</td>
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<td>F</td>
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<td>G</td>
</tr>
</tbody>
</table>

### Customer ambition and broader findings

A significant majority of customers supported us pursuing an accelerated decarbonisation pathway, reaching net zero by 2050 at the latest. Stakeholders’ ambitions were somewhat tempered by the need to balance the pace of decarbonisation with the associated bill impact and the need for the net zero transition to be fair. Overall, 75% of our customers supported option C (‘Major upgrade’) to option E (‘A new world’); and 88% of respondents in the ‘have your say’ survey believed we should seek to achieve net zero before 2050

## Wave 3

**Events:** 91 total – 33 dedicated events  
**Stakeholders engaged:** 32,500 total – 2,154 unique interactions

### Wave 3 findings

#### Open and proactive data sharing will underpin a successful energy transition

- Stakeholders were eager to explore methods to share data more actively to facilitate the transition to DSO

- We will work with stakeholders and partners to understand their future data needs to aid the development of a comprehensive network data offering

- DSO1  
- DSO2

#### Stakeholders urged us to explore ways to share data more actively and in real time

- We will develop new data capabilities to aid the proactive sharing of existing and future network data

- DSO3

#### We have a key role in developing local flexibility markets

- The ESO and other energy market actors believed we have a key role in developing local flexibility markets and the tools and techniques to facilitate them. Stakeholders were supportive of the development of a smart network if it reduces costs to customers and increases efficiency

- We will prepare for an increasing and accelerating role for flexibility in a dynamic, smart energy network

- DSO4  
- DSO5

#### Stakeholders supported our flexibility-first approach

- Stakeholders supported planning to enable high levels of flexibility. They recognised that that customer flexibility would be predominantly market-driven, followed by the DNO- contracted flexibility. Strong support from ESO for continued collaboration on the detailed specification and implementation of our propositions to enable growth in coordinated actions on flexibility to benefit customers

- We will implement a flexibility-first approach, enabling customers to maximise their benefits from these services and markets

- DSO4  
- DSO5

#### Collaboration and joint energy planning is needed

- There was a strong appetite for an even closer working relationship with us and a recognition of the need for more collaboration at a strategic level to ensure effective planning and increased confidence in deliverability of projects to enable greater coordination

- We will continue to collaborate and share data with stakeholders and customers to develop new services, and undertake joint energy planning

- DSO2  
- DSO4

#### DSO Strategy acceptability score: 68%

- This area was harder to navigate for customers and they felt it was not directly relevant for them

- -
Enabling Whole System Solutions

We will advance optimisation of the costs, functionality and performance of energy services for customers through widespread collaboration to improve the whole energy system.

Electricity networks are at the heart of the ongoing transformation of the energy system.

All credible decarbonisation pathways that deliver net zero by 2050 see electricity playing a central role in decarbonising society’s energy needs across transport, heating and industry. But the optimal pathway to decarbonisation is unlikely to involve just electricity. Hybrid, cross-vector technologies such as hydrogen could be vital in enabling decarbonisation across all sectors.

We need to ensure that the electricity system is ready to play its part in this whole system decarbonisation. This is a challenging undertaking, underpinned by the transition to DSO and significant investment in the network. As described in the Scenarios and Investment section, we are exploring the range of credible decarbonisation pathways that could materialise and have developed our Planning Scenario in relation to a broad range of plausible outcomes.

Underpinned by our network investment plans and DSO transition, our whole system plan focuses on how we are integrating whole system thinking into our business, as well as the specific actions we will take to facilitate whole system solutions.

By embedding whole system approaches, and investing £16m on specific initiatives, we will help deliver a greener, lower-carbon electricity system at a lower cost for customers as we make more efficient use of existing assets. We will also help drive improved service and cost in other sectors such as transport and heat to help achieve a net zero carbon economy. Given the challenge associated with quantifying these system-wide benefits, a subset of the direct benefits that we are able to quantify, indicates that our plan will deliver in excess of £253m of value to customers in 2023-28 and beyond.1 Studies conducted by National Grid ESO and the Carbon Trust with Imperial College show that the scale of wider benefits is significantly greater. More detail on the benefits delivered by our whole system plan can be found in the Enabling Whole System Solutions (annex 4.1).

---

1. £28.6m in 2023-28 and £225.0m in 2028-33 (assuming a five-year price control period). We anticipate annual net benefits of around £63m p.a. thereafter.
Defining the whole system and our role in it

Defining the whole system and our role within it.

Historically, our industry has focussed on the whole system at the level of the electricity networks. But the whole system captures many other sectors and industries that are seeking to decarbonise.

Our work with customers, other energy system parties (e.g. the ESO, gas networks and energy suppliers) and stakeholders outside the energy sector (e.g. in transport and industry) has demonstrated that there are whole system opportunities to deliver even greater efficiency, emissions reductions, and better value for customers.

We will improve the whole energy system through widespread collaboration, lowering costs and improving quality of the energy services our customers receive.

To achieve this, we are working to ensure that whole system thinking is integral to all of our operations in two ways.

First, in understanding and playing our role within the whole system transition. This involves proactively managing the uncertainty around the decarbonisation pathway, understanding the potential roles of other vectors within the system, and investing in our network in a way that ensures we keep open all possible decarbonisation pathways.

Second, on a more day-to-day level, we are fostering a whole system way of thinking within our organisation and reflecting that in everything we do. In practice, this means identifying issues affecting the wider energy system, and proactively exploring our part in addressing those issues. In some cases, our role will be to lead on innovative solutions, coordinating across sectors. In others it might be to collaborate under the guidance of another sector, and elsewhere it will simply be to maintain a watching brief.

Achieving our vision is important for wider sustainability as well as for customers. By enabling more efficient use of assets and helping unlock sources of both generation and demand-side flexibility, we can minimise the need to build new infrastructure on our own network and in the wider system. This also supports our strategy to optimise whole system losses while facilitating net zero (see annex 4.5 Losses Strategy for more information).

Progress made in 2015-23 has given us a strong foundation to take forward wider, more innovative whole system solutions.

In the 2015-23 period we made significant progress in a number of areas, improving coordination and whole system thinking across electricity networks. Work is still ongoing in these areas, but some key examples of the progress made so far include:

- Planning: our investment planning processes now consider ESO’s Future Energy Scenarios (FES) and Climate Change Committee’s (CCC’s) forecasts for GB as a whole (see scenarios section). Our involvement in the ENA’s Open Networks engagements has also improved our Network Development Process (Capacity Signposting Report). In March 2021 we also published our Local Area Energy Plan (LAEP) Charter with Northern Gas Networks, setting out four principles to which we will commit to support local authorities in developing LAEPs.1

- Operations: we have improved coordination with the ESO through the summer 2020 COVID-19 pandemic lockdown system-balancing arrangements. We have also been working with other DNOs through the ENA’s Open Networks project on network capacity, procurement, use of flexible resources, and maintaining system operational limits. (See DSO Strategy).

- Data and Digitalisation: we are taking a more coordinated approach to gathering and sharing data with other networks (including Independent Distribution Network Operators (IDNOs)) and local authorities, including through the Distribution Future Energy Scenarios (DFES) consultation process and open data access.2

- Innovation: we have established the Integrated Transport Electricity and Gas Research Laboratory (InTEGReL), a whole system test site built in collaboration with Northern Gas Networks and Newcastle University. InTEGReL is the UK’s first test site that enables large-scale testing of whole system ideas bringing together the transport, electricity and gas sectors.

- Optimising the value of the system for customers and customer assets: we have progressed the roll-out of active network management (ANM), voltage reduction at bulk supply points (BSPs), and static voltage optimisation at HV/LV.

We can now build on our experience with further whole system innovations and broaden our view of the whole system beyond electricity networks and into other sectors.

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2. See: https://doi.org/10.3886/S2020-DFES.
Building whole system plans

Our stakeholder engagement has shaped our vision.

We have engaged with a broad set of stakeholders within the energy sector and across other sectors (heat, transport, water and industry), including regulatory bodies, consumer groups, and industry representatives, including energy equipment manufacturers. See annex 3.3, our detailed stakeholder engagement annex.

The key messages we heard from our engagement include:

— The need for sharing data and technical understanding (e.g. with local authorities to help develop LAEPs).
— The desire for a collective approach to explore solutions to regulatory and commercial barriers.
— That stakeholders have a wide range of energy-related interests, many of which are about energy use rather than energy systems. Therefore initiatives that improve demand and generation, customers’ lives or finances are of more interest than initiatives that improve the network.

We have put a plan together to respond to these stakeholder needs.

Driven by what we have heard from our stakeholders, there are four strategic objectives guiding our whole system planning.

These strategic objectives have shaped our whole system plan for the next price control period. Guided by these objectives, in the next two sections we set out:

— the whole system approaches we are taking across our business, to ensure that our strategic objectives are reflected in our day-to-day decisions; and
— the whole system outcomes we will deliver through specific initiatives.

Our whole system strategy objectives

- Drive whole system decarbonisation

  As increased use of our network facilitates decarbonisation, we will use whole system solutions to optimise carbon reduction and improve performance at an affordable price.

- Unlock value for customers

  Customers will be able to realise value from their assets by actively engaging, providing services to the energy system and to each other, releasing whole energy system cost savings.

- Create a network for the next-generation energy system

  We will set out the blueprint for a next-generation local energy network that links up energy sources and vectors, balancing in real time, to ensure a reliable and dependable energy service for customers.

- Collaborate through proactive whole system planning

  Customers’ future needs will be met through cross-sector planning, both across the energy system and with suppliers and developers of technology, allowing customers to take advantage of new opportunities.
Whole system thinking drives planning and decision making across our business.

Our strategic objectives will ensure that a whole system approach features in our operational decisions day-to-day and that whole system thinking is central to all areas of our business. Below we describe some of the key approaches that we are implementing across our business to achieve this.

— **A flexibility-first approach to asset strategy.** In investing in our network to enable decarbonisation, we will take a flexibility-first approach. This will help us optimise the value of our own and our customers’ assets. As explained in the Scenarios and Investment section, we will invest £87m on flexibility-enabling actions in 2023-28, to deliver £169m of benefits for customers in the period (see DSO and Scenarios and Investment).

— **Understanding and managing cross-sector interdependencies.** We will collaborate with other regional infrastructure operators (e.g. gas network operators, water companies), together with the Environment Agency and regional bodies such as local resilience forums, to build a better understanding of cross-sector interdependencies. We will work together to formulate regional plans to mitigate the highest risks (both from and to our network such as flooding causing the failure of bridge structures carrying multiple utilities), understand the changing needs of other sectors and our impact on them, and improve resilience on our network (ref: annex 4.1 Climate resilience strategy). We will invest around £2m, including contributions to collaborative projects.

— **Using data and partnerships to enhance support to vulnerable customers.** Targeted support through data sharing will make priority services and support tools available among trusted partners. Information on our enhanced service offering, access to affordability services and social indicator mapping tools will be made available and shared to support the most vulnerable within society, also allowing for collaboration referrals and targeted support for hard-to-reach and seldom-heard customers. See our Vulnerability strategy (4.11).

— **Continuous data exchange with the ESO.** We will build on established data- and information-sharing processes to continue identifying and using opportunities for more efficient operation of the whole system. We will implement near-real-time two-way data exchange with the ESO to enable efficient short-term market operation. By providing two-way visibility of our actions to trigger flexibility, we can ensure that our actions are complementary. (see DSO Strategy)

We will undertake more specific whole system deliverables to achieve four customer outcomes, generating value and enabling decarbonisation in collaboration with other sectors.

We have identified four specific customer outcomes that we will aim to deliver in order to achieve our strategic objectives. Each of these outcomes will be delivered through a number of deliverables, such as targeted innovation projects.

We plan to invest £16m to deliver these initiatives, resulting in £253m of savings for customers over the next 10 years (around £29m in 2023-28 and £224m in 2028-33).

Here we set out each of the four outcomes and provide examples of some of our deliverables. A full list of our deliverables can be found in the Whole System outcomes table overleaf, and further details can be found in the Whole System strategy.1

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A progressive set of outcomes

Figure 1: Whole System customer outcomes

Remove barriers for customers to use their equipment to support the whole energy system.

To deliver this outcome we will identify barriers, such as informational gaps and coordination challenges, that limit the ability of customers to connect, invest, use their assets efficiently, or use the energy system efficiently. We will work with these customers to understand their needs and then develop and implement solutions accordingly. This will enable customers to benefit more from the efficient use of their own assets and the existing system, facilitating cost savings as well as quicker and cheaper decarbonisation.

For example, a solar farm looking to connect to our network might require a costly connection based on its generation capacity in the summer, despite much lower generation in the winter. At the same time, a battery operator might be seeking a connection in the same area. If the two could coordinate and connect jointly, there could be significant synergies in the form of reduced utilisation of the network and lower connection costs. One of our whole system initiatives is designed to overcome this coordination challenge. We will invest £0.4m to collaborate with other network operators in our region to create an open register and a process that allows interested parties with complementary energy needs to find each other – ‘energy matchmaking’.

Ensure our customers’ future needs are met through cross-sector and cross-vector planning.

We will work closely with energy industry parties and other stakeholders to ensure that network planning, as well as planning of wider investments such as storage and generation, is carried out as efficiently as possible from a whole system perspective.

For example, we will undertake annual workshops to ensure the widest range of stakeholder input (including heat networks, hydrogen and transport sector) is factored into forward plans, and collaborate to develop cross-vector energy storage technologies to allow energy optimisation between vectors.

We will also continue to participate in processes already in place with the ESO and other DNOs to promote coordinated network planning, e.g. around further developing FES, DFES and network development plans.

Develop the blueprint for the next-generation network by rolling out proven innovation.

As society becomes more dependent on electricity, we will seek ways to maintain and improve reliability, availability, and efficiency throughout the seasons. Many of these innovative solutions will require coordination with other energy sector stakeholders, and/or may be more expensive than traditional solutions but can deliver net benefits when costs and benefits are assessed on a whole system basis.

For example, building on our ED1 Boston Spa energy efficiency trial (BEET) project,1 we will invest £8.5m to pilot voltage optimisation technology that uses smart meter data to safely reduce the supply voltage that consumers receive, and reduce their energy usage as a result. If successful, we will start deploying this technology more widely across our network. From a whole system perspective this will deliver £231.8m of net benefits over the next 10 years (at which time the roll-out will be complete)2 and could help customers save £20 p.a. on the average domestic energy bill (see Customer Value Propositions (CVP) section). Beyond this, these initiatives could deliver an estimated net benefit of £63m p.a.

We will also invest £7.4m to roll out microgrid technology to 30 of our most vulnerable low voltage networks on a fixed basis (see CVP section), and six mobile microgrid vans.3 This will deliver £9.8m whole system net benefits for our customers and wider society over the next 10 years,4 initially through the societal value attributed to the improved system resilience as experienced by customers, and increasingly through the support the microgrids provide to wider system security as the network loading increases as we approach net zero – see our Vulnerability strategy. Beyond this (out to 2050), this initiative is forecast to deliver an estimated net benefit of £19.5m.

Exchange knowledge with those specifying future low carbon technology (LCT) and low carbon use cases.

We will work with partners beyond the energy system to foster whole system thinking in product and service design. If future products can be designed in a way that optimises their performance, reflects whole system needs, and minimises their impact on the electricity system, this will help contribute to low-cost decarbonisation.

For example, we will work with industrial and transport manufacturers and their trade bodies and standards bodies to contribute to the design and specification of future equipment.

---

1. In 2015-23 we will also have deployed this technology in three primary substations to manage energy efficiency.
2. £31.6m in 2023-28 and £200.2m in 2028-33 (assuming a five-year price control period).
3. In 2016-23 we will also have rolled out two microgrids on low voltage networks.
4. £0.7m societal benefits; £5.8m total net benefits in 2023-28, and £15.7m total net benefits in 2028-33 (assuming a five-year price control period).
Our business plan enablers are essential to delivering these four outcomes and achieving our whole system objectives:

- **Innovation:** as well as building on recent successful innovation projects, we will explore, test and challenge new ideas to enable whole system decarbonisation through both incremental and large-scale innovation projects.

- **Data and Digitalisation:** we will invest in our systems, as well as sharing data and information to facilitate cross-industry and cross-sector collaboration.

- **Workforce:** we will train and recruit colleagues to embed a whole system mindset in our business culture.

There is inherent uncertainty in how decarbonisation will unfold, with new technologies and policy decisions emerging frequently. The optimal whole system solutions are, therefore, changing – both as new challenges emerge, and as technological developments present opportunities for new solutions.

**Collaboration is key to unlocking whole system benefits**

Ongoing collaboration with other industry parties is, therefore, key to ensuring that we are unlocking whole system benefits as new challenges and opportunities arise. For example, engaging regularly with energy suppliers will mean that we are aware of developments around time of use tariffs and can plan our network accordingly.

Throughout the next five years we will continue to engage with stakeholders and refine our whole system approach. We will continue to track factors that could impact our assumptions about the possible energy pathways and the implications for whole system decarbonisation. We will take this forward mainly through our interactions with stakeholders on improving DFES. Please refer to the Scenarios and Investment section for further discussion of how we will manage this uncertainty.

**We plan to use smart meter data to optimise voltage improving the energy efficiency of customers’ equipment, with a view to saving each customer up to £20 p.a. on their electricity bill.**

*Mark Callum Smartgrid development engineer*
## Outputs

### EXEC SUMMARY

<table>
<thead>
<tr>
<th>Measure</th>
<th>Indicative input measure*</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WS1</strong> Remove barriers for customers to use their equipment to support the whole energy system, launching an open register and energy matchmaking process that enables parties to work together to reduce costs and deliver whole system benefits</td>
<td></td>
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<tr>
<td><strong>WS2</strong> Ensure our customers’ future needs are met through sector- and cross-sector planning, including annual workshops with a wide range of stakeholders such as the heat, hydrogen and transport sectors to develop regional DFESs</td>
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<tr>
<td><strong>WS3</strong> Develop the blueprint for the next-generation network by rolling out proven microgrid technology and deploying network voltage optimisation to deliver energy efficiency savings for customers</td>
<td></td>
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<tr>
<td><strong>WS4</strong> Facilitate knowledge exchanges with organisations specifying future LCTs and low carbon use cases</td>
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</tr>
</tbody>
</table>

### Outputs Enablers

1. Numbers shown may be subject to rounding. See annex 1.4 key measures for profilled targets.

### Case Studies

<table>
<thead>
<tr>
<th>Customer outcomes</th>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/ indicative input measure*</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS1.1</td>
<td>Undertake an NIA-funded innovation project informed by inter-seasonal energy requirements (ref WS2.3) to determine the system impact of commercial options for inter-seasonal storage. This will provide commercial and technical energy policy insights to drive this future market.</td>
<td>Date of NIA project learnings publication</td>
<td>-</td>
<td>-</td>
<td>End of period</td>
<td></td>
</tr>
<tr>
<td>WS1.2</td>
<td>Collaborate with other network operators in our region to create an open register and a process that allows interested parties with complementary energy needs to find each other – ‘energy matchmaking’. We will facilitate the initial engagement between parties, who can then work together to produce whole system benefits, such as reduced utilisation of the network, reduced probability of constraints and greater value that is possible through enhanced coordination.</td>
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<tr>
<td>WS1.3</td>
<td>Undertake annual workshops to ensure the widest range of stakeholder input (including heat networks, hydrogen and transport sector) is factored into forward plans, and that our DFES becomes the focal point for regional energy scenarios.</td>
<td>Annual workshops for heat networks, hydrogen and transport sectors</td>
<td>-</td>
<td>-</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>WS1.4</td>
<td>Undertake the first-stage deployment of the blueprint for the next-generation energy system to enhance system resilience, particularly for remote customers, by rolling out innovative microgrid technology in some of the most remote parts of our network. (CVP)</td>
<td>No. fixed microgrids rolled out on low voltage (LV) networks</td>
<td>0</td>
<td>2</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>WS2.1</td>
<td>Undertake an NIA-funded innovation project to develop techniques to understand the differing summer and winter loads as electric heat develops and generation becomes dominated by renewables, and the requirement for summer-harvested energy to be stored for winter use.</td>
<td>Date of NIA project learnings publication</td>
<td>-</td>
<td>-</td>
<td>End of period</td>
<td></td>
</tr>
<tr>
<td>WS2.2</td>
<td>Develop new network planning tools to improve our modelling of the impact of flexibility and mobile loads, and therefore improve our network planning process. Work with other DNOs and build on previous learning.</td>
<td>No. cross-vector innovation projects across the period</td>
<td>0</td>
<td>0</td>
<td>≥2</td>
<td></td>
</tr>
<tr>
<td>WS2.3</td>
<td>Building on Northern Gas Network’s (NGN) Winlaton hydrogen project and our joint InTEGReL projects, we will collaborate with Northern Gas Network and other partners to develop cross-sector energy storage technologies to allow energy optimisation between vectors and provide additional value to our customers offering these services</td>
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<tr>
<td>WS2.4</td>
<td>Optimise network voltage to improve energy efficiency, delivering a reduction in customer energy bills and carbon emissions by dynamically managing voltage on our LV network. (CVP)</td>
<td>No. large-scale sites with voltage optimisation to manage energy efficiency</td>
<td>0</td>
<td>3</td>
<td>196</td>
<td></td>
</tr>
<tr>
<td>WS3.1</td>
<td>£243.2m of net benefits from voltage optimisation over 10 years: £20 billion savings p.a.</td>
<td>No. cross-vector innovation projects across the period</td>
<td>0</td>
<td>2</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>WS3.2</td>
<td>£444,000 tCO2e savings over 10 years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>WS3.3</td>
<td>£8.9m of net benefits from microgrids over 10 years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WS3.4</td>
<td>£14.6m of net benefits from microgrids over 10 years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WS4.1</td>
<td>Collaborate with organisations supplying equipment and solutions to industrial and commercial (I&amp;C) customers and their trade bodies. This will ensure that standards for future I&amp;C customer equipment and network infrastructure are specified for optimised performance and costs.</td>
<td>No. low carbon equipment supplier consultations in period</td>
<td>1</td>
<td>5</td>
<td>≥50</td>
<td></td>
</tr>
<tr>
<td>WS4.3</td>
<td>Collaborate with organisations supplying equipment and solutions to domestic customers for use ‘behind the meter’ and their associated trade bodies. This will ensure that standards for network optimisation and home optimisation complement each other, and that system planning keeps pace with changing customer demands.</td>
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</tbody>
</table>
### How engagement with you has shaped our plan

#### Stakeholders engaged...
- **Domestic**: 32,500 total
- **Vulnerable Communities**: 4,762 total
- **Suppliers**: 75 dedicated events
- **Employees**: 10,765 unique interactions
- **Regulators**: 75 dedicated events
- **Government Experts**: 15,475 total
- **Community Energy Groups**: 32,500 total
- **Distributors**: 1,300 unique interactions
- **Vulnerable Communities**: 1,000 unique interactions
- **Businesses**: 69% (Enabling Whole System Solutions acceptance score)
- **WS4**: 10 dedicated events
- **Ref Annex**: 80 dedicated events
- **Outcome Ref**: 283 dedicated events

#### Details

<table>
<thead>
<tr>
<th>Wave 1 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total energy transition costs are important to aid effective future decision making</td>
<td>Stakeholders wanted to understand and minimise the cost impacts from different investments needed to facilitate decarbonisation (including the uptake of LCTs, delivery of infrastructure and bill impacts from switching away from cheaper fossil fuels)</td>
</tr>
<tr>
<td>Innovation will be key for delivering decarbonisation within the agreed time frames</td>
<td>Innovation continued to be a key area of stakeholder interest. Innovators wanted to work closely with us, be part of our network innovation projects and to test their proposed solutions</td>
</tr>
<tr>
<td>Collaboration was recognised as a critical enabler for achieving net zero</td>
<td>We continuously heard there was appetite to do more beyond traditional investment planning and to demonstrate a more joined-up approach across the industries. Stakeholders urged collaboration with manufacturers of smart products, EVs and autonomous vehicles to ensure design of their products is inclusive and conducive to future needs of customers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td>Stakeholders engaged: 15,475 total – 10,765 unique interactions</td>
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<tr>
<td>Delivering the same service but at a lower cost (not on track for net zero emissions by 2050) (Not on track for net zero by 2050)</td>
<td>Stakeholders engaged: 4,762 total – 1,300 unique interactions</td>
</tr>
<tr>
<td>Wave 2 – optioneering</td>
<td>Wave 3 – refinement and finalising</td>
</tr>
<tr>
<td>Wave 3 Events: 91 total – 33 dedicated events</td>
<td>Stakeholders engaged: 32,500 total – 2,154 unique interactions</td>
</tr>
<tr>
<td>Wave 3 tested our draft proposals and customer value propositions, further exploring the opportunities for coordination and collaboration to create an efficient and effective energy system, minimise customer disruption, and support the development of local area energy plans</td>
<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole energy system collaboration and planning is a priority</td>
<td>We will work with customers to understand how to enable their participation in and anticipated benefits from the future energy system</td>
</tr>
<tr>
<td>Stakeholders expect cross-vector and cross-sector coordination</td>
<td>We will collaborate with energy sector partners to develop shared whole system solutions and common scenarios</td>
</tr>
<tr>
<td>Innovation is a priority in shaping the development of a future network</td>
<td>We will continue to identify opportunities to find innovative solutions in developing a resilient future network</td>
</tr>
<tr>
<td>Collaborating with early adopters, LCT experts and community energy groups will help shape an effective energy transition</td>
<td>We will collaborate with early adopters and LCT supply chain stakeholders to gather practice and learning to actively shape the future network and services for customers</td>
</tr>
<tr>
<td>Enabling Whole System Solutions acceptability score: 69%</td>
<td>Customers found this area generally less relevant to their own needs and more difficult to navigate</td>
</tr>
</tbody>
</table>
**Environmental Action Plan**

We will proactively seek to protect the environment through our investments and operations, working collaboratively with partners and our supply chain to deliver innovative, cost-effective solutions that reduce or eliminate environmental risk exposure. In doing so we will minimise carbon emissions, pollution and waste and, where possible, seek to enhance the local environments in which we operate.

We play a key role in facilitating society to decarbonise and we are preparing the network to enable all credible pathways on the transition to net zero. Whilst supporting our region on this journey we will take action to reduce the environmental impact of our own network operations.

**Environmental protection is important to our stakeholders.**

The nature of our business means we have a responsibility to protect the environment and minimise our impact where we can. This presents opportunities to utilise innovation to drive change and overcome challenges. Societal shifts will deliver an improvement in carbon emissions driven by the overall carbon intensity factor falling, for example reducing building and substation energy emissions and losses. In support of this, legislation is forcing progressive societal changes towards the net zero target including the ban on sale of new fossil fuel vehicles by 2035. We have an obligation to protect the environment, support society’s path to net zero and minimise long-term costs to consumers.

Our stakeholders have told us that they expect high levels of ambition when it comes to managing the impact of our network and asset base; both protecting the environment and reducing our business carbon footprint (BCF). Environmental protection was in the top quartile of stakeholder priorities; specifically, we have heard:

- we should lead by example in reducing our own emissions;
- reducing SF₆ emissions and oil leaks is important;
- we should reduce our BCF but via the most cost-effective means;
- biodiversity initiatives should be increased in terms of scope and scale; and
- visual amenity is valuable but not essential.

**Our plans build on strong performance in the 2015-23 period.**

During the current price control period we have performed strongly on environmental measures compared to our own targets and we benchmark well compared to other networks.

- Our BCF has so far in the period reduced by 48 per cent, meaning we have achieved our stretch target to deliver a 47 per cent reduction by the end of 2015-23 against our 10 per cent target;
- Similarly, SF₆ losses are 23 per cent lower since the start of the current price control period;
- We have reduced oil and fluid lost to the ground by 47 per cent to date through investment in our network and deployment of innovative solutions, surpassing our 2015-23 target of 15 per cent; and
- By the end of 2023 we will have removed 120km of overhead lines in Areas of Outstanding Natural Beauty (AONB).

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1. Sulfur hexafluoride, a greenhouse gas.
2. Including contractors and excluding losses, relative to our current business plan baseline (59,700 tCO₂e).
3. Relative to our current business plan baseline (63,246).
An ambitious set of outputs

Our Environmental Action Plan (EAP) delivers an ambitious set of outputs at a lower cost to customers through the use of innovative technologies and solutions.

The total cost of our plan is £25.7m p.a., which is £2.2m (7.9 per cent) lower than we currently spend each year. For this expenditure we will achieve significant output improvements while also accommodating £8.2m p.a. of unavoidable costs relating to the removal of polychlorinated biphenyls (PCBs) – 32 per cent of the expenditure in our EAP. We achieve these outcomes efficiently by harnessing innovative solutions, most notably perfluorocarbon tracer (PFT)\(^1\) technology, allowing us to generate a saving of £8.2m p.a. in cable replacement while achieving comparable fluid loss outcomes.

Reducing our internal BCF is a key priority and our plan will set us on a path to be carbon net neutral by 2040.

While we play a vital role in supporting society to decarbonise, we must also work to decarbonise our own operations and reduce our greenhouse gas emissions. We have set ambitious targets to reduce our internal BCF while delivering value for money for stakeholders. Our plan is carefully calibrated to ensure that we make strong progress while ensuring efficient costs for customers that will come from future developments in technology.

Our stakeholders showed strong support for an ambitious plan that achieved internal carbon net neutral operations by 2040. This puts us ahead of the government’s commitment to be carbon net neutral operations by 2050 and represents a trajectory that aligns with the government’s interim commitment to reduce emissions by 78 per cent from 1990 levels by 2035. Our plan balances ambition with long-term costs, taking measured but progressive steps between 2023 and 2028, while allowing low carbon technologies (LCTs) such as ultra-low emission vehicle (ULEV) and zero emission vehicle (ZEV) technology, charging infrastructure and renewable generation to develop and further reduce in cost, ensuring long-term value for money for customers.

By 2028 we will target a 20 per cent reduction in controllable internal BCF by:

- reducing building and substation emissions by 20 per cent. We will begin to introduce renewable generation onto our property estate, optimising the most cost efficient solutions, and we will introduce BREEAM\(^2\) initiatives to make our sites more sustainable;
- increasing the number of ULEVs and ZEVs on our fleet to 40 per cent and developing the required charging infrastructure across our property portfolio;
- leveraging adjustments to our operations made during the pandemic to support reduced business mileage; and
- reducing SF\(_6\) losses by 15 per cent through targeted asset replacement.

Building and energy substation use accounts for nearly 50 per cent of our total controllable internal BCF.\(^3\) During 2023-28 we will introduce LCTs, including renewable generation across our properties, with a view to matching generation with our own consumption.

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1. Perfluorocarbon tracers: an additive put into fluid-filled cables that can detect leaks by ‘sniffing’ the specific chemical structure of the additive in the ground above the leak, locating leakage from above the ground to target repair.
2. Building Research Establishment Environmental Assessment Method (BREEAM) is a sustainability assessment method that is used to masterplan projects, infrastructure and buildings.
3. In 2020-21.
Reducing our business carbon footprint

We have already begun introducing ULEVs/ZEVs onto our fleet and we plan to scale this up with the addition of a further 265 vehicles to 40 per cent ULEV/ZEVs by the end of 2028. This will support us in reducing the impact of our operational transport emissions. We considered options for various levels of penetrations of ULEVs and ZEVs to our fleet. Our 40 per cent target aligns with our fleet replacement cycle (five to seven years), balances costs of charging infrastructure and provides time for the availability of public charge points to increase to ensure reliable operation of our fleet (see our CBA-46, ULEVs/ZEVs on Fleet). We will look for opportunities to go further in the next price control period where technological developments, infrastructure and funding allows to make this a beneficial proposition for our customers.

To address business transport emissions, which are made up of employees travelling to site or for business meetings, we will retain benefits from the adjustments made to our business during the COVID-19 pandemic, leverage technology and promote more flexible working, as shown in our Workforce Resilience strategy to target a 15 per cent reduction.

SF₆ is 22,800 times more potent than CO₂ and is a key component of grid infrastructure with limited viable alternatives currently available. Our SF₆ strategy targets a 15 per cent reduction in SF₆ through targeted asset replacement and continued use of our thermal imaging Forward Looking InfraRed (FLIR) cameras to pinpoint and target leaks on the network. We have begun trialling the use of non-SF₆ alternatives on our network as we innovate to tackle fugitive emissions with a view to adopting alternatives when viable and cost efficient to do so. For more details, see our SF₆ strategy in our Environmental Action Plan (annex 4.4).

We do not plan to offset our carbon emissions at this stage in our path to net zero operations. Our stakeholders have told us that they would rather we focussed on reducing our own physical carbon emissions than offsetting. An extra £1 of investment in our network to enable decarbonisation offers much better value to customers than incremental spend on carbon offsetting for our own emissions.

We will enhance our work with suppliers to promote environmental stewardship.

Our contractor emissions account for about half of our overall carbon footprint (excluding losses). Without proactively working with our suppliers to reduce their emissions there is a risk this won’t happen fast enough with our many are at very different stages of their own carbon reduction transitions. We will work with our supply chain to reduce their carbon emissions while being mindful of associated costs of new technology requirements that may hinder their ability to operate.

Figure 2: components of our business carbon footprint (BCF)  Figure 3: our path to internal carbon net neutral operations

1. Defra figure used as this is what we report via the reduction and recycling plan (RRP) process, noting that the strictly standardised mean difference (SSMD) states SF₆ is 23,500 times more potent than CO₂.
2. In 2020-21.
We will optimise whole system losses while facilitating net zero.

Losses are simply the difference between the amount of energy entering the network and the amount of energy drawn out of it. No system can be 100 per cent efficient and losses are unavoidable in distributing electricity. The main type of losses are technical losses resulting in electricity converted into heat on the network.

For Northern Powergrid, the magnitude of losses equates to roughly 2TWh per year (94 per cent of our total carbon footprint). When expressed as a percentage of the total energy entering the network, losses are approximately six per cent. This energy that is ‘lost’ needs to be generated, and, therefore, has a financial and carbon impact. We work to ensure losses are as low as reasonably practicable.

Losses are mainly determined by the energy requirements of our customers where the higher the loading, the higher the losses. Decarbonisation will result in a significant increase in network loading, so, when taking into account that the majority of our existing network will continue to operate well into the future, losses will generally increase. We will, therefore, only be in a position to directly influence a small percentage of the losses on our network, primarily when we make changes to our network and install new equipment.

Nonetheless, we recognise there is a significant opportunity for influencing customers and their energy usage (and, therefore, losses). We will work closely with our customers and stakeholders as part of our commitment to provide support to communities to become more energy efficient. See communities customer outcomes CO3.1 and CO3.2.

Our track record illustrates our commitment to managing losses. We have undertaken a range of innovation projects that have sought to better understand losses, and have explored new technologies (such as very low loss amorphous core transformers) that could produce a step change in losses performance. We have undertaken actions that are improving losses performance now, and will continue to do so in the future; such as the use of lower resistance cables at low voltage (LV) and 11kV, and the implementation of static voltage optimisation to reduce energy use behind the meter. We will be upgrading this to dynamic voltage optimisation during the 2023-28 as part of our Whole System Solutions plan. See plan section for more details.

Our losses approach is to optimise whole system losses while facilitating net zero:

1. Optimise Fully integrating losses into asset management decision making and planning processes means that management of losses does not always mean minimising losses, but instead, optimising losses.

2. Whole System A whole system approach is imperative, where increasing distribution network losses to obtain a reduction in transmission losses and wider carbon reduction is a positive outcome.

3. Facilitating net zero Through our transition to Distribution System Operation (DSO), we are committed to a flexibility-first approach. The use of customer flexibility and smart solutions will often lead to an increase in network losses. From a whole system perspective this is the right outcome as this in turn unlocks wider decarbonisation at the lowest cost to customers. In turn, the carbon impact of network losses will diminish over time, as we facilitate increasing volumes of low carbon generation required for net zero.

Our plan to manage losses is detailed in our Losses Strategy in annex 4.4. These actions range from the deployment of low-loss technologies to enhanced use of data for improved planning and operation of the system. As part of the significant decarbonisation investment in transformers, and our environmental investment to remove PCB-contaminated transformers; we will be adopting amorphous core technology where it can provide a net benefit to our customers, which is roughly 80 per cent of all units.

We will report on our progress in delivering our losses strategy annually.

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1 Consisting of roughly 63,000 substations and over 60,000 miles of circuit.
3 Subject to final review of learnings from our amorphous transformer (AMT) trial.
We are adopting science-based targets to measure our emissions in line with net zero.

Science-based targets (SBT) provide a clearly-defined pathway for companies to reduce tCO₂e emissions, helping prevent the impacts of climate change and future-proof business growth. Targets are considered ‘science-based’ if they are in line with the goals of the Paris Agreement – limiting global warming to well below 2°C and pursuing efforts to limit warming to 1.5°C. A carbon budget is calculated that identifies levels of emissions consistent with limiting global warming temperatures.

To meet the carbon budget, our emissions need to reduce annually by 4.2 per cent relative to our baseline of 2019-2011. Our SBT (covering Scopes 1 and 2) is to reduce our emissions by 63 per cent by 2035, at which point we would emit 208,470 tCO₂e p.a.

Our plan is set to achieve our SBTs. They have been developed with the support of an external consultant and will be verified by the science-based target initiative (SBTi).¹

Projected emissions within Scope 2 are dominated by losses. As losses emissions are not directly within our control and are heavily dependent on the rate at which the grid decarbonises, there is significant variability in the future projections. Figures 4 and 5 show our forecast emissions reductions against our SBTs excluding and including losses.²

We will report on our BCF reduction and progress towards our SBT based a common methodology. Within our reporting we will include progress on Scope 3 emissions.³

We will assess and report on embodied carbon in new projects.

We are developing a model that will allow us to calculate a baseline for embodied carbon and then measure the impact of new projects. The method has been developed based on industry best practice sources and methodologies. This gives an opportunity to give greater accountability in our operations and to collaborate with suppliers to deliver downstream benefits and transparency. We will use the data to support our investment decisions based on the whole life carbon cost associated with work on our network.

1. We are in the process of submitting our science-based targets to the SBTi to be verified.
2. Scope 2 emissions for distribution losses.
3. Scope 3 emissions are all indirect upstream and downstream emissions that occur in the value chain of the reporting company, excluding indirect emissions associated with power generation (Scope 2).
Reducing the environmental impact of network activity

Oil and fluid loss from our network poses an environmental threat that we must continue to reduce.

Reducing fluid lost to ground is a priority for our stakeholders and an area where we will continue to have a strong focus. By maintaining and managing our fluid-filled cable (FFC) network we reduce fluid leaks to ground preventing environmental damage and minimising risks of cable failures.

We have significantly outperformed our current plan in this area. By 2023 we will have replaced over 220km of cable compared to our original plan of 134km. This puts us in a strong position, despite having one of the largest FFC networks in the country.

Our investment options to minimise fluid loss during 2023-28 include:

- replacement of the FFC with new solid cables containing no fluid;
- refurbishment of the FFC;
- injection of PFT directly into the FFC; and
- injection of self-healing cable fluid.

Replacement of the fluid-filled cables has traditionally been the main method of reducing fluid loss. While this provides a long-term solution to the risk posed by FFC it is costly. Refurbishment often does not provide good value for money to our customers as the costs associated with refurbishing a FFC circuit can be almost as much as cable replacement. PFT dosing and tracing is now a widely available and has become a proven technology, which is significantly less expensive than cable replacement and allows us to detect leaks faster. Self-healing cable fluid is currently undergoing live trials on our network and the technology, although promising, is very much still in its infancy.

Our target to reduce our fluid loss by 15 per cent leverages the significant asset replacement programme completed in the current price control period, to maintain focus on fluid loss reduction but with much lower investment levels than we’ve seen to date. Our plan will reduce cable replacement annually by 70 per cent and increase PFT injection rates by 400 per cent. We will introduce self-healing cable fluid additive to our network subject to successful trials and adjust PFT investment accordingly.

This blended approach delivers output performance for 2023-28 equivalent to that targeted for 2016-23 while delivering an annual net cost saving of £8.2m.

Figure 6: investment options for fluid-filled cables

Recent legislation requires decontamination or disposal of equipment containing PCBs from our network by 2025.

Polychlorinated biphenyls (PCBs) could potentially exist in all ground- and pole-mounted transformer oil if the transformers were manufactured prior to 1987. New legislation requires removal of all PCB-contaminated oil from our network by the end of 2025 due to its high levels of toxicity.

By testing our ground-mounted transformer population we have identified 461 transformers confirmed to contain PCB oil, which will be addressed by either replacing the oil or the unit. Pole-mounted transformers, however, are sealed units making testing for PCBs currently impossible. To overcome this, we have been working with the Energy Networks Association (ENA), our industry trade body, to develop a statistical model based on historical data to support network operators in estimating the number of pole-mounted transformers that might contain PCB oil.

We currently have a total of 16,925 pole-mounted transformers that were manufactured prior to 1987 that could potentially contain PCBs. Through the statistical model we estimate that the number of pole-mounted transformers we need to address is over 8,400 – a significant challenge. We will be taking the opportunity to reduce PCB risk in a way that maximises synergies and supports decarbonisation including by installing amorphous core transformers to reduce our energy losses whilst sizing our assets for future forecast load growth in our investment scenarios.

Given the large volumes involved, PCBs are the largest cost driver within our environmental plans with an unavoidable annual cost of £8.2m p.a. However this will be almost entirely offset by the savings we have planned through our blended FFC strategy.

1. The length of circuits dosed with perfluorocarbon tracers. Perfluorocarbon (PFT) tracers are an additive put into fluid-filled cables that can detect leaks by ‘sniffing’ the specific chemical structure of the additive in the ground above the leak, locating leakage from above the ground to target repair.
2. Self-healing cable fluid solidifies upon contact with air and can stop very small leaks from becoming larger.
3. PCBs are synthetic organic chemicals that were manufactured for use in various industrial and commercial applications – including oil in electrical transformers, plasticisers in paints, plastics and rubber products – because of their non-flammability, chemical stability, high boiling point and electrical insulation properties.
Managing our wider environmental impact

We will manage our wider environmental impact and take opportunities to bring about positive benefits.

Waste management is imperative when considering the protection of our wider environment. Our plan will set us on a path to achieve zero waste to landfill by 2035. We will aim to divert 90 per cent of waste from all of our operations by 2028, managing the greater quantity of waste generated from the additional network activity required to deliver our overall investment plans and decarbonisation objectives. Additionally we will target a recycling or reuse rate of 85 per cent of total materials by 2028.

We have an opportunity to enrich local habitats through our activities. Our plan is set to deliver biodiversity initiatives to promote natural habitats and increase the variety and variability of species and ecosystems at 200 of our major sites. This relatively low cost initiative (£0.1m p.a.) carried support from our stakeholders and includes working with partners such as Natural England and engaging our local communities. We will also monitor our impact from new connection and network projects to assess our impact on ecosystems.

Noise and other effects from our activities such as dust, smoke, odour and disruption caused by digging up roads can be a nuisance to the communities we serve. We will continue to ensure that we comply with noise and statutory nuisance legislation and respond swiftly to all complaints to reduce, minimise or eliminate noise from our equipment. Our deployment of SilentPower battery vehicles will assist in this area.

Within our region we have four National Parks and five AONBs. By 2023 we will have put underground 120km of overhead lines in these areas. Our stakeholder engagement highlighted an appetite for us to continue this programme and we pride ourselves on being industry leaders in this area. We will continue this programme – at the same run-rate, with up to 10 per cent outside of designated areas – to improve the visual amenity in our region.

Our EAP supports our long-term ambition to minimise our environmental impact while ensuring value for money for our customers.

Our EAP carefully balances ambitious output targets with affordability for our customers. By the end of the 2023-28 period we will be well positioned for net zero operations by 2040. We will have significantly expanded our environmental management standards within our supply chain, achieved double-digit reductions in pollution in our local environments and delivered on legislative obligations for PCBs, all while reducing total costs to customers.

We keep the environmental impact of our network and operations under continual review.

