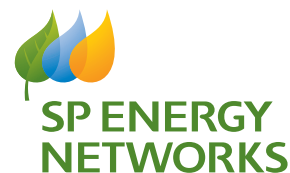
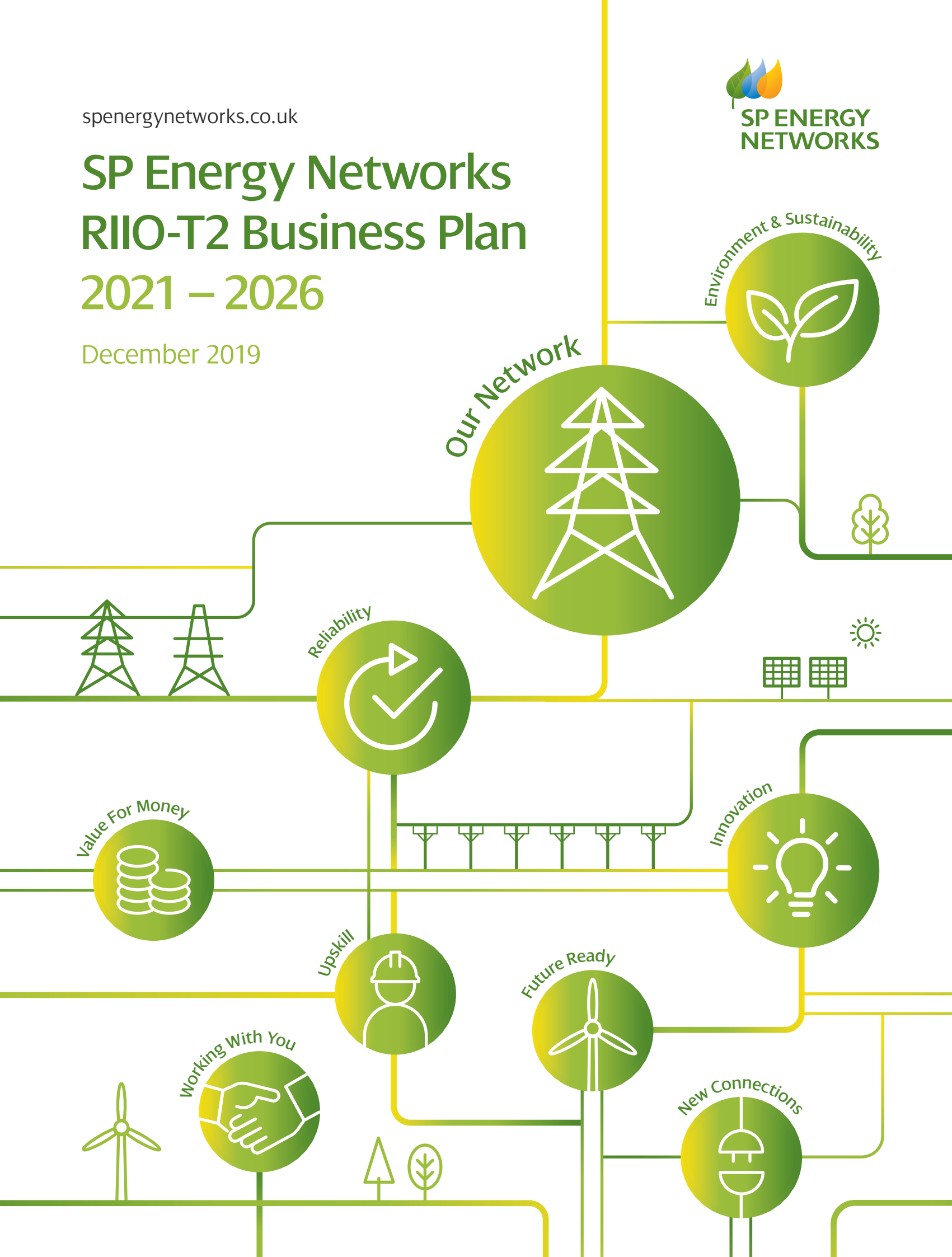


spenergynetworks.co.uk



SP Energy Networks RIIO-T2 Business Plan 2021 – 2026

December 2019



Regulatory Asset Value is forecast to be £2.6bn at the end of RIIO-T1

£2.6bn

Our transmission network comprises over 4,300 kilometres of circuits and 156 substations operating at 400kV, 275kV and 132kV

4,300KM

Our network area serves around 7% of all consumers in Great Britain, and we have connected 30% of all GB onshore wind generation

30%

Scottish Hydro-Electric Transmission

SP Transmission

National Grid Electricity Transmission

At SP Transmission we take electricity generated from power stations, windfarms and various other utilities and transport it through our considerable transmission network to get it to where it is needed.

Our Business

SP Energy Networks owns three regulated electricity network businesses in the UK: SP Transmission plc (SPT), SP Distribution plc (SPD) and SP Manweb plc (SPM).

SPT is the licensed Transmission Owner (TO) for the Central Belt and South of Scotland. We serve 2 million consumers connected via our distribution network and our workforce of 488 internal employees are supported by around 150 major contractors and suppliers.

Our network is crucial to the delivery of the Government's Net Zero target and to help mitigate climate change due to its location in an area of outstanding renewable resource. We therefore have a unique role in connecting renewable generation and delivering the bulk transfer of renewable energy from Scotland into the centres of demand in England and Wales, benefiting consumers well beyond our licence area.

SP Energy Networks are part of the Iberdrola Group. Iberdrola is a global energy leader, the number-one producer of wind power and one of the world's biggest electricity utilities by market capitalisation. Iberdrola will invest 34 billion euros during 2018-2022, laying the foundations for sustainable growth over the next decade. The UK makes up 17% of Iberdrola's global investment portfolio.



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To help navigate our plan, we've included cross-reference boxes like this throughout. These sign-posts also show where you can find additional information within our plan and the supporting annexes.



11GW of Scotland's generation

The journey to a Net Zero future is already underway. Our transmission system is an enabler for generation in the North of Scotland and within our distribution network. 11GW of Scotland's generation is facilitated by our transmission network.

4.7GW renewables connected

We have 4.7GW of renewables already directly connected to our transmission system.

Our plan will facilitate the connection of a further 900MW of renewable energy and further capacity across the network – the equivalent of powering 1.5million homes and with CO₂ reductions of 1.6Mt of CO₂e per annum.

1.6Mt of CO₂e per annum

The boundary upgrades we are undertaking between our network and our neighbouring network operators are essential for facilitating Scotland's renewable generation and ensuring security of supply.

Our plan will deliver an additional 1,600MVA of boundary capacity

As we submit our RIIO-T2 Business Plan our society finds itself at a pivotal moment in history with respect to energy. We are in the midst of a global climate emergency.

The way society currently meets its energy needs is unsustainable. To mitigate the impacts of climate change and achieve a low-carbon energy system requires a level of focused effort and commitment never seen before. The mass electrification of transport and heat has only started and there is a huge amount required to build on the good progress already made in the electricity sector. Energy networks are critical to achieving the wider Net Zero emissions goal and with continued engagement with consumers, network users and our wider stakeholders, we've set progressive plans in place to facilitate a Net Zero future.

A sustainable future

Our plan sets out four strategic goals – informed by our stakeholder priorities – that will keep us moving towards this sustainable future:

Take a leading role in delivering a Net Zero future that is consistent with government objectives.

Deliver the benefits of increased cost efficiency to consumers, network users and wider stakeholders by continually innovating and applying whole system solutions.

Maintain world-leading resilience and system operability to ensure security of supplies throughout the energy transition.

Keep consumers, network users and wider stakeholders at the heart of all of our investment plans and decisions.

This is consistent with the stand taken by the wider ScottishPower group: all the electricity we produce is from renewable sources. Our future will be a clean one, a sustainable one – and critically, an increasingly electric one. However, the role of SP Energy Networks is not to produce power, but to get it where it needs to be. With more renewable generation, the role played by our world-class network will become ever more vital.

A resilient network

The world has changed significantly since the creation of our RIIO-T1 plan and the current pattern of generation presents new challenges for our transmission system. This is one reason we've invested so heavily in innovation. Our plans include a number of new technologies to help the network operate cost-effectively, even when under unprecedented pressure.

Recently, Britain suffered its biggest blackout in more than a decade, leaving 1.1 million customers across the country without power. In addition to this, we've seen several other countries impacted by major interruptions to supplies, and prolonged blackouts. In 2016, major storms in South Australia saw a loss of supply affecting 1.7 million people. In June 2019, an event in South America saw almost 50 million customers impacted across Argentina, Paraguay and Uruguay.

The reasons for these events are varied – some are caused purely by operational issues within the electrical system while others are linked to the wider environment. The recent wildfires in California highlight that climate change can radically alter the environment that infrastructure assets are situated within, with unforeseen consequences. Asset management practices that were historically robust may have to be altered to make them fit for the future.

"Sounds like a reasonable price to pay for a plan that will balance environmental protection with support for customers."

Domestic consumer

A message from our CEO

Adapting to the unknown is important for every section of our business. As the industry changes at pace there is also uncertainty around the future structure of our sector. The political uncertainty over Brexit and the threat of nationalisation is likely to impact our supply chain and may affect our ability to continue to attract staff with the relevant expertise.

Against this backdrop of uncertainty, it is critical that we continue to attract investment to support our ambitious plan and the changes required. We must ensure that the returns from our investment are set at a level that represents the increased risk we face. Ofgem has mandated that our business plan should be based on its working assumption for cost of equity. We have done so, however we firmly believe that this is an unrealistically low rate of return, given the risks and challenges we face.

Our organisation is a progressive one. We do more than just comply with our obligations, and this benefits society as a whole. We are also a major vehicle for productive job creation, supply chain stimulus and educational opportunities in our communities. The transition to Net Zero will require leadership and bold investments, so we must avoid a situation in which the very organisations that are so key to the transition become financially squeezed to the point where they can no longer provide that leadership role. To do so would jeopardise the early pace required to put us on a trajectory to Net Zero and would, ultimately, threaten the achievement of the goal itself. Attracting long term investors with the right credentials will be key to the success of a Net Zero future. In **Annex 25: Finance** and **Annex 34: Our Supplementary Business Plan** we explain in detail why we believe a higher rate of return is necessary, based on the advice of independent economic advisers and supported by consumers.

“Seems a small price to pay for such an ambitious plan.”

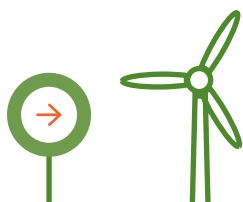
Domestic consumer

Delivering for our customers

Of course, creating a plan is one thing, but delivering it is quite another. Our strategy has always been to forecast robustly and meet our contract with our customers to deliver our outputs without reducing scope or unnecessary deferrals – every action we take has to deliver the best customer value. We intend to continue this into RIIO-T2, placing the customer and their best interests at the heart of our Business.

We continually drive to be more efficient. Our RIIO-T2 plan is 9.5% more efficient than our RIIO-T1 plan which was fast tracked because of its efficiency. This reflects the efficiency improvements we have realised during the RIIO-T1 period, plus a further RIIO-T2 efficiency stretch from design and innovation. As a consequence, we will maintain our average annual costs broadly in line with RIIO-T1 while delivering more outputs. Overall we will maintain a very low cost to consumers – averaging £4.43 per annum.

For more information see **Annex 25: Finance** and **Annex 34: Our Supplementary Business Plan**. Read more about our Stakeholders in section: Co-creating the Plan with our Stakeholders.



3.6GW of thermal generation

3.6GW of thermal generation at Cockerzie and Longannet has closed, with a further loss of 1GW anticipated with the closure of Hunterston in the RIIO-T2 period.

As a result of changes in the portfolio and operation of generation within Scotland, our transmission system must be designed and built to cope with increased variability. Increasingly, we are experiencing rapid swings in the transfer of power between Scotland and England.

6GW swing in 24Hr period

(this is more than winter peak demand in Scotland).

The Scottish Energy Advisory Board (SEAB), commissioned studies which estimate that the economic loss resulting from a major interruption to electricity supplies across Scotland would be

around £1bn per day

Our RIIO-T2 plan is 9.5% more efficient than our RIIO-T1 plan which was fast tracked because of its efficiency.

Comprehensive engagement

Our plan is shaped by feedback from consumers, network users and wider stakeholders. We welcome the insight these groups bring to our business at every level – it helps us define the way we operate.

This price control has also seen the welcome addition of our independent, Transmission User Group chaired by the Rt. Hon Charles Hendry to challenge our investment decisions at every phase of our business plan development.

We have also developed our plans to align with the Scottish Government's Energy Strategy, and are proud to play our part in meeting the ambition for Net Zero greenhouse gas emissions by 2045. We're also working closely with local authorities, including our major cities to ensure they can meet their ambitious Net Zero targets ahead of national timescales.

We have placed a comprehensive assurance framework at the forefront of our business plan development process – with engagement from our Board members throughout. The challenge received from both internal and external experts and from our Board members has provided valuable guidance. This document is the result of an intense collaboration with our stakeholders, including our Independent Transmission User Group. On behalf of the Board, I would like to personally thank everyone involved for the commitment and drive they have shown throughout the process.

We will keep listening, adapting and making changes to accelerate the move to a Net Zero future.



Frank Mitchell

Frank Mitchell
Chief Executive Officer,
SP Energy Networks



Our RIIO-T2 plan in summary

As we detail our plans for the next five years we are building on our long-term track record to deliver to ever more ambitious levels. This not only benefits consumers directly through our business as usual activities, but also generates wider societal benefits, e.g. transport and health – detailed in our consumer value propositions throughout our plan.

We will drive further innovation and efficiency in all that we do in meeting the needs of consumers, network users and wider stakeholders with limited impact on the bill. To do this, we focus on four strategic goals:



A sustainable, Net Zero future

We will take the lead to build a healthier, more accessible energy model – one which leaves the carbon economy behind. We will meet carbon targets, customers' low-carbon ambitions, and make a large, proactive contribution towards Net Zero.



Increase efficiency through constant innovation

We will continue to improve our performance through a continual cycle of innovation. With smarter solutions, we can do more with less – deploying new technology, processes and ways to share data. Innovation will help us deliver uninterrupted supply, faster connections, and meet the ambitions of consumers, network users and wider stakeholders.



Adapt our world-class, resilient network

This is a critical time for networks. Demand is changing, generation is evolving, and new threats are emerging. We will adapt our world-class network to meet these challenges, including extreme weather, cyber security and black start events – delivering ever-higher performance for consumers, network users and wider stakeholders.



Keeping network users and consumers at the heart of our decisions

We will listen and learn even more from our stakeholders. This will allow us to continue to raise our efforts as we work to improve lives, create jobs and protect vulnerable consumers. In everything we do, we aim to do more.

"I think that we as customers will be getting so much out of this plan. The cost of under £5 is nothing compared to the gains. It is very thorough and seems to cover all the points I would want to know about." (Business consumer)

Our plan delivering

This section summarises the balanced decisions made for the long-term. All of our decisions have consumers, network users and wider stakeholders at the heart of them. Tailoring our ambitious targets to maintain our outstanding network resilience whilst helping facilitate Net Zero by the Scottish Government target of 2045.

Below are some of the highlights our strategic goals deliver through our Business Plan for RIIO-T2.

Use new alternatives to avoid adding 56% of potential increase in SF₆, reducing the impact by at least

9,700kg

Facilitate the connection of renewable energy generation

900MW

Innovation has led to a reduction in RIIO-T2 expenditure of

£30m

Improving efficiency in our plan by

9.5%

Maintain current level of network reliability

99.9998%

Longer term monetised risk benefit of

£29.1bn

Reducing constraint costs for consumers

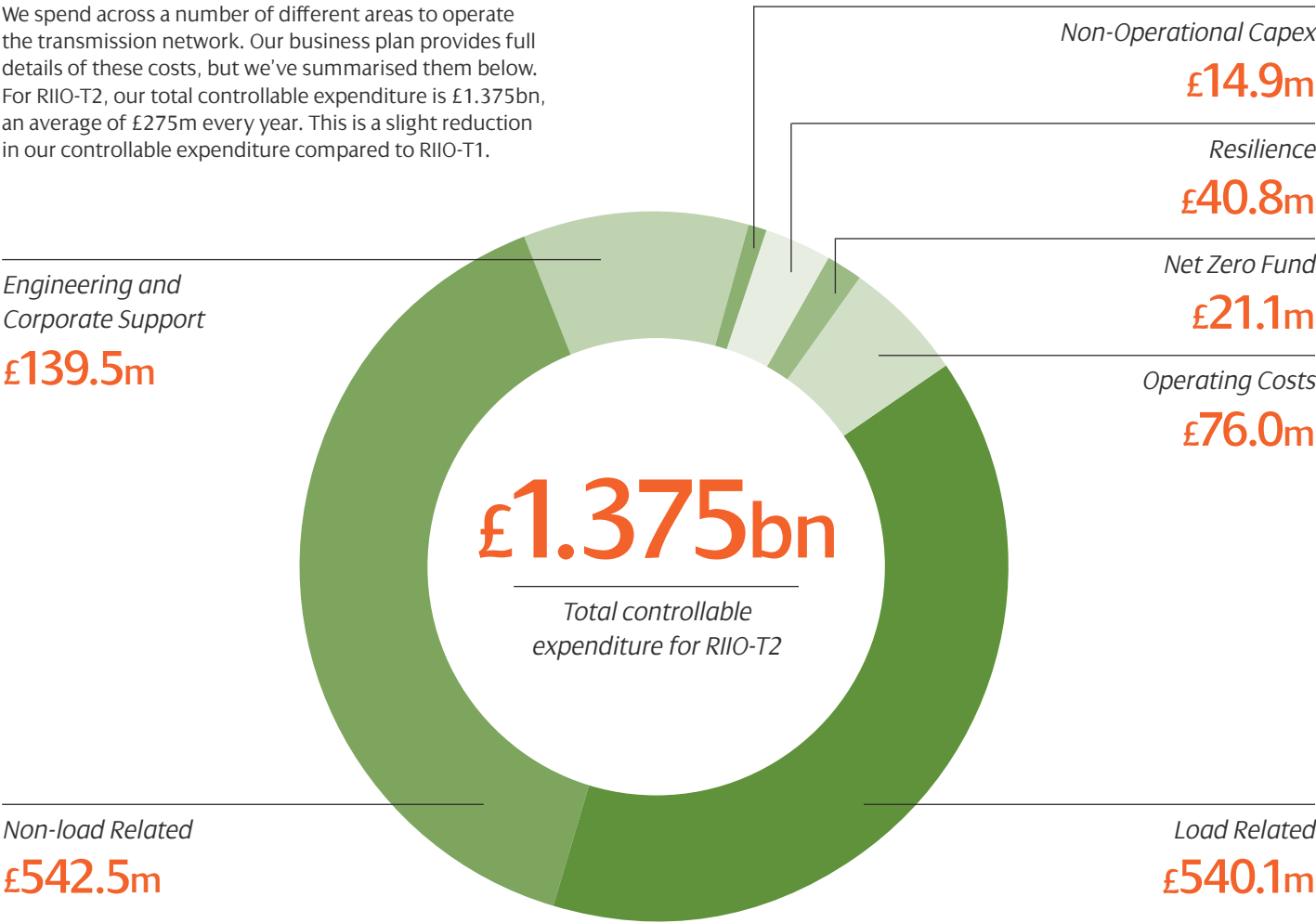
£152m p.a.

Deliver our plan with minimal financial impact to our consumers – less than £5 per year

£4.43

Expenditure in summary

We spend across a number of different areas to operate the transmission network. Our business plan provides full details of these costs, but we've summarised them below. For RIIO-T2, our total controllable expenditure is £1.375bn, an average of £275m every year. This is a slight reduction in our controllable expenditure compared to RIIO-T1.



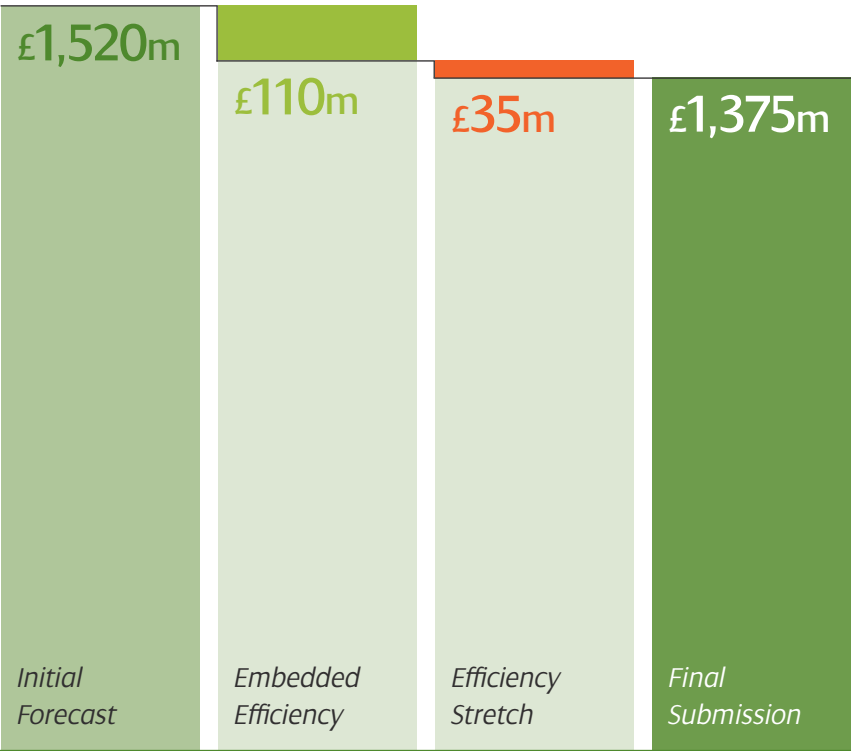
Delivering efficiency

Totex Efficiency (£m 2018/19)

Our plan was fast-tracked in RIIO-T1 with a current best view allowance forecast of £2,362m excluding efficient yet unfunded costs of £102m (£2,464m). Our current expenditure forecast of £2,286m translates to an underlying efficiency rate of 7.2%. To make sure these costs were efficient, we conducted an independent external review.

We have embedded such efficiencies from RIIO-T1 in our RIIO-T2 plan. To get even more value for our consumers, we applied further innovation, value engineering and process savings. This resulted in a further efficiency stretch of 2.5% (compound effect of 9.5%) and is encompassed in our final RIIO-T2 plan of £1,375m.

RIIO-T2 Business Plan



9.5% Total efficiency

RIIO-T2 Expenditure

£m (2018/19 Prices, y/e 31st March)

The table below provides a further RIIO-T2 expenditure breakdown by relevant categories. We also describe the high level drivers of change between the differences in annual average expenditure between RIIO-T2 and RIIO-T1 periods.

		Total	Annual Average RIIO-T2 RIIO-T1		Drivers of Totex change
Load Related	Generation Connections	109.3	21.9	70.0	Our high confidence baseline generation is lower than RIIO-T1, but we will use uncertainty mechanisms to adjust our plan to meet new projects as they emerge.
	Demand Connections	116.2	23.2	9.9	Embedded generation is increasing the need to upgrade the point of connection with SP Distribution to allow this generation to be fully utilised and further volumes to connect.
	Wider Works	314.6	62.9	73.8	Reinforcement of the network to adapt to the changes that emerge, RIIO-T1 included costs associated with the HVDC Western Link which are not replicated.
Non-load Related	Lead – Circuit-breakers	124.2	24.8	20.4	Individual project scope differences, emerging type issues and increased effort on minimising SF ₆ leakage contribute to higher costs in RIIO-T2.
	Lead – Overhead Lines & Cables	251.7	50.3	33.0	Rebuilding the earliest 132kV routes, more complex works on the 400kV network and deterioration of fluid filled cables are the key differences in RIIO-T2.
	Lead – Transformers & Reactors	40.0	8.0	11.0	Improved condition information allows a lower-cost refurbishment programme to reduce costs in RIIO-T2.
	Non-Lead	126.5	25.3	24.9	The projects in this diverse category are different in each period but overall, costs are very similar.
Other	Net Zero Fund	21.1	4.2	—	New initiative for RIIO-T2 which will deliver significant social benefits.
	Resilience	40.8	8.2	5.1	Increases in cyber security and securing rights for network apparatus.
	Non-Operational Capex	14.9	3.0	2.4	Facilitate the consolidation of sites and improve sustainability of buildings.
	Operating Costs	76.0	15.2	11.5	Network growth, cyber security and the greater maintenance requirements of new technology commissioned in RIIO-T1 are the main sources of cost increases.
	Engineering and Corporate Support	139.5	27.9	23.9	Higher levels of essential operational training, delivering our Environmental Action Plan, greater stakeholder engagement and pension changes.
Total Totex		1,374.8	275.0	285.8	
	Non-Controllable Expenditure – Rates	175.3	35.1	29.4	Increase in business rates charged to SPT by local authorities.
	Non-Controllable Expenditure – Pensions	10.2	2.0	2.6	Payments in relation to historical pensions deficit as reviewed by Ofgem.
	Innovation	18.7	3.7	5.6	In RIIO-T1 innovation funding included Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) as well as the Innovation Roll Out Mechanism (IRM, £1.5m per year). For RIIO-T2, the funding does not include the equivalent of NIC which has not yet been defined or IRM which has been removed.
Total Expenditure		1,579.0	315.8	323.4	

Revenues

Ofgem have instructed the use of 4.8% for the cost of equity for this plan. Our evidence suggests Ofgem’s calculation of the cost of equity is too low. We provide our own assessment of the cost of equity that, in our view, provides an appropriate return for shareholders in **Annex 25: Finance** and **Annex 34: Our Supplementary Business Plan**.

In 2020/21 the SPT component of an average bill is forecast to be £4.63. Based on Ofgem’s prescribed cost of equity assumption of 4.8%, we forecast the average bill in RIIO-T2, based on our plan, will be £4.43, a decrease of £0.20, driven by the decrease in the cost of capital. The ongoing investment in RIIO-T1 has led to a significant increase in the size of the business and shareholder investment. The RAV, from which revenues are derived, is projected to grow from £1.6bn to £2.6bn, a c.61% increase, over the course of RIIO-T1, and is projected to grow by a further 11% to £2.9bn over RIIO-T2. Ofgem are proposing the return on equity for this investment reduces from 7.0% in RIIO-T1 to 3.7% in RIIO-T2, on a comparable RPI basis, which is 4.8% on the revised CPIH inflation basis.

Forecast revenues for RIIO-T2

£m (2018/19 Prices)

	Total	Averages		Variance
		RIIO-T2	RIIO-T1	
Depreciation	862.6	172.5	139.7	32.8
Return	396.0	79.2	88.7	-9.5
Revenue associated with RAV	1,258.6	251.7	228.4	23.3
Fast Pot	206.2	41.2	29.1	12.1
Non-Controllable Opex (Rates)	175.3	35.1	31.6	3.5
Equity Issuance Costs	0.0	0.0	1.1	-1.1
Additional Income	0.0	0.0	11.1	-11.1
Tax Allowance	63.1	12.6	13.6	-1.0
Other	-40.1	-8.0	-1.8	-6.2
Revenue not associated with RAV	404.5	80.9	84.7	-3.8
Allowed Baseline Revenues	1,663.1	332.6	313.1	19.5

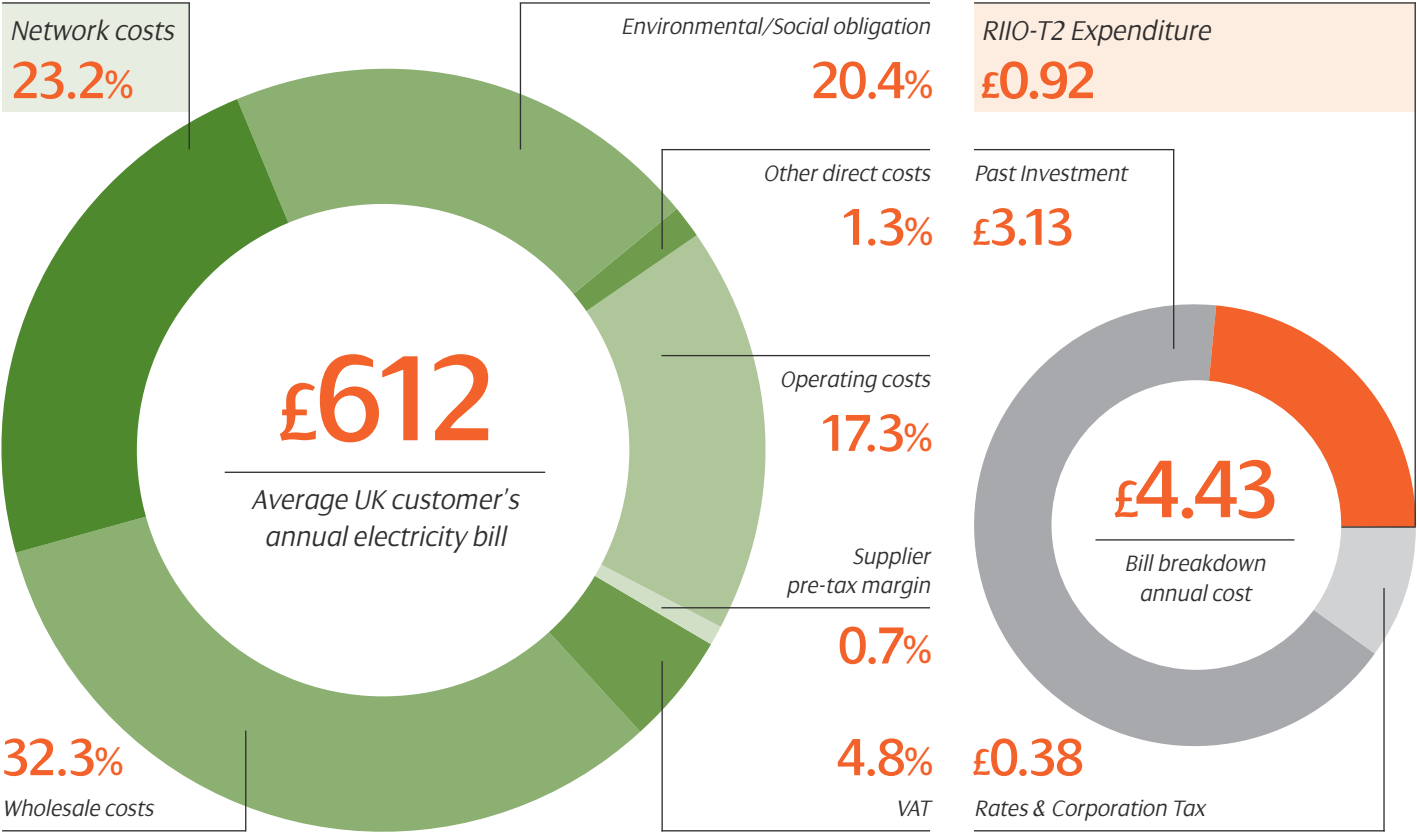
*Cost of equity adjusted to 4.3% for Base Revenue with 0.5% earned through assumed out-performance as per SSMD May 2019.

Consumer bills

The average UK consumer’s electricity bill is £612 – based on the Ofgem analysis in October 2019, network charges account for £142 or 23.2% of this. We have calculated that the Network costs can be split into transmission charges at 6.1% (£37 – combined total of all TOs) and distribution charges at 17.1% (£105).

We have provided a breakdown of the different areas of expenditure included within the bill. This chart forecasts SPT’s RIIO-T2 element of the average annual consumer bill to be only £0.92.

“I am still staggered that SP Transmission can deliver all of this for just under £5 per year per household.”
(Business consumer)



Matching Ofgem's assessment criteria

We have aligned the following executive summary against the guidance criteria set out by Ofgem. Along with a brief synopsis of each area, full mapping to the relevant sections – where our plan is detailed and evidenced – is also provided.

Track record in delivering



Of course, the business planning process has changed for RIIO-T2, but it's worth noting that our RIIO-T1 plan was fast-tracked. This recognised that we had submitted an efficient plan that offered value for money to consumers. However, a plan is only as good as its execution. So how did we actually perform?

We delivered the outputs we committed in RIIO-T1 – our forecast total expenditure for RIIO-T1 is £2,286m. That's 3.2% less than our allowances.

We delivered all our outputs under allowance, through ongoing efficiency and innovation, sharing hard-earned out-performance with consumers. This included the delivery of projects with no allowance to the value of £102m. We have delivered these projects as it was in the best interests of the consumer.

Yes, we're proud of our track record and the trust we have earned from our customers. But we're not standing still. We look to build on this trust in RIIO-T2 through our ongoing transparency and engagement.

This is a plan which has been carefully researched – with due consideration applied to all constraints and potential opportunities – and we have set out how we will manage these using our experience and strong track record of delivery to make sure it's 100% deliverable.

The proof of our RIIO-T1 delivery

1,500MW of new generation connected across 18 new sites

11GW of renewable generation enabled across Scotland

99.9998% network availability

Giving consumers a stronger voice



Consumers, network users and wider stakeholders remain at the heart of our RIIO-T2 Business Plan. We strategically engaged with over 6,850 stakeholders to align our RIIO-T2 strategies and expenditure with their feedback.

Our RIIO-T2 engagement is built on our wider Stakeholder Engagement Strategy and further enhanced by multiple layers of challenge. This included establishing an independent Transmission User Group to assess every aspect of our plan; testing the acceptability of our plans directly with consumers and consumer representatives; stakeholder consultations; as well as formal engagement with Ofgem's Consumer Challenge Group.

The transmission User Group is chaired by The Right Honourable Charles Hendry, who was previously Minister of State for the Department of Energy and Climate Change from 2010-2012. Bringing a wealth of experience in the energy sector, Charles recruited an independent panel of experts from a wide range of sectors to help scrutinise, challenge and co-create our Business Plan. The wide range of stakeholders represented by the members has further ensured that consumers were at the heart of all of our RIIO-T2 decisions.

For the first time we also carried out a consumer research programme at transmission level. This guarantees that we will submit a plan that consumers have genuinely helped to shape, inform and, most importantly, to accept.

Our plans also reflect targets of the UK's devolved governments, as well as the ambitions of local authorities – both are key stakeholders. It's important to note that our engagement with these parties flows both ways, including our work to support the Scottish Government in developing its Network Vision.

How we know it's working

Ranked in the top 16% of companies assessed globally – by AccountAbility, the owners of the AA1000 Stakeholder Engagement standard

Top transmission company for the 2017/18 Stakeholder Engagement Incentive, as recognised by Ofgem

Read more about our track record in section: **Our Track Record, Pg 12.**

Read more about our commitment to deliver in the section: **Delivering Our Plan, Pg 161.**

Read more about our enduring stakeholder engagement strategy **Continuing to Engage with our Stakeholders, Pg 131.**



Maintaining a safe and resilient network



Our network is exceptionally reliable. Our goal is to continue this for the long term: consumers, network users and wider stakeholders will benefit from our planned investments long after RIIO-T2.

Our focus for refurbishment or replacement is on those assets in the poorest condition and which pose the highest risk to reliability. Some of these assets are measured against our risk target, and our detailed planning of interventions means that we maintain risk at the current level. We could have replaced more assets to get to a lower risk position but our analysis shows that it's more economical to keep them for longer. We are confident that we can manage that additional risk and make sure the costs to consumers are fair.

The other main cause of unreliability is severe weather, such as storms, ice or snow. So that we can target investment on unreliable assets and those that are vulnerable to climate effects, we need comprehensive and accurate information on each asset's condition.

To make sure we had the most robust and up-to-date information for this plan, we put an intensive assessment programme in place. During 2018 and so far in 2019, we have:

Assessed our civil assets at 90 sites. These are our older substations which were constructed prior to 2000

Assessed all of our 156 substations in detail

15.8% of our overhead lines routes were selected for detailed inspection based on condition and inspection data.

Tested conductors, climbed and inspected towers, and dug to the foundations on 19 overhead line routes.

To quantify the health and risk of each asset, the data we gather is processed using detailed models. Our expert engineers verify the results, allowing us to invest in the right assets at the right time.

Maintaining a safe and resilient network is fundamental to what we have always done. But the low carbon energy transition brings new challenges and we have proposed four reputational incentives in this area encompassing Health and Safety, successful delivery of large capital projects, network access policy and non-lead asset output measurement. In addition, we have proposed a financial incentive associated with whole system ESO-TO constraint mitigation.

Our plan is also designed to adapt to the rapidly evolving challenges of cyber and physical threats, as well as the longer-term impacts of climate change – most notably flood risk.

When it comes to health and safety, our business operates with industry-leading levels of safety for our staff, contractors and the general public. We will continue to strive for zero harm across all of our activities. In relation to health, our stakeholders have told us we should focus more on mental health, specifically the mental wellbeing of our employees. This is why we have committed to introduce Mental Health First Aiders to support our workforce.

A resilient network needs a workforce and supply chain to match – both are instrumental in delivering our plans and responding to issues. We have used our experience from RIIO-T1 to model the changes we anticipate to the workforce, and the specific requirements to deliver our plan. We have also created a Sustainable Workforce Strategy which will ensure a resilient and diverse workforce throughout RIIO-T2 and beyond.

We have a strong ethos of developing our own staff, making sure our people have the skills and experience they need. Our recruitment pipeline is well established: across SPEN, we are currently recruiting 110 apprentices and graduates from a diverse range of backgrounds, all as trainees. We also regularly move staff between transmission and distribution to broaden their experiences.

All 3,740km of overhead lines inspected every year

10-year cycle of detailed asset condition inspections, covering every route

We will make more use of drones to provide more comprehensive information

93,500 yearly substation asset inspections

Read more about our plans for asset stewardship in delivering our asset replacement and upgrades programme in the section: **Non-load Related Expenditure, Pg 85.**

Read more about our plans to add further resilience to our network in the section: **Supporting and Securing our Network, Pg 116.**

Read more about how we deliver a safe system and healthy working culture in the section: **Health and Safety, Pg 48.**

Read more about our workforce and supply chain in the section: **Delivering Our Plan, Pg 161.**



Meeting the needs of consumers and network users



Along with our extensive internal knowledge we have used our stakeholder engagement and delivery strategy to help meet the needs of consumers, network users and wider stakeholders.

We have built on our ongoing business-as-usual activities to enhance the RIIO-T2 engagement process by ensuring consistent application of strategy, channels and delivery. At the beginning of each business plan chapter we detail what consumers, network users and wider stakeholders have told us and how we have built our plan to meet their needs.