Our ISO14001 accredited environmental management system (EMS) provides a robust framework against which we continually assess our environmental impact, performance against our environmental plans and associated risks and opportunities. A summary of these risks, challenges and opportunities is set out in our Environmental Action Plan (annex 4.4).
### Customer outcomes

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP1 Reduce controllable internal BCF by 20% keeping us in line with the government’s 2035 target and on a path to becoming a carbon-neutral operation by 2040, and introduce a science-based target to measure our impact</td>
<td>EP1.1 Install renewable energy at 60 sites, remaining receptive to technological advances</td>
<td>Controllable internal BCF (excluding losses) (tCO2e)</td>
<td>14,722</td>
<td>14,300</td>
<td>11,430</td>
</tr>
<tr>
<td>EP1</td>
<td>EP1.2 Adopt a verified science-based target to reduce Scope 1 and 2 emissions in line with net zero (4.2% annual reduction to 2035, achieving a 27% reduction in emissions over 2023-28) and report on progress for Scope 3 emissions</td>
<td>Science-based target Scope 1 and 2 emissions (excluding losses) (tCO2e)</td>
<td>12,866</td>
<td>11,740</td>
<td>8,920</td>
</tr>
<tr>
<td></td>
<td>EP1.3 Implement BREEAM, gaining accreditation at 10 sites</td>
<td>Report on Scope 3 BCF annually (tCO2e)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>EP1</td>
<td>EP1.4 Increase ultra-low emission vehicles (ULEVs/ZEVs) on fleet to 40% by 2028, reducing fleet fuel by 40%</td>
<td>Operational transport emissions (tCO2e) (ODI-F)</td>
<td>4,186</td>
<td>4,110</td>
<td>2,750</td>
</tr>
<tr>
<td>EP1</td>
<td>EP1.5 Reduce sulphur hexafluoride (SF6) losses by 15% including replacing SF6-filled equipment with a leak rate in excess of 5kg over a four-year period</td>
<td>Business transport emissions (tCO2e) (ODI-F)</td>
<td>1,558</td>
<td>2,560</td>
<td>2,160</td>
</tr>
<tr>
<td>EP2 Efficiently manage and optimise losses from our network</td>
<td>EP2.1 Develop and report on our losses strategy annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP2</td>
<td>EP2.2 Install super low-loss amorphous core transformers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP2</td>
<td>EP2.3 Install low-loss (i.e. oversized) LV and HV cables</td>
<td>Circuit km</td>
<td>1,582</td>
<td>2,240</td>
<td>1,400</td>
</tr>
<tr>
<td>EP2</td>
<td>EP2.4 Improve the energy efficiency of our substations</td>
<td>No. substations assessed</td>
<td>-</td>
<td>-</td>
<td>100%</td>
</tr>
<tr>
<td>EP3 Promote environmental management in our supply chain, achieving 90% compliance with our responsible procurement charter</td>
<td>EP3.1 EP3.2 Introduce a Responsible Procurement Charter achieving &gt;90% compliance</td>
<td>% of suppliers compliant</td>
<td>-</td>
<td>-</td>
<td>90%</td>
</tr>
<tr>
<td>EP3</td>
<td>EP3.3 Introduce an embodied carbon model in 2023-24 for new projects, and monitor and report on our embodied carbon through appropriate channels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP3</td>
<td>EP3.4 Publish an annual environmental report for our stakeholders covering the delivery of our 2023-28 EAP commitments (ODI-R)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP4 Reduce oil lost to ground by 15%</td>
<td>EP4.1 Replace 40km of fluid-filled cables (FFC) to reduce fluid leaks</td>
<td>Oil/Fluid loss (litres)</td>
<td>28,055</td>
<td>27,300</td>
<td>23,200</td>
</tr>
<tr>
<td>EP4</td>
<td>EP4.2 Dose &gt;250km of FFC with PFT to reduce fluid leaks</td>
<td>FFC replaced (km)</td>
<td>176.5</td>
<td>224.4</td>
<td>40</td>
</tr>
<tr>
<td>EP4</td>
<td>EP4.3 Subject to successful trials, roll out self-healing cable solution</td>
<td>FFC dosed with PFT (km)</td>
<td>81.9</td>
<td>109.2</td>
<td>267</td>
</tr>
<tr>
<td>EP4</td>
<td>EP4.4 Undertake bund replacement and refurbishment to minimise pollution sources</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP5 Remove PCB-contaminated equipment from our network</td>
<td>EP5.1 Remove PCBs from equipment</td>
<td>PCB units removed/remediated</td>
<td>0</td>
<td>12</td>
<td>449*</td>
</tr>
<tr>
<td>EP5</td>
<td>EP5.2 Ground-mounted transformers</td>
<td>Ground-mounted transformers</td>
<td>0</td>
<td>415*</td>
<td>8,400*</td>
</tr>
<tr>
<td>EP5</td>
<td>EP5.3 Pole-mounted transformers</td>
<td>Pole-mounted transformers</td>
<td>0</td>
<td>8</td>
<td>200</td>
</tr>
<tr>
<td>EP6 Take proactive action to protect and enhance the environment in which we operate delivering over 60km of undergrounding to improve visual amenity, biodiversity improvements at 200 sites and 90% of waste diverted from landfill</td>
<td>EP6.1 Improve visual amenity by undergrounding 61km overhead lines inside and outside designated areas</td>
<td>Overhead lines removed (km)</td>
<td>74.9</td>
<td>120.0</td>
<td>61.2</td>
</tr>
<tr>
<td>EP6</td>
<td>EP6.2 Enhance local habitats through biodiversity initiatives to enhance conservation of our environment and species</td>
<td>No. sites with net biodiversity gain (ODI-F)</td>
<td>0</td>
<td>8</td>
<td>200</td>
</tr>
<tr>
<td>EP6</td>
<td>EP6.3 Increase the number of recycling stations in our business</td>
<td>% of waste diverted from landfill (ODI-F)</td>
<td>75%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>EP6</td>
<td>EP6.4 Undertake site enhancements to mitigate noise from our assets</td>
<td>% of total materials recycled (ODI-F)</td>
<td>75%</td>
<td>78%</td>
<td>85%</td>
</tr>
<tr>
<td>EP6</td>
<td>EP6.5 Publish an annual environmental report for our stakeholders covering the delivery of our 2023-28 EAP commitments (ODI-R)</td>
<td>No. noise pollution interventions</td>
<td>28</td>
<td>39</td>
<td>33</td>
</tr>
</tbody>
</table>

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1. Numbers shown may be subject to rounding. See annex 1.4 key measures for profiled targets.
2. We will factor in increased activity levels in 2023-28 to deliver net zero investment when reporting on our performance in this area.
3. Building Research Establishment Environmental Assessment Method (BREEAM) is a sustainability assessment method that is used to master-plan projects, infrastructure and buildings.
5. Cross-reference Openness and Transparency (OT2)/Governance and sustainability frameworks.
7. Polychlorinated biphenyls (PCB).
8. Volumes completed in 2015-23 as part of our reinforcement programme due to high levels of utilisation.
9. Includes 500 units delivered synergistically via reinforcement.
### Wave 1

**Events:** 103 total – 14 dedicated events  
**Stakeholders engaged:** 4,762 total – 721 unique interactions

<table>
<thead>
<tr>
<th>Details</th>
<th>Collaboration with communities and industry experts will enable environmental action</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was a desire from the community and external environmental bodies to receive more communication to reduce carbon footprint and support for our approach to reducing air, noise and visual pollution.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Customers and stakeholders support a biodiversity focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was support for development of a net-biodiversity agenda.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Minimising our environmental impact is important to customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once made aware, customers are concerned about fluid leakages and SF6 emissions and feel these should be addressed.</td>
<td></td>
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</tbody>
</table>

### Wave 2

**Events:** 135 total – 18 dedicated events  
**Stakeholders engaged:** 32,500 total – 14,861 unique interactions

<table>
<thead>
<tr>
<th>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Options</strong></td>
<td>A</td>
</tr>
<tr>
<td><strong>Wave 2 options</strong></td>
<td>Net zero operations beyond 2050</td>
</tr>
<tr>
<td><strong>Customer ambition and broader findings</strong></td>
<td>Customers supported us reducing our environmental impact and felt we should “lead by example”. High levels of ambition (‘A new world’ – Option E) was the most selected option for reducing our BCF and environmental impact. Stakeholders supported ambition in meeting our internal net zero target as soon as possible and sought an expansion of all environmental programmes. 62% of future customers supported investment to make the network greener and more sustainable, urging us to be mindful of the environmental impact of our operations. There was a clear push from the stakeholders to be mindful of the costs associated with environmental improvement.</td>
</tr>
</tbody>
</table>

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### Wave 3

**Events:** 91 total – 8 dedicated events  
**Stakeholders engaged:** 15,475 total – 2,628 unique interactions

| Details | With a mandate from customers to support initiatives to improve our business carbon footprint and environmental impact of the network, the focus for Wave 3 was to test customers’ views about expanding biodiversity initiatives around substations and innovation to reduce network losses. |

### Wave 3 findings

<table>
<thead>
<tr>
<th>Details</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare for net zero with actions to reduce business carbon footprint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees and customers believe we should reduce emissions and set clear targets to reduce our BCF. Some customers were split on their willingness to pay for us to reduce our own carbon footprint.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have defined targets to further reduce our BCF, factoring in the government's net zero targets and timeline.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EP1</td>
<td>Link</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Support for managing electrical losses in support of decarbonisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The majority of customers agreed that we should adopt an ambitious approach to optimising losses.</td>
<td></td>
</tr>
<tr>
<td>We will progress with the implementation of our losses strategy, identifying opportunities for further innovation.</td>
<td></td>
</tr>
<tr>
<td>EP2</td>
<td>Link</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Work actively with your supply chain to reduce their environmental impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers suggested we should work with our contractors to reduce waste, lower emissions and use sustainable packaging. However, they felt it was too expensive to bring them in line with our own targets. Government stakeholders suggested closer supply chain management for environmental protection efforts.</td>
<td></td>
</tr>
<tr>
<td>We will continue to work proactively with our supply chain to promote environmental stewardship.</td>
<td></td>
</tr>
<tr>
<td>EP3</td>
<td>Link</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Manage and mitigate the environmental impact of operating our network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers recommended that we further reduce leakage from fluid-filled cables.</td>
<td></td>
</tr>
<tr>
<td>We will continue to manage and mitigate the environmental impact of our operations by committing to a further reduction in oil lost from underground cables.</td>
<td></td>
</tr>
<tr>
<td>EP4</td>
<td>Link</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>Support for enhancing the wider environment and biodiversity plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders were supportive of investment in environmental protection and want us to raise awareness about our efforts. There was support for improvements in visual amenity by undergrounding cables and to increase the scope and scale of biodiversity programmes.</td>
<td></td>
</tr>
<tr>
<td>We are committed to enhancing our region’s environment, setting ambitious undergrounding targets and enriching biodiversity of our sites.</td>
<td></td>
</tr>
<tr>
<td>EP6</td>
<td>Link</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details</th>
<th>EAP acceptability score: 74%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall acceptance was high with vulnerable customers having the highest levels of acceptability at 78%.</td>
<td></td>
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<tr>
<td>-</td>
<td>Link</td>
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</table>
OUTPUTS – MAINTAINING A SAFE AND RESILIENT NETWORK

Safety

We will be energy industry leaders in safety, keeping our colleagues and members of the public safe so that they can return home safely at the end of the day. We will be proactive in assessing and mitigating emerging safety risks, collaborate with others and explore potential innovation and technologies that offer opportunities to make our network and operations safer.

The safety of our customers and colleagues is paramount. We have delivered an industry-leading safety performance over the current plan period, and will continue to improve during 2023-28 by focussing on the leading causes of injuries and reducing exposure to high-risk activities.

We are committed to delivering a safe network and environment for our colleagues and for those we serve across the region.

We intend to continue our improvement during the next business plan period, so that we can further reduce our accident rates, lessen the severity of incidents, and reduce the impact of occupational ill health on our colleagues and contractors.

We are on track to exceed the commitment we made for 2015-23 to halve our accident rate, which has been underpinned by a record run of 690 consecutive days without a recordable lost-time accident. Our benchmarking positions us as an industry leader on safety performance and we have used this position and our learnings since 2015 as the foundations for our business plan.

Our 2023-28 plan has been built around the following objectives:

— We will deliver an annual safety performance that represents our best-ever performance from 2015-23. Sustaining this performance throughout the five-year period will enable us to halve our accident rate again by 2028.
— Our intention is to remain as a leading safety performer by maintaining our International Organization for Standardization (ISO)-accredited safety management system and investing in training programmes to equip our managers and first-line supervisors with the skills to identify and resolve at-risk behaviours.
— We will also invest in wearable technology solutions for front-line colleagues to provide improved information to reduce risk and manage fatigue.
— We will continue to engage with our customers and communities about managing risk around our network equipment and infrastructure, to ensure the public remains safe.
— Our contractors’ safety performance is a major priority. We will enhance the effectiveness of our collaboration with contractors to deliver a significant improvement in their safety performance.

How much it will cost

<table>
<thead>
<tr>
<th>2023-28 expenditure (annual)</th>
<th>£3.0m</th>
</tr>
</thead>
<tbody>
<tr>
<td>versus 2015-23</td>
<td>£0.0m</td>
</tr>
<tr>
<td>0.5% of totex</td>
<td>0.0%</td>
</tr>
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</table>

One of our 9 plan areas, taken together, delivering more for less.
We will continue to prioritise the health and wellbeing of our colleagues and invest in a technology-supported approach that enables us to better monitor and ensure positive impact in this area.

To support our ambitions to further improve our colleagues’ mental and physical health and wellbeing we will invest in an independently verified, ISO-accredited health and wellbeing programme (ISO45003). The health and wellbeing programme will take our stakeholders’ feedback into account – with particular focus on using technology to monitor and prevent health risks, and reducing the impact of fatigue in our workforce. We will continue to effectively manage working hours, limiting the maximum consecutive hours worked to 16 hours, including on-call periods.

We recognise that supporting colleagues’ health and wellbeing will become ever more important as the impact of the COVID-19 pandemic changes working circumstances. Our health and wellbeing programme will include initiatives to further support the mental health of our colleagues.

Our contractors’ safety performance is not at the same level as ours and we want to support them to improve their performance.

Throughout the extensive engagement we have undertaken, stakeholders have highlighted as one of our highest safety priorities. Stakeholders asked that training for school-age children being highlighted as one of our highest safety priorities. Stakeholders asked that our contractors has remained relatively flat.

We intend to enable our contractors to achieve this ambition and while we recognise this will take time to fully deliver we will set ourselves on the right trajectory by aiming to halve their current accident rate by 2028. To achieve this we will enhance collaboration with our contractors so that we will focus on reducing exposure to high-risk activities and learning from incidents. We will also align our respective safety management systems and focus on the delivery of safety improvement plans.

Ambitious safety awareness programmes for children and minimising inadvertent contact with overhead lines in at-risk sectors will help keep the people we serve safe.

Public safety is important to stakeholders, with safety awareness training for school-age children being highlighted as one of our highest safety priorities. Stakeholders asked that we set an ambitious target to reach more than 55,000 school-aged children each year through our education programmes, which we will aim to achieve through a combination of online training packages, face-to-face training and collaboration with other infrastructure providers in our region.
Rural stakeholders wanted to see a significant investment in safety awareness for high-risk sectors such as agriculture and road haulage that are at risk of inadvertent contact with overhead lines. We are investing in an innovation project that could produce a solution that enables the GPS location of overhead lines to be loaded in the navigation systems of agricultural vehicles to alert drivers to the presence of overhead lines. We will continue to engage with these groups about the hazards of overhead lines and how to avoid inadvertent contact with them.

Stakeholders were also in favour of installing defibrillators in fleet vehicles, which could be used to support our communities. We plan to equip some of our fleet vehicles with portable defibrillators and explore how we can link this into the community first-responder programmes run by the local ambulance services in our region.
Maintaining a Safe and Resilient Network – Safety

How engagement with you has shaped our plan

<table>
<thead>
<tr>
<th>Wave</th>
<th>Events:</th>
<th>Stakeholders engaged:</th>
<th>Wave 1 – open engagement</th>
<th>Wave 2 – optioneering</th>
<th>Wave 3 – refinement and finalising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>103 total – 3 dedicated events</td>
<td>4,762 total – 330 unique interactions</td>
<td>Safety remains important to our customers and stakeholders. They expect us to maintain a robust safety record that also underpins the future operations of our network as we move to net zero. Customers identified the importance of safety education for school children and high-risk industries</td>
<td>Stakeholders suggested we should share good practice and learning through further collaboration with other infrastructure companies to maintain and improve safety plans</td>
<td></td>
</tr>
<tr>
<td>Wave 2</td>
<td>135 total – 14 dedicated events</td>
<td>15,475 total – 4,552 unique interactions</td>
<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td>An industry leader in safety performance</td>
<td>Proactive interventions to further reduce safety risk in our operations</td>
</tr>
<tr>
<td>Wave 3</td>
<td>91 total – 6 dedicated events</td>
<td>32,500 total – 2,473 unique interactions</td>
<td>Customer ambition and broader findings</td>
<td>Option C, a trade-off between being ambitious, building upon our strong current safety performance and doing so in a cost-effective manner, was the strongest preferences across the various stakeholder groups with 27% of votes. 29% of domestic, 27% of business and 33% of rural customers voted for this, making up the majority in each segment. Elements of option D, including investment in innovative wearable technology to monitor risk, promote colleague wellbeing and an increased focus on contractor safety, emerged as additional areas of value for business, taking 23% of votes</td>
<td></td>
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</table>

During Wave 3, continuous improvement in safety, continuing to educate school children and linking safety to net zero, improving the safety standards of contractors and developments in staff wellbeing strategies were discussed.

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleague safety is important</td>
<td>We will reduce the number of injuries to our workforce</td>
<td>S1</td>
<td>Link</td>
</tr>
<tr>
<td>Support for our contractors to deliver same safety standards as we do</td>
<td>We will collaborate with our contractors to enable them to reduce the number of injuries to their workforce</td>
<td>S2</td>
<td>Link</td>
</tr>
<tr>
<td>Employee well-being is important</td>
<td>We will provide training and support to address the individual needs of our colleagues and improve their health and wellbeing</td>
<td>S3</td>
<td>Link</td>
</tr>
<tr>
<td>Education is crucial</td>
<td>We will continue to support promotion of increased awareness of hazards to school-aged children and agricultural workers, and support community first responders</td>
<td>S4</td>
<td>Link</td>
</tr>
<tr>
<td>Safety acceptability score: 73%</td>
<td>Overall acceptance was high with SMEs most accepting at 82%</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>
Reliability and Availability

We will drive excellence in our front-line operations and have a network that is safe, resilient and reliable but also smart and flexible. Progressive use of network technology will allow us to manage an increasingly dynamic and complex low carbon energy landscape for our customers in real time.

By the end of 2023-28 we will have improved the reliability and availability of our network with increased technology and efficient operational response, underpinning our customers’ transition to decarbonisation.

Our reliability and availability performance has improved significantly over a long period of time – our supplies are available 99.99 per cent of the time and the majority of you experience no power cuts in a given year.

System-wide reliability performance is measured by the number of customer interruptions (CI), which is the number of power cuts in a year per 100 connected customers, and the number of customer minutes lost (CML), which is the average power cut duration in terms of the number of minutes lost per connected customer.

We’ve told you that maintaining a high level of reliability on our network is essential and will remain that way, especially as the reliance on electricity increases.

We have also reduced the number of customers experiencing extended power cuts (i.e. those lasting longer than 12 hours) by a third. And we have reduced the average length of planned power cuts by 20 per cent, to just over three hours.

These performance improvements have been driven by investing £35m in doubling the number of remote-control operation points on our high voltage (HV) network over the period; continued deployment of automated power restoration system (APRS) technology to automatically restore customers following faults and supporting our operational response with smart fuse technology at low voltage (LV).

Our stakeholders have told us that they want to see a stronger focus on reducing the length of power cuts (CML). In addition, our stakeholders have been very supportive of the use of new technology to reduce the number and duration of power cuts.

During the engagement, most stakeholders believed we should prioritise investment in the worst-performing parts of the network and use of new technology on our HV and LV network, which will allow us to shorten restoration times and proactively manage potential failures where possible.

We will drive excellence in our front-line operations and have a network that is safe, resilient and reliable but also smart and flexible. Progressive use of network technology will allow us to manage an increasingly dynamic and complex low carbon energy landscape for our customers in real time.

1. The 2015-23 baseline was defined against network performance in 2012-13.
2. Total forecast spend for ED1 on HV automation.

How much it will cost

2023-28 expenditure (annual) £155.2m

versus

2015-23 £14.2m

+10.1%
Building on our strong 2015-23 performance, we can deliver a step change in service in the next regulatory period by installing higher volumes of remote switching and automation on our HV networks. While we have always met or exceeded our reliability targets set by Ofgem, we recognise there is an opportunity in the 2023-28 period to deliver a better service for our customers. On our network, our customers experience CI performance of 49 power cuts, and CML of 37 minutes on average. But Ofgem’s current working assumptions for our 2023-28 targets require a step change in our CI and CML performance relative to today.

Our plan aims to rise to the challenge. Based on our review of the options available and our consultation with stakeholders, we are proposing an investment programme involving accelerated roll-out of automation on our HV network, which is key to improving our network reliability at the lowest cost. We have invested efficiently in HV automation in the past, which has helped us to exceed our reliability targets in the current period. Our plan aims to build on this position by increasing the number of remote switching and network automation points at the HV level.

Our analysis has shown that this is the lowest-cost way to raise performance levels to meet our new targets, when deployed in conjunction with effective operational response to fix faults on the network. There are alternatives to automation, in the form of increased asset replacement or increasing our workforce to deliver improved operational response. However, this is less cost-efficient than automation, which also allows us to optimise the use of our current workforce in response to faults.

We also need to make improvements on our low voltage network to realise performance improvements.

Improvements in our network capability at HV alone will not enable the performance improvement required to meet stakeholder expectations or to meet our regulatory targets. We will also need to improve fault restoration times on our LV network to reduce the impact of interruptions on customers.

Our assessment has shown that our LV network requires continued targeted investment and rapid deployment of new technology to further improve our performance. This is because our LV network has relatively high levels of challenging legacy cable types, which have yet to reach the end of their useful life.

Our programme of investment in network upgrades is efficient.

We have assessed a number of options as well as the stakeholder feedback. Our plan includes expenditure of £155.2m p.a. to deliver our reliability targets. This is £14.2m p.a. (10.1 per cent) more than our expenditure in the 2015-23 period, driven by our investment in network capability upgrades.

We have tested our proposals to ensure that our proposed costs are efficient while delivering customer priorities.

— An optimised programme across HV and LV: our plan contains £64.2m of investment in HV automation technology to double the rate of installation on our network from 2023-28. We will also invest £39.4m in a range of LV technologies across the network over the period, including smart fuses and proactive fault management technology. Over half of this investment will enable further preventative fault detection on our wider suite of LV devices, such as our LV monitors, further enhancing support of efficient net zero investment decisions. These investments in upgraded capability account for the increase in cost compared to 2015-23.

— Keeping ongoing operational costs flat: our business-as-usual fault restoration costs are in line with the industry median, and we will improve on this. We will continue to identify efficiencies to fund front-line performance improvements, which will allow us to provide improved service for our customers at no additional cost.

— Ensuring customers only pay for the upgrades we deliver: the funding to deliver this programme is included in our plan to be funded through baseline allowances. To give Ofgem and customers comfort that we will only be funded for what we deliver of our HV Automation programme, we propose to include this investment as a bespoke price control deliverable (PCD).

The remainder of this section of our Reliability and Availability plan is structured to provide more detail around our stakeholders’ priorities.

— Our plan is focussed on improving system-wide performance on unplanned outages, in order to impact the largest number of customers.

— We also have specific proposals to improve services for customers who experience below-average performance, i.e. our worst-served customers.

— Our plans to improve our planned power cuts service.

— Finally, we set out how we will leverage data, innovate, and upskill our workforce to deliver our commitments and prepare for the future needs of customers.
Improving system-wide reliability and availability

Our plan is set to continue our strong performance trajectory from the current period into the 2023-28 period, delivering a step change improvement through the use of technology as reliance on the electricity network increases.

Ofgem’s targets for 2023-28 will require a step change in our reliability performance. We will strive to achieve the three per cent and 15 per cent reduction in CI and CML in Yorkshire and seven per cent and 15 per cent reduction in CI and CML in Northeast in 2023-24 that these targets demand.

But given the scale of the challenge, those improvements may not be deliverable by March 2023. However, our plan will enable us to continue on a steeper trajectory of improvement, so that by the end of the period we will aim to have reduced the number of power cuts (CI) that our customers experience by 12 per cent relative to our current performance. In addition, we will have sought to have reduced the impact of power cuts on our customers, delivering 25 per cent shorter power cuts (CML) relative to our current performance.1

Figure 2: Northeast – customer interruptions
Figure 3: Yorkshire – customer interruptions
Figure 4: Northeast – customer minutes lost
Figure 5: Yorkshire – customer minutes lost

1. Current performance is the four-year average at 2020-21.
2. Ofgem targets are indicative based on 2019-20 data and will be updated prior to final determinations.
Investing to further improve performance

This will require a programme of enabling investment.

Seventeen per cent of the HV switches on our network are remote-controlled. Automation technology enables us to restore a proportion of customers impacted by HV faults in three minutes and is already providing customers with an improved level of service. Since 2015 so far, over half a million customers have been restored within three minutes by our automated power restoration system, with further restoration within 15 minutes from our control centre using remote control.

In our Emerging Thinking stakeholder engagement consultation,¹ the majority of our stakeholders told us they would like to see at least a ‘major upgrade’ in our network capability. So we are proposing to:

— double the installation rate of automation devices onto our network by investing £64.2m on the HV network by 2028, such that 30 per cent of our HV network will be covered by automation technology, see EJP-10.1 HV Network Automation;

— expand the types of devices that we can remotely control. This enables automation capability to extend further across the overhead line network to benefit our rural communities, who generally experience more reliability and availability issues; and

— invest a further £39.4m to roll out over 8,100 automated restoration devices on our LV network and enable proactive fault management across 9,000 network locations, building on LV monitoring capability for decarbonisation. See DSO Strategy and EJP-10.2 LV Network Automation.

Our comprehensive plan will put us on a new improvement trajectory. However, we have not only considered the new targets, customer priorities and stakeholder willingness to pay in formulating our plan. We have also considered a long-term view of the best way to modernise our network while ensuring affordability for our customers. Our reliability investment plan is proposed as part of a 10-year programme to deliver a modernised, reliable network for our customers, the first leg of which will be delivered in 2023-28.

Only upgrading our network will not be sufficient, however. We will complement our investment programme with the following operational improvements:

— Enhancing the skills of our operational teams: we plan to provide training to our in-house response teams with the goal of deploying multiskilled response units who will be able to react more effectively to a larger variety of faults. In addition, by upskilling our in-house team, we aim to reduce our reliance on contractors.²

— Utilising network diagnostics and industry data more effectively: our existing LV network technology reports extensive information about faults. We aim to develop an industry-leading protocol of using LV diagnostic data to improve our reactive and proactive response to faults.

— Concentrating our efforts on difficult faults: we will aim to deploy additional excavation teams to improve our response to underground faults.

Overall our plan assumes we achieve above industry average restoration times of 45 minutes at HV and 155 minutes at LV (compared to 54 and 180 respectively today).

As we develop customer flexibility in the transition to the role of Distribution System Operation (DSO)³ it will increasingly provide opportunities to improve network reliability. We plan to use restore and dynamic flexibility products to manage risk and help mitigate loss of supplies. We will also investigate how we can use flexibility to improve partial restoration at the LV level.

Improving service levels for customers who experience below-average network performance.

Our stakeholders want to see us continue to strengthen our focus on improving performance for customers who experience long duration interruptions.

Below-average reliability can mean two things for customers: customers who experience long-duration interruptions and customers who experience multiple interruptions during a year.

We have made good progress in terms of long-duration interruptions, reducing the number of 12-hour interruptions by a third since 2015. However our stakeholder engagement has indicated that we should target a further significant reduction in the number of 12-hour interruptions.

Figure 6: customers experiencing 12-hour power cuts⁴

Therefore, we will aim to achieve a 50 per cent reduction in the number of customers experiencing 12-hour power cuts through operational improvements, in particular the following initiatives:

1. Emerging Thinking.
2. See Workforce resilience (People Strategy).
3. See DSO Strategy section.
4. Current performance is the four-year average at 2020-21.
Reducing the impact of interruptions via the use of mobile generation:
- we will further increase the deployment of mobile generation to restore supplies following an interruption, though this must be balanced with the environmental impact of diesel generation; and
- we will increase our fleet of SilentPower electric mobile generation vehicles to six to provide more low carbon restoration solutions. See Vulnerability Customers plan section.

Innovating to improve reliability for customers on challenging segments of our network: we will continue to develop microgrid and microresilience options for customers in rural areas, where challenges to overhead line asset resilience can lead to longer interruptions. See Whole Systems plan section.

Responding to stakeholder feedback.

We will also target reductions in the number of six-hour interruptions our customers experience.

Our stakeholders have reinforced that the 12-hour power cuts standard is a backstop, and that we should increasingly focus on trying to limit power cuts to six hours. We have heard that this is important for customers for several reasons, for example:

- Significant disruption can occur when a power cut extends beyond six hours, because it covers two meal times, and is long enough for frozen food to defrost.
- Six hours can also cover most of a working day, which is particularly important as we expect to see more of our customers working from home, as demonstrated during the COVID-19 pandemic.
- A more than six-hour power cut also presents additional challenges to our customers who require electric vehicle charging. This is expected to be increasingly problematic as we transition to net zero.

Therefore we will target a reduction in the number of six-hour faults on our networks by 15 per cent, supported by the following additional measures:

- Enhancing our despatch facilities to enable faster and more effective response to LV faults using the richer data that new technology will provide.
- Reviewing our inventory of plant and equipment in order to ensure our staff have what they need to better respond to both the most frequently occurring faults, as well as the most complex faults.

Overall, we expect that this trend of increasing sensitivity toward six-hour power cuts is likely to continue as the pace of decarbonisation increases, and we recognise that improvements in this area will be required to meet evolving customer expectations.

Reducing multiple interruptions.

Our customers’ changing use of electricity came through strongly in our engagement. For example, in the case of telecommunications over broadband, our stakeholders suggested multiple power cuts can be in some cases more disruptive than a single longer one.

As such, we will aim to reduce the number of customers that experience five or more power cuts annually by 15 per cent, so that 99 per cent of our customers will not experience more than five power cuts in a year.

In parallel, we also plan to develop offerings for the partial restoration of our customers, recognising from their feedback that this would benefit them as the pace of decarbonisation increases.

Our stakeholders are keen to see us take steps to address the level of service experienced by our worst-served customers (WSC).

Customers that experience both long-duration and multiple power cuts can be said to be WSC.

Our stakeholders have consistently told us that raising standards for this group of customers is crucial. Therefore, we plan to invest £2.5m in improving services for 2,400 WSC by upgrading the assets supplying our rural communities and installing automation to help restore their supplies faster. This will significantly improve the level of service they receive by reducing the duration of power cuts they experience by 50 per cent.

In parallel, our £64.2m investment in HV network automation will be targeted at the worst-performing circuits on our network, delivering significant improvements to customers that experience worse-than-average service on our network.

Our WSC investment is a common PCD.
Improving services for planned power cuts.

Communication and delivering on our promises remains critical to mitigating the impact of planned power cuts.

To maintain and renew assets it is sometimes unavoidable that we interrupt the supply to our customers on a planned basis.

Customer satisfaction with our planned power cuts service has improved by more than 5.8 percentage points since 2015 to over 91.6 per cent,\(^1\) ranking second in the industry.

Through discussion with our stakeholders, we have identified a number of measures that will continue to minimise the disruption that customers experience. We will aim to:

- increase the amount of live line working and deployment of mobile generation to allow us to maintain our assets without power cuts;
- extend our seasonal planned power cut policy to ensure that in winter outages are only taken during daylight hours, and will be cancelled if temperatures drop below freezing; and
- give customers 10 days advance notification of all planned power cuts to allow sufficient time to make alternative arrangements.

Data and digitalisation will provide us with new capabilities.

Going forward we will have access to a far greater quantity of data from HV and LV monitoring, as well as smart meters. This will provide us with valuable insights to address the challenges of improving the reliability and availability of our network as electrification gathers pace.

- At HV, our smart grid enabling investment during the current period provides us with a more robust and modern Internet Protocol (IP) Supervisory Control and Data Acquisition (SCADA) communications network, which is a foundation of our 10-year network automation plan starting in 2023. We will maximise the value of this investment by increasing automation and investing in upgrading our control systems to help restore power more quickly.
- On the LV network, our proposed LV technology investment will allow us to increase the amount of operational information we collect about our network. This provides us with the opportunity to develop best practices regarding the use of LV-monitoring data to enhance reactive and proactive fault response. We will combine the roll-out of monitoring with information from smart meters and pre-fault technology to drive a more proactive approach to network management. To maximise the value of these new initiatives and allow rapid decision making, we will modernise our operational hub to allow more efficient allocation of resources to faults.

Innovation is driving benefits in our plans.

Our fault prediction technology innovation (Foresight) is a key enabler for improving the reliability of our LV network during 2023-28. By the end of 2023-28 we will target fault predictive technology covering 9,000 network locations – over 30 per cent of the accessible ground mounted network. This, combined with our LV monitoring programme, will help us proactively intervene and prevent faults from occurring on our network.

Critically, we will target the deployment of this technology on the worst-performing parts of the network to ensure improvements are targeted towards our WSC.

Enabled by improvements in technology, customer flexibility will provide further reliability and availability opportunities. We will also explore how we can use flexibility at LV as well as using suitcase generation to affect partial restoration.

We will need to upskill our teams to deliver enhanced reliability on an increasingly smarter powergrid.

Innovations such as Foresight allow us to move beyond the traditional paradigm of ‘fix on fail’. To maximise the benefits, we will need to broaden the skills of our people, while developing greater technical specialist skills in certain areas. Our plans to support the necessary skill development in our workforce are set out in annex 5.2 Workforce resilience strategy.

---

1. 2020-21 regulatory year.
### Customer outcomes

| RA1 | Deliver a ≥12% reduction in the number of power cuts
| RA2 | Deliver a ≥25% reduction in the duration of power cuts
| RA3 | Reduce by 50% the annual number of customers that experience a 12-hour power cut
| RA4 | Reduce by 15% the annual number of customers that experience a 6-hour power cut
| RA5 | Ensure 99% of our customers do not experience more than 5 interruptions in a year
| RA6 | Deliver £2.5m of targeted investment to improve network performance in rural areas for 2,400 worst-served customers predominantly in rural areas
| RA7 | Provide customers with 10 days’ notice of planned interruptions, operate only in daylight hours during winter months and cancel if temperatures are <0°C

<table>
<thead>
<tr>
<th><strong>Outcomes</strong></th>
<th><strong>Benefits</strong></th>
<th><strong>Deliverables</strong></th>
<th><strong>Output measure/indicative input measure</strong></th>
<th><strong>ED1 to date</strong></th>
<th><strong>ED1 forecast</strong></th>
<th><strong>ED2 target</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>RA1</td>
<td>System average improvements</td>
<td>RA.1) Deploy 8,600 HV remote switches (Bespoke PCD)</td>
<td>Customer interruptions (unplanned)</td>
<td>48.6</td>
<td>47.4</td>
<td>42.0</td>
</tr>
<tr>
<td></td>
<td>A more reliable network for our customers</td>
<td>RA.2) Deploy 8,100 LV fault-management devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional automation will continue to drive reliability and availability improvements for the duration of the assets’ functionality</td>
<td>RA.3) Establish LV network management capability to allow the increased data from Foresight, LV monitoring and smart meters to be used to improve services</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Creation of a smarter and more flexible network facilitating decarbonisation</td>
<td>RA.4) Innovate in flexibility to support unplanned interruptions and the use of microgrids/microresilience for worst-served customers (HV and LV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased network monitoring and automation allows more efficient targeting of future expenditure through a greater understanding of our network</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>RA2</td>
<td>Reduction in long-duration power cuts</td>
<td>RA.5) Enhance our first response through improving our ability to track and deploy staff to faults more swiftly, by skillset and by location (24/7/365)</td>
<td>Power cuts &gt;12hrs (pre-clock stop)</td>
<td>3,943</td>
<td>3,600</td>
<td>2,700</td>
</tr>
<tr>
<td></td>
<td>Reduced disruption to customers now and in future periods as they become more reliant on electricity supplies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA3</td>
<td>Improvements for worst-served customers</td>
<td>RA.6) Target significant improvements in network operability through use of technology to manage planned outage risk and proactively identify and deliver solutions to emerging ‘problem networks’</td>
<td>Customers who experience &gt;5 interruptions annually</td>
<td>30,174</td>
<td>26,000</td>
<td>23,000</td>
</tr>
<tr>
<td></td>
<td>Improved services for customers who experience a worse than average level of service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long-term investment will allow us to move customers out of this category benefiting them in the long-term</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA4</td>
<td>Power cuts &gt;6hrs (pre-clock stop)</td>
<td>RA.7) Roll out HV Foresight using primary disturbance recorders</td>
<td>Worst-served customers addressed (Common PCD)</td>
<td>0</td>
<td>0</td>
<td>2,400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA5</td>
<td>Better services for planned outages</td>
<td>RA.8) Deliver investment to enable the isolation of substations without incurring network outages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved planned outage customer satisfaction</td>
<td>RA.9) Expand SilentPower mobile battery fleet to support during planned and unplanned interruptions</td>
<td>% of time customers provided with 10 days’ notice</td>
<td>63.5%</td>
<td>70%</td>
<td>80%</td>
</tr>
</tbody>
</table>

---

1. Numbers shown may be subject to rounding. See annex 1.4 Key targets and measures for profiled targets.
2. Relative to a four-year average baseline.
3. In line with Ofgem’s definition.
4. Four-year average figures.
How engagement with you has shaped our plan

Wave 1
Events: 103 total – 4 dedicated events
Stakeholders engaged: 4,762 total – 491 unique interactions

<table>
<thead>
<tr>
<th>Wave 1 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future reliability of the network was key for customers</td>
<td>Reliability of the network was viewed as a key responsibility and an important priority for investment. Stakeholders felt we should prioritise maintaining substations and power lines to ensure the future reliability of the network</td>
</tr>
<tr>
<td>We should seek to minimise the frequency and duration of power cuts</td>
<td>Investment should be targeted at reducing longer restoration times ahead of reducing the frequency of shorter interruptions</td>
</tr>
<tr>
<td>It is important for us to demonstrate balanced reliability investment decisions</td>
<td>Stakeholders want us to provide clear information on the size of any investment needed with comparisons and to balance investment in reliability against other priorities</td>
</tr>
</tbody>
</table>

Wave 2
Events: 135 total – 21 dedicated events
Stakeholders engaged: 15,475 total – 15,189 unique interactions

<table>
<thead>
<tr>
<th>Wave 2 options</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td>Maintain a highly reliable service – network available 99.98% of the time</td>
<td>Reduction in number and length of power cuts while delivering improvements for worst-served and vulnerable customers</td>
<td>Further significant system-wide improvements in reliability levels</td>
<td>Improvements in areas where our reliability performance varies the most through deployment of innovative technology</td>
<td>Reliability performance across our network driven by the roll-out of innovative technology</td>
</tr>
<tr>
<td>Customer ambition and broader findings</td>
<td>25% of stakeholders support setting ambition at option E 'driven by the roll-out of innovative technology'. Across the Emerging Thinking voting (rural panel, political engagements, the microsite, and the domestic and business surveys) 86% voted for option B or above, 65% voted for option C or above, and 43% voted for option D or above</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wave 3
Events: 91 total – 10 dedicated events
Stakeholders engaged: 32,500 total – 3,031 unique interactions

During Wave 3, future reliability of the network and the level of support for technological advancements to support customer locations that are experiencing more power cuts than average were discussed with customers

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prioritise targeted reliability investment</td>
<td>Experience of reliability is good, but targeted and efficient investment should be part of our 2023-28 plan</td>
<td>We will increase our network monitoring, improving long-term asset planning and helping us make efficient investment decisions, focussing on targeted investment in worst-performing areas</td>
<td>RA1 RA2</td>
</tr>
<tr>
<td>Invest in a network for the future, focus on shortening power cuts</td>
<td>Creating a more capable, future focused network with increased automation and reducing faults that last 1.5-3 hours to 3 minutes or less is a priority and valued by our customers</td>
<td>We will restore customers power more quickly by increasing the scale of high voltage remote switching through our automated power restoration system. Investing in innovative technology will restore customers quicker while monitoring the network in real time to identify issues earlier, preventing future power cuts</td>
<td>RA2 RA3 RA4</td>
</tr>
<tr>
<td>Improve services for worst-served customers</td>
<td>Customers wanted to see improvements in service for those who experience significantly worse than average restoration performance. Twelve hours is too long to be off supply, 5-6 hours is the point where a power cut becomes a significant inconvenience for our customers</td>
<td>We will target further improvements in our operational response, resolving longer and more complex power cuts more quickly. Increased use of mobile generation and green SilentPower vehicles will help to restore customers quicker</td>
<td>RA3 RA4 RA5 RA6</td>
</tr>
<tr>
<td>Improve the performance of the network in rural areas</td>
<td>Customers support increased investment in network improvement in areas that have traditionally received less investment (and would not necessarily meet the economic efficiency test for investment) such as rural Northumberland</td>
<td>We will invest in areas that experience below average levels of service that may have received less infrastructure investment. Our network automation programme roll-out will focus on worst-performing areas, further improving reliability</td>
<td>RA5 RA6</td>
</tr>
<tr>
<td>Keep customers up to date so that they can prepare for longer power cuts</td>
<td>Customers told us that they can be flexible and work around longer power cuts, provided we keep in close contact with them and update regularly on progress</td>
<td>We will give customers advanced notice of planned power cuts, with the timing of planned works at times of day and year where the least inconvenience will be felt by customers</td>
<td>RA7</td>
</tr>
<tr>
<td>Reliability and Availability acceptance score: 77%</td>
<td>Overall acceptance was high with 79%, SME and rural customers were most accepting of the plan</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>
Our business-wide approach to resilience

Collaboration is at the heart of our approach.

We work with central government, the Department for Business, Energy & Industrial Strategy (BEIS), and the seven local resilience forums (LRFs) in our region, on a multi-agency basis to ensure we have a firm grip on threats, risks and issues. This structured and enduring stakeholder engagement allows us to plan effectively for the long term and execute coordinated responses to emergency events that bring about or involve disruption to power supplies. Through this industry-wide collaboration we learn about situational exposure to risk, insecurities or vulnerabilities that need mitigation, and build actions into our business planning.

We have built a portfolio of more than 30 operational response plans that we periodically review, drill, test or exercise to ensure we remain prepared and ready. Our operational response plans contain triggers that drive the extent of incident response required. We proactively move through controlled escalation stages of awareness, preparation, readiness and mobilisation as each trigger point is met. In this way, we have become accustomed to switching between business-as-usual operations and emergency response modes. For certain types of disruptive events, it is also necessary to have a specific recovery phase to allow a smooth transition back to normal routines.

The threat landscape will continue to evolve.

The external threat landscape is constantly evolving, whether that be changing weather patterns or the ever-present risk of malicious physical or cyber-attacks. We undertake regular threat assessments, analysis and modelling to assess risks and we carry out proactive asset hardening to resist and absorb any impacts. Long-term resilience is embedded in our investment plans to ensure the assets we install today are fit for the environment in which they will be operating in the future. Our approach to resilience in our plan is set out below:

### Operational and network resilience

- Emergency planning
- Service provider/supply chain risk

### Climate Resilience*

- Severe weather
- Flooding
- Vegetation management

### Physical and Cyber Resilience*

- Electricity system resilience
- Telecommunications

The next three sections of our plan cover three key areas of our approach in line with Ofgem’s resilience framework – Asset Resilience, Climate Resilience, and Physical and Cyber Resilience. Our Workforce Resilience plans can be found here — Workforce Resilience plans. We set out more detail in annex 4.9 Our approach to resilience.
Asset Resilience

Our network will fit the evolving needs of our region. The long-term condition and performance of our asset base will be efficiently managed so it is safe, reliable, environmentally friendly and resilient, maintaining a long-term view on capacity needs for decarbonisation pathways.

Our approach to asset resilience will not only maintain the health of our network but also support the transition to net zero.

Maintaining and renewing our asset base is our single largest expense and the decisions we take to invest (or not) can have a material impact on the service we provide to both our current and future customers.

The average age of our assets is increasing and sustained investment is required to maintain the long-term health of the network. In deciding which investments to make, we optimise between refurbishment and replacement, targeting those assets that are high risk or in poor condition. It is also particularly important that we adopt an approach that manages the condition and performance of the asset base in a way that maximises future capacity for decarbonisation and realises other synergistic benefits. This way we can minimise long-term costs for our customers.

To do this we plan to spend £214.9m p.a. in the 2023-28 period which is five per cent (£10.9m) more than we’ve spent each year in 2015-23. This increase in investment includes £16.9m of expenditure p.a. (£84.3m over the five-year period) that delivers two-for-one outcomes related to decarbonisation – adding capacity for future pathways as part of our core asset renewal programmes that generates an estimated net saving of £471m in future avoided costs between 2028 and 2050.

How much it will cost

<table>
<thead>
<tr>
<th></th>
<th>2023-28 expenditure (annual)</th>
<th>2015-23 versus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£214.9m</td>
<td>+£10.9m</td>
</tr>
<tr>
<td></td>
<td>33.5% of totex</td>
<td>+5.3%</td>
</tr>
</tbody>
</table>

Advanced Powergrid: our business plan for 2023-28 – 103
A resilient asset base is our foundation

The resilience of our network is important for stakeholders and will become even more so, especially given the increased reliance on electricity as we decarbonise.

Our stakeholders have indicated that they want us to:
- maintain network health, continuing with programmes to replace and refurbish assets that drive greater reliability;
- optimise asset lives through the use of condition monitoring;
- deploy innovative technologies to monitor assets and understand where investments should be made;
- recognise the need for a balanced approach to managing risk over the longer term while supporting wider plan objectives; and
- maximise synergies with other elements of our plan, such as ensuring that we adopt a net zero ready approach to asset refurbishment and asset replacement.

We assess our asset health through the use of industry standard methodologies.

- A health index framework for collecting information relating to asset condition and probability of failure. Health is assessed utilising a variety of condition monitoring and inspection data to measure asset condition and performance (which tends to deteriorate as assets age).
- A criticality index to collect information relating to the consequences of failure of an asset (which tends to remain static through its life).

We ascribe a monetary value to the consequence of failure for each asset to represent the impact of failure (criticality). This is then combined with a value for the asset’s probability of failure (health) to allow risk for an individual asset to be calculated as monetised risk (in £s). This can be brought together within and across asset categories to calculate total network risk (monetised) at a given point in time.

Risk can be reduced through replacement and refurbishment activities, which can improve both asset health and criticality. Using this approach, we have made an assessment of the changes in health and criticality that will occur – both without any investment and with our proposed 2023-28 investment plans – and assessed that against our view of network risk.

We do not mechanistically use asset health, criticality and risk indices to drive our investment plans. Instead we use these indices as one of a number of inputs into an asset management approach that combines analytical and operational experience to produce an investment plan that delivers efficient and effective levels of service.

We are ahead of our plan for reducing the levels of network risk.

Our total network risk is ahead of our straight-line profile for the eight-year period 2015-23, at 69.3 per cent (compared to a 62.5 per cent target), and so are well positioned to deliver our targets.

In the Northeast, we have so far delivered 87.6 per cent of our risk-reduction target. We expect to achieve our overall agreed risk-reduction targets by 2023, with total levels of network risk currently 11 per cent lower than they were in 2015.

In Yorkshire we have delivered 57.5 per cent of our risk-reduction to date. However, our plan is phased to deliver more outputs in the latter years of the 2015-23 period. We expect to achieve our target by 2023. Our forecast includes significant lengths of 132kV fluid-filled cable replacement works that are in progress. These schemes are several years into multi-year programmes and have not yet delivered outputs. Total levels of network risk are currently 5 per cent lower than they were in 2015.

Age related deterioration represents a major challenge in the management of long-term risk.

Many of our assets were installed between 1950 and 1970. This age profile of historical investment represents a major challenge in the management of long-term risk. A high proportion of those assets are now moving into the mid- to highest-risk bands, which is driving an overall expected increase in asset risk between 2023 and 2028. A key example of this is our overhead wood pole lines.

This increase in the average age of our assets across most asset categories has resulted in approximately 20 per cent of the network exceeding what has traditionally been accepted as their normal expected life (see figure 1).

The process of managing these installation peaks began in earlier periods, prioritising replacement of critical assets at 132kV and extra high voltage (EHV). In our 2015-23 plan we recognised that the management of this profile would be a key ongoing issue for 2023-28 period and beyond.

Our current approach supports this efficient transition, targeting life extension through refurbishment wherever practicable, with a programme of enhanced asset monitoring to offset projected risk increases and to maintain our low and stable fault rates over the long term. We will continue this approach.

Figure 1: example Health Index profile for low voltage (LV) and high voltage (HV) wood poles

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<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of assets</td>
<td>0</td>
<td>4,000</td>
<td>8,000</td>
<td>12,000</td>
<td>16,000</td>
<td>20,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

1. 2019-20 regulatory year.
Maintaining the long-term health of the network

Our investment strategy will enable us to better understand, maintain and manage the condition of our network in a safe and cost-effective manner.

Our network investment strategy is set out at annex 6.1 Network investment strategy.

Our plan for each asset class has been developed holistically to deliver the following key strategic objectives:

- maintain legal and regulatory compliance;
- deliver long-term stable network asset risk;
- deliver value for money, minimising whole life cycle costs via the optimisation of synergies;
- manage uncertainty around decarbonisation;
- recognise the likelihood that reliance on electricity will increase through the period and beyond, particularly 2030 to 2050; and
- deploy proven innovative technology and continue to explore new solutions to:
  - enhance the maturity of our asset management process;
  - enhance inspection and maintenance techniques;
  - extend asset life through targeted refurbishment;
  - improve intervention targeting; and
  - improve efficiency.

We will target a 24 per cent risk benefit from our asset interventions.

Figure 3 shows the forecasted change in monetised risk due to asset degradation over the five years from 2023 to 2028 and how our interventions will mitigate that.

The specific asset resilience investments set out in our plan reduce whole life risk by 24.0 per cent (relative to there having been no intervention). The result is a modest and manageable overall increase in risk of 7.2 per cent on average across Northeast and Yorkshire over the 2023-28 period. This is reduced further by 2.5 per cent when we consider the benefit from investment for decarbonisation. This modest increase in risk is acceptable as it:

- is a natural part of the ageing of a multi-generational asset; and
- can be managed by asset management by targeted control measures in the period.

We have modelled our investment strategy over the long term to understand how risk will change. Due to our asset age profile we will be on an increasing risk trajectory throughout 2023-28, which will peak in the early 2030s (see figure 3), before reducing again. These projections give us confidence that we are properly balancing the timing of investment in our long-lived assets to keep downward pressure on costs and maintaining the health of the network, thereby sustainably managing the peaks in historical investment.