Overall, as a network operator, we know our network customers are extremely satisfied with the service we provide and we were named as the UK's leading network operator 2019 – awarded Network of the Year at Network Awards for record high performance.

One notable example of how stakeholder feedback shaped our plan is the strong support we received to confirm the belief that the Scottish Government targets to remove petrol and diesel cars would be met. So our plan facilitates the 158,000 electric vehicles that we project will connect in RIIO-T2.

To do this, we used a scenario-based process to evaluate challenges and the range of uncertainty. This is designed to make sure our plan provides the correct level of flexibility.

As the network becomes increasingly congested and more generators connect, we are seeing larger changes in power flows across the country. That's why our plan includes upgrades to our connections with SEN, National Grid and SP Distribution, making sure power can be moved around the country to meet demand.

Over the course of RIIO-T2, we plan to spend £540.1m on accommodating these evolving requirements.

As well as this, we've developed a strong package of output incentives. Informed by robust stakeholder engagement, and building on our experience from RIIO-T1. These output incentives drive the priorities that stakeholders have told us they want us to deliver in RIIO-T2. Within this area, we have proposed new incentives; encompassing improving the quality and timeliness of our network customer connection process, going beyond business as usual stakeholder engagement and maintaining our exceptional reliability levels.

We have also worked with consumers, network users and wider stakeholders including the Independent Transmission User Group to shape our approach and agree on application of the scenarios when building our plan.

Read more about how we have approached consumers' and network users' needs in the section: **Load Related Expenditure, Pg 63.**

Also see **Annex 5: Stakeholder Engagement Activities** for our stakeholder engagement process.



Delivering an environmentally sustainable network



In RIIO-T2, our plan will facilitate the connection of a further 900MW of renewable energy and further capacity across the network. This will provide capacity to power 1.5million homes with renewable generation, and a CO₂ reduction of 1.6Mt per annum.

However, as well as facilitating progress towards Net Zero we recognise that our operations also have an impact on the environment. We have built these considerations into our investment decision process, and identified many opportunities to minimise the effects such as implementing energy efficiency measures at a third of our substations, supporting biodiversity enhancements at up to 20 sites and driving our supply chain for reductions in embodied carbon.

The current volume of oil contained in our circuit breakers is 516,658 litres.

Our circuit breaker investments will remove over 357,000 litres of oil from the system.

Where possible we will take every opportunity to use alternatives to SF₆. Leakage from modern equipment is extremely low, however this is a gas that has many times the global warming potential of CO₂, so we will only add equipment which contains SF₆ if there is no workable alternative. This will mean that new equipment for the 132kV network will be SF₆ free and we'll replace the worst performing assets at this voltage. We will also use only non-SF₆ alternatives for our new 275kV and 400kV gas insulated bus bars. We also commit to using SF₆ free circuit breakers at these voltages if they become commercially viable during the period.

Our proposed incentives in this area include the outputs and wider price control measures we will take to reduce the adverse impact of our networks and business activities on the environment, and to support the transition to a low carbon energy transition. We have proposed to report on our environmental activities, including losses, as reputational only incentives. Our existing SF₆ incentive will be carried forward to include other Insulation Interruption Gases and will use tougher incentive targets. In addition, we propose 3 new incentives which will be assessed by the User Group and will be used to support an acceleration towards Net Zero.

Read more about our section **Sustainable Network, Pg 35 and Annex 7: Environmental Action Plan.**

Read more about **Load Related Expenditure** on **Pg 63.**

Read more about **Non-load Related Expenditure** on **Pg 85.**



Enabling whole system solutions



Whole system planning is ingrained in our business. We have always applied whole system planning across SP Transmission and SP Distribution to improve the service and reduce costs for consumers and network customers. In RIIO-T1 this has been evident through our work to coordinate how we connect and coordinate with generators and the increasing role of flexible demand in minimising future reinforcement requirements. We are currently undertaking a tender for 95MW of such flexibility. Through our integrated distribution and transmission control room, we provide coordinated planning and management across the electricity network in our area.

As we move into RIIO-T2, we have reached out further across the energy system to align with the future plans of generators, the gas network, the transport sector and a diverse range of other stakeholders who represent the wider energy system. This period will also see the creation of a Distribution System Operator (DSO) model. The DSO model will allow us to further develop our coordinated approach, at the same time taking on new responsibilities and activities which enable the uptake of low-carbon technologies.

The transition to Net Zero will only place a greater emphasis on this requirement. As we have built our plans, we have considered future as well as existing requirements to ensure our plans are appropriate for the longer term need of network users and represent good value for consumers. The Scottish Government published a Network Vision for Scotland in early 2019, and we have used this integrated view as one of our references on the wider changes that are required.

This is demonstrated in the energy scenarios which underpin a number of elements of our plan. We have considered the changes that will take place in relation to heat, transport, generation and other demands across the wider energy system. Our plan is designed from the outset to consider the whole system today as well as how it may need to evolve.

Read more in the section:
Whole System Planning, Pg 54.



Managing uncertainty



Today's energy landscape has a number of uncertainties, and we expect these to continue in RIIO-T2. Uncertainty means that we may see changes take place faster than we anticipate or in areas we don't currently expect.

One of the biggest drivers of change on the transmission network is the growth of renewable generation. As we have seen in RIIO-T1, the generation that has connected to the network has been different from that which was forecast at the start of the period. We are also seeing greater interest in off-shore wind generation and growing amounts of distributed generation. These projects are driven by our customers and we need to be able to respond to their needs to connect to the network efficiently.

In recent years the forecasts for electric vehicle registrations are consistently being revised upwards – reflecting mass-market acceptance due in part to increased range, lower prices and higher awareness of climate change. We will also face increasing pressure from policies which aim to make Scotland a Net Zero society by 2045. This will bring with it changes to legislation, changes in customer demands and other uncertainties which we need to be able to provide an efficient and timely response to.

We have rigorously tested our plan and provided detailed justification for our expenditure. We fully expect our plans will have to flex, therefore we are proposing a range of mechanisms to ensure a fair and consistent means of funding these changes for both customers and investors.

Modernising Energy Data

We have published our initial "Digitalisation Strategy" which places a focus on acting on feedback from current and future users of Energy System Data. This can be found on our website and will be developed with stakeholders over the coming months.

Read more about our Uncertainty Mechanism in section: **Managing Uncertainty, Pg 138** and **Digitalisation Strategy, Pg 136.**

Read Financing Our Plan Efficiently: **Financing Our Plan Efficiently, Pg 175.**

Read more about Assurance in section: **Governance and Assurance, Pg 192.**



Driving efficiency through innovation and competition



We have led the way in our investment in innovation. Our innovation has major benefits to other parties across the whole system, including reductions in the costs of operating the national system, time to connect new generation, and the network's environmental impact.

Scotland has been a pioneer in the transition to renewables and our innovations have enabled the rate of change. Project FITNESS has shown that digitalising our substations will reduce costs and future outages, allowing more renewable generation by avoiding network congestion. Our Visor project is helping us understand the new dynamics of the system, and project Phoenix will show how synchronous compensators can make up for the loss of thermal generators, giving us confidence that a carbon-free network is achievable.

The energy system transition will continue to present new challenges to the operation of the network. Our innovation focus remains to rise to the challenges, from system operability and security of supply to reducing environmental impacts and staying cyber resilient.

We estimate that our innovations will provide customers with savings of £30m by the end of RIIO-T2.

We aim to deliver a balanced innovation portfolio in RIIO-T2, through core business-as-usual, incremental and transformative activities. To achieve this, we have developed a comprehensive and targeted innovation strategy. We will structure our innovation into clusters of network modernisation, system security and stability, network flexibility and digitalisation of power networks. The structured approach is part of our strategy to lead the industry in the effectiveness and transparency of our innovation activities.

Competition is not new to us: throughout RIIO-T1 we have fostered an increasingly competitive supply chain to drive more value. We continue to grow our supply chain to increase this benefit further.

We have a Competition Plan which includes the identification of the sub-sea HVDC Eastern Link between Scotland and England as a potential candidate for late competition, working in coordination with National Grid. For early competition, we have identified three sites at Hunterston, Strathaven and Kincardine, where the installation of synchronous compensation is required.

Almost 96% of our transmission construction activities is already delivered by the market.

Read more about our Innovation Strategy in section: **Innovation Built-in, Pg 25 and Annex 6: Innovation Strategy.**



Finance



Our revenues are based on our proposed investments and commitments, all agreed with Ofgem through the business plan process utilising Ofgem's cost of capital assumptions from the SSMD – May 2019.

Ofgem have instructed the use of 4.8% for the cost of equity for this plan. We do not support this. We provide our own assessment and conclusion on cost of equity in **Annex 25: Finance and Annex 34: Our supplementary business plan**. A fair return is required in order to attract long term investors and deliver consumer benefits in GB's drive to Net Zero.

Ofgem's assumptions provide revenues of £1.7bn for the five-year RIIO-T2 period. That's a yearly average of £333m at 18/19 prices, excluding incentives. This compares to the eight-year period of RIIO-T1 of £2.5bn – a yearly average of £313m (see table in **Revenue section – Pg 6**).

The average annual increase in base revenue for the RIIO-T2 period is mainly driven by the increase in RAV-related revenues. In other words, these revenues are driven by the scale of past investment. The RAV through RIIO-T1 is projected to grow from £1.6bn to £2.6bn – an increase of c.61%.

Governance and Assurance



We are proud of our track record and the trust we have earned from our stakeholders. But we're not standing still.

As the energy transition evolves at pace we look to build on this trust and transparency in RIIO-T2 – beginning with submitting a business plan that is robust, accurate, and tested for ambition. To do this, we created a comprehensive governance and assurance framework that sits at the forefront of our business planning process.

Our governance framework is set-up to provide strategic guidance via our SPENH Board and RIIO-T2 steering group, with challenge provided through two key groups: the Transmission Management Committee and the independent Transmission User Group. As part of our commitment to full governance, we have a project risk-register in place to manage and mitigate any project risks; this feeds into SPEN's overall Enterprise Risk Reporting framework.

We have further enhanced an already established risk-based assurance framework, deploying additional assurance activities based on the output of the risk assessments. This has ensured that the plan has been subject to rigorous challenge from internal and external experts, ensuring everything is underpinned with robust and accurate evidence.

Read more about our Finance Plans in sections: **Financing our Plan Efficiently, Pg 175, and Annex 25: Finance**. Read more about Governance and Assurance in our **Governance and Assurance** section, **Pg 192**.



483

connection offers have been made since the beginning of RIIO-T1, maintaining a very high standard across the period with **99.99%** delivered on time.

8.5/10

Awarded 'Team of the year' at the Utility Week Awards – for our industry-leading Stakeholder Engagement team and ranked in the Top 16% of companies assessed globally by AccountAbility, the owners of the AA1000 Stakeholder Engagement standard. Solidifying this position with our highest ever performance in our stakeholder survey for the third consecutive year, with a current score of 8.5/10.



1.56%

Since 2013, transmission network losses have averaged 1.56% of the total energy transmitted and the carbon intensity of these losses has steadily decreased.



1,500MW

Cumulative total of connections to the network across RIIO-T1 is now at 1,500MW. Our baseline target has changed across the period from 2,503MW to a forecast position of 1,620MW reflecting the needs of our customers.

78%

Leading TO in the Environmental Discretionary Reward. Leadership score of 78% for 2018/19.

99.9998%

With 99.9998% of energy supplied, we continue to maintain our outstanding network reliability.

5%



Our controllable Business Carbon Footprint, despite considerable reduction efforts, has increased by 5% since our 2013/14 baseline year (8% reduction, excluding SF₆), due to increased SF₆ leakage rates from a small number of assets and increased total volume of SF₆ on our network. Since 2013, SF₆ leakage as % of total inventory has remained comparatively low, 0.75% of total mass against a target of 0.85%.

0 injuries

Our continuous drive for zero harm has resulted in zero injuries to the general public from our assets or operations and has seen our headline performance indicator Total Recordable Injury Rate (TRIR) reduce for both employees and the contractors we engage to 0.27*.

*TRIR is calculated by multiplying the total number of recordable incidents by the total number of man hours worked in a given period.

67%



We are on track to deliver our modernisation outputs in full having delivered 67% against our baseline target of 59.9% to date.

74.7%

We have consistently outperformed Ofgem's breakeven target of 69% on our stakeholder KPI output averaging 74.7% across the RIIO-T1 period.

Our network capacity has increased by

2,002MVA



since the beginning of RIIO-T1. With an increased forecast to the end of the period of 3,482MVA against a baseline of 1,073MVA as we continue to facilitate the Scottish and UK government's ambitious Net Zero targets.

Our Track Record



How we've performed in RIIO-T1

We were given fast-track status in RIIO-T1 in recognition that our plan was well-justified and efficient. That allowed us to make an early start on delivering our commitments. We have delivered on our targets and stretched ourselves to do more.

Outputs and incentives

The incentive mechanisms for RIIO-T1 are designed to drive network companies to focus on the low carbon transition, put stakeholders at the heart of our plans and deliver value for money for existing and future consumers. We have consistently delivered on these objectives as the table on the previous page (showing our performance as at 2018/19).

We have delivered successfully against each of the output incentive areas throughout the RIIO-T1 period. We have made step changes in customer satisfaction and stakeholder engagement. Our customer satisfaction scores have increased year on year, and SP Energy Networks are now equivalent to first place in the UK CSI top 50 companies – 1.7 points above the current leader First Direct.

Our network reliability, as measured by our Energy Not Supplied (ENS) metric, consistently outperforms our annual target, achieving exceptional network reliability. This outstanding performance was achieved even with an increased number of complex planned outages. We need to take outages on our network to deliver our essential upgrades, new connections and asset replacement work. The unsupplied energy as a result of faults on our networks was only 39MWh, well below the benchmark level of 225MWh. We know that every unreliability event has an impact on our customers so we have made this area a key priority when delivering our plan.

Totex Performance

We proposed an ambitious plan for RIIO-T1 to:

connect large volumes of renewable generation

reinforce the network to allow renewables from all over Scotland to find a market

make the right investments in our existing assets to maintain the high levels of reliability our customers expect.

The level of activity we have undertaken in RIIO-T1 is significantly higher than at any time since privatisation. We've adapted to this challenge and we're on course to deliver what we said we would.

Before committing to an investment, we always make sure it is still the right thing to do. Thanks to our robust planning and accurate forecasts, we've made only minor changes to our plan after conducting these checks.

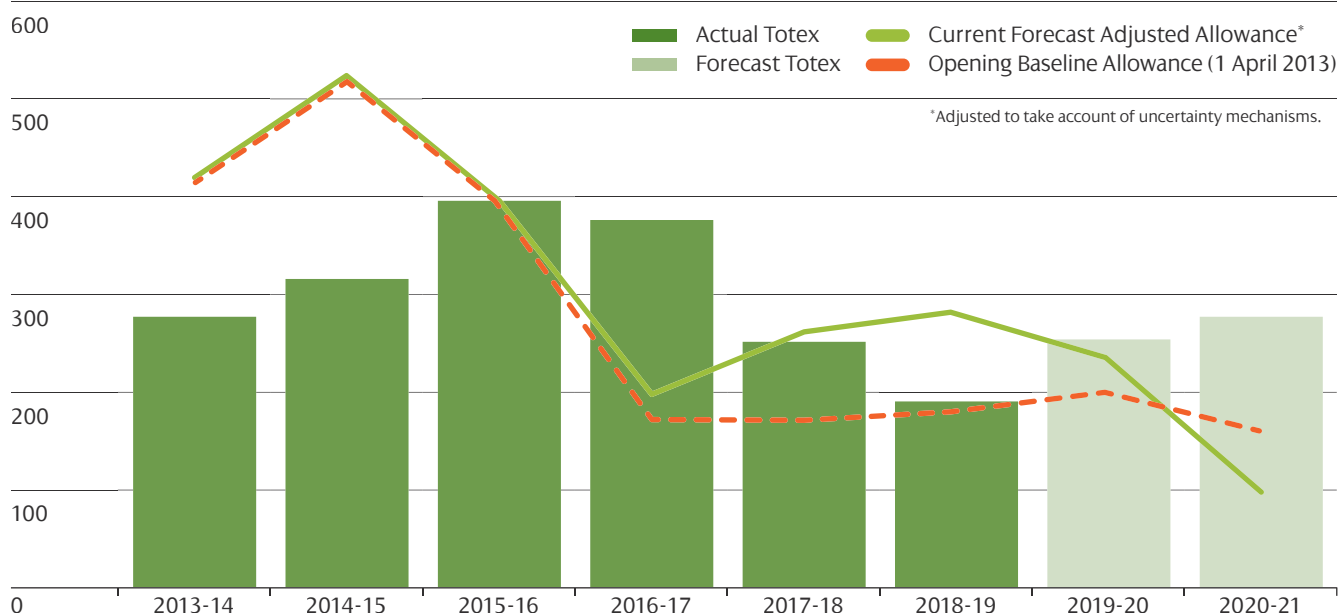
Overall, for RIIO-T1 the forecast for Totex is an outperformance of 3.2%. Innovation and efficiencies in some categories – wider works and overhead line modernisation for example – have been offset by costs above allowance in others such as switchgear modernisation and generation connections.

The figure below illustrates the actual and forecast expenditure against baseline (original) allowances. It also highlights allowance adjustment resulting from incentive mechanisms, primarily the generation connections volume driver.

The annual profile of expenditure in 2014 and 2015 was impacted by the start of the Western Link project being delayed by complex land purchase requirements and cable manufacturing issues. Also in these years, planning issues delayed the South West Scotland projects. Expenditure in the final years of RIIO-T1 includes works which will deliver output in RIIO-T2. Despite the disruption caused by the volatility of the connections background and unexpected asset failures, we have delivered all of the wider works projects and we are on target to deliver all of the planned modernisation outputs.

TO Totex Actual and Forecast expenditure

£m



Capital Expenditure – How we've performed

We have delivered efficiencies in some areas but have faced challenges in others.

Generation connections

Our best forecast for the capacity of generation connection in RIIO-T1 was 2,503MW. Factors outside our control, including the removal of subsidies for onshore wind generation means that the actual capacity of new connections is forecast to be 1,620MW by the end of RIIO-T1. The investment category this relates to is known as sole-use infrastructure. There is an uncertainty mechanism that adjusts our allowance if the actual capacity of generation connected is above or below the 2,503MW target. As we expect to deliver less than the target, our allowances will be reduced from the baseline values.

Shared-use infrastructure provides capacity for multiple generators or for a region of the country. We have created more capacity than forecast, partly to accommodate more generation connecting to the distribution system than expected. We have used more efficient solutions than were specified in our licence but the RIIO-T1 mid-period review resulted in funding not being allowed for these. As a result, we will spend more than allowance in this area.

Wider works

To allow the connection of renewable generation throughout Scotland, we have also delivered an increase in the Scotland-England transfer capacity from 2,800MW to 6,600MW and added 1,440MW to the north to central Scotland boundary.

We have delivered further efficiencies in our wider works programmes. A world-first innovation in network and equipment design led to savings in our series compensation project. Consumers will benefit from the £50m reduction in costs.

We were the first company in GB to adapt our specifications for gas insulated substations to take advantage of more compact and flexible solutions. We also leverage the benefits of being part of the Iberdrola Group to procure at lower cost. These two elements came together to produce efficiencies of £30m.

Procurement efficiencies also helped to deliver savings of around £11m in our shunt compensation projects. This was only possible thanks to our highly skilled in-house engineering team. By assuming design responsibility that normally rests with the supplier, we created a better value solution.

Non-load programme

Our programme is designed to manage the highest risk assets on the network and includes key projects in overhead lines, transformers and substations. We are on track to deliver all of our outputs in this area. We have made only minor changes to our plans. These are mainly as a result of system access restrictions but we have also reprioritised a small number of projects to address emerging condition issues. All of these substitutions have been equivalent in scope to the works that we have deferred.

Fast tracking allowed us to make the most of over-capacity in the supply chain for our overhead line works. We advanced some projects and delivered the outputs for lower costs than we had forecast in our business plan. Over time, this opportunity has reduced and more recent contracts have been in line with our original forecasts. Overall, we expect to share £72m (in 2018/19 prices) savings with consumers.

We have faced challenges in other areas. We expect to spend approximately £22m (based on 2018/19 forecast) more than our allowances in modernising transformers and circuit-breakers. Working in brownfield substations can throw up unexpected local issues and we have experienced some difficulties with our suppliers. Our delivery programmes have also been affected by potential risks where assets owned by other network operators have failed destructively. We assessed our own assets in light of this information, and put temporary access restrictions in place until any concerns were resolved.

Operational expenditure

Operational costs have increased over RIIO-T1 periods for a number of reasons and, overall, we forecast to spend more than allowance.

Large parts of the transmission infrastructure have been nearing the end of their design lives. Although there are programmes of work designed to conduct replacements of these assets when deemed necessary, SPT strive to ensure that assets are replaced in a timely manner according to condition and risk in order to get the best value for money for the end consumer. As a result of this however, deteriorating assets require more regular and extensive maintenance to ensure that they continue to operate safely and reliably.

Totex Plans for RIIO-T2: *what we've learned*

Our plans for RIIO-T2 are built on the high levels of service and genuine efficiency gains delivered in RIIO-T1. All of the efficiencies we delivered are now reflected in our baseline expenditure and we've set ourselves a stretching target to improve further.

We've proposed new uncertainty mechanisms in generation connections, taking the best practice from across the sector. The mechanisms will be designed to reflect the costs incurred with high probability. This will ensure that we recover the funding we need and protect consumers from the risk of underspends.

In areas where we've spent more than our allowances in RIIO-T1, we've improved our planning. This doesn't mean that our costs have increased but we're now better informed, for example, to make earlier design decisions.

In all activities, we continue to find better and more efficient ways to deliver on our plans. We will focus on:

- working safely
- improving value for money
- maintaining high levels of service
- minimising our impact on the environment.

Returns and Profits

We have earned £26.8m (2009/10 prices) to date from incentives, with a further £5.0m forecast – resulting in a total forecast incentive reward of £31.8m (2009/10 prices) in RIIO-T1.

Return on Regulatory Equity (RoRE)

Our information quality incentive (IQI) reward relates to being fast tracked during the RIIO-T1 price control review. Our additional income from Outputs, Incentives and Innovation results from performance under the Network Reliability Incentive, Stakeholder Satisfaction Output, Environmental Discretionary Reward and Performance from offers of timely connection.

There is around a 0.5% difference between the notional and actual gearing basis for SPT as summarised below.

RoRE – SPT operational performance

RIIO-T1

	Notional gearing	Actual gearing
Allowed Equity Return	7.0%	7.4%
Totex Out performance	0.5%	0.6%
IQI Reward	1.0%	1.0%
Outputs, Incentives and Innovation	0.4%	0.4%
Penalties and fines	0.0%	0.0%
RoRE – operational performance	8.9%	9.4%

The table has been extracted from the SPT Regulatory Financial Performance Report (RFPR) tables submitted to Ofgem on 31st July 2019.

Dividend history

Recent SPT dividends have included special dividends to ensure the company's gearing remains aligned with Ofgem's notional level of 55% in RIIO-T1 and include reimbursements to parent companies for pension deficit payments made on the company's behalf.

SPT dividend history

As at 31 March 2019, £m GBP

	Share Capital	Dividend Payout
2018/19	385	92
2017/18	385	76
2016/17	385	72
2015/16	200	10

Source: SPT's Annual Regulatory Account to 31 March 2019.

Pay and reward: customer satisfaction

Each director has an objective for customer service and the measurable outputs are weighted depending on their responsibilities. The objectives of the Customer Service Director, who has responsibility for every aspect of customer experience, are the highest weighted for customer service. In that director's case 68% of the personal element of their bonus is linked to achievement of customer service standards.

Staff participate in SPEN's performance related pay and Annual Incentive Plan. Entitlement to a bonus is dependent upon achievement of objectives set at a business and personal level which are also influenced by customer service.

It is also important to note that delivery of customer service is underpinned significantly by investment delivery in the form of outputs which are also directly incentivised through the Price Control set by the Gas and Electricity Markets Authority.

The company reports annually to Ofgem in a statement on the linkages between Directors' Pay and Standards of Performance. This statement is made in accordance with Section 42C of the Electricity Act 1989.

Our part of consumers' bills

Today the average electricity bill for a domestic customer in the UK is £612 per year. 6.1% of this is attributable to transmission network costs. This can be compared to the average bill immediately prior to RIIO-T1 at £531 with 4% attributable to transmission. The increased proportion reflects the necessary investment to transition the network towards a low-carbon economy; modernising assets that are reaching end of life and maintaining the network to make sure existing and future consumers benefit from very high levels of reliability and performance. In RIIO-T1 we are delivering economic and cost efficient solutions for our customers against a changing energy landscape. We are doing what we promised in our business plan where this is the right thing to do or adjusting it to meet our customers' needs and make sure that investment remains justified.

We have become more efficient as we've delivered our RIIO-T1 plan and that efficiency is embedded into our business. The combined embedded efficiency and efficiency stretch have reduced our RIIO-T2 baseline totex by £145m. We have implemented the outcomes of innovation projects in the design of schemes in our business plan. These have reduced our totex by £30m.

We are not forecasting the deferral or delay of costs from RIIO-T1 that would increase costs in RIIO-T2.

Find out more information in the **Shareholder remuneration** section on **Pg 190**.



We have listened to consumers, network users as well as wider stakeholders to ensure our RIIO-T2 plans are informed by the needs and aspirations of the people our network serves. In keeping with our business-wide stakeholder engagement strategy, we have created a tailored, RIIO-T2-investment-area-specific engagement approach. This ensures we are speaking to the right stakeholders, about the right subjects, in the right way and **keep consumers, network users and wider stakeholders at the heart of our decisions.**

This approach limits stakeholder fatigue and unnecessary costs from broad-brush events being passed onto consumers whilst maximising the feedback we receive. It also empowers less informed stakeholders with the information they need to understand the links between the RIIO-T2 investment decisions we are making now and the wider societal issues, such as the global climate emergency and sustainable economic growth that are important to them. Our goal? To ensure our RIIO-T2 Business Plan is authentically co-created with our stakeholders so we can continue to deliver safe, reliable services and **a sustainable, Net Zero future.**

In this section

You can find the details of our business-wide RIIO-T2 engagement for the development of our Business Plan.

Throughout our plan

Each relevant chapter of our plan is preceded by a summary of the stakeholder engagement undertaken to inform it.

Continuing to Engage with our Stakeholders in RIIO-T2, *Pg 131*

Our stakeholder engagement plans for the RIIO-T2 delivery period are discussed in the Continuing to Engage with our Stakeholders section.



81%

of stakeholders find our RIIO-T2 Business Plan and the associated bill impact acceptable.

Co-creating the plan with our Stakeholders



Our RIIO-T2 Business Plan Stakeholder Engagement Strategy

Our engagement purpose

We engage with stakeholders to increase the resilience and flexibility of our RIIO-T2 Business Plan whilst ensuring consumers, network users and wider stakeholders have the opportunity to make an impact on the future direction of our business. Meaningful engagement allows us to identify issues facing the wider energy industry as well as local communities.

Our industry is facing its most substantial shake-up ever as it acts quickly to facilitate advances in technology as well as changes to the way consumers and network users produce and consume electricity at a local level – all within the context of a global climate emergency and the urgent shift to a Net Zero Britain.

With such huge global considerations at stake, we know collaboration with our stakeholders is key when preparing our 2021-26 investment plans for our Transmission network; a critical component of a zero carbon society.

That's why we continue to engage extensively, understanding how we can best develop our network to meet the needs and preferences of current and future stakeholders across central and southern Scotland.

In doing so, we are confident the investment decisions and strategic proposals contained within this business plan will help realise a better future, quicker and ultimately create a sustainable, resilient, innovative and cost-effective network that benefits everyone now and in the future.

A consistent and innovative approach

Stakeholder engagement is a fundamental part of what we do at SP Energy Networks. Our dynamic Stakeholder Engagement Strategy, further detailed in the Continuing to Engage with our Stakeholders chapter, ensures a consistent approach to engagement no matter the subject or activity. We have used this strategy and applied it to our engagement in the development of our RIIO-T2 Business Plan.

Our engagement strategy is inclusive and gives consideration to both the broad variety of stakeholders we engage with and their differing knowledge levels of our business. This is especially important when it comes to informing our price control investment decisions. These decisions need to take account of foreseeable changes to stakeholder priorities as well as wider political, regulatory and technological developments and less predictable changes that may arise.

As a transmission operator, we participate in the Annual Stakeholder Satisfaction Survey mandated by Ofgem. We survey our supply chain, developers connecting to our network, connected customers, and members of the communities we work in as well as wider stakeholders with a broad interest in what we do. All respondents are asked to rate their overall satisfaction out of 10. We have demonstrated continuous improvement in our transmission survey results year on year from 7.4/10 at the start of RIIO-T1 to 8.3 this year. This increase in scores shows we have experience of taking feedback on board from our stakeholders.

Throughout our RIIO-T2 planning we have aimed to engage in innovative ways to maximise stakeholder input in a world where individuals are increasingly overloaded with information. For example, we created an online '#ChallengeOurPlan' campaign to maintain the RIIO-T2 thread in relevant online posts, presentations and publications. We also made use of a 'blooper reel' video of our User Group for social media and adopted the Japanese 'PechaKucha' style presentation to discuss each investment area of our Business Plan at the All-Energy Conference 2019 and explain the RIIO-2 regulatory pricing framework.

Total number of external stakeholders engaged through events, bilaterals and surveys

6,851

Total number of engagements through online, press and #ChallengeOurPlan campaign

144,027



More details about our nine-step engagement strategy can be found in the **Annex 28: Strategy for Engaging Stakeholders in RIIO-T2**.



Identifying our stakeholders

With a clear purpose and our RIIO-T2-investment-specific engagement topics defined, we identified the wide ranging stakeholders who were best placed to provide insight to ensure an ambitious yet cost effective and future-ready business plan.

Building on the traditional matrix model of evaluating stakeholders by their level of interest and influence we also considered mapping our stakeholder groups by their level of knowledge in relation to each specific RIIO-T2 engagement topic. This enabled us to effectively tailor our engagement activities and maximise the quality of stakeholder feedback.

This method also allowed us to tailor our engagement, ensuring value for money for consumers by negating large, expensive 'tick box' events which we know can be time consuming and expensive for stakeholders both in terms of time out the office as well as travel expenses.

Our approach to identifying and mapping stakeholders also enabled us to identify any gaps in our engagement, particularly with hard-to-reach stakeholders such as end consumers, who do not normally directly engage with transmission operators or, indeed, have any awareness of their existence. In this respect we acknowledged our responsibility to provide tailored, informative engagement at each stage of our business plan, making RIIO-T2 investment more relevant to consumers and their everyday lives as well as to more informed network users and wider stakeholders. We maintained opportunities for open discussion and deliberation at each of our events so that a lack of previous knowledge or awareness of RIIO-T2 was not prohibitive to stakeholder input to our plans.

Our phased approach to engagement

We aligned our stakeholder engagement strategy to each phase of our business plan development. We have identified and continued to refine consumer, network user and wider stakeholder priorities and expectations for our transmission network throughout the current price control period, increasing our focus on RIIO-T2 from April 2017.

At the start of 2019 we also worked with the other GB Transmission Operators to understand the value stakeholders assign to transmission services and the trade-offs associated with different levels of service delivery. In parallel, and following on from these surveys, our relevant RIIO-T2-investment-area managers established consultations using a variety of engagement methods to understand stakeholder views on various service output levels to co-create and refine the content of the RIIO-T2 plan. The final phase of engagement involved testing the acceptability of our plans, ensuring our stakeholders approve what we set out to deliver in our business plan.

By adopting our strategic approach to engagement, we ensured stakeholder feedback led the development of our plans at every step of the process. It enabled stakeholders to provide regular input and challenge our emerging thinking, giving us confidence that our proposals are robust, evidence-based, cost-effective, and ultimately acceptable to those that rely on our services and contribute to the costs of our network.

Engagement with external stakeholders across our Business Plan

(%)



Acknowledging stakeholders have varying levels of knowledge about our business, we mapped key stakeholder groups against each section of our business plan. This enabled us to ensure we appropriately engaged with the right stakeholders on the right topics, allowing us to maximise the quality of our feedback.

By mapping key stakeholder groups to each area of our business plan, we were able to ensure a consistent approach to our engagement and where possible, engaged equally with a variety of stakeholder groups across every aspect of our plan.

- Consumers
- Network Users
- Wider Stakeholders
- Transmission User Group

Consumer and external stakeholder engagement phases and activities

Consumer and external stakeholder engagement phases and activities		Business Plan development phases	Transmission User Group
Identifying stakeholder priorities	Horizon scanning – including government policy and future ambitions	Assess past, current and future performance	Induction
	Transmission of the Future – SPT staff day		
	Competitor analysis and benchmarking	Identify stakeholder needs and desired outcomes	
	Future scenarios workshop with stakeholders		
	Preliminary consumer insight and SPEN Consumer Survey (preliminary Willingness to Pay) online tool		
	Bilateral stakeholder meetings		
	Roundtable discussions		
	Attending third-party conferences and events		
	Coordination with other network operators to share best practice		
	Cross-vector engagement with SGN, local authorities and Transport Scotland		
Environmental regulators workshops			
Annual connections summit			
Educating stakeholders and understanding values	Transmission Operator wide Consumer Surveys ('Willingness to Pay')	Understanding the value of our activities and services	Initial proposals and revising approach
	Incentives bilaterals and round table discussions		
	Roundtable discussions with informed stakeholders		
	One-to-one interviews with consumer representatives		
	Understanding SPEN workshop		
	SPEN qualitative consumer surveys (SPEN-specific Willingness to Pay)		
	Investor relations		
	Coordination with other network operators to share best practice		
Cross-vector engagement with Scottish Government, SGN, local authorities, Transport Scotland, etc.			
Co-creating our business plan	Ongoing engagement with Scottish, Welsh and UK Government	Develop, test and refine business plan and agree performance levels	Addressing challenges, sensitivities and trade-offs
	Future energy scenarios consultation and webinar		
	Online consultations: – non load; future energy scenarios; load; incentives; whole systems; innovation; environment		
	Transmission Operator wide Consumer Surveys ('Willingness-to-Pay')		
	Draft incentive proposals consultation		
	All Energy Conference – dedicated break-out sessions		
	Innovation webinar		
	One-to-one interviews with informed stakeholders and consumer representatives		
	Quarterly Sustainability Stakeholder Working Group Meetings		
	Coordination with other network operators to share best practice		
	Cross-vector engagement with SGN, local authorities and Transport Scotland		
	Internal business plan assurance – second person checks and senior manager reviews		
	#ChallengeOurPlan social media campaign		
Fully-costed 1st draft business plan published for stakeholder feedback			
Business Plan acceptability	Ongoing engagement with Scottish, Welsh and UK Government	Finalisation of commitments	Clarification and re-affirming commitments
	Consumer Surveys (Willingness-to-Accept)		
	One-to-one interviews with informed stakeholders and consumer representatives		
	Quarterly Sustainability Stakeholder Working Group Meetings		
	Continual refinement of the plan based on stakeholder feedback		
	Innovation update and LCNI conference		
	Cross-vector engagement with SGN, local authorities and transport Scotland		
	Internal business plan assurance – second person checks and senior manager reviews		
	Business Plan acceptability testing		
Fully-costed 2nd draft and final business plans published for stakeholder feedback			

SPEN Board assurance

SPEN Board assurance

Triangulation of stakeholder feedback

We understand that not all consumers, network users or wider stakeholders have the same views on our business priorities. Therefore, working with specialist partners, we created and implemented a triangulation methodology to ensure we had a consistent and fair approach to the way we made any trade-offs to deal with differences in opinion or decision making.

Triangulation is a means by which an alternative perspective is used to challenge, validate or extend current research findings and is often used to overcome any divergence in opinion. You can find further information on our approach to triangulation and the process we followed for any instances of conflicting stakeholder views in **Annex 5: Co-creating the Plan with our Stakeholders**.

Triangulation in action

All of our investment decisions are made with the cost to the consumer in mind. In this respect, we inherently make trade-offs between all of our identified RIIO-T2 cost proposals and the impact on consumer bills now and in the future. For example, we may choose to manage more network risk and delay needed investment so we can balance costs between current and future consumers.

All pieces of feedback we received from stakeholders – including consumers, consumer representatives, Ofgem's Consumer Challenge Group and the independent Transmission User Group – both at events and directly as comments on our draft business plans – were collated by the Company. This feedback was then ascribed to the relevant section of our business plan for tracking. Comments were reviewed by senior members of the RIIO-T2 team including directors.

Where comments were conflicting, they were highlighted at regular senior management meetings for review and/or discussed with relevant stakeholders including consumers and consumer representatives. In reality, there was very little conflicting feedback but rather comments seeking further information or clarity.

We recognise that despite our engagements, there are some areas of our business where consumer levels of interest or knowledge are low. Equally, there are investment decisions relating to physical or cyber security where it is not possible to openly discuss our plans in detail. In these instances the triangulation method outlined above is limited. In these instances, decisions were reviewed by the Transmission User Group and informed stakeholders.

You can find more information on the various trade-offs we have made within the relevant stakeholder sections at the start of each business plan chapter.

Further detail on our triangulation methodology including examples, can be found in **Annex 5: Co-creating the Plan with our Stakeholders**.



Innovatively engaging to inform the development of our Business Plan

Having gone through a robust and extensive engagement planning phase, we adopted innovative engagement techniques to gain key stakeholder insight to help shape our plan. Through this, we carried out inclusive, tailored and cost-effective engagement which was specific to our RIIO-T2 business areas and to our plan as a whole.

Outlined below are some of our key engagement activities. Further detail on these engagement activities, including details of consumer group representation can be found in **Annex 5: Co-creating the Plan with our Stakeholders**.