Figure 2: asset resilience investment – whole life risk

<table>
<thead>
<tr>
<th>Year</th>
<th>Northeast</th>
<th>Yorkshire</th>
<th>Northern Powergrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>2028 without intervention</td>
<td>129.9</td>
<td>132.6</td>
<td>131.2</td>
</tr>
<tr>
<td>Impact of interventions</td>
<td>-23.4</td>
<td>-24.6</td>
<td>-24.0</td>
</tr>
<tr>
<td>2028 with proposed intervention</td>
<td>106.5</td>
<td>108.0</td>
<td>107.2</td>
</tr>
<tr>
<td>Modelled benefit from decarbonisation investment</td>
<td>-2.1</td>
<td>-3.0</td>
<td>-2.5</td>
</tr>
<tr>
<td>2028 with modelled benefits from decarbonisation investment</td>
<td>104.4</td>
<td>105.0</td>
<td>104.7</td>
</tr>
</tbody>
</table>

Figure 3: future projected risk profile of the asset base

A resilient asset base is the foundation of our plan; we will maintain the underlying condition of our equipment efficiently and maximise wider future benefits.

Peter Collinson
Investment planning and delivery manager
Deploying innovative techniques to manage risk.

Our plan targets priority areas by deploying condition-monitoring solutions alongside moderate programmes of asset replacement and refurbishment to target worst-performing assets and manage predicted fault rates, see annex 5.3 Digitalisation Strategy and Action Plan. Where power cuts do arise as a result of asset failure our investments in specific reliability initiatives are designed to minimise the impact for our customers (see Reliability and Availability section).

We are able to manage moderate increases in our overall risk profiles within our proposals by:

- prioritising investment in our highest-risk assets, for example low voltage (LV) poles in residential areas, or fluid-filled cables near water courses and manually operated plant;
- prioritising investment in our worst-condition assets by targeting assets with the highest probability of failure as a consequence of observed or measured condition data, or performance data;
- targeting asset refurbishment to ensure we can address a wider range of assets allowing the deferral of more costly asset replacement until more certainty over future loading and utilisation is achieved; and
- establishing other enhanced control measures such as including more frequent or comprehensive asset inspections, additional monitoring and innovation to improve inspection data quality and intervention targeting. Overall, we estimate savings of £177m in the 2023-28 period from our use of these innovative techniques. For further detail see Explaining Our Costs.

Decarbonisation investment will provide additional asset health benefits.

In addition to the risk reduction derived from our asset resilience investments, the replacement of assets as part of our decarbonisation investment (see scenarios and investment section) will deliver asset health benefits. Based on our 'best view' planning scenario, we estimate that this will reduce network risk by a further 2.5 per cent to leave total whole life risk at 4.7 per cent higher than at the start of next price control period. Due to the uncertainties inherent within our forecast for decarbonisation investment the exact value of this additional health benefit will vary and may deliver more or less benefit than estimated here. However, it is clear that a manageable 7.2 per cent increase in risk represents the worst case scenario.

Our asset health and criticality priorities for 2023-28 target investment in our highest-risk and worst-performing assets.

The change in whole life risk is not uniform across our asset categories. Our investment plan targets investment toward the areas where risk is forecast to increase the most.

Figure 4: asset category movements in whole life risk from 2015-23 to 2023-28

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Whole Life Risk (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood poles</td>
<td>107.2%</td>
</tr>
<tr>
<td>Tower lines</td>
<td>107.2%</td>
</tr>
<tr>
<td>Cables</td>
<td>107.2%</td>
</tr>
<tr>
<td>Distribution substation plant</td>
<td>3.9%</td>
</tr>
<tr>
<td>Major substation plant</td>
<td>0.0%</td>
</tr>
<tr>
<td>Non NARM categories and indirects</td>
<td>0.4%</td>
</tr>
<tr>
<td>Total</td>
<td>107.2%</td>
</tr>
</tbody>
</table>

Figure 5: asset category movements in expenditure from 2015-23 to 2023-28

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Expenditure (£m p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood poles</td>
<td>£225.0</td>
</tr>
<tr>
<td>Tower lines</td>
<td>£14.2m</td>
</tr>
<tr>
<td>Cables</td>
<td>£4.7m</td>
</tr>
<tr>
<td>Distribution substation plant</td>
<td>£2.0m</td>
</tr>
<tr>
<td>Major substation plant</td>
<td>£144.9m</td>
</tr>
<tr>
<td>Non NARM categories and indirects</td>
<td>£7.3m</td>
</tr>
<tr>
<td>Total</td>
<td>£214.9m</td>
</tr>
</tbody>
</table>
## An overview of our approach

<table>
<thead>
<tr>
<th>Number</th>
<th>Approach</th>
<th>Engineering Justification Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Wood poles</strong></td>
<td>EJP-4.1a LV Overhead Lines&lt;br&gt;EJP-4.1b HV Overhead Lines&lt;br&gt;EJP-4.2 EHV and 132kV Wood Pole and Mast Overhead Lines</td>
</tr>
<tr>
<td>2</td>
<td><strong>Tower lines</strong></td>
<td>EJP-4.3 EHV and 132kV Tower Lines</td>
</tr>
<tr>
<td>3</td>
<td><strong>Extra high voltage (EHV) and 132kV cables</strong></td>
<td>Environmental Action Plan&lt;br&gt;EJP-1.3a EHV &amp; 132kV Cables (oil)&lt;br&gt;EJP-1.3b EHV &amp; 132kV Cables (gas)&lt;br&gt;EJP-1.3c EHV &amp; 132kV Cables (solid)</td>
</tr>
<tr>
<td>4</td>
<td><strong>Distribution substation plant</strong></td>
<td>EJP-2.1 Distribution Substations – Plant</td>
</tr>
<tr>
<td>5</td>
<td><strong>Major substation plant</strong></td>
<td>EJP-3.1a Major Substations – Plant (Transformers)&lt;br&gt;EJP-3.1b Major Substations – Plant (Switchgear)</td>
</tr>
<tr>
<td>6</td>
<td><strong>Non-network asset risk metric (NARM) categories and indirect costs</strong></td>
<td>For more detail on these cost movements see explaining our costs</td>
</tr>
</tbody>
</table>

### Wood poles

Our plan contains a significant uplift in investment to address the large number of poles installed during the peak investment period of the 1950s-1970s, which are expected to degrade to the point that intervention is required. We have identified opportunities to optimise our replacement intervals through the use of innovative enhanced monitoring techniques (such as the use of Thor hammers) in order to extend asset lives where safe to do so. We will seek to align our interventions with changes required to the network to support future decarbonisation demand, such as where a requirement is triggered to replace overhead line conductors as part of full line rebuilds, particularly at LV.

### Tower lines

We anticipate a moderate increase in risk, which will be managed, by exception, through tower refurbishment and conductor replacement.

### Extra high voltage (EHV) and 132kV cables

We forecast a small increase in risk as a result of a large reduction in investment in the replacement of fluid-filled cable. Our plan significantly increases our use of tracer perfluorocarbon (PFT) tagging to better manage oil and fluid loss (and reduce leak rate by 15 per cent) allowing an overall cost reduction in this area.

### Distribution substation plant

A high proportion of our distribution substation plant asset base will degrade into the highest risk bands (see figure 6). While the increase in asset risk could be managed to existing levels by targeting individual assets for replacement, the projected uptake in the connection of low carbon technologies (LCTs) will also require increased network capacity. To achieve asset health and capacity synergies we will increase full substation replacements where network utilisation is forecast to be the greatest, while accepting a moderate increase in risk.

### Major substation plant

We will see a small increase in risk in this area as we deploy targeted midlife refurbishment to manage an increase in the population of assets that exceed their normal asset lives. We will prioritise investment in assets where the utilisation on the network is highest and the need for reinforcement more certain.

### Non-network asset risk metric (NARM) categories and indirect costs

Our non-NARM investments include increased costs to address overhead line clearances (£1.2m p.a.) and costs for additional inspection, maintenance and repairs activities in line with our strategy to manage the ageing asset base (£4.2m p.a.). These costs are offset by the completion of a number of programmes in the current price control period (such as Black Start resilience).
Figure 6 shows the forecast proportion of assets in each health index category in 2023, the proportion of assets in each health index category by 2028 without intervention (due to asset degradation) and the proportion of assets in each health index category by 2028 after the effects of degradation and our planned investments.

— **Wood poles:** the number of high-risk poles (HI4 and HI5) increases substantially during the next price control period from 24 per cent to 40 per cent of the population. We are able to manage this increase down to about 30 per cent of the population by the end of the period by targeting the replacement of our highest-risk poles, particularly those with the highest criticality (e.g. LV poles in residential areas) as well as increasing our inspection frequencies for those that we do not plan on replacing in the period.

— **Tower lines:** we will continue to manage our tower population through mid-life refurbishments to ensure that these assets do not degrade beyond the point that refurbishments become uneconomic. Half of the tower line conductor population will move beyond the normal expected asset life for the asset base as shown by the movement into the HI3-HI5 health index bands.

— **EHV and 132kV cables:** we project a modest increase in assets in the highest risk bands (HI4 and HI5) as older cable assets degrade. We will manage a potential increase in associated fluid loss incidents by increasing our use of PFT technology.

— **Distribution substation plant:** we will accept a moderate risk increase in this area to ensure we are able to prioritise the replacement of substations that also require additional network capacity where there are also strong condition drivers and where there are synergies with other business objectives such as improved safety and reliability.

— **Major substation plant:** We will see a small increase in risk in this area as the population of HI4 assets increases from one per cent to nine per cent from 2023-28 as many of our oldest assets (currently HI3) degrade beyond their normal expected asset lives. Investment will continue to be targeted at the highest risk (HI5) assets supplemented by an extensive programme of mid-life refurbishments of our HI3-HI4 assets where economic to do so.

### Figure 6: movement in Health Index bands from 2023-28

<table>
<thead>
<tr>
<th>Asset group</th>
<th>Total assets</th>
<th>Health Index band</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HI1</td>
</tr>
<tr>
<td>Wood poles</td>
<td>393,720</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>2028 without ED2 intervention</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>2028 with ED2 intervention</td>
<td>44%</td>
</tr>
<tr>
<td>Tower lines</td>
<td>4,601 towers</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>2028 without ED2 intervention</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>2028 with ED2 intervention</td>
<td>19%</td>
</tr>
<tr>
<td>Extra high voltage/132kV cable</td>
<td>127,745 items of plant</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>2028 without ED2 intervention</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>2028 with ED2 intervention</td>
<td>68%</td>
</tr>
<tr>
<td>Distribution substation plant</td>
<td>10,842 items of plant</td>
<td>41%</td>
</tr>
<tr>
<td></td>
<td>2028 without ED2 intervention</td>
<td>37%</td>
</tr>
<tr>
<td></td>
<td>2028 with ED2 intervention</td>
<td>41%</td>
</tr>
<tr>
<td>Major substation plant</td>
<td>3,179km</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>2028 without ED2 intervention</td>
<td>72%</td>
</tr>
<tr>
<td></td>
<td>2028 with ED2 intervention</td>
<td>74%</td>
</tr>
</tbody>
</table>

We will maximise the substantial value for customers that can be delivered by driving synergies between decarbonisation and asset renewal investment.

We have developed an optimised asset renewal plan, which will create significant additional capacity in the areas that most need it and limit the increase in total cost by minimising asset renewal expenditure on those areas where the future requirements for additional capacity are less certain.

Specifically, we will:

— Use the latest data from network monitoring and analytics to ensure effective identification of priorities, whichever pathway to net zero is followed, and deploy capacity-increasing solutions such as full substation replacements, overhead line rebuilds and circuit overlays, where the network constraints are the most onerous and occur soonest under any credible pathways.

— Defer asset replacement where there is less certainty over future network capacity requirements, and where we judge we can accept and manage the risk of ageing assets through enhanced inspections or monitoring combined with asset life extension techniques.

— Continue to proactively increase the capacity within our network through incremental investment, where efficient, as part of routine asset replacement works through design and specification choices or our policies.

1. Excluding modelled health benefits from decarbonisation investment.
## Significant benefits

**£471m estimated savings between 2023 and 2050**

Our investment proposals are underpinned by robust cost benefit analysis (CBA).

We have undertaken extensive analysis of the least total cost options for our plan, considering the total suite of plan objectives and drivers for investment.

We have used the following CBA tools within our optioneering where appropriate: Ofgem CBA template; NARM long-term risk; and the Energy Networks Association’s (ENAs) Open Networks common evaluation methodology.

For further information on our proposed investments, justifications and links to our engineering justification papers (EJPs) and CBAs see annex 6.2 Our Costs In Detail.

### Benefits

- Reduced cost
- Improved delivery efficiency
- Improved data quality
- Long-term strategic investment
- Maintain safety, legal and Electricity Safety, Quality and Continuity Regulations (ESQCR) regulatory compliance
- Reduced likelihood of unnecessary investments and/or premature replacement of equipment in the journey to net zero by 2050

### Deliverables

<table>
<thead>
<tr>
<th>Output measure/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk substations replaced</td>
<td>168</td>
<td>190</td>
<td>100</td>
</tr>
<tr>
<td>Impact of interventions on whole life risk (%)</td>
<td>-</td>
<td>-</td>
<td>24%</td>
</tr>
<tr>
<td>Delivery of NARMS target</td>
<td>79.0%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Customer outcomes

#### AR1

**Enable an efficient long-term transition to net zero through maximisation of synergies between load-related and asset renewal expenditure**

- £471m of synergy savings between 2028 and 2050
- Increased capacity for accelerated pathways
- Reduced disruption for customers
- Increased efficiency

**AR1.1 Prioritise replacement towards assets that also deliver capacity increases required by our net zero pathways and upsize our assets where required to deliver long-term synergy savings, annually reporting on benefits created**

AR1.2 Enhance our business processes and analysis tools to better enable the identification of load growth and asset condition synergies

#### AR2

**Deliver our investment plan to improve network health through efficient decision-making, deploying innovation and optimisation of interventions**

- Maintain long-term asset risk and reliability
- Reduced cost
- Improved delivery efficiency
- Improved data quality
- Long-term strategic investment
- Maintain safety, legal and Electricity Safety, Quality and Continuity Regulations (ESQCR) regulatory compliance
- Reduced likelihood of unnecessary investments and/or premature replacement of equipment in the journey to net zero by 2050

**AR2.1 Replacement of ‘high risk’ outdoor substations with indoor substations**

**AR2.2 Utilise our new innovative Thor hammer assessment device, alongside foot patrols, to better target the ageing wood poles in worst condition through our inspection and replacement programmes**

**AR2.3 Implement online dissolved gas analysis (DGA) technology on power transformers to identify current and future issues**

**AR2.4 Carry out ‘fingerprint’ analysis on switchgear to identify current and future issues**

**AR2.5 Undertake partial discharge mapping for HV and EHV circuits on underground cables to identify current and future issues**

**AR2.6 Utilise smart meter data to identify customers with high load and therefore, increased risk of overloaded cut-outs**

**AR2.7 Utilise drone technology to capture imagery for routine asset condition inspections, as opposed to helicopters**

**AR2.8 Investigate using AI and machine learning to automatically triage captured drone imagery (ref. AR2.7) and highlight where works are required**

**AR2.9 Undertake a market assessment to investigate alternative technology and/or materials for substations building and civils to ensure we are aligned to modern best practice for non-electrical assets**

**AR2.10 Report on the condition and health of our asset base annually**

### References

1. Numbers shown may be subject to rounding. See annex A1.4 Key targets and measures for profiled targets.
2. Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR).
3. Network Asset Risk Measures target (NOMs in RIIO-ED1).
### How engagement with you has shaped our plan

<table>
<thead>
<tr>
<th>Who we engaged...</th>
<th>Stakeholders engaged: 4,762 total – 64 unique interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1 findings</td>
<td>Details</td>
</tr>
<tr>
<td>Wave 2 options</td>
<td>A</td>
</tr>
<tr>
<td>Options were</td>
<td>Broadly similar levels of reliability performance but with a risk of more faults on some parts of the network</td>
</tr>
<tr>
<td>Customer ambition</td>
<td>Option C was the most popular choice among customers, where 27% thought that a significant short-term investment would yield major improvements and reduce costs in the long term. Business customers were evenly spread across options B to E, while the majority of future energy customers, 35%, voted for option D. Those who selected less ambitious options (A to C) also recognised the importance of investment in the long-term condition of the network but were concerned about the potential higher costs and what this might mean for customer bills</td>
</tr>
<tr>
<td>Wave 3</td>
<td>Events: 91 total – 6 dedicated events</td>
</tr>
</tbody>
</table>

### Wave 3 findings

- **Support for long-term investment and preparations for net zero, balanced with efficiency and affordability**
  - Customers recognised a balance must be struck between the need to invest in long-term improvements, while managing costs in the near-term. Customers and colleagues recommended a proactive renewal strategy, upsizing equipment that would deliver net zero capacity benefits where possible, enabling decarbonisation, cost savings, and reliability improvements.
  - We will actively enable the transition to net zero through a programme of additional, efficient investments within our asset replacement programmes that delivers extra capacity needed for net zero.
  - **AR1**
  - **Link**

- **Introduce innovations alongside replacement and refurbishment programmes to improve reliability and lower future costs**
  - Rural and domestic customers support investment in systems to monitor asset health, recommending ambitious investment in tools that enable pre-emptive maintenance to reduce both long-term costs and faults.
  - We will invest in advanced inspection and analysis techniques to help make better decisions about how, where and when to invest in the network to support greater resilience and net zero readiness.
  - **AR2**
  - **Link**

- **Asset Resilience acceptability score: 75%**
  - Acceptance was high for all customers with SMEs being the highest at 76%.
  - **-**
  - **Link**
Climate Resilience

We will adapt our network and operations to build resilience against the effects of climate change, including working collaboratively and using innovation to develop new solutions to address the range of climate change pathways and consider wider system interdependencies.

Climate change represents a significant ongoing risk to our network and our customers.

We have heard the following key messages from our stakeholders:

— Plan for the worst – consider a 4°C global temperature rise as a worst-case scenario.
— Collaborate with other infrastructure and regional organisations to share knowledge and data.
— Address interdependencies with other infrastructure providers.

We have built strong foundations in the current period. We accelerated our programme of flood mitigation works to ensure that our major sites are compliant with national standards. We are on track to deliver 211 flood defence upgrades by 2023, allowing us to reduce our costs in the 2023-28 period.

Our plan, set out in detail in our Climate Resilience Strategy contains investment of £16.0m p.a. throughout the 2023-28 period on climate resilience, an overall reduction of £6.5m (29 per cent) p.a. compared to 2015-23. The major elements of this work are:

— flood mitigation where our plan contains annual expenditure of £1.2m, a reduction of £4.6m or 79.1 per cent.
— vegetation management where our plan contains expenditure of £10.9m p.a., an increase of £1.3m or 14.1 per cent.

How much it will cost

<table>
<thead>
<tr>
<th>2023-28 expenditure (annual)</th>
<th>£16.0m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-23 versus</td>
<td>-£6.5m</td>
</tr>
<tr>
<td></td>
<td>-28.9%</td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.
Maintaining a Safe and Resilient Network – Climate Resilience

Analysing the potential impacts

We have risk-assessed the impact of climate change and severe weather on our network to inform our plans.

Using the Met Office’s UK Climate Projections 2018 (UKCP18), we have considered a range of scenarios (or climate change pathways) predicting the effect of climate change on our local weather to the end of the century. We have focused on two representative concentration pathway (RCP) scenarios:

- RCP2.6 (close alignment with the 2°C global warming considered in the Paris Agreement); and
- RCP8.5 (a worst-case scenario of 4°C global warming).

The main signals for the UK are warmer, wetter winters; hotter, drier summers; and an increased risk of extremes. We have also considered regional variations and are working with other organisations to consider how their adaptations will affect our network.

In addition, we have carried out benchmarking comparisons against best practice alongside consideration of emerging national guidance from organisations such as the Climate Change Committee, the Department for Environment, Food & Rural Affairs (Defra) and the National Infrastructure Commission. This shows that we are in a strong position as a result of our work to date.

A full risk assessment has been carried out across three timescales (current, 2050s and 2080s) for both RCP2.6 and RCP8.5 to inform our plan. The analysis shows that no significant divergences are seen until beyond 2050 (see figure 1).

Figure 1: UKCP18 climate change profiles

If the global average temperature is kept within 2°C, the Met Office predicts that, by the end of the current century, maximum summer temperature for our region will fall within the range of 30.5°C and 39.5°C.

Should the global average temperature rise reach 4°C the uncertainty in the modelling creates a much wider range of possible outcomes.

Rainfall predictions are equally as uncertain as temperature projections out to the end of the century. Should global temperature stay within 2°C winter rainfall is likely to remain relatively stable.

However, should global temperature rise reach 4°C there is much greater risk that winter rainfall significantly increases for our region. This increases the risk of flooding and possible loss of supplies.

1. Our plan approach aligns with the supplementary Green Book Guidance on ‘Accounting for the Effects of Climate Change’, published by Defra in November 2020. This document sets out specific guidance for projects, policies and programmes that have a lifespan beyond 2035. The guidance states for these projects we should follow a climate resilient approach using at least two climate scenarios to:
   - consider options that include all adaptation measures that would mitigate the known impacts of the 2°C scenario; and
   - make decisions based on our own risk appetite about whether we also want to consider adaptation measures aligned with 4°C.

Northern Powergrid: our business plan for 2023-28 – 112
Developing our response

**Flooding (fluvial and pluvial)**
long periods of above average precipitation or intense rainfall events resulting in flooding and erosion.

- We will continue to maintain compliance with industry requirements for flood mitigation.
- Our plan has £1.2m of flood defence investment (79.1 per cent less than 2015-23) to:
  - carry out minor upgrade works at 13 major substations to ensure continued compliance with Engineering Technical Report (ETR) 138 standards; and
  - carry out flood mitigation works at 35 high-criticality distribution substations in the period to continue to enhance our resilience, for example sites that feed other infrastructure providers.
- We considered options for enhancements to existing flood defences to raise our level of resilience above that considered to be industry best practice, for example by increasing defences at all at-risk major substations up to a 1:1,000 year level. While this carried some support from some stakeholders it did not represent value for money.

**Gradual increase in temperature and rainfall**
warmer and wetter conditions extending vegetation growing seasons.

- Our established programme of works for vegetation management will continue in the 2023-28 period to ensure clearances to overhead lines. We will target 24,100 spans of the network p.a.
- Overall vegetation management costs in our plan are £10.9m p.a., an increase of £1.3m (14.1 per cent). This is driven by the emerging risk of ash tree dieback (forecast to affect 290 spans of overhead line p.a.), clearances to tower bases and substations. The introduction of two light detection and ranging (LiDAR) surveys in the period will better enable us to drive efficiencies through targeting our programmes.

**Extreme heat**
high temperatures reducing the performance and efficiency of assets.

- We will work to embed climate resilience into all our specifications and standards to deliver synergistic resilience through our core asset replacement programmes.

**Storms**
storm conditions leading to operational failure of above ground assets, increased faults and loss of supply to customers.

- We will enhance our storm resilience through strengthening of our overhead line networks through our core asset replacement programmes.

In parallel, we will enhance our ability to recover from major events through learning lessons from major events to inform improvements in our processes and practices, allowing us to promptly calibrate our operational response plans, trigger criteria and controlled escalation stages, see annex 4.9 Our approach to resilience.

Our stakeholders have reinforced the need to manage interdependencies to ensure whole system resilience.

We will continue to work with other infrastructure sectors and regional organisations to identify interdependencies and enhance resilience. This includes collaborations with:

- the national Energy Networks Association (ENA) climate resilience working group, consisting of UK electricity and gas distribution and transmission operators;
- other local infrastructure organisations, such as Northern Gas Networks and Yorkshire Water, to enhance regional climate change strategies;
- other regional bodies on catchment-based flood mitigation projects – £2m is included in our plan to fund these works; and
- local resilience forums, BEIS, and other infrastructure providers on joint scenario planning and testing of recovery processes.

Our plan sets out metrics to track our progress in enhancing the resilience of our network to climate change.

We are working with other network companies as part of the ENA climate resilience working group to develop a comprehensive set of industry-wide, common resilience metrics. We will report on our progress annually.

We will also continue to submit progress reports to Defra and the National Adaptation Plan in line with the five-yearly reporting cycle laid out under the Adaptation Reporting Powers.

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1. ‘1,000 year’ means that, statistically, a flood of that magnitude (or greater) has a 1 in 1,000 chance of occurring in any given year. In terms of probability, the 1,000-year flood has a 0.1 per cent chance of happening in any given year.
## Matin a Safe and Resilient Network – Climate Resilience

<table>
<thead>
<tr>
<th>CR1</th>
<th>Maintain flood defence resilience at all major substations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>Maintain long-term resilience of the network, Increased protection against flooding events</td>
</tr>
<tr>
<td>Deliverables</td>
<td>CR1.1) Improve and maintain flood resilience through targeted adaptations in civil defences and installing additional substation defences across the region, CR1.2) Improve flood resilience at distribution substations, either by moving them out of the line of flooding risk or by implementing mitigation measures, CR1.3) Share data with infrastructure providers on local-level resilience and identify local dependencies</td>
</tr>
<tr>
<td>Output measure/ indicative input measure</td>
<td>High-risk sites protected to ETR138 Total sites resilient to flooding</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>93%</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>99%</td>
</tr>
<tr>
<td>ED2 target</td>
<td>100%</td>
</tr>
<tr>
<td>CR2</td>
<td>Reduce the impact of storms on our network through a comprehensive programme of vegetation management</td>
</tr>
<tr>
<td>Benefits</td>
<td>Maintain resilience of the network, Improved efficiency and, therefore, lower cost due to the use of technology</td>
</tr>
<tr>
<td>Deliverables</td>
<td>CR2.1) Undertake enhanced resilience cuts in line with ENA’s Engineering Technical Report 132 (ETR132) on our overhead network to comply with enhanced resilience requirements, CR2.2) Establish and maintain clearance corridors, CR2.3) Assess and tackle the issues anticipated from ash tree dieback, CR2.4) Undertake a vegetation clearance programme for substations and tower bases, CR2.5) Utilise LiDAR technology to ensure efficient targeting of our vegetation management</td>
</tr>
<tr>
<td>Output measure/ indicative input measure</td>
<td>High voltage (HV) network resilient to high winds (ETR132) ETR132 network clearance (km) Vegetation management clearance spans p.a. (ENATS 43-8)</td>
</tr>
<tr>
<td>ED1 to date</td>
<td>42%</td>
</tr>
<tr>
<td>ED1 forecast</td>
<td>60%</td>
</tr>
<tr>
<td>ED2 target</td>
<td>75%</td>
</tr>
<tr>
<td>CR3</td>
<td>Improve resilience through collaborative work on interdependencies to reduce the risk of cascade failures across systems</td>
</tr>
<tr>
<td>Benefits</td>
<td>Improved resilience of the network, our region, and beyond, Increased efficiency of delivery, Increased collaboration</td>
</tr>
<tr>
<td>Deliverables</td>
<td>CR3.1) Collaborate with other regional infrastructure operators to identify and mitigate interdependencies, CR3.2) Collaborate with the Environment Agency and local authorities on the implementation of their regional flood risk management plans and establish support where appropriate</td>
</tr>
</tbody>
</table>

| CR4 | Maintain operational resilience and embed long-term resilience across our asset programmes, working with others to better understand future risks |
| Benefits | Improved resilience efficiency through long-term adaptation, Improved operational response to post-storm restoration, Increased embedded resilience across all our asset programmes, Improved resilience at lower cost |
| Deliverables | CR4.1) Utilise drones for storm damage assessments, CR4.2) Undertake collaborative exercises to test our operational response. These simulations test our response to the loss of critical national infrastructure and are often carried out in collaboration with government or in coordination with National Grid or our parent company, Berkshire Hathaway Energy, CR4.3) Embed resilience across our asset programme designs and specifications to deliver long-term synergistic resilience, for example moving substations out of the line of fire when replacing them for condition drivers and ensuring we have the appropriate ambient future temperature included when we design and establish the rating for overhead lines, CR4.4) Trial the installation of current flow monitors in areas at risk of wildfire, CR4.5) Undertake collaborative research projects to develop predictive analytics for the effects of weather on our underground networks |

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1. Numbers shown may be subject to rounding. See annex A1.4 Key targets and measures for profiled targets.
2. One major scheme and two shared National Grid sites to be completed in 2025-28.
3. Cumulative in period.
4. Annual average in period.

---

### Output measures

<table>
<thead>
<tr>
<th>Output measure/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-risk sites protected to ETR138</td>
<td>93%</td>
<td>99%</td>
<td>100%</td>
</tr>
<tr>
<td>Total sites resilient to flooding</td>
<td>255</td>
<td>271</td>
<td>48</td>
</tr>
<tr>
<td>Major substation flood defences installed</td>
<td>73</td>
<td>84</td>
<td>13%</td>
</tr>
<tr>
<td>High criticality distribution substations with increased resilience</td>
<td>-</td>
<td>-</td>
<td>35%</td>
</tr>
<tr>
<td>ETR132 network clearance (km)</td>
<td>889</td>
<td>1,295</td>
<td>844</td>
</tr>
<tr>
<td>Vegetation management clearance spans p.a. (ENATS 43-8)</td>
<td>24,800</td>
<td>25,700</td>
<td>24,100</td>
</tr>
<tr>
<td>No. LiDAR network surveys</td>
<td>0</td>
<td>1 in period</td>
<td>2 in period</td>
</tr>
</tbody>
</table>

---

**Data and Digitalisation**

<table>
<thead>
<tr>
<th>CR2.5</th>
<th>Utilise LiDAR technology to ensure efficient targeting of our vegetation management</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. LiDAR network surveys</td>
<td>0</td>
</tr>
</tbody>
</table>

---

**Innovation**

<table>
<thead>
<tr>
<th>CR4.1</th>
<th>Utilise drones for storm damage assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR4.2</td>
<td>Undertake collaborative exercises to test our operational response. These simulations test our response to the loss of critical national infrastructure and are often carried out in collaboration with government or in coordination with National Grid or our parent company, Berkshire Hathaway Energy</td>
</tr>
<tr>
<td>CR4.3</td>
<td>Embed resilience across our asset programme designs and specifications to deliver long-term synergistic resilience, for example moving substations out of the line of fire when replacing them for condition drivers and ensuring we have the appropriate ambient future temperature included when we design and establish the rating for overhead lines</td>
</tr>
<tr>
<td>CR4.4</td>
<td>Trial the installation of current flow monitors in areas at risk of wildfire</td>
</tr>
<tr>
<td>CR4.5</td>
<td>Undertake collaborative research projects to develop predictive analytics for the effects of weather on our underground networks</td>
</tr>
</tbody>
</table>

---

**Workforce Resilience**

<table>
<thead>
<tr>
<th>CR3.1</th>
<th>Collaborate with other regional infrastructure operators to identify and mitigate interdependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR3.2</td>
<td>Collaborate with the Environment Agency and local authorities on the implementation of their regional flood risk management plans and establish support where appropriate</td>
</tr>
</tbody>
</table>

---

**Executive Summary**

- **EXEC SUMMARY**
- **TRACK RECORD**
- **ENGAGEMENT**
- **OUTPUTS**
- **ENABLERS**
- **COSTS**
- **DELIVERY**

---

**CR1.3)** Establish flood defences at high-risk sites and install additional substation defences across the region.

---

**CR2.1)** Establish and maintain clearance corridors.

---

**CR3.2)** Collaborate with the Environment Agency and local authorities on the implementation of their regional flood risk management plans and establish support where appropriate.

---

**CR4.3)** Embed resilience across our asset programme designs and specifications to deliver long-term synergistic resilience, for example moving substations out of the line of fire when replacing them for condition drivers and ensuring we have the appropriate ambient future temperature included when we design and establish the rating for overhead lines.
## How engagement with you has shaped our plan

### Who we engaged...

<table>
<thead>
<tr>
<th>Engagement Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic vulnerable customers</td>
</tr>
<tr>
<td>√</td>
</tr>
</tbody>
</table>

**Wave 1**

**Events:** 103 total – 5 dedicated events
**Stakeholders engaged:** 4,762 total – 150 unique interactions

**Wave 1 findings**

- **The impact of climate change on communities remains a concern**
  - Climate change adaptation and compound events were tangible concerns for customers, especially for those in vulnerable locations or areas prone to flooding.

- **Collaboration is key to building resilient infrastructure**
  - Stakeholders viewed collaboration as necessary to develop resilient infrastructure as there are key interdependencies across different sectors and the supply chain.

- **Consider changes in land use in climate planning**
  - We should consider land use change as part of climate risk assessments and collaborate to understand how adaptation technologies may add more stress to the grid.

**Wave 2**

**Events:** 135 total – 11 dedicated events
**Stakeholders engaged:** 15,475 total – 5,008 unique interactions

**Wave 2 options**

<table>
<thead>
<tr>
<th>Options</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintaining current strong levels of network resilience</td>
<td>Enhanced cross-sector collaboration and investment to build resilience to floods and high winds</td>
<td>Expanded asset relocation and replacement programmes to build further resilience to floods and high winds</td>
<td>Mitigation of evolving risks such as wildfires and interconnection of major sites to defend against high-impact, low-probability events</td>
<td>Comprehensive investment and cross-sector approach addressing future climate change</td>
<td></td>
</tr>
</tbody>
</table>

**Customer ambition and broader findings**

- 34% of stakeholders supported us taking ambitious action **option E** (‘Addressing future challenges’) to increase resilience in the face of increasing severity and frequency of natural hazards – flood and storm events – exacerbated by a changing climate. Among domestic customers, 23% voted for **option B**, which was behind option **E** (34%).

### Wave 3

**Events:** 91 total – 7 dedicated events
**Stakeholders engaged:** 32,500 total – 2,318 unique interactions

Option C was further explored with stakeholders and customers to refine commitments for flood mitigation and extending collaborations with regional infrastructure partners to plan for, and manage together, the consequences of climate change.

**Wave 3 findings**

<table>
<thead>
<tr>
<th>Finding</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take steps to mitigate the impact of climate change on the network</td>
<td>We will continue to manage the risks presented by climate change through our ongoing programme to mitigate flood risk across the network</td>
<td>CC1</td>
<td>Link</td>
</tr>
<tr>
<td>Manage the impact of storms through ongoing network maintenance</td>
<td>We will continue to monitor the impact of climate change on the environment and on the network and manage the impact of weather events such as storms by putting in place operational mitigation measures</td>
<td>CC2</td>
<td>Link</td>
</tr>
<tr>
<td>Work together with other infrastructure partners to manage climate impact</td>
<td>We will further our collaborations with infrastructure partners, working together to identify shared priorities, innovations and practices to reduce risk and impact</td>
<td>CC3</td>
<td>Link</td>
</tr>
<tr>
<td>Collaborate, sharing information and plans to manage future challenges</td>
<td>We will identify opportunities to manage and mitigate network resilience operationally through collaborations and identifying mutually beneficial partnership working</td>
<td>CC4</td>
<td>Link</td>
</tr>
<tr>
<td>Climate Resilience acceptability score: 69%</td>
<td>Overall acceptance was highest with rural customers (85%). For customers with lower levels of acceptance, more information on deliverability is important to them</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>
Physical and Cyber Resilience

We will build on the extensive investments we have already made to protect your information and electricity supply, and to continually reduce the risks of existing and evolving threats.

We understand changing customer needs and net zero ambitions mean a move to an increasingly decarbonised, decentralised and digitalised energy system is required. At the same time, we are seeing increasing IT/OT network risk – particularly in the field of cyber security. However, we are set to start the five-year period from 2023 in a strong position because of the £47m investment we have made in physical and cyber resilience in the period 2015-23, meaning that we can continue to secure your existing and future services while reducing costs.

We know that security of your electricity supply and information is important to you. We plan to invest £49m on driving down risk that will, in turn, create a stronger network that is resilient to cyber and physical attacks, and a further £7m on ensuring we have resilient communications systems that will ensure our engineers can safely control and maintain your electricity supply.

We will start in 2023 from a position of strength.

As a business, we already take the threat to your services and information very seriously and our activities since 2015 have gone above those identified in our 2015-23 business plan. This is particularly the case in cyber security, where the need arose to invest more than £16m in meeting the emerging threat.

In the 2015-23 period we have invested to:

- Establish a dedicated cyber security team and a 24x7x365 security operations centre.
- Certify our systems and processes to the international standard for management of information security, ISO27001.
- Implement the Center for Internet Security’s (CIS) Controls across our systems.
- Meet the requirements set out under the EU Security of Networks & Information Systems (NIS) Directive.
- Establish processes and deploy a wide range of cyber detective and defensive technologies.

How much it will cost

<table>
<thead>
<tr>
<th>2023-28 expenditure (annual)</th>
<th>£14.1m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2% of totex</td>
<td></td>
</tr>
<tr>
<td>versus 2015-23</td>
<td>-£1.6m</td>
</tr>
<tr>
<td>-10.2%</td>
<td></td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.
We also invested significantly in improving the physical security systems at our substations, including establishing a dedicated, round-the-clock, alarm-receiving centre to monitor the security systems at our substations and critical sites.

The investments made since 2015 mean that our focus from 2023 is on maintaining the systems and processes we have established coupled with targeted incremental improvements to further reduce risk. Our business plan will deliver enhanced outputs without increasing the level of spending compared to 2015-23.

You have supported our proposal to invest to reduce risk and improve the resilience of our systems.

Coupling investment in new technology, such as artificial intelligence (AI), with investment in our people, is the cornerstone of our business plan.

— We recognise that, in the cyber security arena, the increasing level of threat means that even just to stand still requires investment. This is driven by the ever-growing level of sophistication and determination of adversaries, be that criminal organisations seeking profit, nation states gaining access to critical infrastructure to cause disruption, or groups looking to cause social harm through attacks. These can be directly targeted at specific organisations, or distributed attacks that look for any opportunity to exploit weaknesses in an organisation’s IT systems.

Recent high-profile examples illustrate this growing threat:

— May 2021: Colonial Pipeline, which carries just over 50 per cent of the fuel supplies across the east coast of the US, was forced to cease operation following a ransomware attack.
— February 2021: Oldsmar, Florida, where a hacker took control of chemical dosing of a water treatment works in an attempt to poison 15,000 residents.
— December 2015 and 2017: nation-state attack on the Ukraine power system that resulted in disruption to power supplies across the country on two separate occasions.

Our customer outcomes focus on reducing the risk of a successful physical or cyber-attack and maintaining resilient communications across our network. Based on our essential service, and feedback on what is important to you, our approach is to deliver on two clear responsibilities: protecting your information and protecting your power supply.

We take these responsibilities seriously. As such they shape our approach to cyber security.

As responsible network operators, we are obligated to ensure our systems are resilient to attack. Your feedback reinforced that stance. You told us you are concerned about the potential impact from the increasing frequency of cyber-attacks and you supported the need for an action plan for communicating any cyber-security risks and mitigations associated with digitalisation including security of transferring smart meter data.

Under the EU Security of Networks & Information Systems (NIS) Directive, we are duty-bound to take appropriate and proportionate measures in securing the network and information systems on which the essential service we deliver to you relies. Equally, under the General Data Protection Regulation (GDPR), we are required to protect our customers’ personal information.

Your feedback continues to echo that it is our responsibility as a network operator and guardian of that information to ensure it is safe, and that we use it appropriately.

You asked us to engage with specialists in this area to ensure we can work to available best practices. Our approach focuses on the continual reduction of risk and does so against the backdrop of an ever-changing cyber-threat landscape. This means we need skilled cyber professionals and training programmes that will see these skills evolve to match the maturity of cyber criminals over time; additionally, we have partnered with a National Cyber Security Centre (NCSC)-approved supplier to ensure we have specialist input in assessing and selecting improvements to help us work toward meeting the NCSC Cyber Assurance Framework.

From 2023, we plan to increase our team by 20 per cent by recruiting more cyber specialists, then investing in their training and ongoing development. More broadly we will invest in our workforce to provide the skills needed to help them do their job in a cyber secure way, building on our solid approach that has already provided our people with the cyber essentials to perform their work in a safe and
We will invest in security tools to protect our networks from unauthorised access or attack.

Part of this will include extending our operational technology network surveillance capability to detect unauthorised or abnormal activity. As part of this, we will enhance our systems to detect network-based attacks to all our major substations.

We will invest in tools that employ AI to help us quickly detect and respond to cyber-attacks on our control systems utilising machine-first decision making, ultimately verified by a human. Our approach, however, is not solely reactive: we will improve the systems that we use to hunt for active threats and weaknesses in our IT and power network control systems by investing in security tools that can continuously inspect our systems, and alert us to weaknesses as they are found, as well as investing in risk-management applications that will help us manage and improve our cyber risk management and governance processes. These initiatives are all aimed at improving our capability to detect cyber-attacks by monitoring more of our data at more points on our systems. This will help our security operations centre see and correlate more events that may be an indicator of a threat or compromise.

We plan to establish secure party connectivity models and expand our cloud security prevention, detection and response capabilities by ensuring that cloud security tools are installed as a standard part of our system build. This continued expansion of our cyber-security capabilities includes mitigating the risks presented by open data and the increased digitalisation of our operations.

Any new or changing systems and processes will be incorporated into our ISO27001-certified information security management system, which is in place to ensure they remain under continuous risk review and improvements.

Our approach to physical security will continue to underpin protecting power supplies.

The new threats of cyber security do not overshadow the well-established physical security threats the network faces.

The significant work we have done since 2015, including meeting the standards set for sites designated as Critical National Infrastructure (CNI), means that we are able to reduce our costs while incrementally maintaining, and improving, our levels of resilience.

From 2023 we will continue to focus on security incident ‘hot spot’ areas responding with improved physical security measures based on best practice that are designed to protect our network from theft and vandalism activity that not only increases costs but also puts your electricity supply at risk.

Such improvements include enhanced fencing, including electric fencing, additional closed-circuit television (CCTV) and perimeter detection and physical security patrols.

We plan to target investments at our highest-risk sites. We will enhance the physical security at 25 per cent of our highest risk substations including all our sites designated as CNI. These enhancements include using new technology that can for example automatically distinguish between human intruders and wildlife. This will be fitted in addition to the security systems already installed, enabling more value to be extracted from our previous investment and help us identify real intrusions and reduce response to false alarms through the deployment of improved CCTV and perimeter detection.

Underpinning our network resilience is a reliable communications network that allows us to safely coordinate our workforce as well as remotely control the electricity network.

During the period it is vital that we invest to mitigate the impact of the retiring of the power resilient public telecom network technologies that we use today for communication with our field engineers.

The Emergency Services Network (Airwave) will be closing down and BT systems (PSTN) that deliver telephone lines to our substations are changing to a more advanced but less power resilient model. These are the power...
resilient systems that our engineers currently use to communicate when mobile telephones cannot be relied on. With our own fixed telecommunications network providing a high degree of resilience, we will invest in mobile communication to ensure our field engineers have continued access to power resilient mobile communication that will ensure that they can safely work to restore power in extreme events.

This investment is essential in order to ensure we are able to meet our obligation to provide 72 hours of power resilience to the systems that we use to remotely control the electricity network and that will be needed to restore power in the event of a major national failure. We plan to maintain the current power resilience for our substation communications in line with the current national resilience guidance.

Cyber security is important to us all, but one of the strongest forms of defence is obfuscation so we cannot share all we will do. An overview of our plans for investment is shown in this section of our plan but our detailed Cyber Resilience plans have been securely provided to Ofgem’s Cyber Security team to scrutinise.

### Customer outcomes

<table>
<thead>
<tr>
<th>Customer outcomes</th>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC1 Protect our customers’ information</td>
<td>Customers’ information will be kept safe</td>
<td>PC1.1) Invest in technology, such as cloud access security broker (CASB) and AI analytics, that helps to identify weaknesses in our IT systems and quickly detect attacks</td>
<td>Loss of information (material cyber breach)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC1.2) Develop and implement a cyber-specialist training programme for our workforce</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC1.3) Invest in automated event response technology to help us quickly respond to cyber-attacks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC1.4) Achieve recertification for ISO27001 and ISO27019</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC2 Protect our customers’ power supply from cyber attacks</td>
<td>Customers’ power supplies will not be impacted by cyber-attacks</td>
<td>PC2.1) Design and implement core OT system and major substations network sensors</td>
<td>Loss of supply (material cyber breach)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC2.2) Develop and implement an OT cyber-specialist training programme</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC2.3) Implement EDR on our core systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC3 Protect our customers’ power supply from physical attacks at our major substations</td>
<td>Customers’ power supplies will not be impacted by physical attacks</td>
<td>PC3.1) Deploy a rapid incident response security solution to quickly protect network substations</td>
<td>Loss of supply (material physical breach)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC3.2) Deploy intelligent perimeter security upgrades</td>
<td>Intelligent perimeter security upgrades</td>
<td>-</td>
<td>-</td>
<td>155</td>
</tr>
<tr>
<td>PC4 Ensure our communications systems are power resilient to help our engineers safely and quickly restore power</td>
<td>Restoration of customers’ power supplies will not be impacted by major communications failures</td>
<td>PC4.1) Deploy a resilient mobile communication system for our critical field colleagues</td>
<td>Date of system upgrade</td>
<td>-</td>
<td>-</td>
<td>2025/26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PC4.2) Establish vehicle deployable emergency communication hubs (deployable resilience)</td>
<td>No. mobile resilience vehicles</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See annex A1.4 Key targets and measures for profiled targets.
## How engagement with you has shaped our plan

### Wave 1

**Events:** 103 total – 5 dedicated events  
**Stakeholders engaged:** 4,762 total – 227 unique interactions

<table>
<thead>
<tr>
<th>Wave 1 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders prioritised actions to mitigate and minimise cyber risks as open data-sharing increases</td>
<td>Stakeholders were concerned about the potential impact from increasing frequency of cyber-attacks. They wanted an action plan for communicating any cyber security risks and mitigations associated with digitalisation including security of transferring smart meter data</td>
</tr>
<tr>
<td>Regular engagement with cyber experts is welcomed</td>
<td>Stakeholders want us to engage with specialists in this area</td>
</tr>
<tr>
<td>A priority for customers is targeted investments for high-risk network sites</td>
<td>Customers wanted us to focus on sites with a history of theft and vandalism, especially those where there is potential for wider corruption across the network</td>
</tr>
</tbody>
</table>

### Wave 2

**Events:** 135 total – 6 dedicated events  
**Stakeholders engaged:** 15,475 total – 4,940 unique interactions

<table>
<thead>
<tr>
<th>Wave 2 options</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td>Strong controls against the risk of physical and cyber-attacks, protecting customer information and the energy network</td>
<td>Advanced protection at our highest risk sites reducing the risk of cyber compromise on the network</td>
<td>Wider roll-out of advanced protection to our high-risk sites, further reducing the risk of compromise on our network</td>
<td>Roll-out of state-of-the-art controls and next generation technology allowing for enhanced detection and response to threats</td>
<td>Near full coverage of our business with state-of-the-art detection and controls, including facilities and systems to support decarbonisation</td>
</tr>
</tbody>
</table>

### Customer ambition and broader findings

Stakeholders’ views were polarised with the favoured options by stakeholders being option E (34%) or option B (25%) levels of ambition in this area. Feedback was divided between those favouring a high level of investment due to perceived significance of physical and cyber hazards, and those favouring low levels of investment due to perceived good performance already in this area. Among domestic customers, there was a clear majority for option E (35%), while among SMEs there was an even split between options B and E (30% for each)

### Wave 3

**Events:** 91 total – 3 dedicated events  
**Stakeholders engaged:** 32,500 total – 2,277 unique interactions

Following diverse views about levels of ambition in Wave 2, Wave 3 explored the level of importance placed on robust cyber security plans, in the physical security of our sites from theft and the impact on customer resilience from power cuts with customers

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
</table>
| Safeguarding customer information is important  
Stakeholders emphasised the need for privacy safeguards as a prerequisite for the introduction of digital technology and smart meters | We will continue to safeguard our customers’ information with future-proofed practices and protocols in place | PC1 | Link |
| Effective cyber security plans are increasing in importance  
Stakeholders were concerned about the increasing frequency of cyber-attacks and the security of our network. Stakeholders urged increased investment in security of IT platforms and to facilitate the automatic detection of, and response to, cyber threats | We take cyber security very seriously and recognise this is an evolving challenge with plans in place to ensure we mitigate these threats | PC1 PC2 | Link |
| Security of equipment and substations is valued  
Customers support improvements to sites with a history of theft and vandalism. Support also existed for the increased use of motion sensors as well as other automated technologies | We will continue to employ practices and technological solutions to protect our network and substations from physical attacks | PC3 | Link |
| Support for future-proofing network communications  
Customers supported plans to enhance technology and communications systems that support power restoration | We will maintain and upgrade our communications systems, which enable power restoration across our network | PC4 | Link |
| Physical and Cyber Resilience acceptability score: 73% | Overall acceptance was high with customers; and trust was important to them at 73% | - | Link |
Our customers will experience a personalised, proactive service that provides choice in how and when they do business with us. Backed by the latest customer-facing systems and use of data, we will use our interactions with customers to support their journey to decarbonisation.