Activity	Engagement Purpose	Reach
Conferences, Events and Stakeholder Consultations <i>Apr '17 – Dec '19</i>	<i>Conferences, events and stakeholder consultations to engage on RIIO-T2</i>	2,285
#ChallengeOurPlan (online) <i>Oct '18 – Dec '19</i>	<i>Online campaign for promotion and information sharing around RIIO-T2</i>	34,118
SPEN Willingness to Pay digital tool <i>Q1 2017</i>	<i>Consumer testing and preliminary insight on Willingness to Pay (WtP)</i>	999
Understanding SP Transmission Workshop <i>Feb '19</i>	<i>Workshop to gauge consumer level of understanding of our business and how we are financed</i>	32
Transmission Operator (TO) Willingness to Pay study <i>May '19</i>	<i>To estimate domestic and non-domestic consumers' WtP for improvements in the service provided by TOs</i>	1,600
Consumer Willingness to Pay Focus Groups <i>May – Jun '19</i>	<i>A qualitative review of attributes of draft business plan, to help support understanding and provide evidence base around outputs of the TO wide WtP research</i>	28
Interviews with consumer representatives <i>Jul – Nov '19</i>	<i>In-depth interviews with informed stakeholders representing a wide range of stakeholders from consumer groups, academia, development trusts and communities</i>	15
Consumer Willingness to Accept research <i>Sept '19</i>	<i>To understand acceptability of our business plan and proposed outputs prior to the final submission</i>	1,892

Independent Challenge

Independent Transmission User Group

Further strengthening our RIIO-T2 stakeholder engagement strategy, we established an independent Transmission User Group for the first time, to formally feedback on our plans.

The independent User Group has used their wide-ranging industry expertise to provide formal challenge and feedback on our RIIO-T2 Business Plan at every phase of its development. This group of experts represents the increasingly broad needs and requirements of our multiple consumers, end users and wider stakeholders and has therefore been paramount to informing our RIIO-T2 investment decisions. To allow them to challenge us effectively, we provided the group with an 'access-all-areas' pass to our Transmission business, both in terms of our staff and physical network infrastructure.

The members of the User Group met to review the phased development of our plans every month since October 2018. They spoke with the senior managers and teams who were responsible for producing each chapter as well as with relevant company directors and our CEO to directly feedback on our investment decisions.

Further adding to their knowledge, the User Group also brought in external representatives and advisors from organisations, such as Citizens Advice Scotland, Citizens Advice England and Wales, Community Energy Scotland and the Scottish Government to inform their ongoing review.

Any questions or challenges raised by the User Group were formally recorded on a Challenge Log which can be reviewed in **Annex 5: Co-creating the Plan with our Stakeholders** alongside responses from SP Energy Networks. The group also made the corresponding response from direct comments on our draft Business Plan documents. Each comment was responded to by the relevant senior manager of the RIIO-T2 team and related actions and amendments noted alongside **Annex 5: Co-creating the Plan with our Stakeholders**.

Further highlighting how our plans are built in-line with our stakeholder priorities, the User Group has not disagreed with any of our RIIO-T2 investment plans. However, the group has engaged with our internal governance structure to recommend areas of focused spending by the Company's Board. The Group has also been paramount in challenging us to clarify the information within our Business Plan surrounding our investment decisions – ultimately making our plans more accessible for external scrutiny.

See the **Continuing to Engage with our Stakeholders** chapter to read how we plan to maintain the role of an independent User Group throughout RIIO-T2 so they continue to play a pivotal role in how we implement and deliver our plans.

For more information can be found in **Annex 5: Co-creating the Plan with our Stakeholders**.



User Group Chair

The Right Honourable Charles Hendry is the Independent Chair of the User Group. Charles has extensive knowledge and experience of the energy industry and served as Minister of State for the Department of Energy and Climate Change (2010–2012). He was also the Conservative Party's spokesman on energy issues, from 2005–2010, holding the portfolio for longer than any other spokesperson.



Transmission User Group members as selected by the chair

Rob Cormie

Director, *Edinburgh Advisers*

Martin Kearns

Chief Electrical Engineer-Nuclear Generation, *EDF Energy*

Julian Leslie

Head of National Control, *Electricity System Operator*

Angela Love

Love Energy Consulting

David Ritchie

Associate Director for Environment and Planning, Environment and Ground Engineering, *AECOM*

Andrew Robertson

Head of Operational Technology, *SSEN*

Dan Thomas

Grid and Operations Manager, *Banks Renewables*

Prof Karen Turner

Director of the Centre for Energy Policy, *University of Strathclyde*

Ofgem's Consumer Challenge Group

The Consumer Challenge Group (CCG) was established to be a 'critical friend' of Ofgem and is responsible for reviewing all electricity and gas transmission and distribution RIIO-2 business plans. The group adds a second layer of independent challenge to our Business Plan and senior members of our RIIO-T2 team have met with the CCG in London at four separate meetings throughout the RIIO-T2 planning process. We have also provided additional information to the Challenge Group to support their review of our plan. Feedback received from the group is then reviewed by the wider RIIO-T2 team and the User Group and incorporated into our plans. For example the Challenge Group has been interested in our past performance and how this compares with our future plans. We have added information in our RIIO-T2 plans to support this as well as providing specific feedback on particular areas of interest to the Challenge Group.

Keeping consumers, network users and wider stakeholders at the heart of our Business Plan decision making

Understanding Priorities: Consumer Survey

We have built our RIIO-T2 Business Plan around the evolving priorities of our stakeholders.

In 2017, we enlisted the help of Explain Market Research to produce a quantitative online tool which allowed us to understand the ranked priorities of 999 of our stakeholders. The results from this exercise have also been used to increase consumer knowledge and therefore engagement in our RIIO-T2 Business Plan – as we explain our future RIIO-T2 investment decisions in relation to these consumer priorities and the necessity of Net Zero.

Prioritising the road to Net Zero with our stakeholders:

Improving the resilience of the electricity network



Investing to facilitate Net Zero, including electric vehicles and more renewable energy



Improving the awareness and resilience of communities who may be most vulnerable in the event of a black start



Improving support to vulnerable consumers; ensuring bill-payers remain at the heart of all investment decisions



Investing in innovation, to create a more efficient, sustainable electricity network with lower costs



Investing to build a more sustainable electricity network and reducing environmental impact



Mitigating the visual impact of overhead lines.



Full details of the study with Explain Market Research can be found in **Annex 5: Co-creating the Plan with our Stakeholders**.



Transmission Operator-Wide Consumer Surveys

When it comes to planning for the future, we know that collaboration is key.

Prior to the submission of our July draft RIIO-T2 Transmission Business Plan, we worked with the other GB Electricity Transmission Operators (TOs) – Scottish Hydro Electric Transmission Limited and National Grid – as well National Grid Gas Transmission to carry out a joint, GB-wide, 'Willingness to Pay' consumer survey.

Explain Market Research, alongside economic consultancy NERA, supported with the delivery of this research. This study has been used in conjunction with our wider RIIO-T2 engagement activities and business-area specific feedback.

Consumers participating in the surveys were asked to state preferences of nine transmission-related attributes covering the broad spectrum of the three Companies' activities. The nine attributes were agreed by the Transmission Operators at the start of the survey as activities consistent to all Transmission Operators and based on each Company's stakeholder priorities. These attributes were then checked for clarity of understanding with consumer focus by Explain Market Research and the stakeholder engagement teams of the Transmission Companies.

Participants were asked to confirm if, and by how much, they would be willing to see the transmission part of their bill apportioned up during the RIIO-T2 price control period to fund an improvement in services such as reducing the average time to recover from a blackout or increasing investment in innovation. High level results from this study showed that on average all consumers were willing to pay more for improvements in all of the attributes they were presented with.

The results from the TO-wide study were positive in showing that consumers value the shared activities common to all Transmission operators. However, noting that the combined amounts consumers were 'willing-to-pay' would result in a bill impact of over £100 per annum, we wished to better understand these results with the more detailed qualitative and quantitative research discussed in the next section.



SP Energy Networks Willingness to Pay Research

To support the quantitative outputs of the TO-wide study, again we worked with Explain Market Research to conduct further, qualitative exploration of consumers' **'Willingness to Pay'**.

We held three face-to-face focus groups with groups of approximately ten consumers segmented by age, consumer type and geographical area. We also held in-depth, one-to-one interviews with a variety of consumer representatives from across the UK who have good to expert-level knowledge of the energy sector. In this research we were able to provide more detailed information on the pros and cons of the nine attributes discussed within the TO-wide study and make these specific to our own activities with real-world images and videos of related activities. We also asked the participants of our studies to rank the nine priorities from most to least important to them.

Results from these exercises have fed in to RIIO-T2 planning discussions throughout the creation of the Business Plan. For example, we know that our consumers valued all transmission-related attributes but felt that funding generic, unfocused community engagement was least important. Relatedly, we have made it clearer that our RIIO-T2 community engagement will be focused on supporting communities who are directly impacted by our work or potentially most vulnerable in the event of a black start event.

We were also able to show drone footage to explain the additional costs and environmental footprint of undergrounding – something which was not immediately apparent in the 'before' and 'after' photographs of the TO-wide study. This resulted in consumers generally valuing undergrounding less than they had previously in regards to the other nine attributes. The results of this research are detailed in **Annex 5: Co-creating the Plan with our Stakeholders**.

RIIO-T2 Business Plan Acceptability Research

The final stage of our programme of research was to summarise our whole business plan using consumer friendly language to carry out 'Willingness to Accept' research on our RIIO-T2 Business Plan. We detailed the average total consumer bill impact and broke this down into the related annual bill impact for each relevant area of our business plan which combines to make up this total.

We made our entire business plan accessible to consumers, local businesses, consumer representatives and wider stakeholders by summarising the plan, our costs and Consumer Value Propositions into a number of short videos contained within an online digital research tool. This tool was shared with 1,048 consumers and 568 business consumers across the length and breadth of Britain via online, face-to-face and one-to-one interviews with consumer and industry representative stakeholders.

We are proud of the high level of overall business plan acceptability we achieved throughout this research:

81% *of stakeholders find our RIIO-T2 Business Plan and associated bill impact acceptable.*

We took an innovative and inclusive approach by engaging with consumers who fall outside our network area. We did this to ensure our overall business plan acceptability results were representative of all GB consumers given our transmission costs are socialised across the whole of Britain. Below, we have broken down our overall acceptability results with domestic and business consumers:

85% of domestic consumers in-patch;

81% of domestic consumers out-of-patch;

83% of business consumers in-patch and

79% of business consumers out-of-patch fully accept our business plan and associated bill impact.

As a percentage of the total average electricity bill, we appreciate our RIIO-T2 related costs will be relatively small. However, we know that even the smallest of increases in consumer bills can have an impact on those living in vulnerable circumstances and because of this, we engaged with vulnerable consumers as well as relevant consumer representatives.

83% *of consumers living in vulnerable circumstances fully accept our RIIO-T2 Business Plan.*

Below we have broken down our acceptability results further, detailing each response to our key acceptability question along with a sample of qualitative feedback from domestic consumers:

82% of domestic consumers find our business plan acceptable;

"When you consider all the benefits, it's a small amount to pay."

"I think it will help to deliver sustainable results which are needed going forward."

"The cost is really good value for money."

13% of consumers said they 'don't know'.

Among those who reported they did not know whether they found our plan acceptable, this was typically down to finding the summarised plan information confusing or preferring more time to reflect about the information being presented.

6% of consumers said 'no'.

Consumers who did not find our business plan acceptable expressed concern around rising energy bills in general. This theme also feeds in to broader regulatory and government discussions on how Britain as a whole socialises the investment costs of achieving a Net Zero future.

Following feedback from Ofgem's Consumer Challenge Group, we also spoke to consumers about the average bill impact associated with the cost of equity. Again, the majority of participants told us they accepted our investment decisions particularly in regards to our role in facilitating the Net Zero future.

For a full breakdown of all acceptability results and insight from this research, please refer to **Annex 5: Co-creating the Plan with our Stakeholder** and **Annex 34: Our Supplementary Business Plan**.



Embedding stakeholder priorities in our RIIO-T2 Business Plan

Throughout the current price control, consumers, network users and wider stakeholders have been very clear in highlighting their expectations of the energy sector are changing as we all act together to address the climate emergency and quickly and efficiently facilitate a Net Zero future.

Evidence of how we have embedded stakeholder priorities within our RIIO-T2 business investment decisions is signposted opposite. This table links stakeholder priorities to the relevant RIIO-T2 investment decisions to show how we are facilitating a Net Zero future in the most cost effective way for consumers. Please also refer to the stakeholder engagement summary sections at the start of each relevant chapter to find more detailed examples of how stakeholder feedback has influenced our strategic direction and help shape our RIIO-T2 Business Plan.

Keeping things clear and simple with our Consumer Value Propositions

All of our investment decisions are multifaceted and substantiated by rigorous modelling, cost-benefit analysis and thorough stakeholder engagement.

To clearly demonstrate this to bill payers across Britain, each applicable investment area of our plan has been summarised in a Consumer Value Proposition (CVP) figure or statement. You can find these CVP summaries at the start of each relevant chapter of our plan. These introductory pages allow you to clearly see the cost of investment versus the added value of the wider benefits associated with them. As you will see, each of our investment decisions represent well thought out, stakeholder-tested, consumer value in terms of the additional environmental, social and economic benefits they each create. Details of the robust tool we have designed with Sia Partners to help us calculate our CVPs can be found in **Annex 28: Strategy for Engaging Stakeholders in RIIO-T2**.

More details can be found in **Annex 28: Strategy for Engaging Stakeholders in RIIO-T2**.



How stakeholder priorities have influenced our plan in the race to a Net Zero future

Improving the resilience of the electricity network to major events (storms, floods, cyber-attack)

Non-load Related Expenditure	Pg 85
Supporting and Securing Our Network	Pg 116
Output Delivery Incentive Proposals	Pg 147

Improving the resilience of communities who may be most vulnerable in the event of a black start

Continuing to Engage with our Stakeholders	Pg 131
Non-Load Related Expenditure	Pg 85
Output Delivery Incentive Proposals	Pg 147

Mitigating the visual impact of overhead lines

An Environmentally Sustainable Network	Pg 35
Co-Creating the plan with our Stakeholders	Pg 16
Continuing to Engage with our Stakeholders	Pg 131

Investing to facilitate future needs, including electric vehicles and more renewable energy

Whole System Planning	Pg 54
Load Related Expenditure	Pg 63
Managing Uncertainty	Pg 138

Improving support to vulnerable consumers; ensuring bill-payers remain at the heart of all investment decisions

Co-Creating the plan with our Stakeholders	Pg 16
Continuing to Engage with our Stakeholders	Pg 131
Output Delivery Incentive Proposals	Pg 147

Investing to build a more sustainable electricity network and reducing environment impact

An Environmentally Sustainable Network	Pg 35
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Investing in innovation, to create a more efficient, sustainable electricity network with lower costs

Innovation Built-in	Pg 25
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Please also refer to the stakeholder engagement summary sections at the start of each relevant chapter to find out more.



We have led the way in Great Britain's energy sector with our innovation activities. We have implemented new technologies and solutions on our network to address the challenges of the energy system transition. Our ambitious plan requires us to be at the forefront of driving innovation throughout the RIIO-T2 period. Our goal is to **increase efficiency through constant innovation** as we head towards a **sustainable, Net Zero future**. We will do this by improving network flexibility and driving digitalisation.

Our business plan will deliver benefits in excess of £30m from roll-out of our successful innovation projects

£30m

Innovation Built-in

Our ambition for RIIO-T2, *Pg 31*

This section deals with the energy system transition challenges.

1

Culture of innovation, *Pg 32*

This section addresses the wider aspects of innovation, such as our internal skillset, investment procedures and governance.

2

Measuring our success, *Pg 32*

This section outlines some of the ways we propose to quantify the outputs from our innovation work, and make sure we deliver positive outcomes.

3



Consumer Value Proposition

Our RIIO-T2 business plan will deliver benefits in excess of £30m from the roll-out of successful innovation projects on our network led by us in RIIO-T1 – 48% payback of the £61.92m RIIO-T1 innovation investment allocated to SP Transmission.

Through our innovation projects we partner with a wide range of third parties, SMEs and universities, investing the funding back into the wider economy and the next generation of researchers.

Through innovation directed at solving strategic energy system transition challenges in RIIO-T2, we aim to leverage a £18.65m investment to realise benefits in excess of £73m in RIIO-T3.

+£73m

Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Our strategic focus for innovation is to address wider network challenges through collaboration with consumers, consumer representatives, network users, other network owners, the system operator and the regulator. We engage with a wide range of vendors, researchers and other third parties – including Scottish communities already managing local energy needs innovatively – to find solutions to challenges presented by the energy system transition.

How and why we have engaged with our stakeholders

To effectively engage on our innovation strategy, we sub-divided stakeholders into different categories and engaged using a variety of channels such as conferences, events, bilaterals and webinars.

Influencers and Gatekeepers – including Ofgem, who manage innovation funding and governance; the Energy Networks Association (ENA), who are the collective voice of the networks, network owners; and the system operator, who define key priorities for innovation and develop network-wide approaches for innovation benefits tracking.

Challengers – for the first time ever, we have been able to engage with the independent Transmission User Group and Ofgem's Challenge Group to gain feedback on our methodology for innovation across the price control period. We have also engaged with independent third parties such as generation companies, the Energy Innovation Centre (EIC) and academics to make our plan as forward-thinking and cost-effective as possible.

End Users and Collaborators – these are experts within our business who will be responsible for the successful roll-out of innovation projects, as well as collaborators including vendors, universities and SMEs who will input into our innovation processes and solutions.

Consumers – we've engaged with consumers, consumer representatives and community energy organisations throughout the development of our innovation plans. We asked them how important they think it is for us to invest in innovation, how much they are willing to pay for this type of activity and finally whether they accept our RIIO-T2 proposals.

What our stakeholders have told us is important to them

The Transmission User Group and Ofgem's challenge group requested a clear definition of innovation activities in RIIO-T2 and highlighted the need for better quantification of benefits to consumers and end users.

Following the presentation of our innovation strategy to our wider stakeholder group we received following suggestions:

"...emphasis on digitisation of power networks, digital technologies, artificial intelligence and wide area monitoring"

"...achieving "system of systems" technical and commercial coordination across the whole energy supply chain. This is needed before moving into multi-vector working..."

How stakeholder feedback has shaped our plans

Our clusters and themes create a strategic focus for innovation funding and will also help third parties and other network owners to identify areas of collaboration in future.

We are developing a joint benefits tracking and reporting methodology in collaboration with other network owners and the ENA increasing transparency.

Feedback from the Transmission User Group and stakeholders helped us highlight more details regarding innovation themes and activities to be undertaken during RIIO-T2. Our whole system approach to innovation will proactively increase our collaboration with distribution operators, gas networks and potentially telecommunication and transport networks in future. It will also help us to engage more easily with new market entrants.

We have reinforced our focus of innovation on network flexibility to enable a whole system approach and on investing to accelerate digitalisation of power networks.

Why these changes are important

We are committed to deliver a balanced innovation portfolio and drive changes within our business to accelerate decarbonisation, enhance digitalisation, and use decentralisation to maintain security of supply in our low carbon future.



We understand the need for innovation

Innovation allows us to do more, for less – from making it easier to connect renewable generation, to improving the efficiency of our day-to-day operations. Innovation is crucial to achieving the government's ambitious targets for Net Zero emissions.

We understand the changes required of the energy system and the associated challenges our transmission network is facing with this transition. We develop our innovation projects to address these challenges and ensure security of supply, despite all the uncertainties. In RIIO-T2, we will continue to invest efficiently in our network. At the same time, we'll keep innovating to maintain and improve the reliability, resilience and service of our network for the benefit of consumers across Britain.

In RIIO-T1 the innovation funding mechanism facilitated projects to help mitigate some of the challenges. However, the work is far from over – if anything, we've just started. As we move from this price control period to the next, the urgency to develop and implement new solutions will increase, and we can't afford to stop the innovation momentum.

One of the key innovation reforms for RIIO-2 is to fund and deliver more innovation through business as usual. This has been the key focus of SP Energy Networks' "Culture of Innovation" campaign launched in 2019. The "Culture of Innovation" is a 3-year campaign running from 2019 to 2021, designed to embed innovation in the DNA of the business and encourage more people within the business to participate in the innovation process.

The culture of innovation campaign is aimed at promoting more innovation through the business as usual process and through contributions from every employee. This takes innovation beyond the scope of fixed teams or representatives and opens it to everyone within the business. Some of the best ideas for innovation within the business originate from employees going about their daily jobs and how to make it better. The year of innovation encourages more innovation in action through our common innovation portal iHUB by:

Driving awareness across the business of all of the types of innovative activities going on, as well as the importance and relevance of innovation to the wider business objectives.

Driving a shift in perception of innovation across the business, that innovation is something everyone should get involved in.

Driving the idea that people could be innovating without realising.

Creating a sense of pride in and inspiration from not only the specific success stories of the innovation team and others around the business but in the innovative approach and culture at SP Energy Networks as a business.

More details about this can be found in **Annex 6: Innovation Strategy**.



How we developed our strategy

We have successfully led and delivered innovation projects in RIIO-T1. We employ an internal governance mechanism to manage our innovation portfolio and project delivery. In RIIO-T1 we participated in industry-wide working groups and engaged extensively with third parties, stakeholders and challenge groups. We have a strong foundation to build and deliver an ambitious innovation strategy in RIIO-T2.

We recognise that innovation is more than technology: it is also about our people, consumers, network users, and wider stakeholders including our regulator. Because of this, we believe our innovation strategy should cover both our 'Innovation Strategic Focus' and 'Culture of Innovation'.

In order to develop the innovation strategic focus section, we began by comprehensively reviewing innovation projects undertaken in RIIO-T1. This allowed us to identify projects with well-defined results that were also highly relevant to our business plan for RIIO-T2.

As well as our own work, we carried out an extensive review of:

Key areas of investment in our business and challenges faced by our network in RIIO-T1.

Innovation projects initiated and led by other UK transmission owners (TOs), distribution network operators (DNOs) and the electricity system operator (ESO) and gas transmission and distribution network owners delivered through the RIIO-T1 network innovation allowance (NIA), network innovation competition (NIC) and innovation roll-out mechanism (IRM) stimuli.

Innovation initiatives from across Europe and the rest of the world.

The key energy system transition challenges and relevant projects identified through this review were developed into innovation options to be considered as part of our business plan development. These innovation options are identified throughout our business plan proposal and are also highlighted in the innovation strategy annex. Additionally, we launched a wider RIIO-T2 innovation strategy stakeholder consultation and gathered feedback on our innovation ambition through webinars, presentations to the Transmission User Group, Consumer Challenge Group and site visits demonstrating innovation in action. Combined with our participation in various innovation stakeholder engagement activities in RIIO-T1, this helped us develop a robust and ambitious innovation strategy.



Inspiring Conversations



Enabled People Managers



Innovation Champions



Innovation Platform



Food for Thought

Culture of Innovation

Our Innovation Strategic Focus

We will deliver a balanced innovation portfolio in RIIO-T2. We will deliver more innovation through business as usual.

The projects in our innovation strategy identified under 'core' – and broadly under 'incremental' – demonstrate that the majority of our investment in innovation in RIIO-T1 and in RIIO-T2 is through the business as usual process.

Our innovation strategy demonstrates that the large scale innovation roll-out such as series compensation, western HVDC link, advanced power quality and condition monitoring and GIS optimisation were funded through business as usual. In RIIO-T2 we aim to deliver the same level of innovation through new technologies, processes and methods embedded in our business plan. We have used the innovation funding mechanisms of Network Innovation Allowance (NIA), Network Innovation Competition (NIC) and Innovation Roll-Out Mechanism (IRM) to conceptualise and deliver truly transformative projects.

We will continue to improve upon the balance between core, incremental and transformative innovation in our portfolio in RIIO-T2 as identified in **Annex 6: Innovation Strategy**.

Digitalisation, Decentralisation, Decarbonisation – Our three key drivers for innovation

Our innovation portfolio and strategy is also categorised into clusters (C) and themes (T), in line with the industry-wide innovation strategy developed by Energy Networks Association (ENA) and ENTSOE's Research and Innovation (R&I) framework. Each cluster (and its underlying themes) is aligned with and addresses one or more of the following energy system transition challenges faced by GB Transmission network owners and the system operator as listed here:

Improving the sustainability of our network and business processes and empowering network customers.

Whole System Approach overcoming boundary restrictions between electricity and gas transmission owners (TOs) and distribution network operators (DNOs), transport and telecommunications sector with increased network customer engagement.

Integrating new technologies and enabling digitalisation, standardisation and cyber security.

Challenges related to Black Start.

Maintaining system security and stability, enabling novel sources for grid services, system strength, and managing increased grid dynamics and interactions.

Evolution of our transmission network and associated uncertainties, including new requirements for reinforcement and the replacement, operation and maintenance of aging assets.

Decentralisation

Developing a more flexible and dynamic grid to be ready for an uncertain future.

Making more use of distributed energy resources.

Adopting a 'whole system' approach to work across our network boundaries and with other sectors.

Decarbonisation

Increasing grid visibility and controllability to accommodate new renewable generation connections, whilst maintaining network reliability.

Enabling decarbonisation of heat and transport.

Collaborating with our supplier base and academia to leverage advancements in research and development worldwide; driving efficiencies and delivering a sustainable grid.

Digitalisation

Using digitalisation, intelligence and data analytics to create meaningful information to optimise the operation of our network.

Enabling standardisation to deliver faster deployable solutions.

Deploying cyber security policies to protect our data and assets in the ever increasingly interconnected network.

Network Flexibility

T9 TO-DNO Interface
T10 Flexible Use of DERs
T11 Flexible Network Use
T12 Whole System Approach

C3

Digitalisation of power networks

T13 New Digital Technologies
T14 Standardisation
T15 Enhanced Data Analytics
T16 Cyber Data Security

C4

System Security and Stability

T5 Grid Observability
T6 Grid Controllability
T7 Network Reliability and Resilience
T8 Enhanced Ancillary Services

C2

Network Modernisation

T1 Optimal Grid Design
T2 Smart Asset Management
T3 New Materials, Processes and Technologies
T4 Health & Safety Environment and Stakeholders

C1

A track record to rely on

As we look forward to what we plan to deliver, we look back at the innovation projects we delivered in RIIO-T1 – and we plan to roll them into business as usual in RIIO-T2.

SP Transmission has actively engaged in the innovation funding mechanisms in RIIO-T1 and developed globally innovative projects. We have also collaborated and learned from other network owners and sectors to adopt innovation projects led by others.

Here are some examples of successful innovation in RIIO-T1 (accounting for up to 86% of the innovation investment led and managed by us) that we will roll-out in RIIO-T2:



Cluster 1: Network Modernisation

HTLS Conductor – £20m IRM in collaboration with 3M. HTLS conductor is designed to operate at higher temperatures than conventional conductors, and offers greater transfer capacity across the network. The HTLS technology successfully installed in RIIO-T1 coupled with the over-arching 'South West Scotland' project, will contribute 1.7GW by 2021 (and 2.1GW by 2023) of additional renewable generation to the GB system.

Alternatives to SF₆ – SPEN is collaborating with manufacturers and other network operators to identify and standardise environmentally friendly alternatives to SF₆. We commissioned our first 400kV installation using an alternative gas in 2019.



Cluster 2: System Security and Stability

VISOR – £8.3m NIC in collaboration with NGET TO, SSEN, NG ESO & GE. This project successfully delivered Great Britain's first wide-area monitoring system, providing dynamic visibility of the GB network to the ESO and TOs across GB.

Phoenix – £18.9m NIC in collaboration with NG ESO, ABB, University of Strathclyde and Denmark Technical University. We are on track to successfully deliver GB's first hybrid synchronous compensator for fast declining essential grid services such as inertia, short-circuit level and reactive power compensation.



Cluster 3: Network Flexibility

Distributed ReStart project – Led by NG ESO in collaboration with SP Energy Networks, this is an important and timely initiative that will ultimately lead to significant benefits for electricity consumers in GB by reducing costs for Black Start services, and will also inform research and development in other countries. Black Start services need to evolve in line with changes in the energy landscape and support the transition to a low carbon, decentralised future.



Cluster 4: Digitalisation of Power Networks

FITNESS – £9.9m NIC in collaboration with ABB, GE, Synaptex and the University of Manchester.

This project successfully commissioned Great Britain's first multi-vendor digital substation solution. It's also an internationally-acclaimed project for informing international standards bodies and other network owners, enabling seamless roll-out of digital substations.

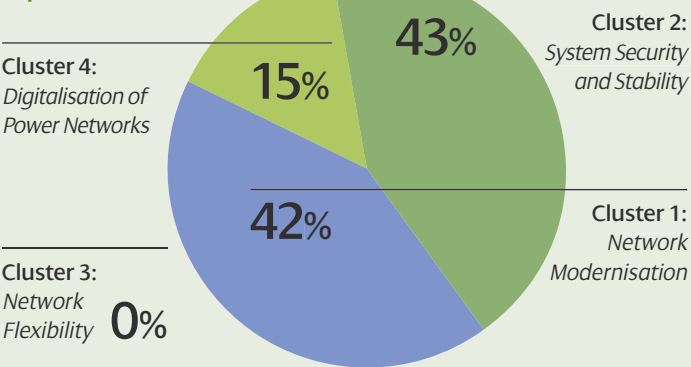
Learning from RIIO-T1 and outlook for RIIO-T2 – implementing Ofgem’s reforms

What really matters is fairly straightforward: how we trial and deliver industry-transformative innovation projects. Our business has evolved to foster an ever-growing culture of innovation, with a drive to build even more innovation capability and ability within our business.

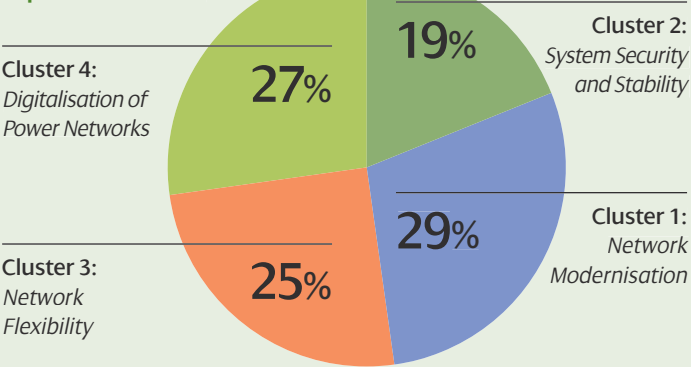
Of course, we will also see the benefits from roll-out of our ground-breaking innovation in RIIO-T1. Our innovation success has provided us with a solid foundation. It also gives us an understanding of the risks, the challenges to be addressed, the level of engagement required with wider stakeholders, and the skillset we need to build within our business to successfully drive innovation for a sustainable future. We deliver innovation to create benefits not only for network owners and the system operator but also for wider stakeholders, environment and, most importantly, consumers.

In RIIO-T2 we hope to be even more transformative and innovative but recognise that innovation carries risk. So we will have to work to find ways of innovating with the available resources. We will also take new ideas and feedback from our stakeholders on board, and implement reforms proposed by Ofgem. In RIIO-T2 we will have an increased focus on cross-sector, cross-boundary projects delivering whole-system approach through our network flexibility cluster. We aim to create more flexibility in the transmission network through increased engagement and visibility of our distribution network and distributed energy resources.

RIIO-T1 Innovation Expenditure Profile



RIIO-T2 Innovation Expenditure Profile



RIIO-T2 Innovation Expenditure Profile (£m)



What will change in RIIO-T2?

Innovation focused on Energy System Transition Challenges
We will start with delivering a more balanced portfolio of innovation projects focused on addressing energy system transition challenges. Our innovation portfolio for RIIO-T2 to enable roll-out of proven innovation represents a balanced ambition across our four clusters and sixteen themes of innovation.

Enabling whole system thinking in innovation
Our network has boundaries, but we cannot allow these to inhibit our innovation. We want to enable more holistic thinking through innovation, to roll out a true whole-system approach.

Accelerating adoption of large scale disruptive / transformative innovation aimed to deliver longer term benefits through business as usual
We will develop innovation initiatives, accelerate digitalisation of our critical infrastructure, ensure stability and security of our network, and trial globally innovative technology solutions through our RIIO-T2 business as usual projects.

Empowering network customers and addressing consumer vulnerability
Network customers are at the heart of what we do. Our job goes far beyond keeping the lights on. We are known for our excellent customer care and we strive to serve the most vulnerable consumers by making them our priority.

Driving efficiency through innovation and competition

Managing uncertainty

Enabling whole system solutions

Delivering an environmentally sustainable network

Meeting the needs of consumers and network users

Maintaining a safe and resilient network

Giving consumers a stronger voice

Track record in delivering

Our ambition for RIIO-T2

1

Our planned innovation activities for RIIO-T2 are categorised under our four innovation clusters and sixteen innovation themes. Under each cluster and theme, our Innovation Annex highlights what we did in RIIO-T1 as part of our innovation portfolio, the projects that we will be progressing as business as usual (BaU) in RIIO-T2, and the innovation areas we will explore in RIIO-T2. We request this allowance over the length of RIIO-T2 and will provide a spending profile in the business plan.

We provide an estimate for cost of investment and the benefit generated for each cluster and theme, and estimated investment that will be required under NIA and for Innovation Roll-Out (IR) funding in RIIO-T2. Our innovation roll-out includes successful projects led by other network owners and operators that we plan to roll-out on our network in RIIO-T2.

Cluster	Business as Usual	Innovation Roll-Out (IR)	Network Innovation Allowance (NIA)
1	System Health Map Use of digital measurement System Security and Stability Instrument transformers Building Information Model (Implementing learning from NGGT)	Managing uncertainty in load related investment Novel methods for analysis of corrosion and effect of environmental exposure on overhead lines (Implementing learning from NGET TO) Use of artificial intelligence for asset management (Implementing learning from NGGT) Investigation into novel digital measurement technologies	Modelling and studies platform with enhanced computational capability Whole System Modelling Investigation into non-intrusive condition monitoring techniques Investigation into environmentally friendly alternatives of substations build and design
		Funding Request: IR £2.4m/NIA £3.1m	Estimated Benefits RIIO-T3: £29m
2	Wide Area Monitoring system integration in control centre Roll-out of Synchronous and Hybrid Synchronous compensators	Integration of virtual synchronous machines (Implementing learning from NG ESO) Wide area control of voltage and frequency (Implementing learning from NG ESO)	Investigation into power system oscillations and management Power Quality Analysis and Mapping Quantification of protection system challenges in future power grids Investigation into nature of future cascading faults and requirement of novel system integrity schemes
		Funding Request: IR £0.8m/NIA £2.7m	Estimated Benefits RIIO-T3: £9m
3	Dynamic Ratings (implementing learning from SSEN Transmission)	Black Start from Distributed Energy Resources Data integration between transmission and distribution systems Enhanced services from distributed generators (Implementing learning from NG ESO)	Solutions for improving TO-DNO Interface Intelligence in transmission system to enable flexible use of DERs Localised state-estimation to enhance network capacity Enabling whole system analysis
		Funding Request: IR £1m/NIA £3.75m	Estimated Benefits RIIO-T3: £21m
4	Cyber Security for digital substations Digital Substation Off-site Test Facility	Standardisation of Digital Solutions Investigations into methods for wide-area cyber security	Enabling Digital Twin Enhanced Data Analytics and Data Flow Investigation into novel digital measurement technologies
		Funding Request: IR £1.0m/NIA £4.0m	Estimated Benefits RIIO-T3: £14m

Funding request of £18.65m

Resulting in net TO benefits in RIIO-T3 in excess of £73m

Culture of Innovation

2

We have fostered an internal culture of innovation that will help us to make the most of the RIIO-T2 innovation funding mechanism and maximise benefits.

We aim to improve innovation deliverability, visibility of outcomes and tracking of benefits to create more value through innovation.

Enabling more innovation through business as usual by transparent selection of projects based on value added through innovation process. We consider, and where applicable implement, innovation options in all our business-as-usual projects.

Focusing our innovation efforts on transformative innovation projects with longer term impact, aligned with Ofgem's definition of energy system transition challenges and wider public sector innovation priorities.

Developing industry-wide approaches for increasing general visibility of impact created through innovative projects through increased public reporting, development of collaborative innovation strategies and tracking of innovation benefits.

Continuous reviews and improvement of the innovation portfolio and projects to ensure we balance and optimise our innovation efforts evenly across challenges and levels of risk.

Gap analysis of innovation incentives and projects, to make sure projects are aligned to their original objectives and are on-track to deliver benefits.

Increased collaboration across different sectors of the energy system to share and adopt learnings that drive transition.

Increased third-party engagement through a transparent assessment process of third-party proposals and feedback procedures.

Empower Network customers through increased engagement with community energy initiatives, non-profit organisations and using innovation to address the needs of those in vulnerable situations.

In RIIO-T2 we will fund and deliver more innovation through business as usual. This has been the key focus of SP Energy Networks' "Culture of Innovation" campaign launched in 2019. The culture of innovation campaign is aimed at promoting more innovation through the business as usual process and through contributions from every employee within the business. The culture of innovation campaign encourages more innovation in action through driving awareness across the business of all of the types of innovative activities going on, as well as importance and relevance of innovation to the wider business objectives.

Measuring our success

3

Benefits Tracking and Forecasting

In RIIO-T2, we propose a unified benefits reporting mechanism across the industry. This will make it easy for consumers, network users and wider stakeholders to see the value generated by innovation. We have agreed on this methodology with other GB GDNs, DNOs, TOs, the SO and the ENA. The details of our proposed framework can be found on the ENA website: <http://www.energynetworks.org/electricity/futures/network-innovation/network-innovation.html>

We propose:

An industry wide cost-benefit analysis (CBA) methodology will establish a unified net benefits tracking mechanism for all network licensees to present the benefits generated through innovation to our stakeholders.

Publication of annual innovation benefits summary report for qualitative benefits, as well as net financial benefits reporting for wider benefits that do not directly accrue to the network owner and operator.

Publication of an industry wide implementation log to provide stakeholders with information regarding the successful roll-out of innovation projects across the GB network. The implementation log and benefits tracking will also inform stakeholders on innovation projects that may not potentially deliver the forecasted benefits.

Benefits Reporting

We recommend a comprehensive qualitative impact assessment and performance-based methodology. This can be used to review the impact of each innovation-funded project, during and after its trial.

The use of impact and benefit assessment will allow all projects funded by innovation stimulus to be assessed, benchmarked and presented to stakeholders in a unified manner. It will also enable Ofgem to assess and publish the benefits generated through the innovation stimuli in RIIO-T2.

This unified benefits forecasting, tracking and reporting methodology will create transparency of the use of innovation funding by network licensees in RIIO-T2.

Managing Uncertainty and Risk

We can manage uncertainty and risk by conducting a risk assessment at the beginning of each project. We only request funding for innovation projects with acceptable risk scores and clearly-defined mitigation measures.