Customer service is an ever-growing and vital part of our business. As your needs and expectations evolve, so does our commitment to offer a proactive, personalised, reliable and flexible service to every customer we serve.

Our commitment to providing an ever-improving service to you on priority topics, such as reliability and connections, will be supplemented as we move into new territory with changes brought about by the energy transition, providing you with support on the journey to decarbonisation.

How much it will cost

ED2 expenditure (annual) £4.2m 0.7% of totex
Vs ED1 2015-23 +£0.2m 5.0%

One of our 9 plan areas, taken together, delivering more for less.
Striving to be the best

Our performance demonstrates our ongoing commitment to customer service.

In the current period we committed that customer service would become faster, more reliable and better communicated. Our overall performance has continued to improve with customer satisfaction scores increasing by 8.2 percentage points to 90.5 per cent since the start of the current period.

In parallel, our complaints have fallen by 43.7 percentage points since the beginning of the current period and we have increased the proportion resolved in one day or less by 29.5 percentage points.

You have told us you value us continually improving customer service.

We have engaged with more than 14,000 customers who have been clear that we should continue to invest in delivering high levels of customer service. Therefore, our aim in 2023-28 is to build upon our progress made to date. We will capitalise on new technologies, further personalising our service, being proactive in our response and giving you a choice in how and when you do business with us.

This will be complemented by supporting you on the journey to net zero and continuing to embed a customer-first culture across our whole business.

To deliver our enhanced commitments we will spend £4.2m each year – a five per cent increase – to provide you with greater flexibility, choice and support to achieve net zero.

We have listened to your feedback and our customer service commitments break down into the four key themes that matter most to you.

Proactive and flexible service: you have told us that immediate, proactive and personalised communications are a priority, combined with flexibility when you do business with us. We will utilise the latest technology to engage with you on new platforms and expand our service offering.

— Building on the £4m invested in digital customer service during 2015-23 and the introduction of our self-service platform, we will aim to further integrate our systems with our customer relationship management (CRM) platform to provide a streamlined, easily accessible service if you choose to engage with us digitally.

— We will introduce at least three new channels to support communication, which have been determined by customer feedback – reply text messaging, direct messaging (e.g. WhatsApp) and video chat, supported by what3words.

— We will enable ease of navigation between channels, while retaining our traditional contact channels so you have the choice to speak to a person, if you wish.

— We will provide greater flexibility by enhancing our appointment offerings, extending our service to provide appointments up to 8pm and over weekends for planned services. Additionally, we will offer same-day/next-day appointments with a cost-reflective charge paid by customers using this service.

— Proactive communications with you before, during and following a power cut remain critical and you have fed back to say that you want greater levels of support once a power cut exceeds six hours, that support for vulnerable customers is a priority, and that you would benefit from practical advice, support and information within your local communities.

— Where you experience a long-running power cut, we will aim to provide proactive, practical, on-site support through deployment of our customer service vehicles and customer service professionals.

— We will deliver enhanced proactive communication to you on planned power cuts and identify where you may benefit from additional on-site support.

Proactively responding to dissatisfaction: you have told us that when something does not go to plan you want to see us managing your expectations, keeping you informed and being proactive in our approach to resolve your dissatisfaction quickly and effectively.

— We will be proactive in our approach, embedding ownership and devolving complaint resolution to our upskilled regional teams where it is better for you and more effective to do so, whilst offering on-site customer service support to engage in person to quickly respond to your concerns.

Customer care: you have told us that delivering personalised and dedicated customer care to vulnerable customers is important, in particular supporting a fair transition to net zero through our services.

— We recognise the importance of providing greater support to our most vulnerable customers and you have said you want us to be ambitious in our commitments, to which we have listened and acted upon – see our Vulnerable Customers section.

Supporting decarbonisation: you have told us to evolve our customer service offerings to provide more support on your journey to net zero. We will use our expertise in this area to provide information, support and
Meeting the Needs of Consumers and Network Users – Customer Service

advice as you transition to using low carbon technologies (LCTs) and provide additional help and guidance.

— We will be proactive in our approach, providing information on energy efficiency and decarbonisation, supporting you via our range of communication channels.

— Our intergenerational research and engagement with early adopters of LCTs shows that customer service to support net zero needs to focus on education and must be generationally targeted with a range of platforms for different needs. We will use our range of channels to target and support understanding of net zero and decarbonisation, to bring to life what it means for our customers.

— Our research shows that the task of decarbonisation can be overwhelming for many customers, with clear guidance, support and education considered essential for real change to occur. We recognise the complexity of this topic and want to use our expertise to help inform you during your interactions with us.

— As our services expand for our large customers, electricity suppliers and Independent Distribution Network Operators (IDNOs), our customer service teams will work in hand in hand with our experts to provide you with tailored support on flexibility products and services.

— We will make the best use of our CRM system to identify your requirements, answer any frequently asked questions on matters such as electric vehicle charging or adopting new forms of high-efficiency electrical heating, and signpost you to externally accredited service providers. Where you need extra support our team will be on hand to provide a personalised service through further understanding your requirements.

— Using insight and information available to us across our region, we will develop and deliver targeted outreach campaigns to further inform you on decarbonisation and how you can support the journey to net zero.

— Backed up by our suite of analytical tools, we will support you by providing access to system data, along with simple intuitive guidance. This will support you in making informed decisions when you wish to connect to our network.

— As part of our commitment to the communities we serve, we will recruit a team of community energy advisors (CEAs) across our regions. They will deliver direct advice and support to communities, partners and local authorities. Through our regional CEAs, we will support local authorities in line with decarbonisation targets. We will collaborate across our teams to ensure that you receive consistent guidance and continuously learn from our communities to enhance our customer guidance in this area. Our CEAs will work seamlessly with our regional and customer service teams to further enhance and tailor the service we provide to you.

Above all we want to ensure we offer you best-in-class customer service.

Our service will be underpinned by further investment in our people and contractors through an annual programme of customer service training, which will evolve as we mature our customer service offering, aligned with high standards of quality.

We will seek independent assurance of our approach via external accreditation of our customer service standards to provide a roadmap of continuous improvement with you, our customers, at the heart of our delivery.

Our satisfaction scores average >90%; we want to improve further, offering the best possible service. We engaged over 14,000 customers and leading organisations about customers’ needs to develop our plans.

Louise Lowes
Head of customer and shared services
## Meeting the Needs of Consumers and Network Users – Customer Service

<table>
<thead>
<tr>
<th>Customer outcomes</th>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/ indicative input metric</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1</td>
<td>Improve customer satisfaction by introducing new contact channels, greater on-site support and choice in booking slots for planned services, providing increased choice and flexibility in how and when customers do business with us*</td>
<td>CS1.1) Give customers more choice in how to contact us through the introduction of three new communication channels, while ensuring full access to traditional contact channels</td>
<td>Broad measure of customer service score (ODI-F)</td>
<td>90.5%</td>
<td>92.0%</td>
<td>93.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No. digital contact channels</td>
<td>5</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Convenience (days of week/time slots)</td>
<td>5 (working days), business hours</td>
<td>7 days am/pm/weekend</td>
<td>7 days next day/same day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CS1.2) Offer greater convenience to customers by extending appointment booking slots for planned services into evening/weekend and same day/next day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CS1.3) Provide proactive communications to customers for both planned and unplanned power cuts, where available, using smart meter data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CS1.4) Provide on-site support where customers experience long-running power cuts</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>CS1.5) Provide an enhanced digital self-service offering, preserving the option of 100% human contact where preferred</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS2</td>
<td>Improve the speed of complaint resolution, resolving 90% of complaints within one day</td>
<td>CS2.1) Resolve complaints through our regional teams where it is quicker and more effective to do so</td>
<td>Complaints resolved within day+1</td>
<td>83.3%</td>
<td>88.0%</td>
<td>≥90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CS2.2) Use data analytics to aid quicker analysis of common themes and group complaints by type to support quicker resolution and root cause analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complaints resolved within day+31</td>
<td>96.4%</td>
<td>98.0%</td>
<td>≥98.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Complaints metric (ODI-F)</td>
<td>2.8</td>
<td>1.8</td>
<td>1.4</td>
</tr>
<tr>
<td>CS3</td>
<td>Expand our customer service offering to provide support for flexibility providers and data users</td>
<td>CS3.1) Expand our services for our large customers, electricity suppliers and Independent Distribution Network Operators, working collaboratively with our customer account management team to provide tailored support on flexibility products and services, making best use of our customer relationship management system to identify requirements, answer FAQs and signpost to approved service providers</td>
<td>Introduction of customer satisfaction survey for data services customers</td>
<td>-</td>
<td>-</td>
<td>2023-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CS3.2) Provide simple, intuitive guidance for data to our customers making it easier to access, find and use</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Numbers shown may be subject to rounding. See A1.4 Key measures in our plan for profiled targets.

2. Cross-reference to Our Communities deliverable CO3.1) Providing information through communications around the path to decarbonisation.
How engagement with you has shaped our plan

Who we engaged …

Wave 1 Events: 103 total – 13 dedicated events Stakeholders engaged: 4,762 total – 1,176 unique interactions

Wave 1 findings

<table>
<thead>
<tr>
<th>Details</th>
<th>Wave 1 – open engagement Wave 2 – optioneering Wave 3 – refinement and finalising</th>
</tr>
</thead>
<tbody>
<tr>
<td>A personalised flexible service is welcomed by customers</td>
<td>— Customers support the use of data to improve our service. Our customers want personalised service offering options when they contact us, but also at their convenience via a wider offering of appointment times for services</td>
</tr>
<tr>
<td>A range of options and channels to communicate with customers is important</td>
<td>— Customers wanted flexible options on ways and channels to interact with us, including social media, website, direct messaging and the opportunity to speak to a colleague when needed</td>
</tr>
<tr>
<td>Service options and digital tools are seen as valuable for a wide range of customer types</td>
<td>— Customers see digital technology as valuable e.g. appointment booking, engineer tracking, planned power cut notifications, and restoration time changes</td>
</tr>
</tbody>
</table>

Wave 2 Events: 135 total – 16 dedicated events Stakeholders engaged: 15,475 total – 14,544 unique interactions

Wave 2 options

<table>
<thead>
<tr>
<th>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivering a great service every day</td>
<td>More choice for a great customer experience and enhanced support services</td>
<td>Enhancing our range of digital and personalised services</td>
<td>Tailored, personalised services, utilising data analytics to provide a proactive customer experience across multiple channels</td>
<td>Personal, fast, flexible and value for money customer service, combining data and digital technology to deliver best-in-class service</td>
<td></td>
</tr>
</tbody>
</table>

Customer ambition and broader findings

The highest number of votes (30%) went to the highest level of ambition option E, while options C and D both shared 20% of the votes. Of this 30% for option E, 83% came from domestic customers, followed by 11% from SMEs. Although most customers were happy with current customer service levels, there was support for improvements such as new digital channels, extended appointment times, enhanced telephony support and personalised person-to-person support via a human where required.

Wave 3 Events: 91 total – 11 dedicated events Stakeholders engaged: 32,500 total – 3,411 unique interactions

The importance and scale of a personalised service was explored with customers during Wave 3, along with engagement to consider the shape of future service offerings to support flexibility and customers’ readiness for net zero

Wave 3 findings

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice of contact channels and flexible services are important</td>
<td>— We will develop more personalised, flexible support services for our customers that take into account their changing needs, working patterns and need to access our services through a wider, more dynamic range of digital channels we will ensure that customers who require or speaking to someone are able to do so</td>
<td>CS1</td>
<td>Link</td>
</tr>
<tr>
<td>Clear, responsive communications and swift resolution of issues</td>
<td>— We will continue to develop our customer support processes and colleague development programme to ensure we meet and exceed customers’ expectations, communicating progress regularly and resolving issues swiftly</td>
<td>CS1 CS2</td>
<td>Link</td>
</tr>
<tr>
<td>Services to support decarbonisation are growing in importance</td>
<td>— We will work in partnership with our customers and stakeholders to develop a range of support services that helps them prepare for net zero</td>
<td>CS3</td>
<td>Link</td>
</tr>
<tr>
<td>The acceptability score for customer service: 77%</td>
<td>— Customer service scored the highest for ease of understanding and clear plan delivery out of all business plan areas</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>
Vulnerable Customers

Vulnerable customers will be at the centre of our thinking. We will use data and strong partnerships to provide tailored services to vulnerable customers. We will support customers in fuel poverty and support a socially inclusive transition to net zero by minimising barriers to enter the energy market so that no one is left behind.

We will provide enhanced services to vulnerable customers.

We recognise that all customers can be at an increased level of vulnerability when experiencing a power cut, and that our role in providing additional support for vulnerable customers who require it is an essential service.

We have a high prevalence of vulnerability in our region, with approximately 4.5m of our customers (56 per cent) meeting Ofgem’s definition of vulnerability.¹

We conducted extensive engagement and research to significantly increase our knowledge and understanding of vulnerable customers and their requirements, with the aim of developing tailored services to meet their needs. Where we had a mandate, we addressed relevant wider social issues with an increased emphasis on fuel poverty and affordability services. The development of our social programme and consumer vulnerability matrix has widened the range of tailored support services we are able to provide. Investment in data gathering and social indicator mapping has (in conjunction with partners) enabled us to target and recruit in excess of 900,000 customers to our Priority Services Membership (PSM)² throughout the period. We have established a robust partnership network that improves access to hard-to-reach customers, expanding our understanding of vulnerability and the issues and challenges that customers are faced with in our region. Finally, we have developed affordability outreach programmes, supporting 5,000 customers a year to alleviate the impact of fuel poverty in our region.

¹ Ofgem’s definition of vulnerability: “We define vulnerability as when a consumer’s personal circumstances and characteristics combine with aspects of the market to create situations where he or she is significantly less able than a typical domestic consumer to protect or represent his or her interests, and/or significantly more likely than a typical domestic consumer to suffer detriment or that detriment is likely to be more substantial.”

² In light of stakeholder feedback, we are referring to the Priority Services Register as the Priority Services Membership.

How much it will cost

<table>
<thead>
<tr>
<th>2023-28 expenditure (annual)</th>
<th>£3.9m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vs ED1 2015-23</td>
<td>+£3.1m</td>
</tr>
<tr>
<td>0.6% of totex</td>
<td>+387.5%</td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.

1. Ofgem’s definition of vulnerability: “We define vulnerability as when a consumer’s personal circumstances and characteristics combine with aspects of the market to create situations where he or she is significantly less able than a typical domestic consumer to protect or represent his or her interests, and/or significantly more likely than a typical domestic consumer to suffer detriment or that detriment is likely to be more substantial.”

2. In light of stakeholder feedback, we are referring to the Priority Services Register as the Priority Services Membership.
Supporting vulnerable customers is a priority for us

Building on these foundations, our plan will formalise and enhance the services we provide to customers in vulnerable situations. Support will include:

- more targeted recruitment to the PSM;
- a new accessible communication channel;
- enhanced support for vulnerable customers;
- smarter use of data;
- ambitious plans to scale up our fuel poverty programmes; and
- the development of new programmes to ensure no one is left behind in the low-carbon energy transition.

Above all, we will ensure that customer vulnerability is central to our activities throughout our work, an approach that our stakeholders widely favour.

Support for vulnerable customers during power cuts was one of our stakeholders’ top priorities. Customers want to see increased outreach and communication campaigns – targeted at the vulnerable – to enhance awareness of the PSM and the support available during power cuts. The support needs to be proactive and accessible, with human contact preferred where possible. Stakeholders also approve of increased collaboration with partners (both those in other sectors and experts in their fields) in order to provide the best service possible. As part of the wider strategy, we will do more to address fuel poverty, and address the barriers to vulnerable customers, including promoting energy efficiency in their homes.

This a stretching plan that commits to a level of ambition over and above Ofgem’s minimum requirements in several key areas. These significant improvements will cost around £3.9m in total p.a. between 2023 and 2028, which represents an increase of £3.1m p.a. compared to our current spend. But this step up in activity and investment will bring forward significant benefits for our most vulnerable customers and is offset by efficiencies in other areas of our plan.

We will deliver more targeted recruitment of vulnerable customers to our PSM to proactively communicate with and manage the needs of vulnerable customers on an ongoing basis.

In order to most effectively help customers in the most vulnerable situations, it is vital to be able to identify and recruit them to our PSM. Ofgem expects us to undertake proactive and targeted advertising of the PSM and the services offered to vulnerable customer groups, and our stakeholder research supports this. Feedback suggests that an ‘all in one solution’ application would be valuable; to enable customers with different communication needs to easily engage with priority services and affordability programmes.

There are in the region of 900,000 households on our PSM. We will build on our existing progress and hold ourselves accountable with stretching targets. We have set a target of recruiting 70 per cent of our eligible high-risk customers to the PSM by the end of the price control period. To do this, we will use data and partners to develop a regional approach to our recruitment to reflect local differences (including rural and urban differences). Campaigns will be delivered through external PR agencies, media communication and media outlets. To complement this, customer-facing staff will have access to an application that enables them to submit real-time amendments to the PSM and complete new registrations.

Sophisticated digital techniques will be employed to recruit, track, maintain and share information on vulnerable customers. We are actively working with other utilities and regulators to develop a shared essential services PSM, and we will continue to use wider data sources and social indicator mapping and partners to help identify hard-to-reach customers and sign them up to the PSM.

Our communication aims to be proactive, accessible and human-centred, an approach supported by our stakeholders. This is why we will continue to communicate in a variety of spoken languages (as a minimum, the top 10 languages in our region), plus non-spoken languages such as British Sign Language, and produce accessible web pages using services such as Recite Me. We will also undertake a review to ensure we are continuing to meet the web content accessibility guidelines (WCAG) Level AA standard, and a wider assessment to check we are using the best techniques and approaches suitable for vulnerable customers.

As part of our plan, we will also develop a new ‘all in one’ application solution for vulnerable customers; an approach supported by our stakeholders that also goes beyond Ofgem’s requirements to deliver for those across our region. See Customer Value Propositions section for more details. The application will be developed with stakeholders and will be robust and responsive to changing needs in the coming years, and aims to:

- improve our accessibility for those customers with special communication needs;
- enable us to respond to their requirements through the new digital platform;
- provide an alternative and less resource-intensive method of communication, which means a decrease in customer time spent contacting us through traditional methods;
- release resource to assist those customers who do not utilise digital channels;
- offer wider benefits, such as energy efficiency advice and affordability programmes;
- provide us with a two-way communication tool, increasing information on customers’ needs and helping overall customer relationship management; and
- improve awareness of low voltage power outages.

The majority of the cost increases relating to PSM recruitment are from the application development and roll-out. There will be an upfront development cost of £1.0m, with ongoing maintenance costs of around £0.2m p.a., however the benefits are likely to be significant.

Customers can make savings as a result of access to valuable information. On average, the savings from switching energy suppliers is around £350 p.a. per switch, while the savings from energy efficiency advice is around £102 per household. The application is likely to increase the instances of all these scenarios, and combined they could have a total value in the region of £4.4m.

1. High-risk customers are defined as those who are medically dependent on electricity, have a severe physical disability, chronic serious illness or have mental health needs.
Taking our support to the next level

As a vital part of our support during power cuts we are committing to faster and more personalised proactive communication and providing enhanced care for our PSM customers.

We have devised initiatives across two broad areas where we can offer enhanced support for vulnerable customers. These areas cover proactive communication before and during a power cut, and enhanced onsite welfare support during a power cut that exceeds six hours. These initiatives have been developed in line with the principles set out by Ofgem, particularly principle one, which requires vulnerable customers to be effectively supported and communicated with throughout.

To meet this new target, we will increase the size of our PSM communication team. This additional capacity will help increase the speed of response, and the ability to respond across channels according to the needs of customers. For planned power cuts we will endeavour to speak to all impacted PSM customers. We will also aim to provide these customers with a proactive contact at least three days ahead of a planned power cut.

Building on the welfare support offered to vulnerable customers during the current price control period, where we developed our vulnerability matrix to tailor services to the customer’s needs, we are planning to establish a new dedicated support team that will provide enhanced, personalised onsite welfare support in the event that a power cut is expected to last longer than six hours, when more than one household is impacted. Our target for 2023-28 is to provide onsite support during the day for 75 per cent of unplanned power cuts that impact more than one household and exceed six hours.

Similarly, we plan to work with businesses that support people in vulnerable situations, such as care homes, to develop resilience strategies.

As part of our enhanced welfare offering we are also aiming to reduce the impact of long-duration power cuts for those customers who are most at risk by increasing our capacity to install remote generation. This remote generation will include adding the capability to install up to 25 ‘suitcase’ generators per week.

There will be additional costs associated with this increased level of service, particularly around proactive customer communication and the enhanced level of support offered on site. In the 2023-28 period, there will be an increase in spending of around £1.5m per year. Almost all of this will fund proactive onsite support for customers.
Delivery partners – delivering success

- Set clear expectations for the interventions, including income maximisation, energy efficiency, health and wellbeing improvements
- Set clear KPIs
- Select projects based on our objectives
- Identify lead partners with expertise and proven delivery ability (e.g. Citizens Advice)
- Develop and deliver programmes tailored to local conditions
- Evaluate against three common metrics agreed across the sector
- Evaluate against our own Northern Powergrid-specific KPIs
- Quantify benefits through DNO-agreed SROI model and proxy bank
- Set clear expectations for the interventions, including income maximisation, energy efficiency, health and wellbeing improvements
- Set clear KPIs
- Survey a sample of customers to gain feedback for improvements
- Measure benefits
- Gain customer and stakeholder feedback

Making better and smarter use of data will improve social indicator mapping, help us better access hard-to-reach customers and deliver targeted support to vulnerable customers across our region.

We need to keep building partnerships with other organisations, and make smart use of data. This aligns with our stakeholders’ wishes for us to improve access to hard-to-reach customers in disadvantaged areas and communities.

In the current price control period, we have used data to access hard-to-reach and seldom-heard customers. Using social-indicator mapping aligned to Ofgem’s vulnerability needs codes, we acquired additional data that provides an accurate view of fuel poverty and low energy homes, and also established a Future Fairness consumer panel. We have been committed to ongoing data improvements, refreshing our social-indicator mapping and acquiring new data that will help us ensure that nobody is left behind during the energy transition.

We will continue to work across these themes by enhancing our access to hard-to-reach customers and collaborating with partnership agencies working across our regions.

Our approach to vulnerability will recognise the changing needs of vulnerable customers, and, through the use of data and working with expert panels and partnerships, we will deliver targeted support to those customers across our region.

We will select partners (including those beyond the energy sector) based on the impact that we can have working together in our region. The partners will use localised information and knowledge to enable intervention. We will continue to deliver programmes through a mix of in-house teams and partners, working proactively on issues such as affordability, and reactively to power cuts.

In practice, we will use data from Experian, our partners, our community fund, and our other programmes (including those for fuel poverty, social impact and education) to better understand social issues. This will enable identification of emerging issues, and target our support in response to the changing needs of customers. These initiatives have been developed in line with the principles set out by Ofgem, particularly principle two, which describes how the smarter use of data can help inform service development and have a greater understanding of social issues.

However, meeting the minimum expectations is not enough. We will identify additional data sources and complete more frequent data refreshes to track new and emerging issues. We will increase our work with partners to ensure representation and support across our region and enhance our access to hard-to-reach customers. This is alongside an annual review of data, partnerships and policy, in conjunction with an annual action plan and ongoing monitoring of our programmes that will be assured by our social issues expert group.

1 SROI: social return on investment.
Focussing on affordability and a just transition

We will offer affordability services that will help customers access debt and financial advice, solutions to reduce energy bills, and critical financial support.

We have made significant progress in addressing fuel poverty issues in by completing in-depth research to inform our approach, establishing fuel poverty support programmes, mapping areas of fuel poverty to assess the extent of the issue in our region and developing a fuel poverty strategy (which will be refreshed annually). Most importantly, we have developed successful programmes in partnership with Citizens Advice.

Affordability is a theme that our stakeholders have strongly reinforced for a long time, and our work to date has allowed customers to access solutions to reduce energy bills and benefit from bespoke income maximisation advice as well as in-house visits from energy efficiency advisors. We also deliver targeted communications campaigns run annually to improve reach.

Our focus in in the 2023-28 period will be to address the differing levels of support within our region, and we plan to build on the success of these programmes by scaling them up across our region. This will allow us to directly support around 100,000 customers, representing 25 per cent of our customers experiencing extreme fuel poverty.

The affordability measures include working with partner organisations to improve the effectiveness and delivery of our affordability service. This means increasing support from two to six of our operating regions so that all customers can benefit from these services regardless of where they are located. The actual support offered will include debt advice, advice on income maximisation and advice on eligibility for grants (such as the Warm Homes Discount). We will also offer referrals to ‘Green Doctor’, a charity-run initiative that delivers in-home efficiency and advice visits and offer critical financial support through a hardship fund for those facing acute fuel poverty or crisis. As noted by our stakeholders, we are seen as being impartial and are therefore well served to offer independent energy efficiency advice.

Enhancing affordability services will increase costs by £0.6m per year, which is primarily direct customer interventions and supporting products and services for vulnerable customers. But we estimate the value of this service to customers could be as much as £40m over the course of the price control period.

As part of the energy transition, we must ensure that none of our customers are left behind on the decarbonisation journey, and that the shift to net zero is made with awareness, affordability and accessibility.

When we established our low-carbon strategy we considered the impact of this strategy on vulnerable customers. We developed a research and engagement programme to understand the challenges and barriers for vulnerable customers faced with the transition, and participated in workshops with the Centre for Sustainable Energy. This work introduced the idea of a vulnerability lens, which we used to prioritise our actions, and informed the development of our ‘nobody left behind’ framework, which sets out our approach for a socially just and inclusive transition. This approach is supported by our stakeholders, who have highlighted that awareness, affordability and accessibility must be central to the energy transition.

The nobody left behind framework will provide the foundations on which we can tailor our engagement approach to ensure inclusivity and accessibility across the next price control period. In doing so, we will deliver against Ofgem’s principle three which aims to remove blockers to participating in a smart, flexible energy system. We will play our part in ensuring future policies and services are fair and reduce barriers to participation by aiming to:

— work with partners to put initiatives in place that will directly support 5,000 vulnerable customers through the transition;
— actively monitor the impact of the journey to net zero on vulnerable customers;
— collaborate with partners to develop actions aimed at overcoming barriers that emerge during the transition; and
— trial new approaches using Ofgem’s network innovation allowance (NIA).

Ensuring no one is left behind will cost £0.6m per year more than we currently spend. We are developing new areas of activity and the costs will cover research, engagement, programme development and partnership working. Our programmes will be delivered by independent and impartial partners and our newly formed team of community energy advisors (see the Our Communities section for more details). The net present value of this service, using a social return on investment model, is over £2m between 2023-28.
Embedding our approach

We want to embed a culture of protecting vulnerable customers in our operation, and be able to maximise opportunities to provide support for these customers.

Supporting vulnerable customers is the responsibility of everyone at Northern Powergrid. A key part of our vision is putting customer vulnerability issues at the centre of our thinking, especially when it comes to our people and our culture.

We have made good progress and we must keep up the momentum. In line with principle four of Ofgem’s baseline expectations, we will continue to work with our expert groups (such as those on social issues, and social responsibility management), who provide essential guidance and support for our teams. We will also continue to deliver vulnerability training to all staff which has helped us identify ‘vulnerability champions’ and created ownership of vulnerable customer issues in the business and across our region. We plan to go further by expanding and enhancing the vulnerability training we offer and give more explicit prioritisation to vulnerable customers in our investment decisions.

Where vulnerability training is concerned, we are planning to increase our in-house capabilities to train staff on vulnerability issues. We will increase the frequency of customer vulnerability training for all colleagues to every two years, improving on our current aim to do so every three years. Colleagues who have face-to-face interactions with vulnerable customers will also benefit from additional enhanced training that examines regional specific challenges, and we will coordinate with our wider customer-first training to ensure that vulnerability issues are covered (see Customer Service section for more details).

Similarly, we will enhance the roles of our vulnerability champions to empower decision-making, raising the profile of these issues throughout the business. Vulnerability issues will also feed into our practical decision making on a routine basis. For example, when considering the priority of network resilience investments, once our standard criteria have been met, we will then use vulnerability criteria to prioritise resilience works where they can deliver benefits for vulnerable customers.

Our approach to vulnerability

Our principal aim is to provide the best possible support and assistance to our vulnerable customers informed by a detailed understanding of their needs.

- To expand our understanding of vulnerability
- To improve our services
- To increase access to the ‘hard to reach’
- To ensure a socially inclusive, fair and equitable transition to Distribution System Operation (DSO)
- To alleviate the impact of fuel poverty

**Engagement, data and research**

- Developing our people
- Developing our partnerships
Customer outcomes

**VN1** Undertake targeted recruitment of vulnerable customers to our PSM, contacting all PSM customers every two years to refresh our records (LO)

- Greater reach to support vulnerable customers
- Greater flexibility for how vulnerable customers access our information and communicate with us

**Benefits**

**Deliverables**

- **VN1.1** Provide customer-facing and front-line staff with access to our PSM so they can submit real-time amendments and complete new registrations
  - % of eligible high-risk customers recruited to PSM (ODI-F)
  - 48% 54% 70%
  - Proactive contact for data cleanse every 24 months for PSM customers (ODI-F)
  - 100% 100% 100%

- **VN1.2** Using data and collaboration with our partners, develop our recruitment campaigns to reflect regional differences, including urban and rural customers

- **VN1.3** Give our vulnerable customers more choice in how they engage with us by creating a fully digitised ‘one-stop-solution’ by 2024-26 to enable a more accessible, faster and convenient route to contact us and access our services. This will also free up capacity for a more responsive telephone-based service for those who prefer it (CVP)

  - Broad measure of customer service score: overall – PSM customers (ODI-F)
  - N/A° N/A° 93.5%
  - PSM sign ups from colleague referrals
  - 8% 13% 25%

**VN2** Provide enhanced support to vulnerable customers during supply interruptions including temporary restoration and proactive communications (LO)

- Tailored support during a power cut
- Personalised and proactive support
- Proactive and more frequent communication utilising a wider range of channels

**Benefits**

**Deliverables**

- **VN2.1** Provide enhanced customer support vehicles during planned and unplanned power cuts. These will include innovative upgrades, for example, suitcase generators and pandemic safety measures

  - Broad measure of customer satisfaction (power cuts – PSM customers) (ODI-F)
  - 91.4% 91.8% 93.1%

- **VN2.2** Deliver proactive communication during supply interruptions utilising digital channels

  - Proactive contact of high-risk (P1) customers within one hour (ODI-F)
  - - 100%

- **VN2.3** Roll out regional use of net zero-ready SilentPower mobile battery vehicles to support temporary restoration during planned and unplanned outages

  - Proactive contact of all PSM customers within three hours (ODI-F)
  - - 95%

- **VN2.4** Establish a new support team to provide additional on-site support in the event that power cuts last longer than six hours, providing personalised, proactive support for vulnerable customers

  - Customers offered enhanced support on site for >6hr power cuts (ODI-F)
  - 7% 14% 75%

**VN3** Use data and partnerships to enhance our support for vulnerable customers, sharing information with trusted partners to access hard-to-reach customers

- Targeted support
- Greater understanding of our customer base

**Benefits**

**Deliverables**

- **VN3.1** Share and make priority services, enhanced service information and support tools available among trusted partners, allowing collaboration for targeted support for hard-to-reach and seldom-heard customers

- **VN3.2** Identify additional data sources and partnerships to allow us to track new and emerging issues and to support customers and, in doing so, improve our understanding of our customer base

**VN4** Support customers in fuel poverty with affordability services, targeting 100,000 customers to unlock up to £40m of benefits

- Up to £40m of benefits
- Different forms of vulnerability addressed

**Benefits**

**Deliverables**

- **VN4.1** Extend our partnership reach to deliver a regionally tailored multifaceted affordability service for 100,000 customers in extreme fuel poverty (c. 25% of those in our region) unlocking £40m of benefits

  - Average no. fuel poverty interventions p.a. (ODI-F)
  - 4,356 6,320 20,000

- **VN4.2** Work with partners to educate customers on energy efficiency and available grants

**VN5** Work with partners to put in place initiatives that overcome barriers to the smart energy transition and support a socially inclusive transition to net zero, targeting 25,000 interventions

- Vulnerable customers supported to allow them to benefit from the low carbon energy transition

**Benefits**

**Deliverables**

- **VN5.1** Work with partners to offer customers tailored support on how to benefit from the transition to net zero and ensure that vulnerable customers are not left behind

  - Average no. of customers engaged through the no one left behind programmes p.a. (ODI-F)
  - - 5,000

**VN6** Embed vulnerability across our business operations

- Enhanced support for vulnerable customers across the range of our services

**Benefits**

**Deliverables**

- **VN6.1** Deliver enhanced, regionally focused training to colleagues every 24 months

  - Front-line staff trained in rolling 24-month programme (ODI-F)
  - N/A° N/A° 100%

- **VN6.2** Apply vulnerability criteria (once standard criteria has been met) as part of prioritising network investment works

- **VN6.3** Publish an annual vulnerability report for our stakeholders covering the delivery of our 2023-28 vulnerability commitments and metrics

1. Numbers shown may be subject to rounding. See A14 Key measures in our planning for profiled targets.
2. Only the power cut element of BMCS is measured in 2015-23.
3. 2015-23 performance is not comparable as this is currently on a three-year cycle – we currently train 100 per cent of colleagues on this basis
4. See Our Communities CO3.2 Community energy advisors
## How engagement with you has shaped our plan

### Who we engaged...

<table>
<thead>
<tr>
<th>Wave 1 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Further analysis and understanding of vulnerable customers’ needs will support PSM recruitment</td>
<td>— We should improve targeting of PSM recruitment to improve awareness of the enhanced service provision and develop a system to prioritise needs</td>
</tr>
<tr>
<td>Efforts to identify and support those most in need is important</td>
<td>— Stakeholders wanted us to ensure that those who are most in need are reached. They believed that those in vulnerable situations often did not know what help was available or how to access assistance</td>
</tr>
<tr>
<td>Barriers that vulnerable customers are likely to experience during the transition to a low carbon future should be addressed</td>
<td>— Stakeholders expected us to protect vulnerable, fuel poor and rural customers during the transition to DSO. Affordability and accessibility were viewed as barriers that vulnerable customers are likely to experience. They felt there was a need to clearly communicate about decarbonisation</td>
</tr>
</tbody>
</table>

### Wave 1

**Events:** 103 total – 10 dedicated events  
**Stakeholders engaged:** 4,762 total – 331 unique interactions

<table>
<thead>
<tr>
<th>Wave 2 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options with levels of ambition were explored to help customers understand the benefits of the service levels proposed</td>
<td>Support for vulnerable customers during power cuts was viewed as important across most groups of stakeholders. Customers and colleagues believed that we should prioritise affordability, fairness and inclusivity, even over investments that enable decarbonisation, and work to embed vulnerability services into business as usual (BAU) activities</td>
</tr>
</tbody>
</table>

### Wave 2

**Events:** 135 total – 10 dedicated events  
**Stakeholders engaged:** 15,475 total – 996 unique interactions

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote and manage the PSM to ensure it reflects the make-up of our region’s vulnerable communities</td>
<td>— We will continue to grow our understanding of the levels of vulnerability across our region to make sure we are able to target our recruitment and support for our customers most in need effectively</td>
</tr>
<tr>
<td>During power cuts, vulnerable customers should be prioritised for additional support</td>
<td>— We will work with our customers and partners to develop and prioritise a range of enhanced support for our vulnerable customers during a power cut. This will include enhanced on-site welfare support for customers impacted by a power cut that exceeds six hours and the development of a priority service app</td>
</tr>
<tr>
<td>Increase partnership working, innovation and data sharing to support those most vulnerable</td>
<td>— We will build on our work with partners and use data smartly to enhance both current support for our customers and communities and the reach of future services</td>
</tr>
<tr>
<td>Increased support for the fuel poor is important</td>
<td>— We will expand the depth, reach and targeting of our fuel poverty support programmes; measuring their impact and benefits to further scale up programmes with the greatest impact</td>
</tr>
<tr>
<td>The energy transition must consider the impact on vulnerable communities</td>
<td>— We will work with local partners and experts to develop new programmes to identify and overcome potential barriers to decarbonisation to enable our customers and communities to benefit from the energy transition</td>
</tr>
<tr>
<td>Support for vulnerable customers should be embedded within all services</td>
<td>— We will continue to work across our business to build ownership, capability and understanding of the changing needs of our vulnerable customers</td>
</tr>
<tr>
<td>Vulnerable Customers acceptability score: 67%</td>
<td>— Customers who gave a lower acceptance score want more information about the new service offer for vulnerable customers. This will be explored further in Wave 4</td>
</tr>
</tbody>
</table>

### Wave 3

**Events:** 91 total – 7 dedicated events  
**Stakeholders engaged:** 32,500 total – 628 unique interactions
Our Communities

We will be a force for good in our communities, leveraging our position in our region to make a positive contribution to the communities we serve.

We see our role as being a force for good, which goes beyond running our network. This includes everything from making a positive contribution to the communities we work and live in, to creating a cleaner, greener energy system that everyone can benefit from. Our performance shows that we benefit most when we engage with trusted partners to deliver programmes that meet our social objectives, and this will continue beyond 2023. We serve not just our customers and region, but the communities we live and work in.

Support for our communities is a principle that we apply to our thinking across all areas of our business plan. We work closely with communities to develop and establish strong programmes and initiatives to improve the lives of the more than eight million customers who we serve. In the next price control period (2023-28) we will integrate our approach further by developing social programmes that simultaneously improve both the network and our communities.

Communities across our region are focussed on the after-effects of the COVID-19 pandemic. This, coupled with the shift towards a decarbonised society, is creating a changing landscape that, in our role as an anchor organisation, we must help communities to navigate.

Understanding how these changes impact households, communities and local authorities has driven our approach and grounded our plans in customer-led evidence. Our social impact initiatives in the current price control period demonstrated that our communities want us to interact more with them and to strive to meet their social needs alongside their energy and business ones.

Our approach to supporting our communities breaks down across three clear themes. Firstly, we must embed social initiatives in a way that delivers the most impact based on local area needs. Secondly, we should be supporting the most disadvantaged schools and encouraging pupils from a broad and diverse range of backgrounds to engage with STEM subjects, as well as to consider careers in energy specifically. Finally, it’s imperative that we help communities to understand, participate in and benefit from the transition to net zero, while overcoming any associated barriers.

We have measured the Social Return on Investment (SROI) that we expect our customer outcomes to deliver during 2023-28 for our communities. That is £9.09 for every £1 spent through delivery of:

- social impact schemes;
- skills-based volunteering; and
- supporting communities on the path to decarbonisation.

How much it will cost

<table>
<thead>
<tr>
<th>ED2 expenditure (annual)</th>
<th>£1.6m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vs ED1 2015-23</td>
<td>+£1.0m</td>
</tr>
<tr>
<td></td>
<td>+166.7%</td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.
A force for good in our region

Partnerships will be key to delivering our communities strategy. We will continue to use our existing strong partnership model to further enhance our relationships and collaboration, and to deliver our customer outcomes.

Our engagement has taught us that our customers value the work we do in their communities, and that we should maximise the promotion of this, thereby increasing the opportunities for people to participate in, and benefit from, the schemes that we support.

We will, therefore, also focus on raising the profile of our community support schemes to enhance awareness and participation.

The cost of our communities propositions will be £1.6m per annum, a £1.0m increase on what we are spending in the current price control period. However, this additional investment is funded through efficiencies elsewhere in our business plan. Therefore we will be able to improve our service in communities without passing this increased cost onto customers.

Our focus when working with our communities is to build on the strong baseline we have established in the current price control period to enhance our social programmes over the period to 2028.

We have worked hard to align our social programmes with our network investment programmes and, over the next planning period, we will aim to roll out social initiatives to support 50 per cent of the schemes in our investment portfolio, a significant increase from the two per cent of investment schemes that we are currently complementing with social programmes.

Key to achieving this is the support of our network of partners across the region, who will deliver grassroots initiatives such as energy efficiency and decarbonisation advice and support, STEM engagement in local schools, tree planting and woodland creation and assisting community energy groups to meet community needs as well as our social objectives.

Areas of need will be identified through our social mapping tool, which we will continue to use to plot the vulnerability characteristics across our region.

The tool provides a socioeconomic profile of an area and helps us accurately assess which initiatives will have the greatest social impacts for local communities, and deliver them.

As part of our digitalisation strategy, we plan to integrate this tool within the asset management team and our operating systems to deliver a modern, intuitive and effective service.

Our education programme is a key pillar in our communities engagement strategy and we will increase its reach in the 2023-28 period.

The aim of the programme is to improve social mobility in our region, particularly for those who live in more disadvantaged areas.

In the current price control period, we have maintained a strong focus within secondary education on developing employability skills. We will use this as a foundation to increase that support in the next price control period and our education programme will be grounded in engaging pupils in STEM and increasing their awareness and understanding of decarbonisation and the path the net zero. We will also ensure that this programme delivers the appropriate safety messages to complement our wider safety programme.

With a specific focus on schools in more disadvantaged areas, our team will be empowered to inspire growth in future skills and to showcase energy and low carbon career pathways, in tandem with our apprenticeship and graduate recruitment propositions outlined in our Workforce Resilience plan.

Our workforce is an integral part of our local communities, one that underpins the regional economy and its growth. We live and work in the communities we serve, and our education programme, along with our wider workforce resilience propositions, is designed to help us progressively diversify our workforce. It will help us to build a pipeline of talent entering our business and the wider energy industry that reflects the diverse make-up of our communities.

We recognise the important position that we hold as an anchor organisation and that we have a key role in supporting a sustainable low carbon future for our region.

We hold a privileged position - our activities have a direct impact on the communities we serve.

Supporting our more disadvantaged communities to save energy and reduce their energy bills has long been a focus of our community initiatives, but the transition to net zero means that our approach needs to evolve and include all customers to help them decarbonise.

We plan to recruit six community energy advisors (CEAs) who will cover our region to deliver advice and support to communities, partners and local organisations. The CEAs will have a number of responsibilities, including delivering decarbonisation advice and support to households, community groups, local organisations and businesses, as well as signposting to external partners offering energy efficiency advice and support. They will also have the technical expertise to support groups looking to develop and deliver community energy schemes.

They will be able to refer vulnerable households to external partners for support as part of our vulnerability strategy to ensure that everyone benefits from the transition to a zero carbon society.

There will be a strong link to the energy efficiency advice being given as part of our customer service offering to ensure that we meet the goals set out in our ‘no one left’ behind proposals. We have a role to play in supporting communities and individuals affected by the transition to low carbon technologies, which is why our communities approach extends to ensuring a just transition and the wider social mobility agenda. The CEAs will be working to deliver these wider social impact initiatives and closely collaborating with the schools team and external partners to ensure that there is a clear map to explain potential career pathways into low carbon industries.
— whether this is from education, or transferring of skills from traditionally carbon-intensive industries.

Our CEAs will also complement our team assisting in the development of local area energy plans (LAEPs) to support the decarbonisation agenda with local authorities and the wider energy sector. The team will use network knowledge, load projections, customer activity and the wider environment to provide feedback, and also feed insights into our own plans. Investment in upskilling external partners will be key. Collaborating with community groups to deliver messaging around decarbonisation and exploring opportunities for secondments into Northern Powergrid will help deliver this programme and, more widely, expand the knowledge of local groups on decarbonisation and the move to net zero. Long-term we will be exploring external contracted partnerships to expand the scheme.

### Customer outcomes

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/indictative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO1</strong></td>
<td>Deliver tailored social impact programmes for 50% of our major investment schemes</td>
<td>CO1.1) Minimum of 50% of major project investment schemes to have a social impact scheme attached</td>
<td>% of major schemes with social impact scheme attached</td>
<td>15%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CO1.2) Review potential social schemes using our social mapping tool</td>
<td>£m investment in social programmes in period</td>
<td>£0.3m</td>
<td>£0.4m</td>
</tr>
<tr>
<td><strong>CO2</strong></td>
<td>Support our communities to promote STEM subjects and careers</td>
<td>CO2.1) Develop relationships with educational establishments across our region with a particular focus on deprived areas</td>
<td>STEM pupils supported in deprived areas p.a.</td>
<td>245</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CO2.2) Support colleagues who want to take part in skills-based volunteering, to provide education on energy careers as well as opportunities within Northern Powergrid</td>
<td>Hours volunteered p.a.</td>
<td>616</td>
<td>770</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CO2.3) Become active in regional recruitment fairs and school, college and university career events</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CO3</strong></td>
<td>Offer community energy advice to support our communities on the path to decarbonisation</td>
<td>CO3.1) Educate our communities through communications, awareness activities and partnerships around the path to decarbonisation</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>CO3.2) Establish community energy advisors in each of our regions to deliver direct advice and support to groups and local authorities</td>
<td>No. schemes supported through community energy advisors</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See [A1.4 Key measures in our plan](#) for profiled targets.
2. Cumulative, in price control.
### How engagement with you has shaped our plan

<table>
<thead>
<tr>
<th>Who we engaged...</th>
<th>Wave 1 – open engagement</th>
<th>Wave 2 – optioneering</th>
<th>Wave 3 – refinement and finalising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Vulnerable</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Partners</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Regulators</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Suppliers</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>Communities</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>How...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 1 findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To create greater social impact, further collaboration with local community partners and SMEs is needed</td>
<td>Stakeholders want further collaboration with local charities, community groups and SMEs to deliver tailored social impact programmes in the area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work comprehensively with schools to support net zero and develop future energy skills</td>
<td>Stakeholders want us to be ambitious when supporting education schemes (e.g. launch a dedicated skills programme in schools to engage with children and build STEM and future energy skills)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educate customers and communities on decarbonisation pathways</td>
<td>Stakeholders want us to clearly communicate the decarbonisation process, particularly for vulnerable customers and the general public, so they understand what their options are</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 2 options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</td>
<td>Targeted support, in collaboration with our partners, for communities and customers most in need. Skilled jobs created in our regions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased reach of our social programme and support for community energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive coverage of our social programmes across the region, supporting those most in need</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‘Social impact’ model that informs asset, social and environmental investments; leverage benefits of decarbonisation and take a leading role in community energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional leader driving sustainable development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer ambition and broader findings</td>
<td>For Northern Powergrid to become a regional leader, option E received the highest number of votes with 29%. Option D, ‘Breaking new ground’, received significantly fewer votes than the other four options, with just 11%. SME and domestic customers were very evenly spread across both options C and E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 3 findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wave 3 events</td>
<td>91 total – 7 dedicated events</td>
<td>Stakeholders engaged: 32,500 total – 2,551 unique interactions</td>
<td></td>
</tr>
<tr>
<td>Wave 3 findings</td>
<td>How this has been addressed in our plans</td>
<td>Outcome Ref</td>
<td>Annex</td>
</tr>
<tr>
<td>Deliver social value schemes for communities and raise awareness of the associated programmes</td>
<td>We will continue to work with local partners to develop targeted programmes to support and build capacity within our local communities alongside planned network investment programmes, which will be increased in scale and ambition</td>
<td>CO1</td>
<td>Link</td>
</tr>
<tr>
<td>Raising aspiration and developing the new skills ready for the energy transition is important</td>
<td>We will expand our work with schools, local colleges and within our communities to raise awareness of future green and smart energy career opportunities</td>
<td>CO2</td>
<td>Link</td>
</tr>
<tr>
<td>Customers and communities need support to navigate the energy transition</td>
<td>We will build on our community energy efforts to develop a supportive advisory approach to enable customers and communities to take confident steps to decarbonise</td>
<td>CO3</td>
<td>Link</td>
</tr>
<tr>
<td>Our Communities acceptance score: 70%</td>
<td>Customers trust that we will deliver the communities plan with a joint score of 71% for acceptance and trust</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>
Connections

We will deliver a cost-effective, efficient and personalised service for all our connections customers, with smarter, more flexible solutions that support the connection of low carbon technologies onto our network in support of the transition to net zero.