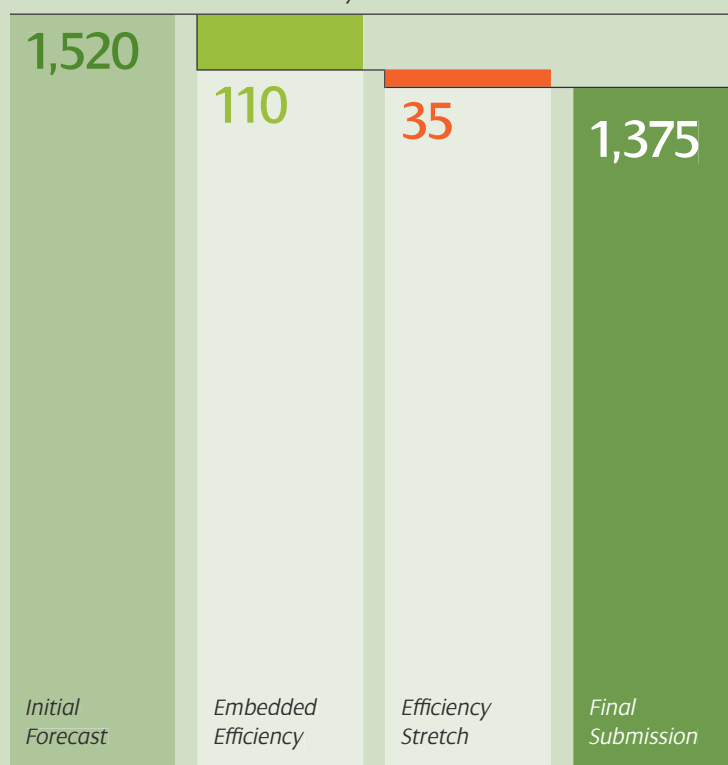
We will continuously improve our project delivery process through gap analysis and reviews to ensure the project is on track to deliver benefits.

We started RIIO-T1 with an assessment by Ofgem that our costs were efficient. We have striven to reduce costs to consumers further by finding better ways to deliver our RIIO-T1 business plan. These efficiencies are fully embedded in our business and are the starting point for our RIIO-T2 business plan.

Our current RIIO-T1 forecast allowance is £2,362m excluding efficient yet unfunded costs of £102m (£2,464m). Our current expenditure forecast of £2,286m translates to an underlying RIIO-T1 efficiency rate of 7.2%. We have embedded these efficiencies from RIIO-T1 in our RIIO-T2 plan. To get even more value for our consumers, we applied further innovation, value engineering and process savings. This resulted in a further efficiency stretch of 2.5% and is encompassed in our final RIIO-T2 plan of £1,375m.

RIIO-T2 Business Plan Totex Efficiency

(£m 2018/19)



Total efficiency

9.5%

Business consumer

"I think that the scope of work and objectives is overwhelming, in that the £4.43 per customer is covering an immense range of tasks and goals and thus offers incredibly good value for only being an annual charge and if they can deliver all that is promised for this price it is certainly justifiable given the price of the overall bill."

Domestic consumer

"In the long run it will save households a lot of money and be better for the environment."

Domestic consumer

"I think the plan seems detailed and for the price is good investment."

Benchmarking Efficiency



How we test for efficiency

We have used external expertise to benchmark our investment proposals to give us additional confidence that our plan is providing value for money. We have also compared our business plan costs with historical data.

External Benchmarking: Process

We engaged Arcadis, an independent specialist consultancy who have extensive experience in electricity transmission, both in the UK and abroad, to critically review the scope and costs of our RIIO-T2 plan. This covered over 50% of the plan's capex and tested our assumptions applied to the wider engineering plan.

Cost information that is detailed enough and with enough data points to be robust is not readily available for electricity transmission. Working with a specialist consultancy would allow us access to a wide range of anonymised data sources and we engaged Arcadis to provide this service. We asked them to review the full scope of our projects, rather than focusing only on specific unit costs. This reflects the complexity and wide range of cost drivers that are characteristics of transmission projects.

The approach was to select a number of load related and non-load related projects to ensure that there was good coverage of the range of activities in the business plan. The 36 projects comprise over 50% of the plan's capex.

The starting point of the analysis was a top-down assessment but Arcadis quickly realised that this was not sufficient. Transmission projects are small in number and each one has its own particular scope. An additional factor was that we undertake project specific engineering design exercises. This means that it's necessary to understand the scopes of work in detail to make sure that like-for-like comparisons are being made. Arcadis therefore undertook 'deep dive' reviews of the schemes, identifying the elements of each project that aligned with their benchmark data.

Extrapolated findings across our planned Load and Non-load expenditure results in cost reductions of

£11m

External Benchmarking: What we learned

Arcadis advised that their benchmarks for each project element are a narrow range which reflects the uncertainty of applying costs from benchmark projects from different locations and at different times to the sample schemes. Arcadis initial feedback was that our costs were efficient relative to these benchmarks in most areas but they identified a small number of aspects that we needed to review.

The efficiency review has resulted in cost reductions of £11m (1%) in our planned load and non-load capital expenditure.

Historical Benchmarking

We have tested the comparable cost elements of our projects against those from RIIO-T1 schemes. This has given us confidence that the efficiency we have embedded through RIIO-T1 is reflected in the costs of our plan. We set ourselves a target to reduce costs further and our plan's costs include the identified reductions in our capital investments.

Business consumer

"I think, overall, it is cheap, and excellent value for money."

Domestic consumer

"It seems like a good scheme that will be beneficial to many households, and makes sure to cover the main issues of safety for its workers and the development of sustainable energy."

Domestic consumer

"The transmission of the electricity I use 365 days of the year for under a fiver? That's a bargain by anybody's standard."

Further details on Arcadis engagement can be found in **Annex 23: Our Assurance Framework**.



We play a critical role in meeting the UK's ambitious climate change targets and in enabling the transition to a **sustainable, Net Zero future**. While we do this, we must reduce our environmental impacts, **increase efficiency through constant innovation and adapt our world-class, resilient network** to withstand the effects of climate change to deliver sustainable value for current and future customers.

Our ambitious plan for environmental sustainability in RIIO-T2 represents a significant step-change from RIIO-T1. This is driven by the accelerating global environmental agenda, UK and Scottish Government Net Zero targets (by 2050 and 2045 respectively), and significant stakeholder support. We welcome the enhanced regulatory regime for this area and our RIIO-T2 plans will enable us to build on our RIIO-T1 performance and quickly reduce, eliminate, reverse or manage a wider range of environmental impacts than ever before, within the context of our long-term Sustainable Business Strategy.

Our Sustainable Business Strategy outlines our stakeholder-led vision, drivers, goals and objectives for environmental and sustainability improvement to 2050, underpinning all of our RIIO-T2 commitments.

The actions and costs to deliver baseline environmental compliance are embedded throughout our Business Plan. This chapter therefore focuses on the beyond-compliance commitments we will deliver during RIIO-T2 to continue to drive more environmentally and socially sustainable performance.

Delivering a more sustainable network, *Pg 38*

Accommodating the sustainability step-change and enhancing supply chain sustainability.

1

Decarbonising our network and assets, *Pg 40*

Reducing business carbon footprint and embodied carbon and increasing climate change resilience.

2

Reducing our environmental impacts, *Pg 43*

Preventing pollution, protecting and enhancing biodiversity, sustainable resource use and supply chain sustainability.

3

Supporting the Net Zero transition, *Pg 46*

Connections for decarbonised energy, transport and heat, smart energy system solutions for decarbonisation and supporting societal sustainability.

4

Further detail on our proposals is provided in *Annex 7: Environmental Action Plan*.



Speed of delivery is key to the effectiveness of our plan. Commitments are prioritised as follows:

By 2021 – Activities carried out in readiness for the start of RIIO-T2.

Throughout RIIO-T2 – Activities starting before or at the beginning of RIIO-T2 and continuing through and potentially beyond the RIIO-T2 period.

By 2023/25 – Activities representing considerable business change, reliant on asset replacement/upgrade programmes, or which follow the completion of other RIIO-T2 commitments, and which will be in place in time to influence the RIIO-T3 development process.

By 2026 – Activities or programmes of work which may start from the beginning of RIIO-T2, but will not complete until 2026.

An Environmentally Sustainable Network



Consumer Value Proposition

Our commitments to SF₆ reduction and alternatives will avoid 9,700kg of SF₆ being added to the network across the RIIO-T2 period, avoiding estimated emissions equivalent to over 1,200 tCO₂e annually.

£11.8m *value over life of assets*

The network losses reduction initiatives contained within our Losses Strategy will result in the avoidance of 3,700 tCO₂e annually.

£36.1m *value over life of assets*

Our commitment to implement energy efficiency measures at 48 substations will reduce energy consumption by more than 1,000MWh per year, enough to power the equivalent of 250 households and save over 250 tCO₂e annually.

£2.4m *value over life of assets*

Our commitment to replace 100% of our 72 cars and vans with electric alternatives by the end of RIIO-T2 will result in the avoidance of over 320 tCO₂e emissions per year.

£0.10m *value over life of assets*

Our proposal to maximise environmental benefit from non-operational land will enable community groups to use the land for free to install upwards of 4MW of new renewable generation, enable c.1,200 tCO₂e carbon savings annually and support biodiversity enhancements at up to 20 sites.

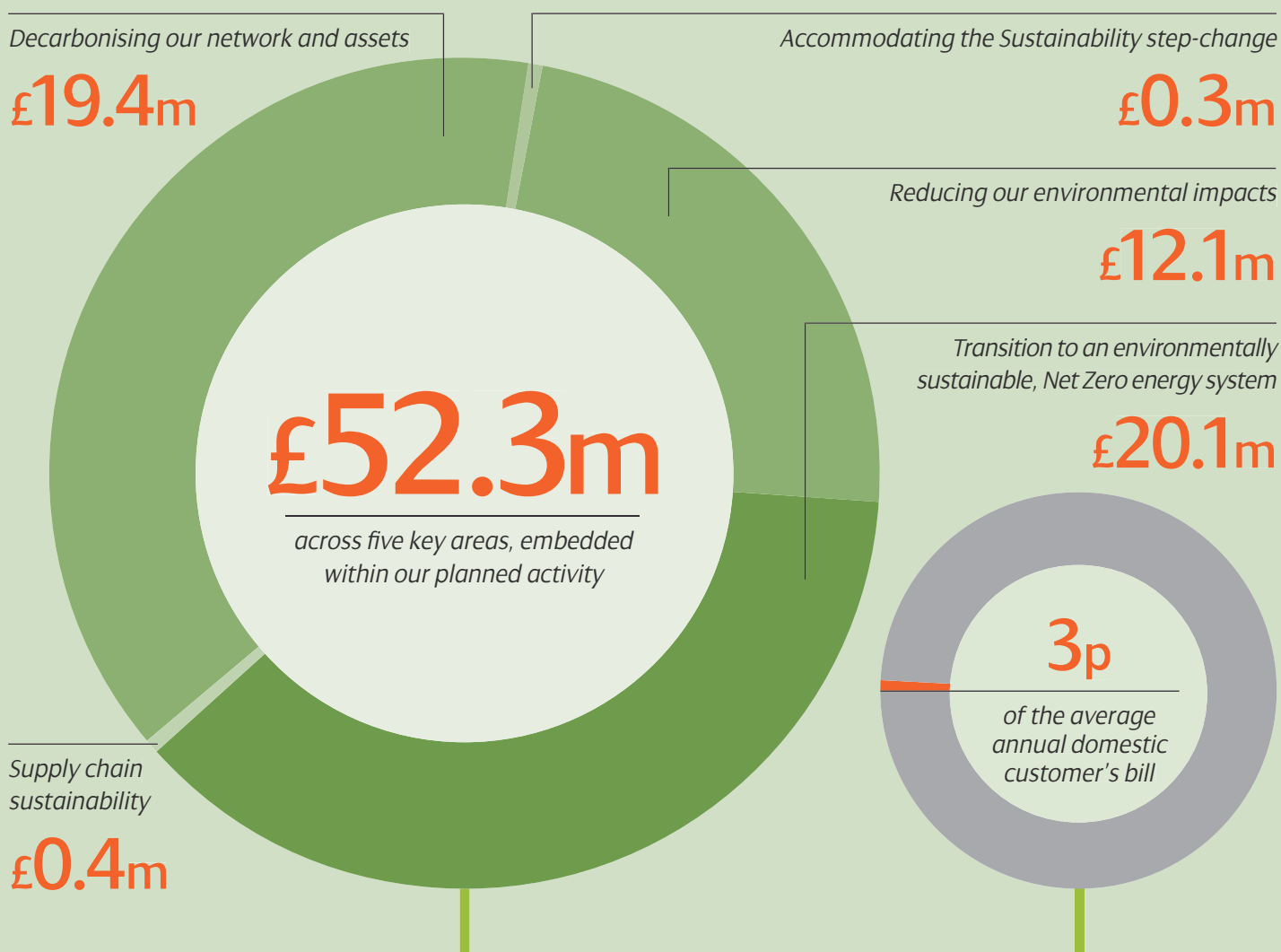
£4.2m *value over life of projects*

Our Net Zero Fund will support the creation of local jobs, deliver significant carbon savings and support our communities in vulnerable circumstances, delivering an estimated £3 worth of social benefit for every £1 invested (Social Return on Investment).

£60m *social benefit*

An overview of our environmental sustainability planned investment

Costs are outlined in this chapter only to provide transparency of the total cost of our RIIO-T2 Environmental Sustainability package. All of these costs are included within the 'Proposed Expenditure and Outputs' section of this Business Plan.



Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

We must make sure our plan is sustainable in terms of strategic direction, prioritisation of environmental, economic and social impacts, timelines for delivery and acceptable levels of financial investment.

To achieve this, we engaged with a wide range of stakeholders to guide our decision making and develop a well-balanced, fully justified plan that facilitates Net Zero while meeting the needs of network users and consumers.

How and why we have engaged with our stakeholders

We focused our engagement on those stakeholders who are knowledgeable about the environmental and sustainability impacts of our work – or are potentially affected by our plans in this area.

We worked with our long established Sustainability Stakeholder Working Group (SSWG) and the Transmission User Group, who have expertise and a broad understanding of our RIIO-T2 plans. Engagement with the SSWG helped us define high level strategy and materiality and identify relevant stakeholders. Workshops with environmental regulators, supply chain and our Young Energy Force stakeholder groups further defined the materiality and prioritisation of our environmental and sustainability plans.

We engaged with network users and consumers through our Willingness to Pay and Willingness to Accept surveys – these identified and prioritised key environmental areas that users and consumers would like us to focus on and the related values they attributed to these activities.

Our online consultation defined stakeholder expectations on carbon reduction, visual amenity and embedding environmental considerations within our plan. We held targeted one-to-one engagement with key environmental stakeholders SEPA and SNH to ensure our plans are informed by priority areas (SF₆, pollution prevention, biodiversity, natural capital, carbon and sustainable resource use). We also engaged with the Scottish Infrastructure Circular Economy Forum and supply chain members to align our proposals on sustainable resource use, embodied carbon and supply chain sustainability.

We proactively engaged with SP Distribution as our related DNO and with National Grid Transmission and SSEN Transmission as our TO peers, at all key stages of plan development.

What our stakeholders have told us is important to them

Consumers told us they expect us to support the low carbon transition by investing in infrastructure to connect renewable generation and utilise the network more efficiently. They want us to make sure the most vulnerable in society are not left behind in the Low Carbon transition. They expect us to reduce our business carbon footprint and set strong expectations for reducing supply chain carbon impact.

They want us to improve the visual impact of existing assets, and support local communities, especially in areas where we carry out work. Improving the environment around our assets is a priority, including developing opportunities to enhance biodiversity and build stronger links between habitats. They want us to set strong expectations for sustainable resource management and waste reduction throughout the whole project life cycle. Collaboration is seen as a priority, especially in regard to the collection, analysis and sharing of data.

The independent User Group provided welcomed feedback on our environmental proposals for RIIO-T2 and is supportive of Ofgem's Environmental Action Plan.

How stakeholder feedback has shaped our plans

As a result of feedback from our supply chain and independent Transmission User Group, we have created a new Supply Chain Sustainability section and committed to considering environmental sustainability in our procurement processes in line with ISO20400, becoming a Supply Chain Sustainability School Partner, increasing our supply chain management resources to enable the collection and analysis of enhanced data and a greater level of collaborative working, and engaging with suppliers early in the development of projects to enable them to propose environmental improvements at concept and design stages.

Engagement with independent Transmission User Group, environmental regulators and biodiversity experts highlighted a desire to set specific biodiversity net gain targets ahead of the development of Scottish legislation. Biodiversity data on our landholdings is not yet sufficiently mature to enable us to develop a meaningful and achievable net gain target and indicative Scottish Government timelines suggest that development of legislation will start during RIIO-T2. Therefore, we have committed to identifying, monitoring and reporting metrics to baseline and track the value of natural capital and levels of biodiversity on our sites and working with local communities, landowners and other stakeholders to deliver 'no net loss' in biodiversity and identify options for delivering 'net gain'. We have proposed an uncertainty mechanism to enable us to deliver any cost effective biodiversity enhancements identified as a result.

Our Sustainability Stakeholder Working Group asked us to clarify which circular economy principles we were planning to embed in our processes. We provided clarification that we will follow an appropriate, recognised standard, such as the BS8001 circular economy implementation framework.

The Consumer Challenge Group and independent Transmission User Group challenged our commitments on SF₆ reduction, noting that these placed reliance upon manufacturers to drive the change. In response, we have developed a new commitment to drive the development and adoption of SF₆-free technologies, collaborating with supply chain and industry peers and piloting new technologies where technically viable.

In face to face engagement, 80% of consumers agreed with our aim to drive cost and environmental efficiencies through innovation and over 80% accepted the cost of our plan.

Why these changes are important

Working closely with our stakeholders is a vital part of mitigating our environmental impact and ensuring the sustainability of all our investment decisions. This is especially important because of the increasing pace of change in the sustainability agenda, which requires us to be open to new information and ideas and make balanced decisions in response. The delivery of sustainability benefits requires the adoption of new approaches and tools, and sustainability initiatives are both a product of, and reliant upon, location-specific knowledge that stakeholders can provide.

Delivering a more sustainable network

1

Our vision is to be a sustainable networks business. We will embed the principles of sustainability in our decision making, by working with our stakeholders to:

Efficiently manage and develop our networks in support of the low carbon transition; and

Achieve neutral or positive environmental and social impacts.

We will be a leader in this area. Our actions to become a sustainable network operator will drive our supply chain and support our customers and communities to become more sustainable.

Our sustainable business model is characterised by:

Consideration of environmental, social and economic costs and benefits in decision making,

Collaboration with stakeholders; and

Transparency in decision-making processes and reporting of performance.

Our Sustainability Drivers, shown above, outline the six key impact areas of activity required in order to deliver our vision of a sustainable networks business.

Our Sustainable Business Strategy is aligned to the United Nations Sustainable Development Goals. Please see our **Annex 7: Environmental Action Plan** for more details.

We take a systematic approach to managing and reducing our environmental impacts by using a documented Environmental Management System (EMS). The environmental impacts of our activities are prioritised for action via a risk assessment process. This system has been externally certified to ISO14001:2015, the international standard for EMS, for over a decade and is fully embedded throughout our business processes.

During the development of our RIIO-T2 Investment Plan, we used Initial Environmental and Sustainability Reviews (IESR) to provide an assessment of projects at the earliest possible stage to identify potential environmental issues and opportunities.