The energy landscape is evolving, with net zero targets driving a significant increase in new connections for low-carbon technologies (LCTs), storage and generation. We are an enabler of this transition – connecting people to the electricity network is one of the most important jobs we do.

Every new connection we deliver contributes to the economic growth of our region by enabling new homes to be built, new businesses to start trading and new sources of renewable generation to come online and start supporting the energy system.

During 2023-28 we will deliver an efficient and cost-effective connections service. We will offer smarter, more flexible solutions that support our region’s net zero ambitions. We will give our customers more choice and deliver a range of additional services and benefits, while aiming to keep the price of a connection flat.

The connection costs that are socialised across all our customers – where the investment we make has a wider benefit to our network – will increase by £3.5m p.a. during 2023-28. This increase is entirely driven by the need to ensure our network can support our region’s transition to net zero.

Ofgem is currently consulting on how our charges should be structured and who should pay the costs of connecting to our network. We have developed this plan based on the current charging framework. We will keep our plan under review, as the decision Ofgem makes may mean that our plan needs to change.

How much it will cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (£m)</th>
<th>Percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED2 expenditure (annual)</td>
<td>£13.5m</td>
<td>2.1% of totex</td>
</tr>
<tr>
<td>Vs ED1 2015-23</td>
<td>+£3.5m</td>
<td>+35.0%</td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.

Connections prices

- Smaller connections: flat
- Major connections: flat
Quicker, easier and more efficient connections

Our plan is shaped by customer feedback.

We engaged with a broad and inclusive range of connections stakeholders and customers to inform our plan, using their feedback to develop and refine our customer outcomes.

All our customers agreed that network investment, flexibility services and the availability of network data would be key to facilitating the significant number of new and modified connections that will be required to achieve net zero.

Our customers encouraged us to be ambitious in terms of our data provision and digitalisation plans. They also stressed the importance of a personalised service and so we will be developing our online platforms for customers who want to self-serve and complement this with enhanced upfront support and technical advice for those who prefer to talk to us before making an application.

Our small works customers prioritised quicker, cheaper connections and we have responded with a target to reduce lead times. We will offer more services aimed at improving their customer journey and deliver more for the same cost for these customers.

Major works customers – consultants and developers in particular – prioritised availability of network data to allow them to perform their own upfront assessments and access to our experts. Local authorities said they need more support to deliver their decarbonisation targets and confidence in our network’s ability to support their long-term, strategic plans.

These insights have shaped our plan.

Connections are an important part of our plan for net zero.

In order to ensure that we open up all the credible pathways to decarbonisation in our region, we will help more customers to get connected to constrained areas of our network with increased levels of network flexibility, smarter solutions and reinforcement where required.

For customers seeking flexible connections, we will facilitate better, more frequent discussions at all voltage levels and help them to understand when this type of offer could result in a quicker and cheaper connection.

Our major works connections customers can expect to benefit from the deployment of active network management (ANM) schemes with associated flexibility contracts that will enable them to get connected quicker and without the need for significant reinforcement. Those same customers will also get access to an Enterprise ANM system that will allow them to access network information and curtailment operations for the parts of the network to which they are connected, and help them to understand factors affecting the performance of their connection. We have already deployed ANM across four locations, further supporting customers who may want to connect. The decarbonisation section provides more detail on our plans in this area including the flexibility services our customers will be able to access.

The decarbonisation of heat and transport are two of the most important drivers for reaching net zero. We will develop new automated processes to streamline the notification and application process for electric vehicle (EV) charge points and heat pumps, making it quicker, easier and lower cost to connect these LCTs.

In the 2023-28 period we will be increasing connections and keeping costs low with new services.

The next five-year business plan period will see us introduce more services and new automated processes that will allow us to deliver a range of additional services and benefits for our customers, while keeping the cost of connections low.

We will help all our customers, including those who are vulnerable, to get connected with a range of tailored support and services to guide them through the connections process and improve their overall experience. We are targeting delivering connections up to 20 per cent more quickly for our small works customers, while delivering the highest levels of customer service, including the ability to choose the date and time of a new connection.

To further support our customers throughout the connections process, we will provide a free advice and application checking service for small works customers who are seeking new connections or making changes to existing ones. This will include customers who are seeking connections for EV charge points, solar photovoltaic (PV) and heat pumps.

Recognising the importance our major works customers place on upfront support, we will facilitate better and more frequent pre-application discussions with our engineers. We will also offer an expanded ‘ask the expert’ service, providing technical advice on topics including which EV charging solution to select or typical loadings and connections arrangements for small and medium-sized enterprises (SMEs). Our Major Connections Strategy (annex 4.12) sets out our vision and connections service outcomes in this area.

We will focus on providing an efficient and cost-effective connections service with smarter, more flexible solutions that support our region’s low carbon ambitions.

Andy MacLennan
Commercial director
A growing number of our customers appreciate self-service opportunities. In response, we are developing our digital platforms to enable customers to self-serve and create a more seamless online experience. However, for those customers that would still prefer to talk to us we will complement this with enhanced upfront support before making an application.

To unlock further benefits for those customers who prefer to self-serve, we will build enhanced functionality on top of our open data platform, including free analytical tools to help with the processing of data, capabilities to enable self-service connection quotations, retrofitting of existing connections and more dynamic heat maps and tools to understand power flows on our network.

Through the provision of network data that is easy to access and understand, we will empower our customers to make more informed decisions about how and where to connect. Publishing more comprehensive network planning and capacity data in open and accessible formats will be key to this.

By making enhancements to our extra high voltage (EHV) and high voltage (HV) network availability heat maps, we will make them more dynamic and user-friendly, including a combined long-term development statement (LTDS) that will give customers full visibility of our network, from low voltage (LV) to EHV and support investment decisions by offering transparency at substation and feeder level.

Our award-winning AutoDesign tool will be evolved so it can be used for new generation connections and to retrofit LCTs to existing properties – this is something we were told was a priority by our stakeholders. Users will be able to identify the most viable options to connect to our LV network and get a real-time cost for the work.

We will also look to develop an industry-first LV heat map that utilises LV monitoring and smart meter data. It will give users unprecedented visibility of our LV network’s capacity and help them make more informed decisions about how and where to connect and at the right time.

We are improving the customer journey so we can offer high-quality connections services.

To do this we will:

— ensure customers have a clear choice between self-service or our expert team-led service with the ability to switch seamlessly between the two;

— support self-service customers with a new web chat tool;

— make the same tools that our own teams use available for our customers;

— maximise the number of small and major works customers self-serving by making more services available online;

— provide more data to customers about our network together with locational signals for capacity availability and forecast load growth to assist deployment strategies; and

— be as efficient as possible with available resources i.e. people, process and IT to make it quicker and easier when planning and delivering work for our customers.

We will give our customers more choice and deliver a range of additional services and benefits, while aiming to keep the cost of a connection flat.

Derek Fairbairn
System design manager
In creating our business plan, we have carefully considered that the decisions we make now will affect our region’s ability to meet net zero.

We have a network investment plan that enables us to cater for all credible decarbonisation scenarios. Our Planning Scenario assumes that we will see around 1.84m EVs on our region’s roads by 2030, requiring 32,000 new connections for EV charging infrastructure alone. We will be ready to support this and ensure our efficient and cost-effective connections service meets the future needs of our customers.

The increased demand has the potential to increase workload and we have carefully considered this and plan to resource our team and deliver capabilities accordingly, balancing need, flexibility and cost.

We will promote fair and open competition.

We will continue to promote fair and open competition in connections so that our customers have more choice in who delivers their connection. We will continue to be open and transparent by publishing guide prices and performance metrics, so that customers can compare our prices and service levels with other independent providers and decide who is best for them.

Through our development work on the open data platform, we plan to provide Independent Connection Providers (ICPs) and Independent Distribution Network Operators (IDNOs) with access to the same planning tools as our own design engineers and technicians.

To develop our future connections service, we engaged with a broad and inclusive range of stakeholders and used their feedback to refine and develop a plan which is truly customer focused and designed to address their future priorities and needs.

Figure 1: increase in connections to facilitate the EV charging infrastructure based on our planning scenario

Our Major Works Connections Strategy sets out the commitments we are making for our diverse range of major works connections customers and stakeholders.

During 2023-28, we will focus on providing a cost-effective and efficient connections service and on supporting customers throughout the end-to-end connections process.

We will empower customers to make more informed decisions about how and where to connect, through the provision of network data that is easy to access and understand. We will complement this with upfront support and advice and more options for customers who prefer to self-serve.

Our Major Connections Strategy sets out our commitments for the 2023-28 period. Customers can expect to benefit from:

— better and more frequent upfront discussions with our engineers;
— a new open data platform that will provide access to free analytical tools and comprehensive network data for those who prefer to self-serve;
— increased levels of ANM to get them connected more quickly, without the need for significant reinforcement, and access to a new Enterprise ANM system that provides detailed network and curtailment data; and
— new automated processes to streamline the notification of and application for EV charge points and heat pumps, making it quicker, cheaper and easier to connect LCTs.

We are aiming to deliver these additional services and benefits while keeping the cost of connections flat for our major works customers.
### Customer outcomes

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
<th>Output measure/* indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN1 Help our small works customers to get connected quickly by providing more self-service options, greater support and more flexibility over delivery</td>
<td>CN1.1 Develop our digital platforms for customers who want to self-serve and provide enhanced upfront support for those who prefer to talk to us before making an application</td>
<td>BMCS connections – small works (ODI-F)</td>
<td>88.9%</td>
<td>91.2%</td>
<td>92.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average connections lead time – small works</td>
<td>71.2</td>
<td>36.2</td>
<td>29.0</td>
</tr>
<tr>
<td></td>
<td>CN1.2 Provide a free advice and application checking service for small works customers and community energy groups, including for LTCs and generation</td>
<td>Time to quote</td>
<td>6.7</td>
<td>3.4</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LVSSA – small works (ODI-F)</td>
<td>14.2</td>
<td>5.5</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time to quote LVSSB – small works (ODI-F)</td>
<td>48.7</td>
<td>28.3</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td>CN1.3 Give small works customers the option to pick the date and time of their connection</td>
<td>Time to deliver LVSSA – small works (ODI-F)</td>
<td>78.5</td>
<td>36.5</td>
<td>29.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LVSSB – small works (ODI-F)</td>
<td>98.9%</td>
<td>99.0%</td>
<td>99.5%</td>
</tr>
</tbody>
</table>

### CN2 Facilitate the mass uptake of LTCs, flexible connections and network flexibility to support the drive to net zero

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CN2.1 Develop AutoDesign functionality to enable customers to self-serve and generate quotations for LV demand connections, load increases for existing LV connections and budget estimates for new LV generation connections. Go-live planned for 2025-26</td>
<td>Major connections satisfaction (overall)</td>
<td>84.3%</td>
<td>85.0%</td>
<td>90.0%</td>
</tr>
<tr>
<td></td>
<td>CN2.2 Utilise AutoDesign technology to develop an LV network availability heat map that utilises LV monitoring and smart meter data to enable real-time system planning. Go-live planned for 2024-25</td>
<td>Major connections satisfaction – pre-application services (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>90.0%</td>
</tr>
<tr>
<td></td>
<td>CN2.3 Introduce new automated systems to streamline the notification/application process for LTCs and facilitate mass uptake. Go-live planned for 2023-24</td>
<td>Major connections satisfaction – delivery (ODI-F)</td>
<td>-</td>
<td>-</td>
<td>90.0%</td>
</tr>
</tbody>
</table>

### CN3 Empower our customers to make more informed decisions about how and where to connect by expanding the scope of network information

<table>
<thead>
<tr>
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<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CN3.1 Make improvements to our HV and EHV network capacity heat maps to include the provision of an integrated LTDS and information that can forecast changes in capacity availability. Go-live planned for 2024-25</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>90.0%</td>
</tr>
</tbody>
</table>

### CN4 Continue to facilitate fair and open competition so that our customers have a choice in who delivers their connection

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Deliverables</th>
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<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CN4.1 Work with ICPs and IDNOs to further minimise input services and extend the scope of contestable works</td>
<td>Connections guaranteed standards % compliance – major works</td>
<td>99.8%</td>
<td>99.8%</td>
<td>99.9%</td>
</tr>
<tr>
<td></td>
<td>CN4.2 Publish guide prices and monthly performance metrics as well as providing clear cost breakdowns in connections quotations</td>
<td>Time to connect – unmetered</td>
<td>13.2 days</td>
<td>13.2 days</td>
<td>&lt;13 days</td>
</tr>
<tr>
<td></td>
<td>CN4.3 Develop a bespoke AutoDesign platform for ICPs and IDNOs with non-contestable costs. Go-live planned for 2024-25</td>
<td>% of major connections appointments met</td>
<td>99.3%</td>
<td>99.5%</td>
<td>99.7%</td>
</tr>
</tbody>
</table>

### CN5 Deliver an efficient connections service for all our customers, providing more technical advice to customers on smarter and more flexible solutions

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<thead>
<tr>
<th>Benefits</th>
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<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CN5.0 Provide an enhanced ‘ask the expert’ technical advice service. Go-live planned for 2023-24</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>90.0%</td>
</tr>
<tr>
<td></td>
<td>CN5.2 Upskill our LV/HV design engineers to facilitate better and more frequent discussions with customers on flexible connections at EHV, HV and LV</td>
<td>Time to connect – unmetered</td>
<td>13.2 days</td>
<td>13.2 days</td>
<td>&lt;13 days</td>
</tr>
<tr>
<td></td>
<td>CN5.3 For EHV connections, where a flexible solution could avoid the need for additional network reinforcement, we will have a detailed discussion within 14 days of receipt of a compliant application and provide the customer with the information they need to make an informed choice on the options available</td>
<td>% of major connections appointments met</td>
<td>99.3%</td>
<td>99.5%</td>
<td>99.7%</td>
</tr>
</tbody>
</table>

1. Numbers shown may be subject to rounding. See annex 1.4 Key measures in our plan for profiled targets.
2. Guaranteed standards including distribution generation standards.
3. 2015-25 period to date annual average.
4. See Whole Systems WWS2.2) Energy matchmaking scheme.

Data and Digitalisation | Workforce Resilience
---|---
Innovation | Included in Major Connections Strategy
Meeting the Needs of Consumers and Network Users – Connections

How engagement with you has shaped our plan

Wave 1

Events: 103 total – 15 dedicated events

Stakeholders engaged: 4,762 total – 1,497 unique interactions

Wave 1 findings

- Self-service and tailored guidance enable an efficient and effective connections service
  - Many customers would prefer to apply for a connection via online self-service rather than a phone call but want the option to speak to someone if necessary

- The cost of connections remains an important consideration for customers
  - Small works customers prioritised quicker, cheaper connections while major works customers prioritised value for money, upfront support and greater efficiency

- The availability of both digital and in-person channels remains important for customers
  - While there was general support for greater self-service and digital channels, customers also stressed the importance of in-person support and guidance. Customers wanted to understand the additional support available.

Wave 2

Events: 135 total – 16 dedicated events

Stakeholders engaged: 15,475 total – 5,196 unique interactions

Wave 2 options

<table>
<thead>
<tr>
<th>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
</tr>
<tr>
<td>Providing you with personal and online supported service offerings</td>
</tr>
<tr>
<td><strong>B</strong></td>
</tr>
<tr>
<td>Enhancing the personal service we provide and providing more online self-service tools</td>
</tr>
<tr>
<td><strong>C</strong></td>
</tr>
<tr>
<td>Delivering smarter, quicker, and flexible connections and supporting LCT uptake</td>
</tr>
<tr>
<td><strong>D</strong></td>
</tr>
<tr>
<td>New measures to facilitate mass LCT uptake, flexible connections, and variable network access</td>
</tr>
<tr>
<td><strong>E</strong></td>
</tr>
<tr>
<td>High levels of network flexibility and connectivity to drive, enable, support, and accelerate the low carbon transition</td>
</tr>
</tbody>
</table>

Customer ambition and broader findings

- The highest level of support was option E, with 33% of the vote; particularly for domestic customers, with 75% of them voting for the highest level of ambition to invest in network flexibility in line with a low carbon future and to increase the speed at which new connections could be established. The majority of SMEs (41%) and rural customers (39%) also supported option E, whereas option A received the fewest votes in all categories. Stakeholders commented on the importance of considering the impact on costs of this option.

Wave 3

Events: 91 total – 12 dedicated events

Stakeholders engaged: 32,500 total – 2,261 unique interactions

The role of connections to enable increased uptake of LCTs in support of decarbonisation was explored, alongside the importance of data sharing with stakeholders and the characteristics of the connections process and support models.

Wave 3 findings

- Greater support to enable small works customers to get connected efficiently and effectively
  - Clear support to connect small works more efficiently at a competitive cost and for delivering value for money to customers
- Prepare to enable an increase in LCT connections in support of net zero
  - There was clear support for high levels of ambition for proactive investments to create a smart network that enables flexible connections to facilitate the uptake of a range of LCTs
- Up to date, accessible network information underpins the energy transition for our customers
  - Stakeholders and customers supported regional collaborations
- Support for data and information sharing to deliver all effective connections processes across all parties
- Customers want a choice in how they engage and interact with us
  - There is support for increased self-service connections processes while maintaining in-person support.
- Connections acceptability score: 72%

How this has been addressed in our plans

<table>
<thead>
<tr>
<th>Outcome Ref</th>
<th>Annex</th>
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<tbody>
<tr>
<td>CN1</td>
<td>Link</td>
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<td>CN2</td>
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<td>CN4</td>
<td>Link</td>
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<tr>
<td>CN5</td>
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Northern Powergrid: our business plan for 2023-28 – 143
Openness and Transparency

We will remain open and transparent in how we operate, earning the trust of our stakeholders through Distribution System Operation (DSO) in our region. We will report on the delivery of our commitments, open ourselves up to scrutiny and support new and existing markets by providing open data, taking a flexibility-first approach to network investment.

We will evolve our open and honest culture by building trust and being even more collaborative, ensuring that together we can achieve our shared goals.

As a business we understand that being open and transparent is how we establish effective relationships, collaborate with our partners and encourage others to compete with us. We have a strong foundation and actively publish reports, share network data, facilitate fair procurement processes, encourage independent scrutiny and enable healthy competition. However, despite the mechanisms already in place, we recognise that we need to be progressive and continue to act reliably and with integrity as the demands on our business increase.

We need to continue to build trust and reinforce our open culture.

Like you, we believe that by making our data open, we can facilitate the move to a more flexible net zero energy system, stimulate competition, and enable you to interact with us more quickly, cost-effectively and easily. Our Data and Digitalisation section sets out the full details of our open data offering, including our plans to publish more network data such as combined long-term development statements, interactive heat maps, and more information on capacity and network performance. We will also explore how we can use smart meter data to provide personalised, proactive energy efficiency information and support. And importantly, we will create tools to improve the accessibility of our data to help and encourage you to maximise its use.

More information is positive, but we must also demonstrate our truly transparent system of operation.

Our regulatory framework incentivises us to optimise efficiencies and minimise costs to achieve long-term, sustainable network performance and deliver value for money. As a result, when we make decisions about our network, we always select the solution to achieve the best outcome, irrespective of whether it is asset or non-asset based. This ensures that, when investment decisions are made, they are fair and maximise customer benefits. Nonetheless, we recognise and want to address that for some, a perceived conflict of interest exists.

How much it will cost

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<tbody>
<tr>
<td>ED2 expenditure (annual)</td>
<td>£0.7m 0.1% of totex</td>
</tr>
<tr>
<td>Vs ED1 2015-23</td>
<td>+£0.2m +40.1%</td>
</tr>
</tbody>
</table>

One of our 9 plan areas, taken together, delivering more for less.
Earning the trust of our stakeholders

We have already taken steps to reaffirm that our approach to making investment decisions is transparent and equitable. We have published our investment appraisal processes and supporting metrics and have also appointed an independent body to review the application of our procedures and report its findings to us. In addition, we have identified areas where potential conflicts could materialise and made clear distinctions around roles and responsibilities to ensure that decisions are discrete and independent.

Irrespective of this, we plan to go further, and will use our transition to DSO to evolve our internal arrangements by further separating our systems and ensuring our appraisal and decision-making processes are even more robust, independent and well-defined. This will include even greater transparency by providing opportunities for you to give feedback on our major investment decisions, both in terms of traditional reinforcement and flexibility services.

To encourage more flexibility in the regulated energy sector, there has to be more competition.

We believe in healthy competition and we actively encourage Independent Connection Providers (ICPs) and Independent Distribution Network Operators (IDNOs) to carry out contestable services. By ensuring our procurement processes are fair and transparent we also attract suppliers to compete for our business. But we know that encouraging competition is important to you, and so we want to do more.

In Connections, we plan to enhance our bespoke AutoDesign platform, enabling ICPs and IDNOs to access a range of self-service tools to identify optimum points of connection and obtain instant quotations. This will save time and, for major works connections where AutoDesign is used, it will eliminate charges for connection offer expenses. We will also continue to extend the scope of contestable services that ICPs are able to undertake.

Our enhanced open data will provide real-time network information, tools and analytics to help identify opportunities such as where network reinforcement is needed. In performing the role of DSO we will continue to foster the utilisation of flexibility-first solutions by running a robust and transparent investment appraisal process. And finally, where projects meet the relevant criteria, we will adopt Ofgem’s early and late models of competition. Our plans for late competition will comprise a milestone approach that minimises customer detriment. Eligible early competition projects will be evaluated in terms of viability and customers’ interests.

Collaboration is essential to help us successfully deliver DSO roles and achieve our environmental commitments.

We already utilise robust and transparent procurement processes to achieve high standards of service that are delivered safely and efficiently. However, we know that by working even more closely with our suppliers we can collectively adopt best practice and accomplish our net zero targets. You have confirmed that you support our approach and believe it is important for our suppliers to demonstrate strict ethical, social and environmental standards.

We are taking steps to implement your feedback. Our Environmental Action Plan (EAP) includes a commitment aligning our procurement processes with the international standards set out in ISO20400. We will adopt a responsible procurement policy and an accompanying charter. The charter is being developed with the Energy Networks Association (ENA) and will clarify our environmental, health and safety, operational and compliance requirements. This will include that a minimum of 98 per cent of suppliers working on our network will be ISO14001 accredited. We have set a target of 90 per cent compliance with our charter and will report on this to you and Ofgem. During the 2023-28 period, we will engage an independent third party to review our procurement processes, allowing us to check progress and adapt accordingly.

You have told us that, to be successful, we need to take you with us on our journey to net zero.

We know that only together can we achieve a sustainable decarbonised whole energy system, foster regional economic development, promote flexible energy solutions and become more efficient. These are big challenges, and we have an important role to play. In conjunction with regional energy organisations, we will provide support and guidance using our six new community energy advisors (see Our Communities section). We will also upskill external partners and community groups to promote decarbonisation, and support groups involved in the transition to future energy systems.

Supplementing this will be the actions we take to deliver DSO and facilitate our region’s decarbonisation. We will use knowledge of our network, customers and the wider environment to provide feedback to local authorities on their future energy plans and seek input on ours. In addition, we will invest in enhanced cross-sector and cross-vector collaboration to improve system planning, and will undertake annual workshops to ensure comprehensive input. It is our intention that our distribution future energy scenarios (DFES) will become the focal point for regional energy scenarios. As a result, we plan to create six regional system-planning engineering roles to enable our local area energy planning and community energy schemes.

To ensure we are fulfilling our promises, we will appraise our performance with enhanced rigour and scrutiny.

We start from a strong position. Our governance is robust and demonstrates we understand and care about our responsibilities. Our sufficiently independent non-executive directors hold the executive directors and senior leadership team to account. We routinely report to our shareholder, the regulator and you, while several expert groups independently audit our activities. But even with these arrangements, we have found that the oversight provided by the Customer Engagement Group (CEG) during the development of this business plan has helped us to challenge our ambition, clarify benefits and evaluate if our planned expenditure is aligned with your priorities and willingness to pay.

Accordingly, we plan to retain the CEG at a cost of £0.7m during 2023 to 2028, not only to critique and report on our future business plans and the achievement of our commitments, but also to oversee our ongoing stakeholder engagement programme. As the value provided by the CEG is contingent on its independence, the chair and members will be regularly refreshed.
We will share timely and clear information about our performance, plans and achievements.

This is particularly important for our rapidly evolving priorities such as our transition to DSO and the facilitation of our region’s decarbonisation. But, when we asked you about our reporting, you told us that you wanted clearer visibility of our activity and associated costs, but you did not want us to invest in this area.

As a result, we plan to publish the reports produced by the CEG and an annual report on our DSO plans. To drive efficiencies, we will better utilise our existing material by making it easier to find on our website and more understandable by using less technical jargon. In support of our open and honest values, we will also limit the information we redact for commercial reasons.

We know we need our workforce behind us to realise our goals and commitments.

We are proud of the relationships we have built with our trade unions and, while our safety and people services teams have regular dialogue with our trade unions, our directors would welcome even greater exposure to the views of our employees. We, therefore, plan to invite our trade union representatives to attend one board meeting per year and let them choose how best to utilise the time.

### Customer outcomes

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<tbody>
<tr>
<td>OT1</td>
<td>Develop our commercial function to stimulate flexibility markets, procure flexibility and govern our internal investment appraisal processes, openly publishing and reporting on outcomes</td>
<td>Increased transparency</td>
<td>OT1.1) Publish and report on our internal processes for investment appraisal of flexibility solutions and network reinforcement in such a way that demonstrates our flexibility-first approach and ensures the best outcome for the long-term planning of the network</td>
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<tr>
<td></td>
<td></td>
<td>Increased independence scrutiny</td>
<td>OT2.1) Establish our CEG as a standing body to scrutinise our stakeholder engagement activities and delivery of our business plan outcomes</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased access to our performance, key performance indicators and decision making</td>
<td>OT2.2) Extend our reporting framework to include annual reports on DSO, Major Connections, our Environmental Action Plan, Vulnerable Customers, including upgrading accessibility to material via our website, further utilising plain English, and limiting our use of content redaction</td>
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<td></td>
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<td></td>
<td>OT2.3) Establish regular trade union meetings with our board</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OT2.4) Develop a responsible procurement charter and supporting responsible procurement charter (including underlying metrics) to drive initiatives such as sustainability and decarbonisation throughout our supply chain</td>
<td>Suppliers compliant with responsible procurement charter</td>
<td>≥90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OT2.5) Develop and implement a sustainable procurement policy and align it to the guidance set out in ISO20400</td>
<td>Network suppliers ISO14001 accredited</td>
<td>97% 97% ≥98%</td>
</tr>
<tr>
<td>OT3</td>
<td>Enable fair and open competition</td>
<td>Increased competition</td>
<td>OT3.1) Continue to proactively engage with ICPs and IDNOs to further minimise the input services they require and to extend the scope of contestable works and the services they can offer their customers (LO)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Greater choice for customers</td>
<td>OT3.2) Adopt Ofgem’s early and late competition models for applicable projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduction in cost</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. Numbers shown may be subject to rounding. See A1.4 Key measures in our plan for profiled targets.
2. Cross-reference Connections CN4.3) Bespoke AutoDesign platform for ICPs and IDNOs; cross-reference Connections CN2) Data and heat maps.

---

Northern Powergrid: our business plan for 2023-28 – 146
## How engagement with you has shaped our plan

<table>
<thead>
<tr>
<th>Wave 1</th>
<th>Events: 103 total</th>
<th>Stakeholders engaged: 4,762 total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open, innovative and meaningful engagement is important to stakeholders</td>
<td>Stakeholders wanted engagement from us to be topical and innovative and to be informed about how their feedback has been used or adopted</td>
<td></td>
</tr>
<tr>
<td>Regular performance reporting and simplification of communication is important to customers</td>
<td>Stakeholders recommended we increase the use of our data, provide regular reporting on spending and investment, and reduce technical jargon in communications</td>
<td></td>
</tr>
<tr>
<td>Open data sharing is welcomed by stakeholders</td>
<td>Support existed for more information and open-sourced data sharing with customers and stakeholders</td>
<td></td>
</tr>
</tbody>
</table>

### Wave 2 Options

<table>
<thead>
<tr>
<th>Options were costed to help customers understand the benefits and potential bill impact of the service levels proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders in regulatory integrity – always doing the right thing</td>
</tr>
<tr>
<td>A modest acceleration of DSO and digitalisation plans and increasing access to network open data</td>
</tr>
<tr>
<td>Actively facilitating regional decarbonisation in performing the role of DSO and through our supply chain</td>
</tr>
<tr>
<td>A regional leader on the path to decarbonisation, collaboratively working with local authorities and other stakeholders</td>
</tr>
<tr>
<td>Sustainable development is at the heart of our organisation and its decision making</td>
</tr>
</tbody>
</table>

### Customer ambition and broader findings

45% of domestic and 47% of business and vulnerable customers recommended we establish a high level of ambition by supporting option E, placing openness and transparency at the heart of the organisation and our decision making. Rural customers supported the most ambitious options in equal measure, with options D and E getting 33% of the votes each. Stakeholders were interested in how we work with our supply chain and wanted to see clearer reporting on topics like cost and collaboration with regional organisations. Stakeholders also would like to see further investment in technology that can improve our network operations and increase our ability to be driven by high-quality open data.

### Wave 3

| Events: 91 total | Stakeholders engaged: 32,500 total |
|---|
| During Wave 3, the approach for future energy services was discussed with stakeholders along with the need to report performance to customers on a regular basis, in a coherent and easy to navigate manner. The ongoing role for accountability and reporting to groups such as the CEG and challenge panels was also debated |

### Wave 3 Findings

<table>
<thead>
<tr>
<th>Stakeholder support for preparations for growing flexibility markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generators prioritised investment in the network and proactive communication on flexibility opportunities</td>
</tr>
<tr>
<td>How this has been addressed in our plans</td>
</tr>
<tr>
<td>Outcome Ref</td>
</tr>
<tr>
<td>Annex</td>
</tr>
<tr>
<td>We will continue to support a flexibility-first approach, developing our services, commercial support functions and reporting practices as this continues to gather momentum through the energy transition</td>
</tr>
<tr>
<td>OT1</td>
</tr>
<tr>
<td>Link</td>
</tr>
</tbody>
</table>

### Environmental reporting and governance is important

<table>
<thead>
<tr>
<th>Customers and stakeholders viewed “ensuring more than 95% of suppliers meet strict environmental management standards” as crucial</th>
</tr>
</thead>
<tbody>
<tr>
<td>We will actively hold ourselves to account, reporting on our performance transparently by our stakeholders and customers</td>
</tr>
<tr>
<td>OT2</td>
</tr>
<tr>
<td>Link</td>
</tr>
</tbody>
</table>

### Collaboration and a continued role for the CEG is supported

<table>
<thead>
<tr>
<th>Stakeholders and customers supported substantial regional collaboration and retaining the CEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>We will continue to support and promote collaboration, diligent governance and a fair, open and competitive regulatory environment. We will retain the CEG as a standing body</td>
</tr>
<tr>
<td>OT2 OT3</td>
</tr>
<tr>
<td>Link</td>
</tr>
</tbody>
</table>

### Openness and Transparency acceptability score: 74%

<table>
<thead>
<tr>
<th>Acceptance scored highly with trust at 71% being equally important to our customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
<tr>
<td>Link</td>
</tr>
</tbody>
</table>
We have built an ambitious plan for 2023-28 and in certain areas we have identified opportunities to deliver additional value to unlock significant and meaningful benefits for our customers and communities.

We are proposing four consumer value propositions (CVPs) where we have identified robust benefits for our customers. Our CVPs cover four of the five categories allowed by Ofgem. These propositions go beyond the minimum requirements and functions typically undertaken by an energy network company as ‘business as usual’.

Our CVPs form part of our overall plan to ensure we lead the drive to decarbonisation in our regions while making the transition as efficient and affordable as possible.

The benefits of our CVPs have been independently modelled to estimate the consumer value in each case. We have used the industry-wide social return on investment (SROI) tool to do this.

The Customer Engagement Group (CEG) has reviewed our CVPs and we have considered their feedback as part of the development.

The full details of our CVP proposals are set out in annex 1.5 Detail on our CVPs.

<table>
<thead>
<tr>
<th>Plan area</th>
<th>Costs</th>
<th>Consumer value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vulnerable Customers</td>
<td>£1.8m</td>
<td>£4.4m</td>
</tr>
<tr>
<td>DSO and Major Connections</td>
<td>£6.0m</td>
<td>£7.6m</td>
</tr>
<tr>
<td>Enabling Whole System Solutions</td>
<td>£8.1m</td>
<td>£31.6m</td>
</tr>
<tr>
<td>Enabling Whole System Solutions</td>
<td>£6.4m</td>
<td>£7.6m¹</td>
</tr>
</tbody>
</table>

1. The net present value (NPV) of the project is shown over a 10-year period as the CVP relates to the first-stage deployment of a future energy system and so the benefits are reflected over a longer time period.
Our Consumer Value Propositions

CVP1: app to support vulnerable customers
We will develop a one-stop app solution to support vulnerable customers to provide a more accessible, faster and convenient route to contact us and access our services.

Through our engagement, our stakeholders – including our social issues expert group – have placed emphasis on support for vulnerable customers during power cuts. Digital solutions and increased contact channels were identified as important opportunities to enhance our services.

In response to this and as part of our Vulnerability strategy (annex 4.11), we will develop an app solution that will give customers greater flexibility and convenience with access to real-time information, consolidated in one place. By extending our digital channels we will make digital services more accessible for those with complex and diverse vulnerabilities. The pandemic has accelerated an uptake of digital technologies; however, we recognise that some vulnerable communities have greater instances of digital exclusion. An additional benefit of introducing our app is that, as we open up a new channel for people who prefer engaging through that medium, we free up more capacity in our contact centre to support the digitally excluded and those customers who prefer to engage in person.

Customers will benefit from a personalised experience with access to live information on the network, proactive communications, be able to manage their own customer records and access information to support them to save money and benefit from the transition to decarbonisation.

Our proposition goes beyond the Ofgem minimum standards for vulnerable customers as it will offer consumers even greater choice in how to interact with us and provide the option to seamlessly self-serve their data and information requirements.

Our app will cost £1.8m during the 2023-28 period and will deliver a net present value of £4.4m based on an SROI of £2.85 for every £1 spent over 2023-28.

The value assumes uptake of 300,000 customers from our 900,000-strong Priority Services Membership (PSM) households, delivering benefits including reducing stress caused during a power outage, customers feeling more in control and savings realised as a result of information provided to support switching energy suppliers and energy efficiency advice.

We propose that 30 per cent of any CVP reward would be contingent on delivery of the app, with the remaining 70 per cent contingent on uptake (number of vulnerable customer users) proportionate to the forecast used to derive the projected benefits. Non-delivery of the app would result in full clawback of any reward.

This will cost around £6.0m in the 2023–28 period, delivering a net present value of £7.6m based on an SROI of £1.47 for every £1 spent.

The benefits we have modelled include the savings from designers’ time as customers self-serve their connection requirements and the savings achieved from connection offer expenses.

We have however been unable to reliably determine the benefits from the open data portal as we cannot quantify who will use the data, what it will be used for and the downstream benefits this will bring. Our approach reflects a very prudent view as we anticipate benefits delivered from the open data portal will be significant.

CVP2: self-service analytics toolkit
We will build enhanced functionality on top of our open data platform to unlock additional customer benefits including a set of free analytical tools to help process data and enhance self-service.

Our stakeholders have told us that they not only want to access but also to better understand and be able to interact with our network data. We have received very strong support for our self-service offerings such as AutoDesign. In response to demand for this type of provision we will develop a comprehensive open data platform that we can build on to establish a variety of self-service channels across a range of existing and future service lines.

The decarbonisation transition will impact a wide range of stakeholders, all of whom will have different requirements to serve a variety of outcomes. To give functionality to our open data we will provide an analytics toolkit that will allow more self-service and value to be extracted from our data, supporting uptake of low carbon technologies (LCTs) and planning for decarbonisation.

Our analytics toolkit will include capabilities to enable self-service connection quotations, budget estimates, the connection of LCTs, dynamic heat maps, and tools to understand power flows on our network.

Our plans go beyond Ofgem’s minimum data provision requirements, adding analytics tools and self-service offerings, brought together into one place for ease of access. This will allow customers to extract maximum value from our data. It will also provide a scalable solution as more LCTs connect to our network.

This will cost £1.8m in the 2023–28 period, delivering a net present value of £7.6m based on an SROI of £1.47 for every £1 spent.
We propose that any CVP reward is contingent on delivery of each functional work package that goes above Ofgem’s baseline requirements package. We propose a 20 per cent clawback of the reward for any of the packages that are not delivered. The functional work packages are: connection quotations, connection budget estimates, small LCT retrofitting of connections, dynamic heat maps and the analytical tools.

Our self-serve analytics toolkit CVP will deliver a range of benefits across our customer base:

- Domestic (including vulnerable) customers will be able to assess the viability and costs associated with adoption of LCTs such as electric vehicles and heat pumps, simply by inputting their addresses.
- LCT installers will be able to identify costs and timescales for projects in real time.
- Major connections customers will be able to self-serve to obtain quotes for potential connections to the network up to 210kVA.
- Flexibility aggregators will have visibility of the network to identify potential network constraints where flexibility opportunities lie and support wider decarbonisation initiatives.
- Local authorities will be able to use network data to plan for decarbonisation and identify the most cost-effective routes to deliver their plans, which may include assessment of development opportunities, green belt and brown belt development, locational pricing signals, public transport planning, localised community energy schemes and supporting vulnerable customers.
- Independent Connection Providers and Independent Distribution Network Operators will be able to self-serve their requirements for network data and formal points of connection offers as and when they need to, further reducing the requirement for input services and supporting competition. Their connections will be faster and cheaper.

CVP3: dynamic voltage optimisation
We will improve domestic energy efficiency through dynamic voltage optimisation to reduce customers’ bills and carbon emissions.

Our stakeholders have told us that decarbonisation and affordability are key priorities.

Our Boston Spa energy efficiency trial (BEET) innovation project is piloting using smart meter data in near real time to dynamically optimise the high voltage (HV) and low voltage (LV) network to improve customer energy efficiency. The project consists of three phases, and we are currently in phase two.

Subject to successful trials in the remainder of the current period, we will rapidly ramp up deployment to target roll-out of the technology and capability to 147 primary substations (27 per cent) serving 1.0m customers over the 2023-28 period. Beyond 2028 we will complete the roll-out to a further 294 substations,1 which will mean over the project’s lifetime it will deliver benefits to 3.1m customers.

1. Eighty per cent of our primary substations. The remaining 20 per cent of our network is either technically incompatible with this solution or voltage optimisation is not required.

Boston Spa energy efficiency trial (BEET)

Phase one
Now completed, proved that existing methods of voltage control available to us are not suitable for voltage optimisation and therefore a new approach was required.

Phase two
We are integrating smart grid and smart meter systems to develop capability to undertake and implement a new voltage optimisation technique within a trial area in Boston Spa.

Phase three
We will explore whether this new technique can be used to provide other services, such as frequency response.
With our solution deployed we estimate that on average customers will receive a reduction in their energy bills of approximately £20 p.a. as well as 27kg of lower carbon emissions annually per household per year as we deliver optimised voltage levels. Customers will be able to benefit from these savings without having to take any action. Additional benefits will be felt by the wider system including additional capacity to connect and improved network operability due to the identification and mitigation of voltage and thermal issues on the network.

Our proposal delivers above Ofgem’s minimum requirements. It delivers whole system benefits by leveraging our assets and data to manage energy efficiency behind the meter, generating wider economic and societal benefits while making the system more efficient.

Our proposal will cost £8.1m over the 2023-28 period, and will deliver a net present value of £31.6m based on an SROI of £4.52 for every £1 spent.

In the event of non-delivery we propose any reward is clawed back pro rata on the proportion of customers for whom the solution is not delivered compared to the projection used to calculate the reward.

Our Consumer Value Propositions

CVP4: next-generation energy systems

We will undertake first-stage deployment of the blueprint for a next-generation energy system, enhancing system resilience, particularly for remote customers.

Our engagement has reinforced that reliability and resilience are particular concerns for our rural customers who want to participate in decarbonisation.

Through our innovation programme we are currently testing the viability of enhancing resilience through use of storage and smart technology at remote substations to provide a step change in resilience for remote customers, facilitating communities to become mutually supportive of one another in the event of upstream faults.

Subject to successful trials, we plan to begin first stage roll-out in the 2023-28 period, demonstrating this solution on our network by deploying 30 microgrids as a blueprint for the next-generation energy system.

Customers will experience a more resilient energy supply, protecting them from the inconvenience caused by even very short interruptions. This will improve customer service, particularly for customers in rural areas who are susceptible to supply interruptions and support the transition to a future energy system which is becoming increasingly reliant on electricity. Through use of storage and smart technology at remote substations we will support localised dependable energy as the number of energy vectors reduces.

Successful deployment will allow for wider roll-out beyond 2028 and, by 2050, potentially up to 20 per cent of our network could be served by microgrids. The benefits however will be wider than just for our customers, as other Distribution Network Operators (DNOs) are able to adopt the solution in other parts of the country.

Our proposal delivers above the baseline standards as it could demonstrate that power microgrids provide a more dependable whole system.

In the event of non-delivery we propose a linear clawback of reward based on the number of microgrids delivered during the period.

Our proposal will cost £6.4m in the 2023-28 period delivering an NPV of £7.6m based on a SROI of £1.40 for every £1 spent over a ten year period.

We used the value of lost load and the costs savings microgrids can achieve through deferred reinforcement that would otherwise be required between 2023-33 to calculate customer benefits.

A ten year period was deemed more suitable to capture consumer value as we look to prove the concept for future roll-out and capture some of the costs savings from deferred reinforcement, which will be required between 2023 and 2050.

Support for our plan

“We the business planning process has been thorough and you have articulated to the many stakeholders what the issues are and also what some of the options are as you endeavour to adapt to fundamental changes in the energy sector.”

Keith Jackson, Boston Spa community green group, member of Northern Powergrid stakeholder panel
Unleashing the potential of... Innovation

We have developed a sector-leading programme of exciting, cutting-edge innovation that accelerates the creation of next-generation energy systems and balances the targeted development and deployment of solutions demanded in our plan. We will explore high-potential transformational technologies to unlock unimagined benefits for current and future energy system customers.

Our plan recognises that innovation is vital to enabling decarbonisation while ensuring both the reliability of our network and affordability of our services for all of our customers.

We approach innovation mindful of the fact that the customer benefit matters more than our methodology. For instance, although an innovative solution will often deliver technical changes – for example, reduced reinforcement to connect low carbon technologies (LCTs), or faster restoration of customers’ power for heat, transport and lighting – it’s the benefit that the customers see that matters most. There will be technical solutions, information and data-based techniques, commercial agreements and other methods that enable those changes, and all are within the scope of our innovation strategy.

Our track record gives us confidence in harnessing the benefits of innovation. We have delivered more than £23m of benefits since 2015, with more to come, by rolling out innovation associated with developments such as improved low voltage (LV) fault management, flexible connection arrangements, and perfluorocarbon oil leak tracers into business as usual. Voltage management has created 4GW of capacity for customers to install domestic solar generation (creating a potential customer value of up to £75m).

1. Dependent on customer take-up of the opportunity. Based our ground-mounted substations, 75 per cent require no work or tap settings only and 25 per cent require replacement with an upgraded transformer.
Driving benefits through innovation

Building on this, in 2023-28 we will seek to provide higher value and better services, connecting increased numbers of electric vehicles (EVs) and heat pumps, and catering for the resultant increased demand, while maintaining downward pressure on costs and ensuring vulnerable customers are not at a disadvantage in the energy system transition. The innovation-related benefits in our 2023-28 business plan build on an already high level of deployment within 2015-23. We plan to accelerate the deployment of innovation benefits as the programme matures though 2021-28.

We will do this through a focus on four strategic outcomes that address the challenges we face:

1. Developing and deploying technologies and creative solutions that enable faster, lower cost pathways to decarbonisation.
2. Working with partners to open up new channels that significantly, efficiently and effectively increase the exploitation of data flows across the whole energy system.
3. Increasing the reliability, resilience and security of the power grid to improve not only its own dependability, but also that of the overall energy system.
4. Promoting and safeguarding the interests of customers, particularly those who may otherwise be significantly disadvantaged or left behind in the energy system transition.

Additionally, we will embrace our central role in the energy system by looking beyond the services that have been familiar to our sector, applying our thinking to the whole energy system and its supply chain, assisting communities and charities in their decarbonisation work, and adopting data techniques and traditional or novel assets as appropriate for efficient and effective investment.

**Innovation is embedded throughout our plan, delivering £278m of net totex savings in the 2023-28 period.**

Innovation is embedded throughout the 12 output areas in our plan delivering significant savings.

Our plan contains £150.5m of investment in business-as-usual (BAU) innovation and roll-out of previously proven innovation in the 2023-28 period. This investment drives net totex efficiency savings of £277.6m embedded in our cost forecasts (70 per cent of the total efficiencies in our plan).

In addition to this, automating our connections interactions will lead to improved service levels but we estimate that it will save customers using the connections process to around £10m in the 2023-28 period. Our dynamic voltage optimisation roll-out (see Consumer Value Proposition section and annex 1.5 Detail on our Consumer Value Propositions) using information from smart meters is estimated to generate £34m of energy bill savings for customers by 2028.

This is a total benefit to customers in excess of £320m in the 2023-28 period.

To be able to roll out more beneficial innovation learning beyond the 2023-28 period we are also investing now for the future where there is a reasonable likelihood of significant customer benefits.

We will invest £24.5m funded via Ofgem’s network innovation allowance (NIA) mechanism is significant innovation associated with decarbonisation and the activities that support it, including customer vulnerability and ensuring customers can depend on their decarbonised energy supply. Additionally, we expect to bid for further funding via the Strategic Investment Fund (SIF), Innovate UK, Horizon 2020 or similar routes as appropriate bid topics become available. We set out more detail on our proposed use of NIA and SIF funding in annex 5.1 Innovation Strategy.

---

**2023-28 period (£m)**

<table>
<thead>
<tr>
<th>Output area</th>
<th>Investment in BAU innovation and roll-out</th>
<th>Net cost savings from innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decarbonisation</td>
<td>45.2</td>
<td>125.9</td>
</tr>
<tr>
<td>Reliability and Availability</td>
<td>21.1</td>
<td>24.2</td>
</tr>
<tr>
<td>Asset Resilience</td>
<td>19.7</td>
<td>83.7</td>
</tr>
<tr>
<td>Climate Resilience</td>
<td>1.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Environment</td>
<td>37.3</td>
<td>41.2</td>
</tr>
<tr>
<td>Safety</td>
<td>8.1</td>
<td>-</td>
</tr>
<tr>
<td>Physical and Cyber Resilience</td>
<td>12.1</td>
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<td>Customer Service</td>
<td>2.6</td>
<td>-</td>
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<tr>
<td>Vulnerability</td>
<td>1.8</td>
<td>-</td>
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<tr>
<td>Our Communities</td>
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<td>-</td>
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<tr>
<td>Openness and Transparency</td>
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<td>-</td>
</tr>
<tr>
<td><strong>Subtotal: totex</strong></td>
<td><strong>150.5</strong></td>
<td><strong>277.6</strong></td>
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**Connections customer savings**

<table>
<thead>
<tr>
<th><strong>2023-28 period (£m)</strong></th>
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<tbody>
<tr>
<td>Connections customer savings</td>
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</table>

**Energy bills savings**

<table>
<thead>
<tr>
<th><strong>2023-28 period (£m)</strong></th>
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<tbody>
<tr>
<td>Energy bills savings</td>
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</table>

**Total**

<table>
<thead>
<tr>
<th><strong>2023-28 period (£m)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

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1. These strategic outcomes are discussed in greater detail in **annex 5.1 Innovation Strategy**.
2. Excludes 2023-28 NIA costs and benefits
4. Relates to non-discounted cost benefits from our voltage optimisation CVP.
We have identified six key areas of transformational capability where we believe that a step change in knowledge and expertise is required in the 2023-28 period.

The majority of our innovation activity is associated with the areas of our plan that demand significant change and capability enhancement, which we refer to as ‘pull’ innovation. Pull factors include:

— the need to manage rapid load growth on the existing network, particularly at LV, driven by decarbonisation;
— the need to be able to model flexibility power flows and benefits, especially to address LV constraints;
— the requirement to analyse, understand and respond to changes in load diversity caused by mass adoption of LCTs and the flexibility techniques that we expect to emerge; and
— the desire to enhance the notification and connections process to facilitate increased low carbon installation and multi-vector load use (e.g. hybrid heat pumps).

We have embedded £277.6m of innovation benefits in our 2023-28 costs.

**Strategic outcomes**

- **Charting the best course to net zero**
- **Collaboratively unlocking the value of open data**
- **Achieving next-level energy system dependability**
- **Ensuring all customers benefit**

**Transformational capabilities**

1. Identify opportunities to accelerate the benefits of flexibility
2. Develop sophisticated data management and analytics to inform energy system forecasting, planning and real-time decision making
3. Enhance the connections process to facilitate higher volumes and different types of connection, including the addition of loads via existing connection points
4. Increase the dependability of our customers’ electricity supply
5. Remove barriers preventing access to the energy market for all customers including access to energy data; particularly those not currently engaged or informed, vulnerable or less advantaged
6. Create capabilities to deliver a next-generation local energy network that links up whole system energy sources and vectors, balancing in real time
Innovation is also driven by the development of new technologies and techniques often with the potential to disrupt traditional approaches. This ‘push’ innovation is harder to predict as it is generally associated with emerging technologies. An example from the recent past would be the rise of electric vehicles as a serious transport choice. Going forward, artificial intelligence (AI), 5G, and internet of things (IoT) solutions are likely to offer potential that has not yet been applied to situations such as ours, as are self-driving vehicles. But there will be other digitalisation technologies and data capabilities as yet unknown that might be just as important. We need to remain agile and ready to seize the opportunities they will offer.

Data and digitalisation is particularly relevant because it will offer both push and pull opportunities, especially as we move to DSO world. Initially it will improve the way we deliver our existing services – connecting customers’ load, keeping the lights on, and facilitating decarbonisation. But we expect this to evolve to enable a host of wider whole system benefits for customers and some of the two-way automated interfaces we will need are yet to be conceived. The Boston Spa energy efficiency trial (BEET) combining network and customer data to drive automated system optimisation is an embryonic example of what closed-loop blended data might do for us.

The relationship between the strategic outcomes, transformation capabilities and push and pull innovation motives is discussed further in annex 5.1 Innovation Strategy.

Innovation is also key to delivering our customer output commitments.

Innovation benefits drive many of the customer outcomes we are committing to in this plan.

Innovation has enabled simple techniques – such as changing voltage set points to improve access to our network for low carbon energy, freeing up capacity for customers – and we can build upon these as we go into 2023-28.

We aim to improve customer service by digitalising the connections and notifications process, improving network data quality and facilitating faster installation of customer equipment. This builds on the improved convenience and time and cost savings of our AutoDesign system.

Rethinking restoration through our use of SilentPower vehicles for small LV faults has reduced both emissions and running costs and we will expand this as we decarbonise further, rolling this solution out as part of our customer vulnerability plans.

Our microgrids roll-out (see Consumer Value Proposition section and annex 1.5 Detail on our Consumer Value Propositions) will improve the dependability of energy supplies customers need as they decarbonise and as the energy system moves to intermittent and seasonal renewable energy sources. This dependability benefit is particularly notable during extreme weather events driven by climate change.

We will improve operational performance via our innovation including a richer understanding of our assets and of the implications and benefits of flexibility, minimising disruption on the network and improving scheduling of network reinforcement and renewal.

Collaboration is at the heart of our strategy to ensure maximum benefits from innovation for our region, the industry and wider sectors.

We are committed to maintaining a culture and environment within our business where new technologies and learnings are sought out, shared and embraced to provide a modern local energy network where improvements are always being made.

Innovation is deliberately not a siloed area. We source ideas widely across our organisation, from other companies within our ownership group, and from external organisations and institutions.

We have a well-established ethos of partnership and collaboration with a diverse range of organisations; our current innovation portfolio including our customer-led distribution system (CLDS), activating community engagement (ACE), SilentPower, Integrated Transport Electricity and Gas Research Laboratory (InTEGReL), AutoDesign and MicroResilience projects is testament to that. This has been reinforced by the Energy Innovation Centre (EIC) ranking us as the most collaborative electricity network.

This is set to continue as we develop existing relationships and actively seek out new partnerships and opportunities to collaborate. In a typical year around two thirds of the innovation ideas by value are suggested by third parties and 85 per cent of our innovation investment is with third parties. All innovation proposals we undertake will continue to be subject to review by our expert non-executive director with innovation oversight reporting directly to our board.

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1. Details of CLDS, ACE, SilentPower, InTEGReL, AutoDesign and MicroResilience and other projects in our portfolio can be found at https://www.northernpowergrid.com/innovation.
Our BEET and Community DSO Network Innovation Competition (NIA) bid represented two excellent examples of third-party-generated projects brought to us by a customer and engineering consultancies respectively. Ofgem’s Strategic Investment Fund will further foster the opportunity to develop collaborative and third-party driven projects in 2023-28, with more diverse parties and ideas taking part and opening up a wider set of benefits for customers.

Our approach to delivering innovation projects further embeds our culture of innovation. Project managers are selected from the parts of the business that will benefit from the eventual roll-out of the learning, and have responsibility for facilitating that roll-out. Members of our executive team take responsibility for the progress of our innovation activities in their operational units.

As part of our whole system approach to decarbonisation, it is essential that our collaboration includes other network companies and companies from other sectors. This includes working together to develop innovation projects but also disseminating the learning from the projects of others. We are doing that already through our work at InTEGReL and with Nissan, our discussions with the rail sector, and our dissemination of Distributed Solar and Storage Study (DS3)1 learning to developers. This will only increase in the 2023-28 period.

**SilentPower**

SilentPower has allowed us to use a carbon-free alternative to reduce running costs and support customers’ solar generation in 25 per cent of the small faults previously restored by mobile diesel generators. We plan to roll out six additional vehicles to support our customer vulnerability strategy in the 2023-28 period.

**AutoDesign**

AutoDesign has reduced connections costs and allowed more than 2,850 small LV designs to be produced by customers to generate indicative connections costs, reducing timescales from 10 working days to just a few minutes. AutoDesign also allows customers to choose the cable route on their property and see relative costs of different routes.

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1. Learn more about our DS3 project: [https://www.northernpowergrid.com/innovation/projects/distributed-storage-solar-study-nia-npg-011](https://www.northernpowergrid.com/innovation/projects/distributed-storage-solar-study-nia-npg-011)
## Supporting our objectives

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Innovation transformational capabilities</th>
<th>Benefits</th>
<th>Impact on output areas</th>
</tr>
</thead>
</table>
| IN1  | Identify opportunities to accelerate the benefits of flexibility | — Allow use of low cost energy at times of plentiful generation  
— Contain network costs by avoiding reinforcement  
— Facilitate faster connections and installations of customer equipment  
— Minimise disruption at times of reduced network or generation availability  
— Improved scheduling of asset reinforcement and renewal – lower cost, disruption to customers, smarter works coordination  
— A richer understanding of the implications and benefits of flexibility, how best to deploy it and the mechanisms to use it most effectively | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ○ ○ ○ ○ ○ ○ ○ ● ○ ○ ● ○ |
| IN2  | Develop sophisticated data management and analytics to inform energy system forecasting, planning and real-time decision making | — More targeted, lower-cost reinforcement and flexibility purchasing  
— Allow energy matchmaking in the connections process, reducing connections costs  
— Interconnected systems giving faster speed of response, more efficient processes and easier access to information  
— New opportunities to exploit mass data streams through integration and access to key information  
— Improved scheduling of asset reinforcement and renewal – lower cost, less disruption to customers, smarter works coordination  
— Cost reduction via artificial intelligence (AI) in place of labour-intensive processes | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ● ● ● ● ● ● ● ● ● ● ● |
| IN3  | Enhance the connections process to facilitate higher volumes and different types of connection | — Ensure that the electricity network is not a barrier to decarbonisation  
— Lower cost for connections  
— A quicker and more tailored connections service, driving improved customer satisfaction  
— Longer opening hours and more convenient access to our services  
— Transparency of connections design and pricing decision making  
— Greater internal capacity to facilitate more low carbon technologies (LCT) connections that contribute towards our net zero ambitions | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ○ ○ ○ ○ ○ ○ ● ○ ○ ● ○ |
| IN4  | Maintain the dependability of the energy system as seen by the customer during the energy system transition and decarbonisation | — Energy remains dependable even with a reduced number of energy sources  
— Customers can expect power to their homes particularly when they need it most (e.g. during storms)  
— Power for all uses including heat, transport, and information systems will be available throughout the seasons  
— Summer minimum and winter maximum demands and corresponding generation loads catered for | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ○ ○ ● ● ● ● ● ● ○ ○ ○ |
| IN5  | Remove barriers preventing access to the energy system, including access to energy data, particularly for those not currently engaged or informed, vulnerable or less-advantaged | — Customers know they can depend on the whole energy system to provide power to meet their needs as they become more reliant on electricity  
— Customers support the work programmes and initiatives we run to manage the network  
— Customers are more inclined to transition to LCTs | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ○ ○ ● ○ ○ ○ ● ● ● ● ● |
| IN6  | Create capabilities to deliver a next generation local energy network that links up whole system energy sources and vectors, balancing in real time | — All customers understand the benefits of a smart flexible energy system and know how to access them  
— Facilitating a fair and equitable transition to a low carbon energy system  
— A faster route to net zero with more customers able to access low carbon energy  
— Enhanced energy system reliance to physical and cyber disruption | Decarbonisation  
Safety  
Reliability and Availability  
Asset Resilience  
Climate Resilience  
Physical and Cyber Resilience  
Customer Service  
Vulnerable Customers  
Our Communities  
Connections  
Connected Future | ● ● ○ ● ● ● ● ● ● ● ○ |

Key: ● Major Impact  ○ Minor Impact  ○ No Impact
## How engagement with you has shaped our plan

### Wave 1

**Events:** 103 total – 2 dedicated events  
**Stakeholders engaged:** 4,762 total – 61 unique interactions

<table>
<thead>
<tr>
<th>Open data and information sharing will support innovation to deliver net zero</th>
<th>Stakeholders wanted us to share more information and open-source data with them and customers to increase the quality of messaging and to increase innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilising innovation to provide additional support for vulnerable customers and communities is welcomed</td>
<td>Stakeholders urged us to expand engagement to explore how innovation can develop solutions to provide support for vulnerable customers and leverage emerging technologies</td>
</tr>
</tbody>
</table>

### Wave 2

**Events:** 135 total – 5 dedicated events  
**Stakeholders engaged:** 15,475 total – 187 unique interactions

*Most customers stated that we should invest in innovation projects linked to reliability of our network, as this was viewed as being central to our role as a DNO. Customers supported continued investment in innovation projects, especially when linked to decarbonisation. However, they recommended we do more to consider customer outcomes and financial returns when making innovation funding decisions in other areas.*

### Wave 3

**Events:** 91 total – 9 dedicated events  
**Stakeholders engaged:** 32,500 total – 417 unique interactions

*During Wave 3, the role of innovation to enable a net zero transition and network resilience was explored with stakeholders. Initiatives to support vulnerable customer and communities were debated with an emphasis on the importance of demonstrable outcomes and benefits.*

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
</table>
| Flexibility is important for a successful energy transition  
Most domestic and business customers and 67% of rural customers voted for the upper levels of ambition (options D or E) to create high levels of flexibility and connectivity | We will work with stakeholders, industry partners and flexibility providers to develop our current and future flexibility market offer | IN1 | Link |
| Open data with greater availability of network data is supported  
Most stakeholders support increased collection and sharing of data on energy consumption. Most domestic and future customers are comfortable with us sharing data on household-level energy use | We recognise the important role open data plays in supporting an effective energy transition and we will develop data capture and analysis capabilities to support future dynamic network management | IN2 | Link |
| We should invest ‘ahead of need’ to support flexible connections  
Local and national authorities, interest groups, and councillors emphasise their support for the increased use of solutions such as heat pumps, hydrogen, smart meters, solar farms, geothermal generation, or even direct current, with several constituencies actively planning for investments | We will progress the development of agile connections practices and processes to support an acceleration in LCT connections | IN3 | Link |
| We should develop a network for the future  
Stakeholders perceived that we have a key role to play in the transition to net zero by ensuring that the required infrastructure is in place to facilitate new connections for LCTs | We will continue to prepare the network for the energy transition, maintaining resilience and reliability for our customers | IN4 | Link |
| Future energy services and data sharing is supported  
Many stakeholders are eager to explore methods to better share data more actively to facilitate the transition to DSO | We will work collaboratively with partners and stakeholders to identify ways to mitigate future barriers preventing access to the energy system for our customers | IN1 | Link |
| Stakeholders support our collaborative approach to innovation  
Stakeholders want us, the government and the regulator to work together to ensure that policies and regulations are in place to allow peer-to-peer trading. This will mean that more communities can benefit from using local energy | We will continue to develop a whole system approach to the development of a smart, future-proofed network for our customers | IN6 | Link |
| Innovation acceptability score: 79% | 79% of customers agree that Innovation is crucial for the successful delivery of the plan | - | Link |
Unleashing the potential of...

Data and Digitalisation

Changing customer needs and the decarbonisation challenge require an increasingly decentralised and digitalised energy system. That includes the value in sharing data openly both within the sector and with wider stakeholders. These, along with stakeholder feedback, are the key factors that have shaped our vision for data and digitalisation.

We have been on our digitalisation journey for some time. In the 2015-23 period, we invested to capitalise on new and emerging technologies to increase our digital capabilities and secure your information and power supplies. We undertook significant investment of more than £21m in digitising our asset records and implementing system design tools to model a wide variety of operational conditions as we transitioned to a more active network operation. In the same period we invested £26m in cyber resilience, meaning that we can continue to secure your existing and future services while reducing costs. (Read more in the Physical and Cyber Resilience section.)

We are well advanced in the deployment of our smart grid enablers programme, which is transforming our ability to monitor, control and communicate with more than 860 major substations and 5,500 distribution substations in 2015-23. This programme allows us to respond in real time to information about power flows on our network, which contributes to reliability and availability.

These examples are the building blocks in which we will continue to invest to build our digital capability. Our investments to date have provided a stable foundation, allowing us to focus on providing the technology to underpin the next phase of the journey. Decarbonisation, and all its opportunities and challenges, will be front and centre, but our comprehensive data and digitalisation strategy covers the entire plan. To deliver those requirements involves a relatively complex set of detailed, interconnected and inevitably technical workstreams. But the key guiding principles on which we have based our strategy are things that we think make sense to everyone in our business and to our stakeholders:

- **Openness and transparency** – enabling innovation and development of new markets while delivering net zero at the lowest cost.
- **Whole system efficiency** – preparing for both a cost- and carbon-optimised whole energy system.
- **Service excellence** – delivering seamless, efficient service with more choice and personalisation.
- **Cyber security** – responding to and mitigating the cyber threats of increased digitalisation.
- **Reduced cost** – driving lower-cost, efficient operations in both the front and back office.
We are planning to deliver an increased level of digitalisation of our network in both scale and sophistication. In some cases, that will call for a widespread roll-out of technology applications that we might already be experienced with. In others, we will need to augment our capabilities to keep pace with the requirements and unlock the value associated with more complex interactions.

In particular, we expect to significantly expand our use of data for planning and operation of network and customer assets and we are anticipating that that to lead to applications where mixed data sets (both from within and outside our system) combine with analytical and control capabilities to exert a level of automatic, closed-loop control over our assets and those owned and operated by others.

The pace of change will be determined by the need. It is not efficient to deploy solutions where there are no problems, but we must also be ready to efficiently deliver solutions when problems arise. To ensure that the technologies available at the earliest stage of maturity can continue to deliver at the highest levels of maturity, we have and will continue to select solutions that are scalable, so can grow and shrink as our needs change, extensible, to allow us to take a modular approach to plugging in new capabilities, and interoperable, to drive a loosely coupled architecture that is flexible both internally and when connecting with external sources too.

For instance, we plan to utilise cloud-based analytical services to initiate the capability early in our plans, providing common data warehousing early, but utilising the modular and scalable nature of this architecture to add artificial intelligence (AI) and machine learning when the time is right, growing the storage capacity automatically as the amount of data increases with our maturity. This model will also allow us to easily bring in external data sources systematically while providing the platform upon which we can build our open data portals and customer-facing analytical services.

Our extensive engagement has confirmed that you support our plans to open up our data and to invest in technologies needed to drive decarbonisation as part of the whole energy system.

We have engaged with our stakeholders specifically on data and digitalisation, while also ensuring that we reflect the reality that this is not an end in itself. It is a cross-cutting theme that runs right through our business plan and the associated engagement programme. The development of our digitalisation strategy and action plan (DSAP) is not a brand-new initiative. We have published three versions of our plan so far, engaging widely with our stakeholders as we have refined our thinking and aligned our data and digitalisation plan ever more closely with our wider business plan.

To ensure our plan is fit for purpose and focused on the right initiatives, we have undertaken research into stakeholder requirements and have engaged with multiple categories of stakeholders through a series of events, targeted engagements and subject matter expert conversations.

In our latest iteration of DSAP we have formalised our stakeholder engagement methodology in annex 5.3 Digitalisation Strategy and Action Plan. In developing our plan we first developed a list of stakeholders that we wanted to connect with – a mix of new and established relationships selected on the basis of their industry, use of data and subject matter expertise. This included individual customers, organisations and institutions such as universities, central and local government, major industries and green energy groups. We then directly contacted this list, comprising more than 1,700 stakeholders, alongside distributing a press release and utilising social media to further publicise our DSAP, inviting further comment. Specifically using social media, we used polls to ask for feedback on key questions.

To ensure that we have sought well-balanced, specific and 360-degree feedback, we have incorporated it into each iteration of our DSAP, and introduced a continuous stakeholder review process, where we horizon scan for new stakeholders as well as constantly refining our stakeholder list to further understand their needs and interests so we can tailor our engagement.

Engaging discretely on data and digitalisation was challenging, as independently, our initiatives offer little consumer value in isolation of the business outcome they support. However, when we were able to engage on it alongside other areas of our plan, stakeholders were better able to contextualise the enabling nature of data and digitalisation and provide clearer insight. We have built this into our engagement methodology in our DSAP.

We have interacted with over 27,500 stakeholders through more than 350 events and activities across our regions, seeking their views and gaining input into our business plan which has shaped our data and digitalisation offering. We will continue to engage with, and respond to, our stakeholders’ needs throughout the 2023-28 period.
Our data and digitalisation plan accounts for all the technology investments required to support decarbonisation and deliver the propositions in the rest of our business plan.

Ultimately, we recognise that the costs of data and digitalisation are significant, but we are committed to keeping base costs flat compared to 2015-23 and will introduce new incremental investment only to support our plans for decarbonisation.

In total, we plan to spend £234.5m on data and digitalisation initiatives in the 2023-28 period, an average annual cost of £46.9m. This is an £10m increase compared to the average annual expenditure in the 2015-23 period of £36.9m, made up entirely of new investments to support decarbonisation. This expenditure includes £112.2m of capex and £122.3m of opex. For more detail on our data and digitalisation costs see annex 6.2 Our costs in detail.

Our entire suite of initiatives – see annex 5.3 Digitalisation Strategy and Action Plan – is closely aligned to our business plan areas. Each initiative has been mapped to at least one, but in most cases, multiple outcome areas that in turn deliver the benefits you will read about in other parts of our plan. Some examples of how our investments in data and digitalisation unlock efficiencies set out in our plan are shown in figure 2 and explained in our costs section.

The key driver behind our data and digitalisation strategy is the need to support our plans for decarbonisation through our Distribution System Operator (DSO) strategy and Enabling Whole System Solutions propositions.

Our data and digitalisation strategy details the systems that we need to invest in during the 2023-28 period, while the DSO Strategy details how and why we will use these systems – see annex 4.2 DSO Strategy. Our investments in systems will enable us to capture, manage, analyse and share data – both for our own use and for our customers. A summary of the mapping between the two strategies is included in our DSO strategy.

New and increasingly more complex ways of managing and continuously balancing the network are key to our decarbonisation plans, and we need unprecedented levels of data and digitalisation to be successful. Our initiatives will provide the capability to optimise the management of distributed energy resources, customer flexibility, our low voltage (LV) network, the need for new connections and our interaction with the wider market. Although we will primarily create and utilise these rich data sources, such as the digitalisation of the LV network, to ready ourselves for decarbonisation, we are able to utilise the same source data to produce the open data products and services we know you would like to see.

We will significantly enhance our data and analytics capabilities, skills and platforms, enabling the capture and analysis of network and market data and increasing our ability to share high-quality open data and create open data products and services in near real time.

To do this, we must first understand the quality and completeness of our energy system data, capture more of it, enhance its integrity and store it in a structured manner to share it across internal and external systems. That activity lays a foundation that means we can ensure that our open data is interoperable with other Distribution Network Operators (DNOs) and the Electricity System Operator’s published models and datasets. We will use a data vocabulary that is consistent with industry standard (Data Management Body of Knowledge) while our data and digitalisation transformation office will further ensure alignment when designing data models, by adding additional application planning interfaces (APIs), formats and reporting of our datasets.

Once the data is cleansed, structured and stored, it can be analysed to extract value and inform decisions for network planning and network operations. Advanced analytics capabilities will be implemented allowing our planning and operations forecasting to be enhanced through further refinement of our power flow models and by supplementing our forecasting and scenario data to predict future power flows under different decarbonisation scenarios.

Data and digitalisation will enable us to offer you with an improved, personalised, proactive service and give you choice in how and when you do business with us, including the ability to serve yourself. For example, we will enhance our AutoDesign tool so that connection customers can self-serve and generate quotations for LV demand and load increases and create budget estimates for new generation connections.
Supporting our objectives

**Digitalisation underpins our business plan.**

The stakeholder engagement we have carried out has helped to identify 76 initiatives, which we have grouped into 10 focus areas. These underpin both our decarbonisation outcomes and the improvements we are committing to across the rest of the plan. In 2023-28 we will:

- **DD1** provide high-quality open data to a wide audience so that stakeholders are empowered to become active participants in a deep and liquid energy market;
- **DD2** upgrade technology and tooling to improve network management, planning and investment to increase efficiencies in operating the power network;
- **DD3** introduce data and applications at the point of need in order to improve colleague efficiency and effectiveness;
- **DD4** continue to invest in advanced cyber controls and tools to maintain a robust cyber security posture, aligned to the threats emerging from increased digitalisation;
- **DD5** modernise the back-office environment to reduce risk, secure information and improve colleague experience;
- **DD6** introduce improved field-force, work and asset management processes to improve operational performance;
- **DD7** deploy robotics and automation to reduce the cost of low-value, high-volume tasks and improve customer and colleague experience;
- **DD8** implement self-serve, personalised web technologies to be ready for greater customer demand, providing insight and interaction portals to improve customer experience and reducing cost to serve;
- **DD9** enable advanced analytics and real-time visibility of our assets to improve the operation of the power network; and
- **DD10** provide future-proofed, agile solutions in order to be flexible enough to adapt to the change in the energy sector.

In figure 1, we show how the 10 focus areas deliver the functionality required by each of the business plan performance areas, demonstrating the holistic nature of our data and digitalisation strategy and how it cuts across each area of our plan. You can see, in each of our performance area sections, we have marked with a symbol (§) where a deliverable is enabled by one of the data and digitalisation initiatives but you can find more detail of these initiatives in our DSAP in annex 5.3 Digitalisation Strategy and Action Plan.

We will update our digitalisation action plan on a six-monthly cycle to show our progress and to further engage with our stakeholders to develop our approach.

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**Figure 1: data and digitalisation – our 10 focus areas**

<table>
<thead>
<tr>
<th>Enhanced customer interfaces</th>
<th>Open data</th>
<th>Self-service web</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximising value from data and technology</td>
<td>Advanced analytics</td>
<td>Robotics and automation</td>
</tr>
<tr>
<td>Enabling decarbonisation</td>
<td>Enhanced network management</td>
<td></td>
</tr>
<tr>
<td>Driving efficiency</td>
<td>Field-force management</td>
<td>Data at the point of need</td>
</tr>
<tr>
<td>Ability to adapt</td>
<td>Future-proofed agile solutions</td>
<td>Cyber security controls</td>
</tr>
</tbody>
</table>
Figure 2: data and digitalisation impacts across our plan

<table>
<thead>
<tr>
<th>Focus areas</th>
<th>CAPEX (£m)</th>
<th>Impact on output areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD1 The journey to open data</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>DD2 Network management capability to enable net zero</td>
<td>23.1</td>
<td></td>
</tr>
<tr>
<td>DD3 Data at the point of need</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>DD4 Cyber security and resilience</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>DD5 Modern back office</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>DD6 Field force management</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>DD7 Robotics and automation</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>DD8 Enabling customers to self-serve</td>
<td>21.9</td>
<td></td>
</tr>
<tr>
<td>DD9 Advanced analytics</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>DD10 Future-proofed agile</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>112.2</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: data and digitalisation capabilities unlocking savings in our plans

Data and digitalisation releasing benefits

<table>
<thead>
<tr>
<th>Enhanced network management</th>
<th>£22.9m investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling...</td>
<td></td>
</tr>
<tr>
<td>£21.3m net saving from LV monitoring through managing constraints and deferring reinforcement</td>
<td></td>
</tr>
</tbody>
</table>

Advanced analytics capabilities

utilising cloud platforms to improve planning, design and forecasting (including automation and artificial intelligence (AI))

<table>
<thead>
<tr>
<th>Data and digitalisation releasing benefits</th>
<th>£6.6m investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling...</td>
<td></td>
</tr>
<tr>
<td>£42.5m net saving from Thor hammer data analytics to better target our replacement and inspection programmes on older wood poles in worst condition</td>
<td></td>
</tr>
<tr>
<td>£6.0m net saving from analytics to target replacement of worst-performing LV cables</td>
<td></td>
</tr>
<tr>
<td>£8.1m net saving from analytics to target high-risk cut-outs</td>
<td></td>
</tr>
</tbody>
</table>
We are committed to a ‘presumed open’, best practice approach to data visibility.

One of the areas where we expect to see change is in relation to the role that we play in modernising energy data and making it more accessible to a wider set of customers, stakeholders and partners. We are committed to following Ofgem’s data best practice guidance principles and Energy Data Taskforce recommendations on the visibility of data and assets, especially regarding ‘maximising value of data’ and demonstrating adoption of the ‘presumed open’ approach. There is much to do to deliver on this; however we have started on the journey.

Our starting point is that all energy data is ‘presumed open’ – and then evaluating the justification for imposing any limits. This will be achieved by (1) taking security, privacy and compliance as a key driver in our new data platform, (2) identifying and agreeing a clear roles and responsibilities matrix in our new data governance structure and processes, (3) actively monitoring our data management dashboard, and (4) taking a continuous effort to empower all users, including our colleagues, with skills and awareness. For further details see our Workforce Resilience section.

Our plans include significant investment in the platforms, processes and skills to enable a more digital- and data-centric organisation able to meet the needs of a changing energy sector. We have identified and defined multiple data roles and responsibilities and the roles of data custodian and data user(s). These roles will provide a dedicated data contact point for you, as potential data users, to raise queries or request additional core supporting information you might need.

We are developing an ‘open data triage approach’ along with transparent justification and mitigation processes for where our data cannot be shared. Open Data Triage is a process to systematically identify issues (privacy, security, commercial, negative consumer impact or legislation and regulatory barriers) with a dataset that limits their potential openness and then identify what techniques can be used to mitigate these issues.

We currently publish 14 manually refreshed open data sets including real-time power cut data. Based on what we have heard from you, we intend to increase the number of available data products and services by 70 per cent, 45 per cent of which will refresh in real time via automated processes delivered through APIs as well as dedicated portals. You will have access to at least 10 new open data products and services (already identified through stakeholder engagement) equating to gigabytes of interconnected data that can be layered over or combined with external and internal data and inputted into models and simulations, e.g. complex decarbonisation modelling.

We will provide access to our data through a user-centric and future-proof data platform using open standards such as RDF, XML, CGMES, CIM and the Dublin Core Metadata Structure. At least 40 per cent of our key datasets will materially improve through data cleanse activities, which will become the cornerstone of our data catalogue. The data catalogue will have an external interface and links to sector open data aggregators so that you can understand the data we are providing, and we will create data dictionaries and usage vignettes that will accompany our open datasets, data products and services. This will be in place for all new open data products and services planned for 2023 and beyond.

We already have strong measures in place to protect our data and systems in accordance with security, privacy and resilience best practice so this is not considered a gap, but we will continue to strive to improve further in this area. We have a solid cyber security footprint at present that robustly protects our corporate information. We have ISO27001 accreditation, which deals with information security in our business operations and are working towards ISO270019 accreditation, which applies similar principles to our operational technology environment.

We have cyber-incident response plans that incorporate the impact of a data breach, but we recognise that as our capabilities grow and we continue to publish more open data, we will need to keep pace.

Our data and digitalisation plans are ambitious, but we know they are deliverable.

We have fully costed our initiatives to include business change and have sequenced our plans, working with our strategic technology partners to ensure we can deliver using our existing delivery models, supplemented by new models that we will deploy in the period.

Our reliance on data and digitalisation means that it is essential that our data and digitalisation plans are deliverable and sustainable throughout 2023-28. Following a deliverability review, we have concluded it is necessary to employ a delivery model that utilises a mix of internal resources and external partners, such as the one we have in place today.

Each of our initiatives has been costed using a model that includes the required planning and design effort, the cost of the solution itself (covering hardware, software, testing, project management and integration costs), solution implementation and the business change required to ensure that we not only deploy technology, but we also embed it within the business.

We have also modelled resources across the five-year period to ensure we have the internal capabilities to deliver the initiatives as envisaged and finally, we have sequenced the initiatives as programmes of work, factoring best practice insight from our strategic technology partners in setting out the plans to deliver the work required.

Finally, being part of Berkshire Hathaway Energy provides us with significant benefits, such as strategic relationships with software and hardware vendors, and a large economy of scale when it comes to system provision. We are able to utilise top-tier enterprise and application providers to provide a best-in-class integrated suite of applications. That core suite of capabilities covers almost all the requirements of our DSAP. The benefit of this approach is that our increasing reliance on data and digitalisation will be enabled by tried and tested systems and processes, at an efficient cost.

### How engagement with you has shaped our plan

#### Stakeholders engaged: 4,762 total – 529 unique interactions

<table>
<thead>
<tr>
<th>Wave 1</th>
<th>Events: 103 total – 8 dedicated events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1 findings</td>
<td>Stakeholders engaged: 4,762 total – 529 unique interactions</td>
</tr>
<tr>
<td>Open data and data sharing is welcomed</td>
<td>Support existed for more information and open-source data sharing with stakeholders</td>
</tr>
<tr>
<td>Developing future data and digital skills is important</td>
<td>Employees should be supported through additional training to have the digital skills needed for their current and future roles</td>
</tr>
<tr>
<td>A blended digital approach with self-service and guidance is needed</td>
<td>Stakeholders wanted a balance of digital (including self-service) with human service, providing choice for customer experience</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wave 2</th>
<th>Events: 135 total – 3 dedicated events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 2 options</td>
<td>Stakeholders engaged: 15,475 total – 257 unique interactions</td>
</tr>
<tr>
<td>Options with levels of ambition were explored to help customers understand the benefits of the service levels proposed</td>
<td>Option E was the most frequently selected when stakeholders were asked about our plans for the use of data and digitalisation. Customers expect that a move to greater digitalisation is inevitable, and it is important to be able to quantify the benefits for customers</td>
</tr>
<tr>
<td>Customers ambition and broader findings</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wave 3</th>
<th>Events: 91 total – 14 dedicated events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 3 findings</td>
<td>Stakeholders engaged: 32,500 total – 832 unique interactions</td>
</tr>
<tr>
<td>Enabling self-service for customers is important</td>
<td>Stakeholders said the introduction of a self-service system for connections and open data was particularly important</td>
</tr>
<tr>
<td>Advanced network data visibility will underpin the net zero transition</td>
<td>Technical experts in particular supported plans to improve visibility of network operating conditions</td>
</tr>
<tr>
<td>We should use use digital technologies to drive efficiency</td>
<td>Technology is seen as an opportunity to reduce costs for customers</td>
</tr>
<tr>
<td>Skills and capabilities in cyber security are important to customers</td>
<td>Willingness to pay exercises indicated that cyber security is viewed as a growing threat and, therefore, as essential to prioritise in the future</td>
</tr>
<tr>
<td>Develop and optimise high performing back-office systems</td>
<td></td>
</tr>
<tr>
<td>Improved network resilience supporting reliability gains for customers is supported</td>
<td></td>
</tr>
<tr>
<td>Deliver a tailored future customer experience</td>
<td></td>
</tr>
<tr>
<td>Data and Digitalisation acceptability score: 79%</td>
<td>79% of customers agree that Data and Digitalisation is crucial for the successful plan delivery</td>
</tr>
</tbody>
</table>

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**EXEC SUMMARY**

**TRACK RECORD**

**ENGAGEMENT**

**OUTPUTS**

**ENABLERS**

**COSTS**

**DELIVERY**

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**Northern Powergrid: our business plan for 2023-28 – 165**
Unleashing the potential of...
Our People

Our workforce and extensive contractor base are central to the delivery of our ambitious plans for the 2023-28 period and continuing to provide outstanding personal customer service.

The responsibility we carry as a major investor in the region and as one of the leaders in the journey towards net zero creates exciting opportunities for us to increase the pace at which we build an increasingly diverse, skilled and resilient workforce.

Our Workforce Resilience strategy is designed with these challenges and opportunities in mind. It underpins delivery for every area of the plan by focussing on four strategic priorities.

— **Expanding our workforce** – attracting, recruiting, training and developing more than 1,000 people to meet the immediate and future needs of our customers, driven by the decarbonisation agenda.

— **Investing in upskilling** – building more training capacity and capability to upskill our existing colleagues in the evolving technical, operational and digital skills required to manage an increasingly smart, digitised and connected energy system.

— **Increasing workforce engagement and satisfaction** – continuing to actively engage with our colleagues and their trade unions to improve their experience, increasing the extent to which they feel empowered to innovate and take ownership to deliver the highest levels of service for our customers.

— **Becoming a more diverse and inclusive organisation** – opening up career and development opportunities for existing and future colleagues, attracting more talent from underrepresented groups, and enhancing our business innovation, decision making and delivery through more diverse teams.

Our workforce priorities are strongly supported by stakeholder feedback. During the COVID-19 pandemic our teams demonstrated strong personal resilience to quickly adapt so we could maintain our 24/7 services, underlining the critical role our people play in the region, with more than 85 per cent of our workforce designated as key workers.

As a major employer, we have an important role in the post-pandemic economic recovery in our region, to provide fairly paid, skilled jobs and progression opportunities for fulfilling careers at a secure business. Investing in the development and upskilling of our existing colleagues, we will use our recruitment power to help build a more diverse and inclusive organisation where we support equal access to opportunities for all.
An increasingly diverse and resilient team

The groundwork for our workforce resilience plan has already begun and, by the end of 2021, we will have developed our detailed delivery plan. As this section of the plan is ultimately about our people, we want them to help shape how we will deliver it and we will be running a comprehensive programme of engagement in the second half of 2021. We will focus on four key stakeholder groups:

— internal stakeholders (colleagues, future workforce, and trade unions);
— utilities working groups and partnerships, such as Energy & Utility Skills (EU Skills) and the National Skills Academy for Power (NSAP);
— community interest groups such as Women into Science and Engineering (WISE); and
— external partnership organisations, with whom we will increase our collaboration (such as schools, universities and local government associations).

We will head into the future having made great strides with our people agenda over the past few years:

— creating over 1,000 job opportunities, largely through our workforce renewal programme, which has developed top class apprenticeship programmes that have enabled us to make significant progress to address the issue of an ageing workforce, while being able to tap into their vast wealth of experience as part of training the next generation of engineers and technicians;
— establishing a more locally focussed delivery organisation to take the leadership of our service operations closer to our customers and their communities. This has improved the way we serve the diverse needs of the customer groups and natural geography of the areas we cover, and created new management opportunities for emerging talent;
— developing a new, modern technical competency framework in partnership with trade unions, refreshing the collectively bargained pay deals and creating the blueprint for co-developing future progressive framework agreements;
— maintaining high levels of loyalty that mean we have a good track record of retaining talented and skilled people in our business;
— improving the safety, security and wellbeing of our work environment for our colleagues with our lowest-ever accident rates and the introduction of new wellbeing support measures;
— developing a common ‘job architecture framework’ to organise roles across the business and strengthen career pathways;
— expanding learning and development programmes to help structure our colleagues’ upskilling;
— enhancing the onboarding experience for new colleagues joining our business; and
— starting on the journey to address the gender pay gap by targeting recruitment of more women into the higher-paid engineering roles and supporting career development for all with a range of flexible working options.

We need long-term workforce capacity and capability to help us to decarbonise, reach net zero and take on the functions of Distribution System Operation (DSO).

We know that the significant growth in network investment means that we are going to need a larger workforce with a skillset that has evolved to meet the emerging needs of managing a smarter, more connected and digitised energy system. We have factored in an additional £0.6m p.a. to cover the cost of this additional investment in training and development.

**Employment group** | % of workforce | Men | Women
---|---|---|---
Operational crafts | 41% | 96% | 4%
Engineering and technical | 31% | 93% | 7%
Business support | 17% | 33% | 67%
Management and specialists | 11% | 56% | 44%

**Average**
- Age: 43.2
- Years length of service: 16
- Women in engineering/STEM roles: 5% (37)
- Women in senior leadership roles: 24% (16)

**Adding to our skillset**

<table>
<thead>
<tr>
<th>Digitalisation</th>
<th>DSO</th>
<th>All colleagues</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>managing a more digital network; smart technician roles</td>
<td>deploying and managing network flexibility</td>
<td>digital and analytics skills, customer service and communication</td>
<td>building diverse teams and an inclusive workplace culture, optimising remote team working</td>
</tr>
</tbody>
</table>

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We’re excited about the career opportunities our plan creates for existing and future colleagues – including attracting and retaining talented people from underrepresented groups that better reflect the communities we serve.

Angie Patterson
Director of organisation development
Meeting the demand for skills

Through upskilling existing field staff, recruiting the next generation of engineers and technicians to replace those who retire and leave the business, as well as expanding the size of the workforce, our workforce renewal and training programme will equip us with a highly skilled and resilient workforce. We will continue to collaborate across the energy sector through partnerships such as EU Skills and the NSAP to work together on the significant skills challenge we face as an industry.

Adapting to the significant increase in digital technologies and use of data that will become the norm in maintaining and managing the future energy system is a skills challenge for our entire workforce. We expect to see more specialist digital and data roles in our business than today but we also know that our upskilling programme must ensure that our colleagues are proficient in the new digital technologies and data management techniques that are relevant to their roles.

We will be expanding our innovation programme in 2023-28 as a key enabler for delivering our plan and our colleagues will play an increasingly important role in identifying opportunities to be innovative. We must ensure we create the environment for colleagues to think creatively and foster new ideas.

To attract a more diverse range of applicants, we will enhance our recruitment activities to reach and appeal to all underrepresented groups and create more opportunities to apply for careers with us. These changes will make our business more appealing to a broader range of potential colleagues. But to better reflect the communities we serve, we will focus particularly on women, people from ethnic minorities and those from less socio-economically advantaged backgrounds.

**We recognise the business imperative to increase the diversity of our workforce and develop a more inclusive workplace culture along with the broader benefits these bring to the communities we serve.**

Creating a more diverse, inclusive and equitable organisation is critical to ensuring we can meet the evolving needs of our business, our colleagues and our customers. In the past five years, around 27 per cent of new recruits were women and four per cent identified as being from a Black, Asian or minority ethnic (BAME) background. We want to attract more, talented people from a wider range of backgrounds to our company as we grow and develop our workforce.

By the end of 2021 we will have developed and published our diversity and inclusion (D&I) plan, following a comprehensive colleague and stakeholder engagement programme. This will identify the initiatives and measures we will undertake to:

- bring in and develop the diverse skills required to deliver our current and future business needs;
- build a workforce with more varied backgrounds, perspectives and experiences to enhance our performance and contribution to the region; and
- open up the way we work to create a more flexible, inclusive and equitable workplace where there is space for everyone, people feel valued, confident and can thrive, leading to our business benefiting from a greater range of talented people who want to join our team and stay with us.

**Support for our plan**

“With the twin challenges of net zero and smart networks, we need to broaden and deepen distribution networks staff skills. We have discussed the strategic impact with Northern Powergrid to develop a plan to renew and rejuvenate its workforce that reflects our colleagues’ passion for engineering excellence and superior customer service.”

Mike MacDonald
Full time officer, Prospect Union
Our immediate D&I commitments (summarised below) reflect ongoing engagement with colleagues, our Customer Engagement Group (CEG), trade unions and other sectors guiding our approach. So far, the messages are clear:

— we should strive to be a more diverse, inclusive and equitable organisation;
— diversity goes beyond gender and ethnicity and we should be considerate of all demographics and characteristics, such as sexual orientation, neurodiversity and socio-economic backgrounds;
— everyone should have equal access to opportunities for new roles, development and career progression and roles should be awarded on merit;
— everyone has a role in improving diversity, inclusion and equity but the tone, direction and meaningful action come from the top; and
— we need to be open to learn from others in our sector, and beyond, to adopt good practice and coordinate our efforts to address sector-wide challenges.

Meaningful and sustainable change will be a multi-year journey. We are prepared for this and recognise the need to evolve our commitments in line with our business and employee needs, and societal shifts.

We will be tracking and communicating progress against our core commitments and, where we have robust and relevant employee data, we will set specific forecasts in our plan. They represent realistic but stretching steps towards meeting our desired outcomes.

For example, our forecast for increasing the percentage of women at Northern Powergrid will reflect our ambition based on the positive actions we will take to attract and retain more women in the company.

We remain committed to recruitment processes that seek to identify the people who will best fit the needs of the company. So, in relation to increasing the involvement of any under-represented group, our focus will be on:

— broadening the pool of candidates for selection by providing greater access to job opportunities to a more diverse set of candidates; and
— refining our selection processes so that they are better at recognising the potential that a person has to be a successful part of our team.

**The way we structure and operate our business must evolve to meet new, changing demands in the 2023-28 period and to provide a rewarding experience for our colleagues.**

Taking on the functions of DSO and other significant changes on the horizon mean that our organisation needs to be set up and structured effectively to deliver an efficient, high-quality and reliable service for customers.

Our job architecture framework will be used to open up opportunities to:

— create clearer career pathways and development through improved visibility of roles and the requirements;
— enhance productivity through more effective team structures with clear distinction of accountability; and
— facilitate improved talent analytics, enabling identification of where changes to job design can improve access to opportunities for all.

We have a highly skilled and committed workforce. The average length of service is 16 years and to retain the valued skills, knowledge and experience we will:

— regularly engage with our colleagues to continuously improve how we operate and about their experience of working with us; and
— continue to build and maintain strong relationships with trade unions by engaging on all aspects of our people agenda.

The success of our business rests on the ability of our colleagues to do their jobs in a safe and secure environment. We have already introduced a network of mental health champions across the business, adopting a similar model to the successful safety representatives we have for field staff, focussed on improved mental wellbeing. Mental health has, in particular, moved to the forefront during the COVID-19 pandemic and we will be expanding our programme of support measures for colleagues, to include:

— proactive awareness, personal resilience and mindfulness training; more workplace mental health champions, with regular training; and
— a range of practical support tools and resources for colleagues and managers.

We believe in shared values, goals and success. The different pay structures for all our colleagues have elements that reward the delivery of our business plan commitments and we will be continuing with this approach into the 2023-28 period. We explain more about our workforce plans in **annex 5.2 Workforce Resilience strategy**.

Our individual strategies for **Innovation, Data and Digitalisation and DSO** contain more information on how we see our colleagues enabling success in those areas of our plan.
### Customer outcomes

<table>
<thead>
<tr>
<th>Deliverables</th>
<th>Output measures/ indicative input measure</th>
<th>ED1 to date</th>
<th>ED1 forecast</th>
<th>ED2 target</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR1.1</td>
<td>Create more than 1,000 new job opportunities through expansion of our Workforce Renewal and apprenticeship programmes, and develop new entry pathways across a variety of roles</td>
<td>No. job opportunities created</td>
<td>855</td>
<td>1,175</td>
</tr>
<tr>
<td>WR1.2</td>
<td>Review and upgrade recruitment processes to increase access to opportunities at Northern Powergrid and the attraction and hiring of talent from underrepresented groups</td>
<td>Internally, we will be tracking our progress in increasing the attraction by the average number of applications per role overall, % of applicants and % successful applicants from underrepresented groups (women, employees from ethnic minorities and employees from less socio-economically advantaged backgrounds). We are improving data collection of applicant demographic data in 2015-23 to provide a richer picture of our baseline position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR1.3</td>
<td>Review and upgrade our internal and external selection approach to support equal access to opportunities with robust and inclusive processes</td>
<td>% employees completing training related to future skills</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>WR1.4</td>
<td>Develop our education outreach programme, targeting underrepresented groups, to coordinate activities that promote our sector, uptake of STEM subjects and employment opportunities</td>
<td>We will track: % of students engaged in activities that promote STEM careers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR2.1</td>
<td>Provide a sector-leading training programme to equip our workforce with the evolving skills and techniques required to manage the future energy network</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR2.2</td>
<td>Develop a new smart grid technician apprenticeship programme to train people for new, dedicated roles in managing the digital network and functions of DSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR2.3</td>
<td>Train our people in data management, analysis and use of new technologies to accelerate adoption of enhanced data and digital capabilities throughout our business</td>
<td>We will track: % of colleagues attaining career progression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR3.1</td>
<td>Enhance our colleague health and wellbeing programme and management training to reduce the stigma around mental health, better identify colleagues in need of help, and provide a range of proactive, diagnostic and responsive support options</td>
<td>% attendance rate</td>
<td>97%</td>
<td>97%</td>
</tr>
<tr>
<td>WR3.2</td>
<td>Continue to actively engage trade unions on people and strategic issues to keep improving our colleague experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR3.3</td>
<td>Improve our digital-enabled workforce planning capabilities to maximise deployment of our workforce to deliver an effective and efficient customer service</td>
<td>We will track: % of new joiner retention after two years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WR4.1</td>
<td>Provide more flexibility in the working arrangements and range of benefits available to increase access to job opportunities and career progression, allowing all colleagues greater choice to support their individual needs</td>
<td>% of women – total workforce</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>WR4.2</td>
<td>Raise awareness and educate employees on D&amp;I and, through ongoing top down and bottom up activities, help create a more open environment where people feel valued, confident and can thrive</td>
<td>% of women – engineering/STEM roles</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>WR4.3</td>
<td>Extend and upgrade our Leadership Expectations framework to incorporate D&amp;I expectations and equip leaders with the knowledge and tools to deliver these and act as role models</td>
<td>% of women – leadership roles</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>WR4.4</td>
<td>Work collaboratively with external partners and fund research to develop innovative approaches to address key D&amp;I challenges in our organisation and the sector</td>
<td>Mean gender pay gap in average hourly pay (%)</td>
<td>21.4%</td>
<td></td>
</tr>
</tbody>
</table>
### How engagement with you has shaped our plan

#### Wave 1

- **Events:** 103 total – 13 dedicated events
- **Stakeholders engaged:** 4,762 total – 455 unique interactions

<table>
<thead>
<tr>
<th>Wave 1 findings</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprenticeships should be a key priority for us</td>
<td>— We should continue to leverage the apprenticeship programme to reduce the average age of the workforce and provide new entry opportunities</td>
</tr>
<tr>
<td>Increasing diversity and inclusion was deemed important by all stakeholders</td>
<td>— To attract a more diverse workforce, prospective candidates need to see people like them working successfully in the sector (women, BAME role models and mentors). Working and training practices should be adapted for the workforce to increase inclusivity and diversity (including unconscious bias training)</td>
</tr>
<tr>
<td>Upskilling and training employees for the energy transition is an important goal</td>
<td>— To ensure high retention rates, the workforce should be supported through additional training to have the digital skills needed for their current and future roles</td>
</tr>
</tbody>
</table>

#### Wave 2

- **Events:** 135 total – 25 dedicated events
- **Stakeholders engaged:** 15,475 total – 380 unique interactions

**Overall**

Most stakeholders believed that our workforce resilience efforts are ‘about right’ in scope and ambition. They recommended diversity and inclusion, workforce renewal, training, and employee wellbeing as areas for future focus. Additionally, stakeholders believed that we should focus on the workforce renewal programme to create job opportunities, with apprenticeships programmes particularly highlighted.

**Decarbonisation workforce and skills challenge**

The net-zero agenda will drive a significant increase in work volumes as well as a change in the industrial and technical skills requirements for our operational workforce. Digital knowledge and skills are becoming increasingly important for our workforce. Stakeholders recognise the need to meet this challenge with the capacity and capability to upskill our workforce.

**Post-COVID-19 recovery**

Our role in the region as a major employer and investor in infrastructure places us well to support the post-COVID-19 economic recovery by creating job opportunities directly and through our supply chain.

**Diversity and inclusion**

All stakeholder groups recognised and valued the importance of having a diverse workforce. The general consensus was that jobs should be awarded on merit and not by quotas. There is a need for greater clarity of our position on diversity and inclusion and the positive actions we are taking to address the challenge.

#### Wave 3

- **Events:** 91 total – 9 dedicated events
- **Stakeholders engaged:** 32,500 total – 417 unique interactions

Wave 3 consulted with groups such as trade union representatives, expert stakeholders and customer representatives to test the extent to which we should proactively take steps to address diversity and inclusion and develop the skills and capacity for the challenges of a smart energy future.

<table>
<thead>
<tr>
<th>Wave 3 findings</th>
<th>How this has been addressed in our plans</th>
<th>Outcome Ref</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>— Develop a workforce to meet the future needs of the energy transition</td>
<td>— We are creating new job opportunities to build our workforce capacity</td>
<td>WR1</td>
<td>Link</td>
</tr>
<tr>
<td>Trade unions and internal stakeholders recommend that we work to improve recruitment pipelines, partnering with schools to attract diverse skillsets and invest in upskilling existing workforce</td>
<td>— We are enhancing recruitment processes and entry pathways and programmes to attract more people from a wider set of backgrounds to our company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Optimise and develop a high performing, supportive culture</td>
<td>— We will introduce more flexible working and benefits options to increase access to job opportunities and career progression</td>
<td>WR3</td>
<td>Link</td>
</tr>
<tr>
<td>Trade unions and other internal stakeholders thought that we could improve workforce motivation through developing reward programmes, clearer career pathways, and promoting the ‘employee voice’</td>
<td>— We will engage regularly with trade unions and colleagues on key issues and report on actions we take to improve satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Invest in developing future skills and multi-skilling workforce</td>
<td>— We are investing in upskilling our existing workforce in the new skills required to manage a more digitalised energy network and creating new roles in our business to manage a smarter network</td>
<td>WR2</td>
<td>Link</td>
</tr>
<tr>
<td>Academics and training partners emphasised the importance of upskilling and multiskilling to grow the skillsets of our existing workforce</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— Take further steps to build a diverse workforce</td>
<td>— We are increasing our leadership expectations and education and awareness as part of our strategy to improve workforce diversity and inclusivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholders recommended that we proactively address diversity and inclusion issues through targeted recruitment campaigns and increasing the visibility of underrepresented groups in our publicity</td>
<td>— We are retaining our ‘best person for the job’ position and are taking positive action to increase access to opportunities for all</td>
<td>WR4</td>
<td>Link</td>
</tr>
<tr>
<td>— Workforce Resilience acceptability score: 79%</td>
<td>— 79% of customers agree that Workforce Resilience is crucial for the successful delivery of our plan</td>
<td>-</td>
<td>Link</td>
</tr>
</tbody>
</table>

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Northern Powergrid: our business plan for 2023-28 – 171
EXPLAINING OUR COSTS

Over the course of the 2023-28 period we plan to spend a total of £3.2bn, which equates to £642.1m per year. Three of our 12 output areas account for 87 per cent of our total costs: Asset Resilience (33 per cent), Decarbonisation (30 per cent) and Reliability and Availability (24 per cent).

Total expenditure is increasing by £170.9m p.a. (36 per cent) compared to the average we are expecting for the 2015-23 period. As figure 1 shows, this increase is driven primarily by the need to enable the ambitious decarbonisation pathway our country is on.

— Decarbonisation plan expenditure, required to provide significant amounts of new capacity to cater for growth in technologies such as heat pumps (HPs) and electric vehicles (EVs), and to add the required digitalisation and smart grid enabling solutions, totals £189.3m p.a. This is an increase of £148.1m p.a. and accounts for 87 per cent of the increase in our total expenditure.

— Asset resilience expenditure is our largest area of expenditure; it increases by £10.9m p.a. to a total of £214.9m p.a. to keep our asset in good condition and retain their resilience. This category would reduce by £6.0m p.a. if we were not proposing to build in £16.9m of ‘two-for-one’ investment opportunities, where we will efficiently add extra capacity required for the future as we replace or refurbish degraded parts of the network.

— The investment needed to deliver the significant reliability improvements we are targeting accounts for a further £14.2m p.a. increase compared to the current period.

— A further increase of £5.2m p.a. is driven by the impact of our decarbonisation objectives on some of the other output areas of our plan. For example, we expect to spend £3.5m p.a. as part of our connections expenditure to allow new generation and low carbon sources of demand to access our network.

— The total cost to deliver the other services, inclusive of the proposed upgrades, in the remaining nine output areas will reduce by £7.5m p.a.

1. The costs covered in this plan are part of ‘Totex’. Totex generally consists of all the expenditure related to our regulated activities that are under our control and are funded through the price control. Some costs we incur are not delivered as ‘Totex assets’, are either funded directly by the customer or are ‘pass through’ costs; these are covered in the ‘non-activity based costs’ section.
An overview of our costs

By any measure, this represents a significant investment in our region. It also presents a great opportunity to save money for the long term. The similarities and overlaps that exist in the two biggest components of our plan create lots of potential for ‘two-for-one’ efficiencies – and we have factored that into our plan.

It is our responsibility to find and release those benefits on behalf of our customers, which can be very significant. For example, the £16.9m p.a. of ‘two-for-one’ synergistic investments that we have factored into our asset resilience programme amounts to £84m over five years in a programme of around £1bn. Our analysis shows that the long-term benefits of that £84m are likely to exceed £400m because we invest a relatively small premium to create additional capacity as we renew the asset. That capacity will ultimately be needed on the decarbonisation journey, well within the lifetime of those new assets – so the future reinforcement cost is avoided. It works the other way too. The 2023-28 decarbonisation investment creates ‘two-for-one’ resilience benefits, without which the asset resilience costs in our plan would have been higher.

We believe that our plan strikes the right balance between enabling the drive towards decarbonisation, improving services for customers, and keeping customer bills low. The significant cost efficiencies that we have factored into our projections, coupled with reductions in financing costs, help to limit the impact on customer bills of the step up in investment that we are proposing to make.

### £m

<table>
<thead>
<tr>
<th>ED2 expenditure (p.a.)</th>
<th>Variance to ED1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decarbonisation-related costs</td>
</tr>
<tr>
<td>Decarbonisation</td>
<td>189.3</td>
</tr>
<tr>
<td>Asset Resilience</td>
<td>214.9</td>
</tr>
<tr>
<td>Reliability and Availability</td>
<td>155.2</td>
</tr>
<tr>
<td>Subtotal</td>
<td>559.4</td>
</tr>
<tr>
<td>Environmental Action Plan</td>
<td>25.7</td>
</tr>
<tr>
<td>Safety</td>
<td>3.0</td>
</tr>
<tr>
<td>Climate Resilience</td>
<td>16.0</td>
</tr>
<tr>
<td>Physical and Cyber Resilience</td>
<td>14.1</td>
</tr>
<tr>
<td>Customer Service</td>
<td>4.2</td>
</tr>
<tr>
<td>Vulnerable Customers</td>
<td>3.9</td>
</tr>
<tr>
<td>Our Communities</td>
<td>1.6</td>
</tr>
<tr>
<td>Connections</td>
<td>13.5</td>
</tr>
<tr>
<td>Openness and Transparency</td>
<td>0.7</td>
</tr>
<tr>
<td>Subtotal 9 other output areas</td>
<td>82.7</td>
</tr>
<tr>
<td>Totex</td>
<td>642.1</td>
</tr>
</tbody>
</table>

1. All costs are stated in 2020-21 prices.
The investments needed to facilitate decarbonisation would, on their own, increase the bill by £6.63.

The additional resilience investment we are proposing will add a further £0.49.

Our proposals to make the network more reliable would push it up another £0.64.

But everywhere else we will do more for less, which, alongside significantly lower financing costs, knocks off £3.17.

When combined with the other factors that impact customer bills, including a regulatory depreciation period that spreads the costs fairly across generations, the result is an overall increase in bills of £4.59.

This represents a five per cent bill increase in return for significantly improved service levels and a 36 per cent increase in investment.

The cost increases we expect are primarily driven by the need for greater network investment to support decarbonisation. Away from that most significant factor, the other driver of the increase in network investment costs is asset resilience, which is lower than it would be if we were not going to get the asset health improvements that will be a by-product of the decarbonisation investments but is higher than the current spend levels because it incorporates the ‘two-for-one’ synergistic investments that will create long-term savings.

Decarbonisation also drives a £32.8m per annum increase in our indirect costs (closely associated and business support) and non-operational capex, which drives all of the variance in these areas relative to the current period (£26.7m).

Keeping bills low for our customers and providing value for money means constantly challenging ourselves to be more efficient in how we deliver our services. In the remainder of this section we explain how we are controlling our costs through efficiency and innovation. It includes:

- the reasons why we are confident that these costs are efficient, representing a significant improvement on what is already an industry-leading efficiency performance;
- breakdowns of our main cost categories, focusing particular attention on areas where our costs are materially changing compared to the current period; and
- descriptions of the options we have considered and justification for our choices.

For stakeholders who want to examine the cost projections and justification more closely, annex 6.2 Our Costs in Detail provides even more information.
Ensuring our plan is efficient

Our long-term approach is to minimise the total cost of running our network, and in doing so deliver the best value for money for our customers.

We are confident that our plan is efficient and offers excellent value for money for customers, because:

— we are building on a sector-leading efficiency position; and
— we are also including efficiencies worth a total of £1.0bn to customers:
  – £396m of totex efficiencies embedded in our plan;
  – £471m of decarbonisation synergy savings beyond the plan period, over 2028 to 2050; and
  – £136m of financing savings forecast in the 2023-28 period.

The subsections below expand on these four strands of evidence.

The foundation of this plan, our existing cost base, is efficient.

Our plan builds on our existing cost base, which currently supports our ‘baseline’ activities. The efficiency of our current costs is therefore both:

— the first step in evaluating the efficiency of the costs in this plan; and
— an important element of our track record.

In assessing our existing cost base, we have focussed on comparisons to the other companies operating in our sector. They undertake the same activities and offer the closest possible comparison.

Total cost benchmarking shows our entire cost base is efficient compared to our peers.

Total cost benchmarking is the only approach to benchmarking that fully accounts for trade-offs between different parts of the cost base. Doing so avoids the risk of these trade-offs distorting the outcome.

To provide an entirely objective, externally set measure of our cost efficiency, we have used the same ‘top down totex’ approach that our regulator used during the previous price control review. In addition:

— we have presented the results for each of the last two regulatory periods, covering 10 years of data in total, to illustrate our long-term approach to efficiency; and
— we have also presented results using a customer-centric cost driver that was externally endorsed at the last price control review,2 and with and without our regulator’s adjustment for labour cost differences in London and the South East.3

The headlines are that:

— our group level results are consistently close to an upper-quartile totex benchmark, within about one to two per cent;
— we are the most efficient group on several of the results and compete closely with one or two other groups for the most efficient position across all of them; and
— each of our licensees has costs below the efficiency benchmark on at least one of the two cost drivers used, demonstrating that they each have efficient costs.

The group level results supporting these headlines are set out at figures 2 and 3.

Figure 2: total cost regression benchmarks using the ED1 top-down cost driver

<table>
<thead>
<tr>
<th></th>
<th>Costs over 2010-15</th>
<th>Costs over 2015-20</th>
<th>Regional labour cost adjustment</th>
<th>Regional labour cost adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
</tr>
<tr>
<td>Northern Powergrid</td>
<td>100.58% 3</td>
<td>100.95% 2</td>
<td>101.40% 1</td>
<td>101.70% 2</td>
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<tr>
<td>ENW</td>
<td>107.75% 3</td>
<td>108.36% 3</td>
<td>102.23% 3</td>
<td>102.67% 4</td>
</tr>
<tr>
<td>WPD</td>
<td>114.62% 6</td>
<td>115.11% 6</td>
<td>114.82% 5</td>
<td>115.24% 5</td>
</tr>
<tr>
<td>UKPN</td>
<td>113.85% 5</td>
<td>108.94% 4</td>
<td>101.87% 2</td>
<td>97.98% 1</td>
</tr>
<tr>
<td>SPEN</td>
<td>111.21% 4</td>
<td>111.52% 5</td>
<td>115.30% 6</td>
<td>115.63% 6</td>
</tr>
<tr>
<td>SEN</td>
<td>89.73% 1</td>
<td>88.28% 1</td>
<td>103.74% 4</td>
<td>101.90% 3</td>
</tr>
</tbody>
</table>

Figure 3: total cost regression benchmarks using customer numbers as a cost driver

<table>
<thead>
<tr>
<th></th>
<th>Costs over 2010-15</th>
<th>Costs over 2015-20</th>
<th>Regional labour cost adjustment</th>
<th>Regional labour cost adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
<td>Efficiency Rank</td>
</tr>
<tr>
<td>Northern Powergrid</td>
<td>99.79% 1</td>
<td>102.50% 1</td>
<td>101.57% 3</td>
<td>101.79% 3</td>
</tr>
<tr>
<td>ENW</td>
<td>104.69% 2</td>
<td>107.98% 4</td>
<td>100.29% 1</td>
<td>100.89% 2</td>
</tr>
<tr>
<td>WPD</td>
<td>113.43% 6</td>
<td>116.58% 6</td>
<td>114.42% 4</td>
<td>114.75% 4</td>
</tr>
<tr>
<td>UKPN</td>
<td>107.99% 4</td>
<td>106.37% 3</td>
<td>100.79% 2</td>
<td>97.27% 1</td>
</tr>
<tr>
<td>SPEN</td>
<td>110.74% 5</td>
<td>113.56% 5</td>
<td>115.05% 5</td>
<td>115.19% 5</td>
</tr>
<tr>
<td>SEN</td>
<td>104.95% 3</td>
<td>105.21% 2</td>
<td>118.78% 6</td>
<td>116.07% 6</td>
</tr>
</tbody>
</table>

1. Calculated using a 5.8 per cent cost of equity – Ofgem’s working assumption of 4.65 per cent would increase the saving.
2. See Ofgem’s cost assessment working group study on totex benchmarking, undertaken by Frontier Economics.
3. The water regulator (and the appeal body for the water sector, the Competition and Markets Authority) has also concluded these types of adjustment can be unnecessary, depending on the cost driver used.
The disaggregated benchmarking of our cost base confirms us as a leading operator in some cost categories, and closer to the middle of the pack in others. Although the analysis does provide some useful insights, disaggregated benchmarking suffers from some serious problems, primarily that it cannot take into account the trade-offs that are essential to a business optimising its total costs, which is what matters in the end. For those reasons, we do not support its use as the basis for a regulator setting cost targets for companies. What can be said is that combining these benchmarking results supports all the same conclusions as the total cost benchmarking.

More detail supporting each of these results are set out in annex 6.3 Cost Benchmarking, including licensee level results.1

Our track record of achieving value for money for our customers through sustainably low long-term costs is second to none. The results set out in figures 2 and 3 also demonstrate our unparalleled long-term track record of achieving value for money for our customers through sustainable cost control.

— Our efficiency position is consistently strong not only on our latest costs but also over a much longer period.
— Some other Distribution Network Operators (DNOs) – UK Power Networks and Electricity North West – have delivered catch-up efficiencies, but not setting a new benchmark relative to us.

Our efficiency record stretches back to before 2010, where we consistently benchmarked well on the basis of the costs and methods that Ofgem analysed at the time. Our performance has been sustained over many years and reflects our continued focus on minimisation of totex to deliver the outputs for customers.

We believe that this track record means that our customers can be confident that not only can we achieve the low costs that are factored into the starting point for this plan, but we can credibly commit to continuing to achieve them.

We have embedded £396m of totex efficiencies in our plan, equivalent to 12 per cent of our total 2023-28 forecast costs, while delivering more for customers.

As well as starting from an efficient base, we have also embedded sizeable efficiency benefits into the plan. As explained in the next section, we have sought to optimise our plan across the entirety of our cost base and output commitments. This has yielded totex efficiencies of £396m – figure 4 illustrates the efficiency savings we have embedded into our plan.2

Our ongoing performance is not only built on our current efficiency in a numerical sense, but it also results from applying the same rigorous approach that we have consistently applied over the years, which gives us confidence that our plan is efficient, as briefly described later in this section.

1. We have absorbed within this assessment some region-specific factors that add to our direct costs, such as operating in sparse areas and also with unique network configurations. Depending on how our regulator assesses costs, these factors could become relevant later in the price review.

2. More detail on our embedded cost efficiencies is set out in annex 6.3: Our Costs in Detail.
Continuing to drive efficiency

Our efficiency performance, both historically and in prospect, is the consequence of an active approach to system management that we have been applying for many years. At its core, it has four components.

— **Clear strategic focus** – on minimising the totex required to deliver our outputs.
— **Clarity of output objectives** – the objectives of our investment strategy are to:
  - ensure all the credible pathways to decarbonisation remain open after 2028;
  - maintain a resilient and reliable network, particularly in relation to extreme weather;
  - contribute to the resilience of the wider system; and
  - adhere to the legal requirements placed upon us in respect of health and safety and environmental impact, etc.

— **Exhaustive optimisation at the planning stage** – we deliver our outputs at least totex by seeking out synergies across activities, plans and options, over time and across the network; and also by assessment and execution of some careful and conscious trade-offs (within the technical and legal limits we are allowed to operate in) where objectives may conflict.
— **Continued optimisation in real time** – as new information comes to light we don’t just stick to the plan, but we are continually evaluating further scope for cost reduction or output enhancement.

Effective electricity system planning reflects the understanding that any investment or intervention on the network will both be long-lived, and will also impact on assets and interventions elsewhere on the network, affecting both costs and output provision. This creates the need to, at its core, solve a highly complex spatial optimisation problem over multiple time periods, which requires high skills and enabling technologies to be deployed, both at the planning stage and in real time.

While the need to invest in the decarbonisation of the energy system at the scale we are contemplating is new, our approach to minimising the costs of doing so (in combination with all other costs on the system) has been developed over many years and gives us confidence that our plan is efficient. Indeed, we have actively sought out the ‘two-for-one’ benefits that the investment in decarbonisation can potentially create on the system.

Example of our approach: optimising our asset renewal requirements with decarbonisation priorities...

As well as the cost savings we have factored into our plan for 2023-28, the way we respond to decarbonisation presents many ‘two-for-one’ opportunities for our customers beyond 2028 – provided that we maximise synergies between reinforcement and asset renewal investment.

If we were setting our plan without the future imperatives of net zero, we would plan to spend approximately £866m on asset renewal – which we term our baseline asset renewal scenario. This would inevitably create some additional capacity, for example because some assets are only available in larger sizes today than when they were first installed. But this would be limited; and not necessarily that well targeted.

Instead we have developed an optimised asset renewal plan, which will create significant additional capacity in the areas that most need it; and limit the increase in total cost to £84m by minimising asset renewal expenditure on those areas where the future requirements for additional capacity are less certain. Specifically, we will:

— use the latest data from network monitoring and analytics to ensure effective identification of priorities, whichever pathway to net zero is followed, and deploy capacity increasing solutions such as full substation replacements, overhead line rebuilds and circuit overlays, where the network constraints are the most onerous and will bite soonest under any scenario; and

— defer asset replacement where there is less certainty over future network capacity requirements, and where we judge we can accept and manage the risk of ageing assets through enhanced inspections or monitoring combined with asset life extension techniques.
Our optimised asset renewal and enhancement plan will cost £950m and is the basis for the costs set out in this plan; a net increase of only £84m compared to our baseline plan.

The additional capacity it will deliver will future-proof sections of our network that, if not reinforced now, would require expenditure of up to £555m between 2028 and 2050; reinforcement that we can confidently predict will be required over this time frame under the government’s 10-point plan for net zero.

This future saving of £555m for an £84m investment in the coming five years represents a real-terms return of £471m, which translates to about a 550 per cent financial return for our customers.

In the context of the overwhelming feedback from our stakeholders that we need to meet the net zero challenge, we think this trade-off is worthwhile. Much of this additional risk falls directly on us, and so is ours to accept and manage (provided Ofgem allows a reasonable rate of return on our investments).

Even where part of the risk falls on our customers, for example if old assets cause more power cuts, we are exposed to these outcomes through Ofgem’s incentive schemes and so our interests as asset managers are fully aligned with those of our customers.

Ofgem sets a number of key financial parameters in its determinations that have a material impact on allowed revenue. The parameters for 2023-28 will lead to lower financing costs – reflecting the savings that we and other companies expect to be able to make in capital markets.

Figure 6 summarises the impact of each key financial parameter that totals a £27m annual reduction in allowed revenue (£136m over the 2023-28 period).

Our estimate of the potential savings based on a 5.8 per cent cost of equity is lower than it would be using Ofgem’s working assumption of 4.65 per cent, since we do not think that equity finance can be obtained as cheaply as Ofgem has assumed in its working assumption (in businesses such as ours, which also have a large amount of debt finance). Further information on financing parameters is set out in our Financing section.

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1. See Ofgem, 2004, DPCR8 final proposals, page 77: rebased to use the Office for National Statistics’ Consumer Prices Index including owner occupiers’ housing costs (CPIH) rather than the Retail Price Index (RPI), assuming a 100bps delta between the two measures.
Investing in the network

At £329.7m, average annual investment will be £135m higher than in the current period, primarily to enable the decarbonisation transition.

The network investment category is by far the largest component of our cost base. It accounts for around half of totex. We have made it clear throughout this plan that the transformation in energy use that is part of the decarbonisation path that our nation is taking has a major impact on our investment plans.

While decarbonisation is the major driver of the increase in investment, around £1.0bn of the £1.6bn of expenditure needs to be deployed around the network to ensure that:

- the asset base stays in good condition for the long term;
- reliability and resilience are increased, particularly to severe weather;
- safety and other legal standards are maintained; and
- the environment is protected.

In developing our plans, we have continued our approach to minimising totex to deliver the outputs. Two key themes run throughout the cost categories below: first, they result from a detailed optimisation of our costs, reflecting the different synergies and trade-offs that exist, both across the network and over time. Second, once that plan has been developed, we keep driving efficiency in our plan by assessing options to select the best approach to deliver, and by continuing our approach to monitoring and driving down unit costs.

The expenditure covered within the network investment category underpins our delivery commitments in all 12 output areas. In particular it the primary driver of the improvements we are targeting in relation to decarbonisation, asset resilience, and reliability and availability.

In 2015-23 we expect to spend £194.7m p.a. on network investment costs (NICs), which contributes to our overall position as the most efficient group in our sector on a totex basis. During the next price control we expect these investments to increase by £135.0m p.a. (+69.4 per cent) relative to 2015-23. This increase is mainly driven by the need enable decarbonisation (that impacts on our reinforcement and operational IT and telecommunications (IT&T) costs). Our network investment for the 2023-28 period is broken down across Ofgem’s cost categories as shown in figure 7.

Figure 7: network investment costs

<table>
<thead>
<tr>
<th>Cost area</th>
<th>2023-28 total</th>
<th>2023-28 average</th>
<th>2015-23 average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£m</td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Load-related expenditure</td>
<td>645.5</td>
<td>129.1</td>
<td>24.8</td>
<td>104.2</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>588.5</td>
<td>117.7</td>
<td>20.0</td>
<td>97.6</td>
</tr>
<tr>
<td>Connections</td>
<td>57.0</td>
<td>11.4</td>
<td>4.8</td>
<td>6.6</td>
</tr>
<tr>
<td>Non-load: asset renewal</td>
<td>634.0</td>
<td>126.8</td>
<td>122.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Refurbishment</td>
<td>69.0</td>
<td>13.8</td>
<td>14.9</td>
<td>(1.1)</td>
</tr>
<tr>
<td>Asset replacement</td>
<td>532.0</td>
<td>106.4</td>
<td>103.0</td>
<td>3.4</td>
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<tr>
<td>Civil works</td>
<td>33.0</td>
<td>6.6</td>
<td>4.9</td>
<td>1.7</td>
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<tr>
<td>Non-load: other</td>
<td>368.6</td>
<td>73.7</td>
<td>47.1</td>
<td>26.6</td>
</tr>
<tr>
<td>Operational IT and telecoms</td>
<td>104.3</td>
<td>20.9</td>
<td>7.2</td>
<td>13.7</td>
</tr>
<tr>
<td>Flood mitigation</td>
<td>6.0</td>
<td>1.2</td>
<td>5.8</td>
<td>(4.6)</td>
</tr>
<tr>
<td>Quality of supply (inc. WSC)</td>
<td>66.7</td>
<td>13.3</td>
<td>4.4</td>
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<td>Environmental</td>
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<td>Overhead clearances</td>
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<td>1.2</td>
<td>4.6</td>
</tr>
<tr>
<td>Diversions and easements</td>
<td>57.0</td>
<td>11.4</td>
<td>12.1</td>
<td>(0.7)</td>
</tr>
<tr>
<td>Other</td>
<td>0.5</td>
<td>0.1</td>
<td>6.0</td>
<td>(6.0)</td>
</tr>
<tr>
<td><strong>Network investment</strong></td>
<td><strong>1,648.5</strong></td>
<td><strong>329.7</strong></td>
<td><strong>194.7</strong></td>
<td><strong>135.0</strong></td>
</tr>
</tbody>
</table>

1. Includes Rising and Lateral Mains.
2. Worst-served customers (WSC).
In order to ensure that our overall total costs are efficient, we focus on making investment decisions that deliver synergies across our obligations, achieving multiple benefits wherever possible. In order to identify these opportunities and target our investments, we utilise a number of analytical techniques in determining the level of network investment needed. These include:

- asset risk modelling using common network asset indices methodology (CNAIM) that drives 68 per cent of asset replacement expenditure;
- statistical population modelling;
- historical performance analysis;
- socio-demographic analysis;
- techno-economic intervention modelling; and
- analysis of the external environment.

Our use of data and analytics will increase very significantly in the coming period. In particular, we will be deploying much more granular network monitoring and intelligence in order to monitor and pinpoint emerging trends and requirements. This will enable us to make the most of flexibility in energy use from customers and integrate smart grid solutions into our network operation. These will be important tools in the management of uncertainty and optimisation of interventions enabling us to get ahead, and stay ahead, of the curve, allowing our customers to reduce their carbon emissions and maximise the use of low carbon energy through connecting in excess of 831k electric vehicles and 251k heat pumps.

In relation to the first area, we have carried out extensive optioneering on every major category of network investment. In each area, we have identified the range of feasible investment options or strategies. Having eliminated any options that do not deliver acceptable outcomes, we have weighed up the costs and benefits, factoring in the stakeholder feedback we have received. We select the option that delivers the best overall value for money, including any benefits associated with keeping open options in an area where there is significant uncertainty.

On unit costs, a key driver of efficiency is our contracting and procurement strategies, because much of the activity involved in our network investments is carried out by contractors or is cost associated with the supply of major pieces of equipment. This brings the benefits of competitive pressure and market innovation into our cost base and helps us manage our resource needs across peaks and troughs of network investment. It also gives the option to bring in the specialist expertise and equipment that we might need for a particular set of investments, without customers having to fund the upfront costs of training and costly machinery which we may not need to use very often. On the other hand, if is more economic to bring the work in-house, we have the option to do that.

We provide additional detail on the practical implementation of this approach in the following section. You can read more about this element of our approach in our Delivery Strategy (annex 7.1).

Investing in a low carbon future

Load-related expenditure will increase by £104.2m compared to 2015-23 as a result of the impact of decarbonisation on our projected reinforcement and connections volumes.

Decarbonisation represents the single largest cost driver for 2023-28 relative to the current period. Our planning scenario for enabling net zero drives our forecast reinforcement to increase by 488 per cent, equivalent to £97.7m p.a.

We will take a flexibility-first approach to network investment through prioritising flexibility-enabling actions through the DSO strategy. Our plan contains a blend of price-driven and DNO-contracted customer flexibility, smart solutions and conventional network reinforcement to deliver the best value for our customers.

- We will invest in flexibility enablers as part of our DSO Strategy investment of £87.4m, which includes £20.8m in low voltage (LV) monitoring to increase visibility of network conditions and capacity constraints.
- We have assumed that customers will be flexible in their electricity usage in response to price signals from suppliers and use of smart management systems, which help to smooth the demand profile saving £113.2m in avoided network costs.
- We will manage the constraints by deploying DNO-contracted customer flexibility of £5.0m and network flexibility through £9.5m of smart solutions. These actions combined with the LV monitoring proposed in our DSO Strategy save £88.2m in network costs.
- We will build additional capacity where there is more certainty in future growth through £505.7m of load-driven network reinforcement and £74.3m of fault-level investment.

The synergies available vary across the network, and we are actively seeking these out and optimising them. For example, the low voltage infrastructure has a very high probability of requiring additional capacity in all plausible net zero pathways, providing customers the infrastructure necessary to maximise use of low carbon energy, allowing contribution to whole system flexibility and delivering short-term losses benefits, so the risk of stranded assets is very low. The increase in network reinforcement investment at the low voltage level to support net zero also contributes towards the management of asset resilience risk, creating a synergy saving in asset resilience costs in 2023-28, effectively providing asset health benefits for ‘free’.

In contrast, the synergies are less widespread at the higher voltage levels, and this has required us to critically assess potential high-value extra high voltage (EHV) projects to ensure they are needed in multiple decarbonisation pathways in order to minimise asset stranding risk.

Our analysis and discussion around our decarbonisation supporting investment plans are set out in more detail within the Scenarios and Investment section of our plan and its accompanying annex Scenarios and investment (annex 4.1).

While connections forecasts are fundamentally driven by projections of economic activity in the region, decarbonisation and net zero will have a material impact on both the volumes and types of connections we expect to be making in the period.
A comprehensive investment programme

Investment in asset renewal, driven by our condition and asset risk management approach, will be £126.8m per annum.

The core objective of our asset renewal programme is to maintain the underlying condition of the asset base over the long term and manage the risk associated with asset failure. This activity is central to ensuring we meet our Electricity Safety, Quality and Continuity Regulations (ESQCR) obligations.

In the decarbonisation context, we target an additional benefit: to help reduce the long-run cost of increased electrification. To do that we will target asset replacement at the highest priority asset risks, and where we are investing we will assess the likelihood that part of the network experiencing capacity constraints along the decarbonisation pathway out to 2050.

This will deliver acceptable levels of asset resilience with typically half of the investment spending providing a future capacity benefit for decarbonisation.

Our projections assume that we will encounter situations where an asset is a candidate for renewal investment, but there is uncertainty in future network capacity requirements and we are able to manage the risk through enhanced inspections or monitoring combined with asset life extension techniques. In those situations we will defer asset replacement.

Throughout our programme our general approach will be to look to release network capacity by installing upsized assets where increased capacity can be provided at low incremental cost.

We use extensive condition and performance monitoring to inform the investment decisions to ensure timely replacement. Across all asset classes we considered the following options, which are discussed in more detail across our suite of Engineering Justification Papers (EJPs):

- replace on failure – increasing risk profile impacting fault volumes and associated costs;
- refurbishment – preserving the asset to its original design performance by means of replacement of components on a like-for-like basis;
- risk-based replacement – preventing an increase in faults and associated rise in fault repair costs. In this case, assets are returned to the start of the lifecycle and often replaced with more capable, higher capacity equivalent assets; and
- bespoke options specific to either the project or the asset in question.

Management of our overhead lines is our single largest asset renewal investment area and is driving a 59.7 per cent increase in cost.

At this point in our network’s lifecycle the age and health profile of our overhead line wood pole asset base is the key driver of our asset renewal costs and the dominant feature of the risk profile across all voltages.

- A significant proportion of the wood pole population is more than 50 years old.
- Due to this profile, risk within this asset base is projected to continue to increase by a further 29 per cent by the end of the 2023-28 period without intervention.
- We also have a large population of steel poles supporting the LV overhead network, which carry a significantly more expensive unit cost relative to wooden structures (three times more on average to replace).

We are proposing to adopt a 15-year programme to manage the pole population condition and begin to bring risk down over the longer term.

- We will use innovative pole condition assessments using Thor hammer technology to extend asset lives, replacing individual poles where condition and risk are unacceptable.
- We will replace overhead line circuits in areas where low carbon technology (LCT) uptake is high.

Low-performing legacy cable types mean that our underground cables require investment of £155.9m to maintain reliability.

Our low voltage underground networks are poorly performing in terms of fault rates compared to other DNOs due to the proportion of some relatively unreliable legacy cable types:

- Our Northeast population of consac cables makes up only 12 per cent of the network but accounts for more than 50 per cent of LV underground network faults.
- Yorkshire’s population of obsolete aluminium neutral waveform cables also drives a relatively high adverse fault rate performance.

Widespread low voltage monitoring will enable more ‘surgical’ interventions to address condition and performance issues – enabling us to address more circuits than under the current approach.

We are targeting maintaining existing fault rates at HV-132kV through replacement of poorly performing cable sections and use of enhanced partial discharge monitoring.

We will manage the environmental impact of our fluid-filled cables by increasing the use of perfluorocarbon tracer (PFT) tagging and self-healing cable technology.
Our approach to managing our substations plant expands our approach to asset life extension.

We will expand our approach and implement innovative ways of achieving life extension through the use of enhanced asset monitoring such as online dissolved gas analysis (DGA) saving £2.9m in the period. We will also prioritise replacement of assets that also deliver capacity increases required by our net zero pathways.

We will continue to target the replacement of individual distribution substation components wherever practical and economic with consideration of full substation replacement undertaken on an as-needed basis only.

There is a change in our protection strategy as we start to replace early microprocessor relays.

Replacement of protection relays has historically occurred at the same time as the plant they are associated with due to the asset life of the relay technology being used. One-off and standalone replacement of relays was limited to poorly performing relays.

The early microprocessor relays have a lower asset life expectancy compared to their electrometrical counterparts and therefore cannot be replaced at the same time as their associated plant.

2023-28 starts to see the replacement of these relays on a risk basis at a cost of £29.8m.

Our approach to building and civil assets continues to be to replace deteriorated assets that are beyond economic repair at a cost of £33.0m.

Substation civil elements will always deteriorate with age and exposure to the weather. Failure to maintain the integrity of substation roofs, doors and walls could lead to unrestricted access, which in turn gives rise to an increase in the risk of death or serious injury to a member of the public from contact with live electrical plant.

Substation civil assets are visually inspected for obvious signs of deterioration annually, with a more thorough dedicated civil inspection carried out on a five-year cycle. These inspections drive our intervention programmes.

The vast majority of our civil assets are in good condition and are not showing obvious signs of deterioration. Often the first sign of issues is water penetration into the interior fabric of the substation; this can cause issues if the leak is onto live electrical equipment and also accelerate the corrosion of the plant.

Similarly, the majority of substation doors and boundary fences are in good condition. These assets are often the first line of defence in preventing third party access to our equipment and must be kept in good condition to maintain compliance with our legal obligations.

Investment in operational telecoms increases by £13.7m per annum compared to 2015-23 driven by our DSO Strategy enablers and resilience improvements.

Our investments will build on our large-scale operational telecoms work carried out in the 2015-23 period by concentrating on improving the resilience of the network to meet future and emerging requirements and support the DSO transition.

As with all infrastructure asset bases there is a baseline investment requirement for the refurbishment and replacement of equipment. Operational telecoms is no different and we must maintain our existing towers, microwave links, telecoms batteries and pilot wire infrastructure.

We are also overlaying the baseline requirement with the need to improve the resilience of the network via additional communication links providing increased capacity and redundancy.

Our existing emergency voice communication is expected to be retired during the period so we will build a resilient private voice network across the network utilising digital mobile radio (DMR) technology. This is used in major power outage situations or Black Start events where existing commercial mobile voice communications is not able to provide voice service for operational activities.

The need for more reliable local low voltage networks will increase due to the electrification of the transport and heat sectors. This means improvements through conventional and innovative technology are an important part of our plan. We will use groundbreaking pre-fault detection and data analytics to target deployment of fault management devices and replacement of poor-performing assets.
Our flood defence investment is £4.6m per annum lower than the current period due to the level of resilience that we have already achieved.

We have invested significantly in flood defences in the current and previous price control period in response to strong stakeholder feedback. Our strong delivery in this area means our investment in the next period can reduce while continuing to increase the level of overall flood resilience.

Flood defence investment decisions are determined following a risk-based Energy Networks Association (ENA) methodology. It is prescriptive in terms of the level of protection to be applied at substations at risk of flooding based on the consequence of failure.

By the end of the 2015-23 period our network will be compliant with the defences prescribed by the methodology (Engineering Technology Report (ETR) 138). We plan to make incremental enhancements to existing major substation defences to maintain defences to revised flood risk assessments and to increase defences to a higher level of resilience.

We will defend distribution substations that have higher consequence of failure. The protection of distribution substations falls outside the scope of ETR 138; however, where a specific requirement is identified for a particular substation (e.g. where a substation has been previously affected by a flood event or a substation that feeds critical infrastructure) flood mitigation measures will be deployed.

Quality of supply improvements will be delivered through technology deployment and targeted network improvements investing £8.9m more per annum compared to the current period.

We will install significantly higher volumes of remote switching and network automation on the high voltage networks to match the capabilities of other DNOs so that our customers benefit from the same level of service.

The automation will be targeted at our worst-performing circuits, thereby simultaneously improving services for our customers that receive lower than average service levels.

The automation programme will involve 8,600 automated switches at a total cost of £64.2m. This will be a mixture of ground- and pole-mounted automated switches, which we expect to split 70:30.

We are targeting £2.5m of investment towards improvements for our worst-served customers (WSC).

In order to tackle performance for our population of WSC, we have designed a £2.5m scheme that will upgrade assets supplying our rural communities and install automation to help restore supplies faster. This will significantly improve the level of service they receive and reduce the number of interruptions they experience by 50 per cent.

Environmental costs will increase by £46.0m to deliver against expanded obligations and support decarbonisation.

Compliance with polychlorinated biphenyls (PCBs) legislation is the largest increase in costs within this area.

— We have followed the ENA-developed statistical model to evaluate the likely volumes of equipment we will have to replace and estimate that 7,900 pole-mounted transformers will need to be removed from the network at a cost of £41.2m.

— This includes the replacement of these units with amorphous core equivalents, which will reduce losses and improve the network’s efficiency. This carries an incremental cost of £13.4m (included within the £41.2m) and is proven to be cost-effective over the life of the asset via Cost Benefit Analysis.

Oil pollution mitigation scheme:

— Latest environmental surveys have highlighted a significant number of existing transformer bunds that have experienced a material loss of integrity and are no longer fit for purpose. We will reline the existing bunds with innovative coating that will completely reinstate the bunds’ integrity.

Visual amenity:

— We will continue our successful stakeholder-led programme to underground overhead lines in Areas of Outstanding Natural Beauty (AONB) at the same run-rate as 2015-23.

Delivering on our legal obligations and operating a network that is safe for operators and the public is a £4.6m per annum change compared to the current period.

An investment of £29.0m is required in 2023-28 to comply with our ESOCR obligations to maintain clearances to overhead lines, which represents a 370.5 per cent increase on 2015-23 expenditure.

These clearance infringements are identified through our inspection programmes.

The solutions we adopt to resolve clearances will factor in the capacity requirements for net zero and the need to de-loop services as required.

We will continue our risk-based management strategy for asbestos management. Our interventions will continue to be focussed on the asbestos that poses the greatest risk to operators working with our substations.

Our approaches to fire prevention and mitigation, substation security and metal theft remain unchanged to the current period.

1. Excludes synergy of 500 units delivered through our reinforcement programme.

2. LiDAR is a technology used to create high-resolution models of ground elevation.
Operating our network efficiently

In the current period, we expect to spend £122.9m per annum on network operating costs (NOCs), which represents an efficient starting point for the forthcoming period. As we show in annex 6.2, Cost Benchmarking, we are a leading operator on a toptex basis, which is the most robust way to evaluate efficiency. The NOCs category is an example of where, taking those costs in isolation, we benchmark at the ‘middle of the pack’ on a disaggregated basis but that ‘penalises’ money we spend in this category that saves money elsewhere to contribute to efficient aggregate total expenditure.

Over the course of the next period, we expect our NOCs to marginally increase by £3.1m (2.6 per cent) p.a. driven by increases in inspections and maintenance, and tree cutting costs.

**Our plan is set to hold fault costs flat compared to the 2015-23 period at the same time as targeting the significant service improvements.**

Fauls expenditure is the largest component of NOCs accounting for about 70 per cent of the total. Our plan is set to hold fault costs flat in the 2023-28 period (marginal 0.1 per cent increase) while delivering significant service improvements as set out in our customer outcome commitments for Reliability and Availability. Our plan targets 12 per cent fewer and 25 per cent shorter power cuts, a 50 per cent reduction in the number of customers experiencing 12-hour faults and a 15 per cent reduction in six-hour faults on our network. These major service improvements will be achieved by driving efficiencies that allow us to hold our fault costs at current levels.

Our plans in this area include some exciting initiatives to keep downward pressure on costs and improve service levels. That includes making more use of new technology that will improve our ability to respond to power cuts, including the deployment of technology that will enable early warning of faults and more precise fault location and the use of more SilentPower battery generators.

Inspections and maintenance will rise by £4.2m p.a. to facilitate additional domestic property safety inspections.

We expect that our planned inspections expenditure will be £6.0m p.a., £1.1m (23.4 per cent) higher than the average in the 2015-23 period. The two main areas of increased cost pressure are:

- The addition of new activity for domestic cut out inspections, adding £4.8m of new expenditure to our plan (£1.0m p.a.; and
- Moving from a simple time-based assessment every 10 years to a condition and risk-based assessment through more frequent inspections using innovative Thor hammer technology. While this will add £0.2m to our inspection costs, we estimate that this change in approach will deliver net efficiency savings of £42.8m in the period from the deferral of asset replacement.

Our planned maintenance expenditure for the 2023-28 period is expected to be £86.3m p.a., £2.9m (19.1 per cent) higher than the p.a. average in the 2015-23 period. This is due the increased use of PFT technology (perfluorocarbon tracers) and the use of innovative self-healing cable additives to identify and remediate leaks in fluid filled cables as set out in our Environmental Action Plan (annex 4.4). These approaches drive additional costs of £4.1m and £0.9m p.a. respectively but unlock net efficiency savings of £34.7m and £6.5m respectively over the period through reduced asset replacement.

**Vegetation management costs will increase to address the emerging risk associated with ash tree dieback.**

Vegetation management costs in the 2023-28 period are £1.3m (4.1 per cent) p.a. higher than 2015-23 driven by the need to do more work to address the impact of ash tree dieback (£0.6m p.a. increase) and the incremental costs to manage clearances to tower bases and substations (£0.5m increase). Our costs include the introduction of LiDAR surveys during the period allowing us to better target our vegetation management works and drive efficiency in this area. The surveys will cost £1.6m to complete but drive savings of £2.6m in period related to ash tree dieback and will enable lower cut volumes beyond 2028.

The smart meter roll-out has been extended beyond the original 2020 deadline to June 2025. During the roll-out meter operators identify unsafe situations at a customer’s premises that require DNO intervention. In the 2023-28 period we expect to spend £6.5m in total and £2.2m p.a. resolving unsafe sites to facilitate the smart meter roll-out for the first three years to its completion equivalent to an annual average cost of £1.3m over the whole period, some £2.7m p.a. lower than in the current period.

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**Figure 8: network operating costs**

<table>
<thead>
<tr>
<th>Cost</th>
<th>2023-28 total</th>
<th>2023-28 average</th>
<th>2015-23 average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£m</td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Faults</td>
<td>431.5</td>
<td>86.3</td>
<td>86.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Inspections and maintenance</td>
<td>121.5</td>
<td>24.3</td>
<td>20.1</td>
<td>4.2</td>
</tr>
<tr>
<td>Tree cutting</td>
<td>54.5</td>
<td>10.9</td>
<td>9.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Smart meter interventions</td>
<td>6.5</td>
<td>1.3</td>
<td>4.0</td>
<td>(2.7)</td>
</tr>
<tr>
<td>Other NOCs</td>
<td>16.0</td>
<td>3.2</td>
<td>3.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Network operating costs</td>
<td>630.0</td>
<td>126.0</td>
<td>122.9</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Supporting our business

Our indirect costs and non-operational capex in 2023-28 will be £186.4m per annum, £32.7m higher compared to the current period. Our core indirect costs are actually coming down slightly as we find more efficient ways to provide a better service to our customers.

The overall increase is driven by those areas where our outputs involve new or a significant increase in activity levels, but the dominant driver is the need to decarbonise, which accounts for £26.7m (82 per cent) of the increase. We will also spend more on activities where stakeholders have made it clear we should play a more prominent role in the future, such as providing enhanced services for vulnerable customers and taking greater action in our communities.

This category of costs is one in which our efficiency track record benchmarks strongly. Taking these costs in isolation, we benchmark as the leader in the industry a disaggregated basis, partly because some of the benefits of expenditure we make elsewhere are actually coming down slightly as we continuously optimise. Annex 6.2: Cost Benchmarking provides more details on the efficiency assessment.

In figure 10 we show the detailed breakdown of where we expect the £32.7m of increased expenditure to sit, and what the increased spend will support. As well as the increase in costs associated with decarbonisation, we also envisage more support for vulnerable customers to promote a just transition to net zero and increased costs in support of our communities.

Decarbonisation-related indirects drive efficiencies across the whole system on the path to net zero.

Our decarbonisation strategy is to embrace and manage uncertainty to ensure all credible pathways to net zero remain open. Central to this is a flexibility-first approach, enabled through a blend of smart grid and DSO initiatives, smart grid solutions, customer flexibility and targeted network reinforcement. This approach requires an additional £26.7m of indirect costs per year compared with current levels. These costs fall broadly into four types:

— the costs necessary to establish and operate DSO to enable customers to make the right choices (£12.9m);
— the costs necessary to support the targeted investment in reinforcement (£13.1m);
— costs incurred in remaining on our own path to net zero as an organisation (£1.1m); and
— costs in support of work within our communities (£0.4m).

Our continued transition to DSO requires investment in non-operational IT systems and bringing additional individuals into the business to ensure we have the right skills and tools in the organisation to deliver the changes required. As our DSO Strategy shows, the establishment of an active DSO is a key enabler of customer flexibility and has the potential to generate £169.2m savings of investment on the grid (largely on the EHV system). Consequently, the costs incurred here have the important purpose of driving down the total costs of achieving net zero.

In addition, the scale of the increase in our network investment programme (£135m p.a., about 70 per cent) does mean that our indirect costs need to increase to support that. As described in our Decarbonisation section, our network and the country’s electricity systems as a whole are transforming to meet an increasing uptake of LCTs such as HPs and EVs. As the demands placed on the system become larger and more complex, it is critical that this transformation proceeds efficiently, and the increased indirect costs associated with network design, control centre, stores and engineering support are vital enablers to achieve that objective.

The key feature of these decarbonisation-related indirect expenditures is that they drive a wider efficiency benefit. DSO-related costs create the opportunity to save significant investment during 2023-28 and beyond; while the indirect costs associated with the enhanced investment programme are necessary to ensure that that programme is efficiently planned and continuously optimised.

Figure 9: indirect costs and non-operational investment

<table>
<thead>
<tr>
<th>Cost</th>
<th>2023-28 total</th>
<th>2023-28 average</th>
<th>2015-23 average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£m</td>
<td>£</td>
<td>£</td>
<td>£</td>
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<tr>
<td>Indirect costs associated with</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>decarbonisation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closely associated costs</td>
<td>77.5</td>
<td>15.5</td>
<td>-</td>
<td>15.5</td>
</tr>
<tr>
<td>Business support costs</td>
<td>13.5</td>
<td>2.7</td>
<td>-</td>
<td>2.7</td>
</tr>
<tr>
<td>Non-operational investment</td>
<td>42.5</td>
<td>8.5</td>
<td>-</td>
<td>8.5</td>
</tr>
<tr>
<td>Subtotal</td>
<td>133.5</td>
<td>26.7</td>
<td>-</td>
<td>26.7</td>
</tr>
<tr>
<td>Closely associated costs</td>
<td>496.9</td>
<td>99.4</td>
<td>84.2</td>
<td>15.1</td>
</tr>
<tr>
<td>Business support costs</td>
<td>278.1</td>
<td>55.6</td>
<td>49.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Non-operational investment</td>
<td>157.0</td>
<td>31.4</td>
<td>19.6</td>
<td>11.8</td>
</tr>
<tr>
<td>Total indirect and</td>
<td>932.0</td>
<td>186.4</td>
<td>153.7</td>
<td>32.7</td>
</tr>
<tr>
<td>non-operational costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Our stakeholders have been clear that we must do more than just keep the lights on.

As part of supporting our reliability improvement plans, we will invest £16m in fault management and location devices to support service improvements on our LV network.

More broadly, our stakeholders (including our regulator) have been explicit that in 2023-28 we must play a fuller and more prominent role in our region. We have developed an ambitious set of propositions to deliver this, which are set out in the Openness and Transparency, Communities, and Vulnerable Customers sections of our plan. Meeting this step-up in expectations means that we will invest more in these areas than we have done previously. We will:

- formalise, enhance and increase the scale of the services we currently provide to vulnerable customers, rolling out our programmes more widely across our regions and introducing new measures to ensure that no one is left behind as we transition to net zero – spending around £3.1m p.a. more than we do now (nearly a five-fold increase);
- be a force for good in our communities, leveraging our position in our region to make a positive contribution to those we serve. Our plan increases investment by more than double in social initiatives, such as tree planting, support for local schools around STEM, employability skills, energy efficiency for households and communities and support for community energy groups, when we are completing major investment works in our communities; and
- retain our Consumer Engagement Group (CEG) on a permanent basis so that our delivery against our commitments will be properly scrutinised. This will cost around £3.5m for the next five-year period.

Having tested these plans with our stakeholders, we believe that although this represents a material increase in expenditure, our programme matches their required ambition, targets the areas they care most about, and delivers excellent value for money.

Figure 10: indirect costs and non-operational investment – detailed breakdown

<table>
<thead>
<tr>
<th>Cost</th>
<th>2023-28 total</th>
<th>2023-28 average</th>
<th>2015-23 average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core indirect costs</td>
<td>750.0</td>
<td>150.0</td>
<td>151.8</td>
<td>(1.8)</td>
</tr>
<tr>
<td>Indirect costs in support of the DSO</td>
<td>64.5</td>
<td>12.9</td>
<td>-</td>
<td>12.9</td>
</tr>
<tr>
<td>Indirect costs to support the roll-out of the additional investment in the network</td>
<td>65.5</td>
<td>13.1</td>
<td>-</td>
<td>13.1</td>
</tr>
<tr>
<td>Investment in EVs</td>
<td>5.0</td>
<td>1.0</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Investment to reduce building and substation energy use</td>
<td>0.5</td>
<td>0.1</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td>Costs in support of communities</td>
<td>2.0</td>
<td>0.4</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td>Subtotal – costs driven by decarbonisation</td>
<td>133.5</td>
<td>26.7</td>
<td>-</td>
<td>26.7</td>
</tr>
<tr>
<td>Additional tools and instruments in support of low voltage automation</td>
<td>16.0</td>
<td>3.2</td>
<td>-</td>
<td>3.2</td>
</tr>
<tr>
<td>Costs in support of vulnerable customers</td>
<td>19.5</td>
<td>3.9</td>
<td>0.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Costs in support of communities</td>
<td>6.5</td>
<td>1.3</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Indirect costs for the Customer Engagement Group</td>
<td>3.5</td>
<td>0.7</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Costs for a training centre</td>
<td>3.0</td>
<td>0.6</td>
<td>-</td>
<td>0.6</td>
</tr>
<tr>
<td>Base indirect costs and non-op capex</td>
<td>932.0</td>
<td>186.4</td>
<td>153.7</td>
<td>32.7</td>
</tr>
</tbody>
</table>
Non-activity based costs

Non-activity based costs tend to be non-discretionary and not directly driven by work on our network. This cost category includes items such as our pension deficit repair payments.

A full breakdown of these costs is shown in the annex Our costs in detail (annex 6.3). Overall, we expect there to be a 24 per cent reduction in our non-activity costs in 2023-28 relative to 2015-23. This is mainly due to a reduction in costs associated with pension deficit funding.

Pass-through costs

- Licence fees – Ofgem determines how much we pay for our distribution licence fee. We have assumed that the fee in the next period will be consistent with the current level.
- Business rates – the amount that we pay in rates is derived from complex formulas. Since the last valuation this has been broadly based on the value of our assets and the allowed return on these assets.
- Exit charges – Ofgem determines how much we pay to connect our network to the National Grid. These charges generally remain stable across the period.
- Smart meter enablers – these costs include expenditure on additional IT assets and services that are specifically associated with the systems required to access, store, process and use smart meter-derived data.

Other non-activity based costs

The largest element of non-activity based costs is our pension deficit payments: our treatment follows the requirements specified by Ofgem. Our pension deficit is calculated by an actuary every three years. The deficit as of 31 March 2019 was agreed with the trustees in 2020 to be £146m, with a recovery plan of deficit repair payments of £30m p.a. plus RPI continuing until March 2023, followed by two years of £15m p.a. plus RPI. The actual allowance for the 2023-28 period will be agreed every three years with Ofgem, to align with the triennial cycle for the pension scheme. The next triennial valuation will take place as of 31 March 2022.

Figure 11: non-activity based costs

<table>
<thead>
<tr>
<th>Cost area</th>
<th>2023-28 total</th>
<th>2023-28 average</th>
<th>2015-23 average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£m</td>
<td>£m</td>
<td>£m</td>
<td>£</td>
</tr>
<tr>
<td>Pass-through costs</td>
<td>430.3</td>
<td>86.1</td>
<td>80.8</td>
<td>5.3</td>
</tr>
<tr>
<td>Other non-activity based costs</td>
<td>16.3</td>
<td>3.3</td>
<td>24.6</td>
<td>(21.3)</td>
</tr>
<tr>
<td>Total activity based costs</td>
<td>446.6</td>
<td>89.4</td>
<td>105.4</td>
<td>(16.0)</td>
</tr>
</tbody>
</table>
Real price effects (RPEs) and ongoing efficiency

On average over time, many of the inputs we use will increase in price faster than the Office for National Statistics’ (ONS) CPIH measure of inflation that is embedded as standard in our revenue allowances. These input cost changes are called real price effects (RPEs). The flip side of this is that we continually look to get better at what we do, helping to offset rising input prices.

One of the clearest examples of a RPE comes from real terms pay growth, which reflects productivity growth across the economy and is why living standards tend to rise over time. For example:

- From January 2000 to 2021, average earnings in the economy rose 23 per cent in real terms, above CPIH, or one per cent p.a.
- This has happened over a period that included the dot-com slowdown, global financial crisis, the austerity that followed and, most recently, the COVID-19 pandemic.
- Even in a pandemic year (2020), the Bank of England recently found that the average pay settlement held up at 2.5 per cent, i.e. 1.7 percentage points above CPIH inflation.

Labour is our biggest input, and for a high proportion of our staff we need to recruit from specialist pools of labour that have at times seen faster wage growth than average. We are also exposed to fluctuations in the prices of materials such as copper or aluminium through the cables and transformers that we need to buy to improve our network.

Over 2023-28, Ofgem has said that it will only make allowance for these costs through indexation mechanisms. This policy means that our customers will bear the risk of fluctuation in prices, while we will be exposed to the risk of a mismatch between the price of inputs we actually use and the indexation mechanism. As a result, it is crucial that the indices are well constructed.

Unlike RPEs, ongoing efficiency will be set as a fixed assumption by our regulator. This section of our plan sets out our proposals for RPEs and ongoing efficiency.

We have engaged economic experts to review the evidence and develop a balanced approach to indexation design.

To ensure Ofgem’s policy is executed as successfully as possible, and to achieve a balanced outcome, we are proposing indexation for RPEs that has been calibrated by independent experts, the economic consultancy NERA, based on the available evidence.

RPEs are an economically complex subject, which is why the involvement of economic experts is important. We commissioned this essential study jointly with other Distribution Network Operators (DNOs) for three reasons:

- The DNOs are undertaking essentially the same activity and we expect our regulator to apply the same approach to the entire sector.
- Jointly tendering is more cost-effective than each DNO commissioning a similar study.
- Pooling each DNO’s data on input price changes, for example for transformers and cable, allows a better justified approach to indexation to be developed.

Figure 12: breakdown of RPEs

<table>
<thead>
<tr>
<th>Cost area</th>
<th>Justification</th>
<th>Share of sector costs</th>
<th>Proposed index</th>
</tr>
</thead>
<tbody>
<tr>
<td>General labour</td>
<td>Across the economy there is indisputable evidence that wages tend to grow faster than CPIH inflation</td>
<td>30%</td>
<td>Indexed using:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ONS private sector weekly earnings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ONS annual survey for hours and earnings median hourly earnings</td>
</tr>
<tr>
<td>Specialist labour</td>
<td>As with general labour, the evidence of labour RPEs is indisputable. In this category the benchmarks are tailored towards electrical and civil engineering</td>
<td>36%</td>
<td>NERA index based on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS PAFI civil engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS PAFI electrical engineering</td>
</tr>
<tr>
<td>Materials (capex)</td>
<td>Electricity distributors use specialist components that become part of their networks like cable and transformers and wood poles. Prices depend heavily on commodity prices, which can be volatile</td>
<td>18%</td>
<td>NERA index based on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS PAFI pipes and accessories, aluminium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS PAFI pipes and accessories, copper</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS structural steelwork materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS aluminium products</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ONS wood, sawn and planed</td>
</tr>
<tr>
<td>Materials (opex)</td>
<td>Similar to capex materials, but with indices tailored towards a lower weight on major network components</td>
<td>3%</td>
<td>NERA index based on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS RCI Infrastructure materials (FOCOS)</td>
</tr>
<tr>
<td>Plant and equipment</td>
<td>As well as components that become part of the network (materials), DNOs use various items of plant, such as generators, tools and road transport</td>
<td>7%</td>
<td>NERA index based on:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ONS machinery and equipment output PPI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- BCIS PAFI plant and road vehicles</td>
</tr>
</tbody>
</table>

1. CPIH: Consumer Prices Index including owner occupiers’ housing costs.
NERA has used data from the sector to benchmark the input price changes the sector has actually seen against the various candidate indices that could be used for an RPE mechanism. This has resulted in a data-led evaluation of the RPEs that the sector is most likely to face going forwards.

This allows us to propose evidence-based indexation for our key input categories.

The table in figure 12 provides a summary of the indexation we propose based on the NERA report, along with a brief summary of the justification.

The full NERA report can be accessed from the RPEs and ongoing efficiency annex (6.4).

We have also engaged economic experts to review all the available evidence on ongoing efficiency.

Although input prices such as labour costs and specialist materials tend to rise faster than CPIH inflation, we will also get better at what we do over time. This means we will not need to use as many inputs to deliver the same outputs.

Similar to RPEs, understanding the scope for ongoing efficiency is an economically complex subject. We have therefore also commissioned NERA to review the evidence on behalf of all electricity distributors.

To ensure a balanced view, NERA has triangulated evidence including:

— the standard dataset used in this area when evaluating comparator sectors, which is EU KLEMS;
— analysis of actual DNO productivity over the past decade;
— economy-wide productivity estimates; and
— forecasts from economic commentators of productivity growth.

All four sources of evidence point to lower values of ongoing efficiency than have been assumed in Ofgem’s recent regulatory decisions, and NERA concludes that the range 0.1 per cent to 0.5 per cent “defines the widest range of assumptions that could reasonably be derived from the evidence”.

For the purposes of this business plan, we have adopted the most challenging assumption within this reasonable range, of 0.5 per cent.
Making it happen

We have set out a significant increase in activity levels and the development of Distribution System Operation (DSO) capabilities.

Our plan is to invest around a third more every year than we have in the current period in total (see Costs section). This is overwhelmingly driven by the need to ensure that we open up all credible pathways for our region to decarbonise.

We’ve set out more on our delivery plans in our:
- Delivery Strategy annex 7.1
- DSO plan section annex
- Digitalisation Strategy and Action Plan, annex 5.3
- Workforce Resilience annex 5.2

We are expanding our capabilities for DSO.

In order to efficiently support decarbonisation goals, we must enable a smart, flexible energy system where we actively manage the more complex power flows on distribution grids such that we can optimise the value for the system.

In our plan we invest in information technology systems, skills and data to enable optimal use of our assets and sharing of information to facilitate the most cost-effective route to decarbonisation. This is a significant change for our business but we are confident we can manage the risks that come with such a transition because of our track record and the strength of our DSO, Data and Digitalisation, and Workforce Resilience strategies.

We are building on a strong base and track record in the 2015-23 period. See our Track Record section.

We are already well underway in modernising our network through our smart grid enablers programme and investments in smart meter supporting systems.

- We have been actively testing the flexibility market, running flexibility expressions of interest and rolling out around 440MW of flexible connections across our active network management (ANM) areas.
- We are now routinely collaborating with a variety of industry stakeholders in developing Distribution Future Energy Scenarios (DFES) and engaging on our forecasts through an open data platform.
- We have focussed our innovation portfolio on preparing for the future through projects such as customer-led distribution system (CLDS) and trialling vehicle-to-grid smart charging.

Our strong track record of delivering against our forecasts gives us confidence that we can deliver our plan. Throughout 2015-23 our investment has closely tracked in line with our plan. We are delivering our network health targets and meeting or exceeding our 53 business plan commitments for the current period.
**Gearing up to deliver**

Our plan sets out a robust strategy detailing how we will develop our DSO capabilities.

We will invest in systems and skills to deliver a significant upgrade in our data capture and analytics capabilities alongside deploying flexibility and stimulating markets to optimise our system efficiently. Building on activities in the current price control period, some key elements of our strategy include:

— Investing £21m in rolling out LV monitoring such that 50 per cent of our ground-mounted substation networks are covered by 2028, a continuation of an ongoing programme we have already been successfully implementing during the 2015-23 period.

— Building on the successful implementation of our AutoDesign platform by delivering an easy to use customer portal for a range of existing and new data sets, expanding today’s tool to include different voltage levels and to include new and existing customer connections.

— Continuing to explore using flexibility, building on flexibility to optimise network assets, building on learnings from flexibility tenders we have been running since 2018.

Our cross-cutting plans for Data and Digitalisation and Workforce Resilience both centre on the need to support the DSO transition.

Our DSO strategy describes the use cases for the systems that will be delivered through the data and digitalisation strategy.

— Through our deliverability review we have concluded that to deliver our ambitious outcomes, it will be necessary to employ a delivery model that utilises a mix of internal resources and external partners.

— Each of our initiatives is costed using a model that includes planning and design, the cost of the solution itself (covering hardware, software, testing, project management and integration costs), solution implementation and business change to ensure that we not only deploy technology, but we also embed it within the business.

— We have also modelled resources across the five-year period to ensure we have the internal capabilities to deliver the initiatives as envisaged.

— We have sequenced the initiatives as programmes of work, factoring best practice insight from our strategic technology partners in setting out the plans to deliver the work required.

To successfully deliver DSO functions, we must attract people with new skills and expertise to our business, as well as upskilling our existing workforce. To ensure we achieve this, our plan will see us:

— evolving our training programmes to upskill our industrial and technical workforce;

— increasing our training delivery capabilities and capacity to accommodate the higher volumes of people to be trained;

— bringing colleagues with specialist data management skills into the business, through both recruitment and procurement;

— improving the core data skills of our current colleagues; and

— engaging our workforce on the transition to DSO to be clear on the impact it will have on their roles and how their skills will need to change.

2023-28 will also require a material increase in investment in the network.

When delivering DSO functions we will monitor, manage and then, only if necessary, reinforce our network. The scale of the change that is required to decarbonise means that even though we have adopted this flexibility-first approach, opening all the credible pathways to net zero will still require a material increase in network reinforcement. Network investment costs in total increase by over 70 per cent in our ‘best view scenario’ — see our Costs section — which assumes that:

— about 941,000 electric vehicles (EVs) will be connected to our network by 2028 compared to about 31,000 today; and

— over 309,000 heat pumps (HPs) will be connected, an increase of over tenfold compared to today — see our Scenarios and Investment section.

Our current delivery strategy (annex 7.3) for much of the work that is required in 2023-28 is to continue our outsourced model with contractors across our region. This allows us the flexibility to scale resources to respond to the delivery challenge. By using strategic framework agreements we are able to award contracts for significant programmes of work that are designed to be scalable in line with requirements.

Through tender processes we identify all of the appropriate contractors across our region that are able to deliver the contracts, including those able to respond to changes in scale. We have a proven track record of delivering large programmes of work this way. We know that providing we plan ahead properly, our contractors will flex their resource capacity in anticipation of the demand. Our engagement activity tells us that we have a supply chain that is eager and able to support us in meeting our delivery challenges.

We have a proven track record of delivering at industry-leading levels of cost efficiency. Through engagement with our supply chain, we know we can deliver our ambitious ED2 plan and enable regional decarbonisation.

**Andy Bilclough**
Director of field operations

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**EXEC SUMMARY** | **TRACK RECORD** | **ENGAGEMENT** | **OUTPUTS** | **ENABLERS** | **COSTS** | **DELIVERY**
---|---|---|---|---|---|---

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## Impact assessment

<table>
<thead>
<tr>
<th>Plan area</th>
<th>Activity levels</th>
<th>Performance levels</th>
<th>Headline changes vs. 2015-23</th>
<th>Key features of our delivery plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decarbonisation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scenarios and Investment</td>
<td>↑</td>
<td>↑</td>
<td>Over four times increase in network reinforcement</td>
<td>Scale contractor resources through strategic framework agreements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dynamic system planning and forecasting</td>
<td></td>
</tr>
<tr>
<td>DSO Strategy</td>
<td></td>
<td></td>
<td>Open data platform</td>
<td>Increase number of people working to fulfill DSO functions to c. 40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flexibility procurement</td>
<td>Scale existing LV monitoring programme</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Installation of 10,000 low voltage (LV) monitors and their ongoing management</td>
<td><strong>Data and Digitalisation initiatives below</strong></td>
</tr>
<tr>
<td>Whole Systems</td>
<td></td>
<td></td>
<td>200 large-scale sites with voltage optimisation</td>
<td>Build on innovation outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Roll-out of 30 innovative microgrids</td>
<td>Recruit and train further staff to install smart grid equipment</td>
</tr>
<tr>
<td>Environmental Action Plan</td>
<td></td>
<td></td>
<td>C. 8,400 polychlorinated biphenyl (PCB)-driven pole-mounted transformer changes</td>
<td>Scale existing supply chain through strategic framework agreements</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Four times increase in perfluorocarbon tracer (PFT) for cable leakage</td>
<td>Leverage ‘hot glove’ resources for live-line working where possible</td>
</tr>
<tr>
<td>Asset Resilience</td>
<td></td>
<td></td>
<td>Synergistic planning using latest decarbonisation forecasts</td>
<td>Deliver programmes through strategic framework agreements</td>
</tr>
<tr>
<td>Reliability and Availability</td>
<td></td>
<td></td>
<td>8,600 high voltage (HV) automated switches and enhanced LV technology at 9,000 locations</td>
<td>Scale existing supply chain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(c. double 2016-23 run-rate)</td>
<td>Multiskill operational teams</td>
</tr>
<tr>
<td>Safety</td>
<td>←</td>
<td>←</td>
<td>Expansion of safety management system to our contractor base</td>
<td>Invest in new safety and driving training programmes and systems</td>
</tr>
<tr>
<td>Climate Resilience</td>
<td>←</td>
<td>←</td>
<td>A further 48 flood defences</td>
<td>Adapt existing programmes and supply chain for 2023-28 volumes</td>
</tr>
<tr>
<td>Physical and Cyber Resilience</td>
<td>←</td>
<td>←</td>
<td>Enhanced physical security at all of our Critical National Infrastructure-designated sites</td>
<td>New OT cyber-specialist recruitment and training programme</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replacement power-resilient telecoms solution</td>
<td>New solutions to detect threats and respond to attacks</td>
</tr>
<tr>
<td>Customer Service</td>
<td>←</td>
<td>←</td>
<td>Increase broad measure of customer service (BMCS) score to 93.5%</td>
<td>New technology to offer greater choice to customers</td>
</tr>
<tr>
<td>Vulnerable Customers</td>
<td>↑</td>
<td>↑</td>
<td>Reach &gt;70% of eligible high-risk customers with Priority Services Membership (PSM)</td>
<td>Increase customer support vehicles</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recruitment of enhanced on-site welfare support for &gt;6 hour power cuts</td>
<td>Establish new arrangements to provide additional on-site support</td>
</tr>
<tr>
<td>Our Communities</td>
<td>←</td>
<td>←</td>
<td>Additional £1.0m on social programmes to improve the network and community</td>
<td>Establish community energy advisors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upskill external partners on decarbonisation</td>
</tr>
<tr>
<td>Connections</td>
<td></td>
<td></td>
<td>20% faster small works lead times</td>
<td>Build on existing systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Expansion of AutoDesign self-service</td>
<td>Develop our digital platforms to enable customers to self-serve and facilitate mass LCT uptake</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Capacity to accommodate significant increase in low carbon technology (LCT) connections</td>
<td></td>
</tr>
<tr>
<td>Openness and Transparency</td>
<td>←</td>
<td>←</td>
<td>Sustainable procurement policy aligned to ISO260400</td>
<td>Modify our procurement approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>98% of suppliers with ISO14001 environmental accreditation</td>
<td>Work with our supply chain to obtain accreditation</td>
</tr>
<tr>
<td><strong>Enablers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>←</td>
<td>←</td>
<td>Flexibility product development</td>
<td>Continue our delivery model of internal resources working with new and existing external partners</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Harnessing flexibility at low voltage to resolve LV network constraints</td>
<td></td>
</tr>
<tr>
<td>Data and Digitalisation</td>
<td>↑</td>
<td>↑</td>
<td>C. 80% increase in investment (+£10m p.a.) to deliver data and flexibility outcomes</td>
<td>Mix of internal resources and external strategic partners</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Enhanced data governance</td>
<td>Recruitment and training for data skills</td>
</tr>
<tr>
<td>Workforce Resilience</td>
<td>←</td>
<td>←</td>
<td>Create &gt;1,000 new job opportunities</td>
<td>Upskilling and recruiting our workforce with data science, digital, commercial and technical engineering expertise</td>
</tr>
</tbody>
</table>
Financing

Our stable and robust financial position is supported by the long-term outlook of our shareholder, the Berkshire Hathaway Energy group, which is ultimately owned by Berkshire Hathaway Inc.

Our approach to financing the business reflects Berkshire Hathaway’s long-term outlook and preference for sustainable capital growth over dividends. The financial flexibility offered by this approach helps us maintain the highest credit rating of any of the standalone network groups.

Our proposed financing package will provide the funding to deliver the ambitions set out in this business plan.

All stakeholders agree that the cost of capital for 2023-28 will be lower than our regulator’s assumption at the last price control review. While there is uncertainty over the exact cost of capital, and in particular, a reasonable range for the cost of equity finance that the evidence supports, we believe our regulator has – over the past few years – given way to pressure, failed to take proper account of that evidence, and attempted to set returns at too low a level.

This section takes as its starting point the working assumption for the cost of capital and specific stress-tests that our regulator has required. It also signals those areas where we think the evidence justifies a different approach.

**Ofgem’s assumptions for cost of capital are too low, especially given the pivotal nature of the sector in the net zero transition.**

Ofgem’s current working assumption for the cost of equity, of 4.65 per cent plus the Office for National Statistics’ Consumer Prices Index including owner-occupiers’ housing costs (CPIH), is too low. It is below the marginal cost of equity and risks deterring investment in the distribution network at a time when the need for investment is acute.

Ofgem’s approach does not match the methodology taken by the Competition and Markets Authority (CMA) in its recent redeterminations of price controls for the water sector. And the gas distribution and transmission network companies are challenging Ofgem’s approach as we put this plan together. In reaching our own view, we have worked with financial expert Oxera to review the evidence. It has concluded that the cost of equity for companies in our sector is between 5.8 per cent and 6.9 per cent.

We have also been engaging with stakeholders to show them the impact on bills over the long term of both an appropriate cost of equity – which can be no lower than the 5.8 per cent at the bottom of Oxera’s range – and a regulatory depreciation period that establishes a fairer share of the costs across current and future generations of customers. Our views on all these points are expanded on in annex 7.2 Financing.

Nonetheless, Ofgem requires that this plan, and the various financial tests it includes, is set out based on Ofgem’s current working assumption, so that is what we have set out below.

**The cost of raising new debt is at an all-time low and is expected to stay low for some time.**

The cost of new debt over the 2015-23 period has also been very low, reducing the average cost of Distribution Network Operator (DNO) borrowings, and therefore, the costs that need to be factored into network charges.

Our plan adopts Ofgem’s working assumption of a 2.087 per cent (real, pre-tax) average allowance for debt costs for 2023-28. It is based on Ofgem indexing debt allowances to a 17-year trailing average of the cost of long-term utilities debt, including its initial estimate of the various additional costs of borrowing that DNOs can expect to incur.

The working assumption will be replaced by a final calibrated index after Ofgem has seen company business plans and been able to better forecast expected debt costs. We set out more details on this area in annex 7.2 Financing.

The debt interest rates that are eventually factored into our charges will ultimately depend on how debt market conditions evolve over the coming years, not on the 2.087 per cent working assumption, or on what people today think the debt index might do.
Our dividend and tax policies are backed by a shareholder with a track record of reinvesting heavily in our business.

Equity finance is essential to ensuring the long-term financial sustainability of any business. And dividends are one common way that a return is paid on this type of finance.

Our shareholder’s preference has generally been to operate with slightly more equity in the financing structure than the notional 35 per cent that Ofgem currently assumes for price-setting purposes, to allow the financial flexibility necessary to deal with any uncertainties we may face over the 2023-28 period. Ofgem’s working assumption for 2023-28 is 40 per cent equity finance.

Our dividend policy is to only pay dividends after having due regard to available distributable reserves, available liquid funds and the financial resources and facilities needed to enable us to carry on our business for at least the next year. The level of dividends paid is set to maintain sufficient equity in the company so as not to jeopardise its investment grade issuer credit rating.

Over 2015-21, we have so far paid £322m in dividends. Over the same period £996m was reinvested into the business. These dividends are largely retained within the UK group. In the first six years of this regulatory period only £150m was paid to our shareholder.

Northern Powergrid and our ultimate parent company, Berkshire Hathaway, have a responsible approach to tax.

The capitalisation rate is the proportion of our totex costs that are added to the regulatory asset value (RAV) and then spread over many years in our allowed revenue. Those cost allowances that aren’t added to RAV flow immediately into our allowed revenue.

Our plan uses a 71 per cent capitalisation rate. This means that for every £1 of totex allowances that we spend, 71p will be added to the size of our financial investment (RAV additions), while 29p will be charged immediately to customers through our allowed revenue in the same year. This assumption is set to maintain a consistent policy with the current regulatory period. It also has the benefit that it avoids compounding an intergenerational fairness problem that Ofgem’s regulatory depreciation policies have created in 2015-23, which is set to become even worse if they do not change course.

Once costs have been added to the RAV, they must be paid back over time. The technical term for them being paid back is regulatory depreciation and, until they are paid back, interest must be paid in the form of the cost of capital.

Ofgem’s current policy is that new investments will have a regulatory depreciation period of 45 years. We use this standard assumption for the assessment of financial risk that Ofgem has asked us to undertake.

However, we also believe that this long regulatory depreciation period disproportionately pushes the cost of decarbonisation onto future generations because those costs will stay in our financial asset base for a long time, during which they will attract inflation and a return, which compounds over the long term, to increase the amount that is ultimately charged to customers. In and of itself, there is nothing wrong with this mechanism. It’s an appropriate part of financing a long-term business. But it is essential to strike the right balance. Under these circumstances, a shorter regulatory depreciation period would enhance intergenerational fairness and make the sector more stable over the long term. The longer the depreciation period, the greater the cost burden that falls on future generations. We set out more details on this issue in the section on Customer Bills.

As with all our costs, we have managed our pension costs efficiently.

Pensions are part of the benefits we offer to employees. In our case, they are a more significant cost to the company because our industry carries historical pension commitments that were protected by law at privatisation.

We took action more quickly than other companies to control our pension costs by closing our final salary pension schemes to new joiners in stages between 1995 and 1997. This was 10-15 years before almost all other distribution network companies stopped offering defined benefit pensions to their new joiners as standard. As a result, we are much further along the path than many of our peers in seeing that cost burden diminish.

But there are still some obligations to meet to those employees who were offered those benefits at that time. This plan includes the cost of our final salary scheme in line with objective actuarial calculations and the outcome of the most recent triennial review conducted with the trustees, along with the cost of our defined benefit scheme (which does not require actuarial calculations because our contributions are fixed, and which is set in line with similar, efficient, private sector organisations).

The final salary pension deficit repair element of our cost allowances will be trued up by Ofgem to the actual values, which will depend on factors such as changes to interest rates and investment performance.

During 2023-28 we will efficiently manage the pension deficit and avoid a stranded surplus accruing in the scheme.
We do not use excessive debt finance or risky financial instruments, so our business is robust to risks.

We have an obligation to maintain an investment-grade credit rating – which in our case means maintaining a BBB- or higher rating with Fitch Group and S&P and a Baa3 or higher rating with Moody’s. In practice we target a higher rating, of A- and A3, because this provides the business with financial flexibility in unexpected circumstances, and also for potential major increases in investment requirements, such as those associated with decarbonisation. Targeting a lower rating would mean issuing more debt finance (and paying the equity this replaces as dividends).

But this can be costly to reverse in the future, for example because debt is more expensive to buy back in the open market once it has been issued.

We have assessed ourselves against a threshold of BBB+ or Baa1 for the credit tests set out in this business plan. This allows a modest amount of clearance compared to the very bottom of the investment grade range, and helps avoid the risk of unexpected circumstances pushing metrics below acceptable levels. The table below illustrates the results of this approach for each of the key debt financial ratios, on the basis of the ‘notional company’ that Ofgem uses to normalise differences across companies.

Taking Ofgem’s current working assumptions for the relevant financial parameters and our plan, our business would pass Ofgem’s credit tests in the 2023-28 period.

In annex 7.5 Credit metrics and annex 7.2 Financing we provide a set of more detailed financial projections, results based on our actual (as well as notional) debt costs and equity structure, give more detail on our underlying analysis, and provide more background on the credit rating process (including the qualitative factors that rating agencies can also take into account).

**Figure 1: assessment of credit metrics (notional company basis)**

<table>
<thead>
<tr>
<th>Key: credit ratings</th>
<th>2023-28 average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Northeast</td>
</tr>
<tr>
<td>Opening gearing</td>
<td>60.00%</td>
</tr>
<tr>
<td>Funds from operations (FFO) interest cover (including accretions)</td>
<td>3.92x</td>
</tr>
<tr>
<td>FFO interest cover (cash interest)</td>
<td>4.45x</td>
</tr>
<tr>
<td>Adjusted interest cover ratio (AICR) or post maintenance interest cover ratio (PMICR)</td>
<td>1.46x</td>
</tr>
<tr>
<td>Nominal PMICR</td>
<td>2.08x</td>
</tr>
<tr>
<td>FFO/net debt</td>
<td>11.70%</td>
</tr>
<tr>
<td>Retained cash flow/net debt</td>
<td>9.80%</td>
</tr>
</tbody>
</table>

**Figure 2: financial stress test scenarios**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Stress tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate</td>
<td>±1% compared to forward implied rates as per the base case in each year (for risk-free rate (RFR), London interbank offer rate (Libor) and iBoxx inputs)</td>
</tr>
<tr>
<td>CPIH</td>
<td>±1% in each year</td>
</tr>
<tr>
<td>Retail Price Index – CPIH divergence</td>
<td>±0.5% from assumed wedge, applied to either RPI or CPIH</td>
</tr>
<tr>
<td>Totex</td>
<td>±10%</td>
</tr>
<tr>
<td>Return on regulatory equity</td>
<td>±2% compared to base assumption</td>
</tr>
<tr>
<td>Proportion of inflation linked debt</td>
<td>±5%</td>
</tr>
</tbody>
</table>

In support of our overall assessment of our financial risk, we stress-tested the business against short- and long-term risks using scenarios that Ofgem specified.

As Ofgem’s cost of equity is too low, some of our underlying credit metrics are likely to fall below the investment grade threshold, especially in certain stress test scenarios. However, under all the scenarios, taking Ofgem’s current working assumptions for the relevant financial parameters and our plan, our business would pass Ofgem’s credit test in the 2023-28 period. We set out the full results in our Credit metrics and financeability annex (7.1).
Balancing ambition with affordability

Our stakeholders have been clear about the need for decarbonisation and investment, but they also expect us to focus on affordability – our plan strikes this balance.

Our plan proposes a 36 per cent increase in investment to enable decarbonisation for a modest five per cent increase in customer bills. This would take the average domestic customer bill to around £94.40, an increase of 10p per week. In this section we explain how the bill you pay is made up and the key choices that influence it.

Most of our customers will never see a bill from us. Instead they receive a much larger bill from an electricity supplier that charges for everything – including distribution costs but also the generation of the electricity used by customers, transmission costs, a range of environmental and social programmes and the costs of the electricity supplier itself.

For the average domestic customer our charges represent about £90 per year, or approximately 15 per cent of the total electricity bill.

As well as our 3.9m home and businesses, we have many other types of customer, such as 250,000 commercial businesses and 30,000 industrial customers. More details on the bill impact for these other types of customer are provided in annex 7.2 Financing.

Ofgem is currently consulting on how our charges should be structured and who should pay the costs of connecting to our network. We have developed this plan based on the current charging framework. We will keep our plan under review, as the decision Ofgem makes may mean that our plan needs to change.

Customers pay for some of the costs of investing in and maintaining our distribution network immediately, but a large portion will be paid for over a much longer period.

Our plan for 2023-28 will see us spend over £642m p.a. to open up all the credible pathways for decarbonisation, improve the performance of the network, and deliver an enhanced service everywhere else. This is about a third more than we invest each year at the moment.

Not all of our costs are paid immediately by customers. About 71 per cent of what we spend relates to investment in equipment that will last for anything from several years right through to several decades. Because of that, those costs are recovered in your bills over a long period, called the regulatory depreciation period, currently 45 years. The other 29 per cent is paid immediately.

The 45 years can be thought of like the life of the financial asset, or the length of a mortgage. The longer this financial asset life is, the smaller each year’s repayments will be, but the more interest will be paid over time.

The regulatory depreciation period has been increasing over 2015-23, from 20 years to 45 years, under Ofgem’s existing policies. This is similar to allowing current customers to take a partial payment holiday on new investments – but, like a payment holiday on a loan, it stores up costs for the future. This policy disproportionately benefits the current generation of customers.

We think this outcome is unfair. It would amount to us all agreeing that there is a need to invest in the decarbonisation journey, but relying on the next generation to pay for most of it while we take a payment holiday. We believe Ofgem should shorten the regulatory depreciation period, back closer to the levels last seen around 2015, to support intergenerational fairness, and avoid today’s children and young adults from having to bear an even greater portion of the burden of transitioning to net zero. With a shorter regulatory depreciation period, customers would stop taking a payment holiday, and would finish paying for today’s investments sooner. This would avoid future generations funding as much growth in our financial asset base.

Our customer bill also includes a range of other costs.

A customer bill also comprises:

- corporation tax – where the rate is increasing from 19 per cent today to 25 per cent over 2023-28;
- a return for investors (those equity and debt investors who are funding the 70 per cent of cost that is not recovered immediately);
- the impact of various regulatory mechanisms which will be determined by Ofgem – we have assumed these will not have any effect on this plan; and
- various other costs that we have to incur, for example our share of transmission charges, business rates on our properties and network, and our share of the cost of running central smart metering data services.

For further details, please see:

- Annex 7.1 Delivery strategy
- Annex 7.2 Financing
- Annex 7.4 Decarbonisation uncertainty & Ofgem uncertainty mechanisms
- Annex 7.5 Credit metrics

While our spend increases because of decarbonisation, we know we need to keep bills affordable and ensure fairness between generations. We believe our proposed business plan strikes the right balance for our customers.

Owen Sutherland
Head of financial planning

DELIVERY

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We heard your thoughts on how our proposals would impact your bills.

We engaged extensively on the level of ambition and customer outcomes in our plan and the associated investment requirements to deliver them (see annex 3.1 Enhanced engagement process). In order to enable stakeholders to make informed decisions, we explained the potential bill impact associated with the various different options being explored from early in the process.

As we moved through the different stages of the engagement process, we continued to explain the potential impact on your bills, investment decisions and the period in which costs are recovered. This was shared each week with our citizens panel and also published on our Emerging Thinking website to ensure your voice was represented in our planning.

Our business plan acceptance testing surveyed 1,272 customers, with a minimum of 194 from fuel-poor households, to test affordability. We also surveyed 227 small and medium-sized enterprise (SME) businesses and 39 stakeholders.

The bill impact that results from every aspect of our plan, including our dialogue with our customers, is set out in the charts below.

Figure 3 shows what the bill impact would be under Ofgem’s working assumption financial parameters, including the cost of capital that we think is too low to cover our costs, and pushing a lot of the costs of decarbonisation onto future generations by using 45-year asset lives. If Ofgem sets this price control, our charges in 2023-24 would be about £5 lower than in 2022-23, at £85.

Figure 4 shows what the bill impact would be under our proposed financial parameters (namely, an appropriate cost of equity), with the issues surrounding regulatory depreciation periods that load extra costs onto future generations addressed. This would see our charges increase by about £4.60 in 2023-24, to £94.40. We think this still represents extremely good value for everything we are offering.
Managing uncertainty and risk

As a business we manage a wide range of risks on a day-to-day basis, ranging from the immediate issues that could delay restoration of a power cut through to long-term risks to our asset base that could raise our costs if not mitigated. Part of the rationale of having a regulated, privatised network business is to allocate risks to the regulated company to manage, insulating bill payers and taxpayers from them.

This section of our plan:
— focuses on the regulatory mechanisms that can be used to mitigate some of these risks;
— sets out our track record of accepting and managing risk on behalf of customers; and
— provides an introduction to decarbonisation uncertainty.

We will manage risks on behalf of customers wherever we are best placed to do so.

We are proposing no additional regulatory uncertainty mechanisms beyond those our regulator thinks offer good value to customers and should be in place for our whole sector.1

We will take on and manage all the risks that aren’t covered by these mechanisms within the cost allowances set out in this business plan.

Ofgem’s consumer challenge group gave clear feedback that companies ought to manage risks.

In the recent review of transmission and gas distribution business plans, the consumer challenge group said: “The weaker performers proposed a wide range of additional uncertainty mechanisms, in which risks that the companies were better placed to manage, were passed on to consumers.”

This is consistent with our own understanding of the views of stakeholders and how we can best serve our customers – by accepting and managing risks on their behalf. It is also consistent with our view that, apart from in truly exceptional cases, uncertainty mechanisms that are justified for one electricity distribution company would be justified for the entire sector.

Our track record on accepting and then managing risk is well established.

Our track record is demonstrated by two key pieces of evidence:
— This is the second price control in a row where we have proposed no additional regulatory uncertainty mechanisms as part of our business plan.
— We are continuing to effectively manage the risks in the current 2015-23 regulatory period so that expenditure is broadly in line with our cost allowances.

The pace and pathway of the net zero transition is the biggest uncertainty we know about.

Decarbonising the economy will require significant changes, including to how transport is fuelled and buildings are heated. This will lead to electricity distribution networks being used much more, but we don’t know the exact end point or timing. For example, we don’t know:
— the rate of uptake of low carbon technologies such as electric vehicles or heat pumps;
— the extent to which we can leverage DNO-contracted flexibility in our area; and
— the extent to which peak demand will shift due to price driven customer flexibility.

The investments set out in this plan will be needed very soon under any realistic scenario.

The costs in this plan are based on the level of investment that we forecast will be necessary under the government’s 10-point plan, and on the number of heat pumps being used in homes and electric vehicles on our roads that this plan would involve.

But even if uptake is slower than the government currently plans, our plan would not result in wasted money. Even on the slower-uptake scenarios, the same assets will still be needed within less than 10 years. A substantial subset of these assets are growing old and will also need to be replaced before then for asset condition reasons since demand is growing it will still make sense to renew them with larger assets.

1. We include in annex 7.4 Uncertainty Mechanisms, a brief summary of the uncertainty mechanisms Ofgem currently proposes; and which Ofgem will keep under review until the end of the price control process.
Investing at the level implied by a low-uptake scenario would also build a growing risk that if the country accelerates towards one of the higher scenarios it could become impossible for our distribution network to keep up. Notwithstanding this, we set out more on how the cost forecasts in this plan relate to uncertainty over the pace and progress of decarbonisation in our annex on managing uncertainty over decarbonisation pathways, see annex 7.4 Decarbonisation uncertainty and Ofgem uncertainty mechanisms.

Uncertainty mechanisms will also be put in place to manage unexpected eventualities.

Our regulator has decided that there will be uncertainty mechanism(s) in place in this area to adjust cost allowances as more information becomes available during the 2023-28 regulatory period. The design of the mechanism(s) is still being developed by our regulator and will depend on how much of the decarbonisation pathway is funded through baseline cost allowances but either way the mechanisms need to be well-enough designed to ensure the sector is not excessively exposed to factors outside of its control, without distorting investment and operating decisions or accommodating poor network planning.

Whatever the exact suite of mechanisms, we also expect that a backstop mechanism may well be necessary to avoid the risk of major under- or over-funding. This could easily be achieved by leaving in place the existing reopener for significant variances in load-related expenditure compared to allowances, calibrated so that companies cannot win or lose excessively from factors outside their control.

We will take into account the design of any finalised uncertainty mechanisms that our regulator sets out later this year, in our final plan.

We also expect to manage a broader range of uncertainties.

The table below illustrates with examples the range of the known uncertainties, other than the decarbonisation pathway, that we currently expect to manage on behalf of our customers. We will do so within the cost allowances set out in this plan, and under the generic mechanisms that cover all risks, unless Ofgem develops additional mechanisms for the sector ahead of the price control being finalised. Potential sector-wide mechanisms are being actively considered by Ofgem in some of these areas, and if they are put in place they will be applied to our plan. As well as the above risks, we also expect to manage a broad range of unknown uncertainties within the cost allowances we set out, provided that none of these risks become critical enough to trigger Ofgem’s backstop mechanisms. While we cannot know in advance where these risks will emerge, it could include similar risks to those that materialised in the 2015-23 period, such as significant unanticipated investments that we made in cyber defences, and our accelerated and extended programme of flood defences to mitigate growing extreme weather risks, all of which we managed within our cost allowances.

Figure 1: examples of risks we expect to manage within the 2023-28 period

<table>
<thead>
<tr>
<th>Risk</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public and employee safety</td>
<td>We have an extensive electricity network in close proximity to the public and that our employees also need to work on. The legal framework for managing these risks exposes us to potentially major fines if we fail to do so appropriately.</td>
</tr>
<tr>
<td>Employment law and taxation</td>
<td>Changes in employment law, or new legal judgements on unclear areas, can lead to significant changes in employment costs, as can changes in taxes such as employer national insurance contributions.</td>
</tr>
<tr>
<td>Type defects</td>
<td>Specific assets can have defects, which make them more susceptible to failure. Where these emerge, we may need to accelerate replacement.</td>
</tr>
<tr>
<td>Diversion requirements</td>
<td>The majority of our assets are sited on other people’s land, with specific rights of tenure. We deal with large volumes of requests to move assets which can expose us to varying levels of cost.</td>
</tr>
<tr>
<td>Contaminated assets</td>
<td>Various historically installed assets carry known contamination risks, such as asbestos or lead paint, that we need to manage and remediate where appropriate.</td>
</tr>
<tr>
<td>Metal theft</td>
<td>Our assets can be a target for theft, particularly when copper prices rise. This can result in costs to us from asset repair, poor scores on reliability incentives, and from investing more to reduce the risk.</td>
</tr>
<tr>
<td>Un-indexed unit cost variations</td>
<td>Ofgem plans to implement indexation of certain costs, such as employment or materials costs, instead of its previous approach of providing baseline allowances for average increases. Although allowances for these variations is necessary, the available indices are imperfect and expose us to additional risks.</td>
</tr>
<tr>
<td>Refinancing requirements</td>
<td>Ofgem sets its cost of debt index so that its expected allowance covers the expected costs of the sector but each company has a unique refinancing profile and is exposed to the risk that its cost of refinancing happens to be exceptionally high.</td>
</tr>
</tbody>
</table>
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