Annex 7: Environmental Action Plan provides more detail on how our strategy aligns with the United Nations Sustainable Development Goals.

Our Sustainability Drivers



Sustainable Society



Carbon and Energy Reduction



Climate Change Resilience



Water Efficiency and Protection



Land and Biodiversity Improvement



Sustainable Resource Use

Accommodating the Sustainability step-change

RIIO-T2 Cost: £0.36m

RIIO-T2 Commitment

We will maintain and continually improve our ISO14001 certified Environmental Management System to achieve 'beyond compliance' environmental performance.	<i>Throughout RIIO-T2</i>
We will collaborate with SEPA on a Sustainability Growth Agreement.	<i>By 2021</i>
We will embed a process for Initial Environmental and Sustainability Reviews (IESRs) for all relevant projects, to identify potential environmental issues and opportunities at the earliest stage.	<i>By 2021</i>
We will improve the quality of environmental data collected and analysed at all stages of the asset lifecycle, investing in enhanced geospatial systems and formalising data sharing collaborations with key stakeholders.	<i>By 2023</i>
We will continue to ensure that our staff, contractors and supply chain have the skills and knowledge to move beyond compliance and achieve our Sustainability Goals.	<i>By 2023</i>
We will continue to drive industry-wide collaboration in RIIO-T2 for the benefit of all customers.	<i>Throughout RIIO-T2</i>
We will continue to engage our key environmental stakeholders via our Sustainability Stakeholder Working Group, ensuring progress via collaboration activities arising from this engagement.	<i>Throughout RIIO-T2</i>
We will continue to provide transparent reporting of our environmental and sustainability performance, publishing an annual report of our progress against all environmental and sustainability commitments (as detailed in our Environmental Action Plan in Annex 7) in line with metrics and a format developed in collaboration with the other TOs.	<i>Throughout RIIO-T2</i>

Driving efficiency through innovation and competition

Managing uncertainty

Enabling whole system solutions

Delivering an environmentally sustainable network

Meeting the needs of consumers and network users

Maintaining a safe and resilient network

Giving consumers a stronger voice

Track record in delivering

Supply Chain Sustainability

RIIO-T2 Cost: £0.39m

Our strong relationship with our supply chain is critical to the successful and sustainable delivery of our plans. Our diverse suppliers provide a wide range of services throughout the whole lifecycle of assets, including design, manufacture and installation. Beyond safe, efficient and compliant works, we must collaborate to minimise environmental impacts, set enhanced environmental standards and drive industry-wide environmental improvements, drawing on the huge breadth and depth of expertise and services within our supply chain.

RIIO-T1 Performance

During RIIO-T1, we have updated our standard contract terms, pre-qualification questionnaires and specifications, obligating suppliers and contractors to meet high environmental management standards and report their progress monthly. Suppliers and contractors have helped us to reduce the environmental impact of many of our projects, from enabling the re-use of thousands of tonnes of materials to greater use of recycled materials.



RIIO-T2 Commitment

We will introduce consideration of environmental sustainability in our procurement processes in line with ISO20400 Sustainable Procurement Standard, including a carbon metric as a minimum.	By 2023
We will work in collaboration with our suppliers and industry peers to develop a suite of targets and impact metrics designed to drive environmental improvements throughout our value chain.	Throughout RIIO-T2
We will further enhance environmental management standards and KPIs within contract specifications and supplier codes of conduct (including requirements for public disclosure of metrics) and cascade to all relevant suppliers.	By 2021
We will target more than 80% of RIIO-T2 suppliers (by value) meeting these enhanced environmental standards.	By 2026
We will report on the actual percentage of suppliers (by value) meeting these standards.	By 2023
We will engage with suppliers throughout the duration of their contracts to continue to reduce impacts and optimise benefits.	Throughout RIIO-T2
We will increase our internal supply chain management resources to enable the collection and analysis of enhanced data and a greater level of collaborative working.	By 2021
We will become a Supply Chain Sustainability School Partner, requiring contractors and suppliers for all new contracts to become members and undertake relevant sustainability and environmental training.	By 2023
We will engage with suppliers early in the development of projects to enable them to propose environmental improvements at concept and design stages.	By 2026

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Delivery Incentive Proposals' for details of our proposal for an incentive aimed at maximising supply chain sustainability. Where appropriate and justified, costs arising from supply chain sustainability activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

More detail about our proposed incentive and uncertainty mechanisms for RIIO-T2 can be found in our chapter **Output Delivery Incentive Proposals**, Pg 147.



Decarbonising our network and assets

2

We mitigate climate change most significantly through our actions to connect low carbon generation for societal decarbonisation. While we do this, we must reduce the carbon footprint of our business and operations, and ensure that our network is climate-change resilient. Our targets for decarbonising our network are deliberately very challenging and achieving them requires transformation at every level of our business.

Our Strategic Vision

We will be a carbon neutral company throughout our value and supply chains, and will actively support our customers and local communities towards achieving this goal.

We will develop our network to mitigate impacts of climate change. The materials required for network construction and operation will come from sustainable sources.

Our strategic objective is to reduce our controllable carbon footprint (excluding network losses) by 15% by 2023, by 80% by 2030, and to achieve carbon neutrality by 2050.

We will review these targets in light of the recent Committee on Climate Change recommendation and Scottish Government decision to target Net Zero by 2045 in Scotland.

We measure and annually report our Business Carbon Footprint (BCF), in line with Ofgem Guidance, comprising:

Network Losses
Fugitive emissions (SF ₆ and, increasingly, other Interruptible Insulation Gases (IIGs))
Buildings energy use (substations, offices and depots)
Operational transport
Business travel
Fuel combustion (e.g. generators).

The BCF does not include emissions from activities conducted by contractors on our behalf, nor the carbon embedded in the assets forming our network.

Related Sustainability Drivers



Sustainable Resource Use



Climate Change Resilience



Carbon and Energy Reduction

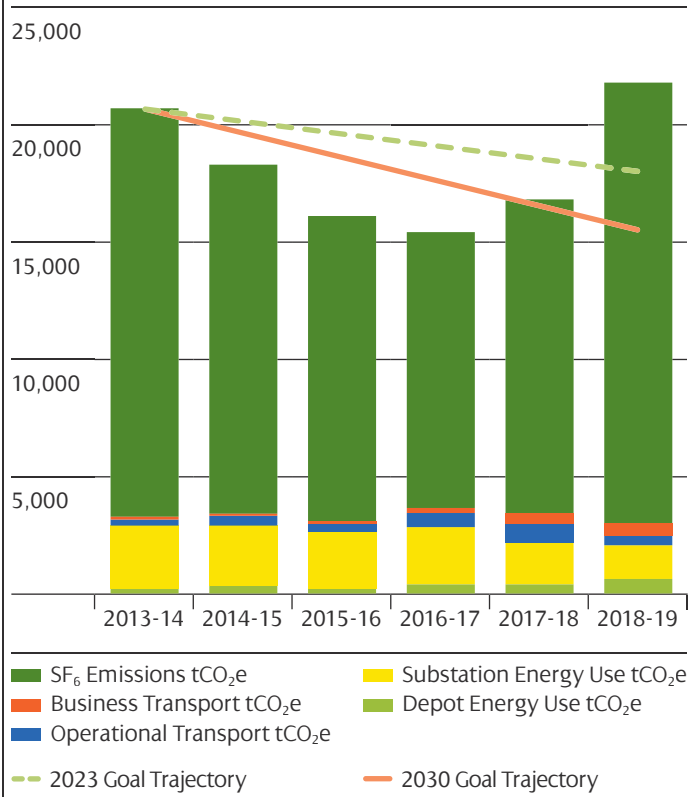
Performance

RIIO-T2 Cost: £0.22m

RIIO-T1 Performance

Despite considerable reduction efforts, our controllable Business Carbon Footprint has increased by 5% since our 2013-14 baseline year. This is due to increased leakage of Sulphur Hexafluoride (SF₆) gas, which is an industry-wide issue and is described in detail on the following pages. We have delivered reductions across the remaining categories of controllable carbon footprint during RIIO-T1. Carbon emissions from network losses are not within the scope of our control as they are determined by the amount and carbon intensity of electricity generated and transmitted through the network. Losses are therefore excluded from the graph below for clarity, but outlined on the following pages.

SP Transmission Business Carbon Footprint
Tonnes CO₂ Equivalent



RIIO-T2 Commitment

We will implement processes for carbon management in relevant business activities, aligned with PAS 2080 Carbon Management in Infrastructure. **By 2023**

We will adopt a science based target for Scope 1* & 2* carbon reduction. **By 2021**

We will adopt a science based target for Scope 3* carbon reduction. **By 2023**

We will identify, and subsequently monitor, metrics to track progress towards our science-based carbon reduction targets. **By 2021**

* Scope 1: emissions from our owned assets. Scope 2: emissions from our purchases of energy. Scope 3: other emissions that are a consequence of our actions (e.g. business travel, contractors' emissions).

Driving efficiency through innovation and competition

Managing uncertainty

Enabling whole system solutions

Delivering an environmentally sustainable network

Meeting the needs of consumers and network users

Maintaining a safe and resilient network

Giving consumers a stronger voice

Track record in delivering

Reducing Embodied Carbon and Scope 3 Emissions

RIIO-T2 Cost: £0.09m

Our recent life cycle assessment pilot indicates that activities in our supply chain may represent over 70% of the total carbon impact of our network and operations. This finding is supported by similar figures reported by other organisations that have also started to quantify whole life carbon footprints. Our stakeholders also frequently highlight the need for us to cascade our environmental targets to accelerate reductions in carbon emissions throughout our value chain.

In order to reduce our carbon impact, we must work with our suppliers and continue to collaborate with other client organisations. We are engaging with our supply chain, other infrastructure companies and enterprise and environmental advisories to develop an aligned approach that encourages our supply chain to deliver steep carbon reductions whilst maintaining value for money and supplier diversity.

Beyond this, we are considering how we can facilitate our supply chain members to propose and deliver solutions to provide greater environmental impact reductions beyond their core contract bid.

RIIO-T2 Commitment

We will work collaboratively with our stakeholders, including the other Transmission Operators, throughout RIIO-T2 with the aim of assessing and managing capital carbon on our projects, driving efficiencies throughout our supply chain, and sharing best practice. *Throughout RIIO-T2*

We will, in collaboration with the other Transmission Operators, introduce a measurement tool for embodied carbon in new projects, in order to establish a baseline and set a reduction target. *By 2023*

We will identify, and subsequently monitor and report, metrics to track embodied carbon and our progress towards our Scope 3 science-based carbon reduction target. *By 2023*

We will collaborate with our supply chain and other Transmission Operators to drive scope 3 and embodied carbon footprint reductions. *Throughout RIIO-T2*

We will collaborate with our supply chain to implement sustainable project sites to reduce carbon and other impacts, for example energy efficiency, diesel use, re-use of materials and reducing impact of transportation. *By 2023*

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposal for an incentive aimed at maximising supply chain sustainability. Where appropriate and justified, costs arising from embodied carbon reduction activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Business Carbon Footprint – Sulphur Hexafluoride (SF₆)

RIIO-T2 Cost: £4.76m

SF₆ is a gas used extensively in electricity transmission assets as an insulator and arc-quenching medium in high voltage equipment. As SF₆ has excellent insulating properties that cannot be commonly matched by other gases available in the market, it has become the primary insulation and interrupting medium for voltages above 66kV over the last 40 years. SF₆ is, however, a fluorinated gas (F-gas) and a potent greenhouse gas with a Global Warming Potential (GWP) of 23,500 times that of CO₂.

SF₆ emissions are the largest controllable element of our direct business carbon footprint. SF₆ leakage dominates our footprint due to the substantial number of SF₆-filled assets on our network, the high global warming potential of the gas itself, and increasing leakage from older assets. This issue commands intense focus from our executive, strategic and operational teams and we are committed to exploring every available solution.

RIIO-T1 Performance

Since 2013, average SF₆ leakage as % of total volume has remained comparatively low, within target at 0.75% of total mass against a target of 0.85%. However, leakage needs to be significantly reduced in order to achieve our 2030 and 2050 carbon reduction targets. To reduce leakage, we will quickly repair or replace assets, drawing on expert support to utilise the latest approaches and technologies.

Despite a considerable amount of effort spent in repairing leaky assets, SF₆ leakage increased by 40% overall in 2018/19. Over 50% of leakage in the year was due to increased leakage from aging assets at a single site requiring increasing repair efforts. This site will continue to be our top priority for leakage repairs.

RIIO-T2 Commitment

We will continue to require manufacturers to provide equipment with an SF₆ leakage rate which is half of the internationally recognised standards, where technically viable. *Throughout RIIO-T2*

We will continue to carefully monitor and manage our assets to minimise SF₆ leakage, repair leaks quickly, and where this is not possible, replace the asset before its anticipated end of life. *Throughout RIIO-T2*

Where a repair to a leaking asset proves ineffective and the asset requires to be replaced, we will offset the SF₆ emissions from that asset until it's replacement via a Carbon Offsetting partner. *Throughout RIIO-T2*

We will use alternatives to SF₆ insulating gas for all new circuit-breakers and GIS installations where there are technically feasible market-ready solutions. *Throughout RIIO-T2*

We will drive the development and adoption of SF₆-free technologies, collaborating with supply chain and industry peers and piloting new technologies where technically viable. *Throughout RIIO-T2*

Annex 7: Environmental Action Plan

provides our detailed proposals for our embodied carbon management and climate change adaptation commitments, costs and performance profiles.



RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposal for an incentive aimed at reducing carbon impact from insulation and interruption gases. Where appropriate and justified, costs arising from SF₆ reduction activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Business Carbon Footprint – Other

RIIO-T2 Cost: £8.8m

Beyond scope 3 emissions and SF₆ leakage, the remainder of our controllable Business Carbon Footprint consists of the carbon impact of the energy used in our depots and substations, and the energy and fuels used for operational and business transport. In 2018–19, these categories represented around 14% of our total carbon footprint excluding losses and 1.3% of our total carbon footprint including losses.

We seek to reduce impacts across these categories by employing energy efficiency measures, implementing opportunities for self-supply using renewables, encouraging staff to reduce their business travel and use low carbon options, and by enabling the move towards low carbon vehicles.

RIIO-T1 Performance

Since 2013, we have achieved an 8% reduction in carbon footprint across these categories.

Full details of our buildings energy and transport carbon performance can be found in **Annex 7: Environmental Action Plan** and on **pages 24 and 29** of our **Transmission Annual Sustainability Statement**.

RIIO-T2 Commitment

We will implement energy efficiency measures as part of our RIIO-T2 building refurbishment programme at 48 substations (representing around 1/3 of our sites), with the aim of reducing energy consumption by more than 1,000MWh per year. *By 2026*

We aim to decarbonise our operational fleet by replacing 100% of our 72 cars and vans with electric alternatives by the end of RIIO-T2.* *By 2026*

We will strive to lead the decarbonisation of fleet vehicles, working with suppliers and other fleet operators to pilot technically viable alternatives to drive technical advancements and early adoption. *Throughout RIIO-T2*

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposal for an incentive aimed at accelerating adoption of low carbon fleet. Where appropriate and justified, costs arising from carbon reduction activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

*Some traditional fuel vehicles may be retained as strategic assets in the short term for use in the event of black start or other rare events until alternative low-carbon vehicles and charging systems are sufficiently mature.

Losses Carbon Footprint

RIIO-T2 Cost: Embedded in Load and Non-load Expenditure

Losses are an inevitable consequence of transferring energy across electricity networks. They represent the difference between all the energy that is injected into a system from generation and the energy that is taken out of the same system by demand. The carbon impact of losses is a function of the carbon intensity of the energy flowing through our network (which is decreasing year on year) and the amount of energy flowing through and across our system (which is increasing, due to increased renewable generation).

Increased renewable generation connections in Scotland lead to increasing amounts of energy being transferred across transmission networks, and therefore to higher losses. In the case of SP Transmission, the energy being transferred across our transmission system between Scottish Hydro-Electric Transmission to the north and National Grid Electricity Transmission to the south contributes to our losses. Technical considerations mean that efforts to reduce losses (e.g. by reducing circuit resistance) are often neutralised by factors such as increased current. Additionally, individual loss reductions cannot be separated from the dynamic characteristics of the wider network.

Against this background of increased transfer of electricity across our network, achieving a reduction in total network losses would not be economic or efficient. However, we are working to reduce the losses associated with each unit of energy transmitted across the SP Transmission network by considering losses and wider environmental impacts carefully when evaluating options for transmission reinforcements or asset replacement. Current estimates suggest that total network losses may rise by around 17% during the RIIO-T2 period; however the carbon intensity of these losses will decrease as energy generation continues to decarbonise.

RIIO-T1 Performance

Since 2013, transmission network losses have averaged 1.56% of the total energy transmitted, and the carbon intensity of these losses has steadily decreased. Key loss-reducing developments delivered in the RIIO-T1 period include the Western Link HVDC interconnector, series compensation, and the installation of shunt reactors and capacitors. We have reported on these developments annually, and our Losses Strategy has been updated periodically to ensure its continuing relevance. Please note that the carbon impact of losses is not included in the graph overleaf as it is not within our control and is of such a scale that it dominates all other elements of carbon footprint.

Full details of our losses strategy, performance and initiatives to date can be found in our **Transmission Annual Sustainability Statement, pages 24 to 27**, in our annual **Losses Report** and within **Annex 7: Our Environmental Action Plan**.

For more details on our fleet decarbonisation commitments, please see **Supporting and Securing our Network**.

Annex 7: Environmental Action Plan provides our detailed proposals for our SF₆ and business carbon footprint management commitments, costs and performance profiles.



Losses Carbon Footprint continued

RIIO-T2 Commitment

We will implement our RIIO-T2 Losses Reduction Strategy to reduce losses on the network by an estimated 14,500MWh (circa 3% of 2018/19 losses), thereby limiting losses to a lower level than would otherwise be the case, where this is economic and provides benefit to customers.

*Throughout
RIIO-T2*

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposal for an incentive to report on our actions to minimise electricity losses. We currently do not propose any uncertainty mechanisms specifically relating to network losses.

Climate Change Adaptation

RIIO-T2 Cost:

£5.5m

Recognising how critical network reliability is for the GB economy, it is important that our substations and assets are resilient to the effects of climate change, including the potential for increased flooding and higher temperatures.

As climate predictions evolve, we carry out work to ensure that our assets are protected from potential flooding. For more detail, please see Flood Mitigation within Supporting and Securing our Network.

RIIO-T1 Performance

Since 2013, we have been addressing sites with the potential to be affected by coastal and river flooding, and in RIIO-T2 we will seek to assess and protect further assets from surface water flooding in line with industry technical guidelines.

RIIO-T2 Commitment

We will undertake detailed Flood Risk Assessments at our remaining 10 high risk sites and implement measures to mitigate the risk to the network from flooding.

By 2026

We will publish a report in line with the 3rd Round of Adaptation Reporting under the Climate Change Act, in line with the Energy Networks Association work to produce a sector report.

By 2026

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

We do not propose any incentive mechanisms specifically relating to climate change adaptation. Where appropriate and justified, costs arising from climate change adaptation activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Annex 7: Environmental Action Plan provides our detailed proposals for our losses commitments, costs and performance profiles.



Reducing our environmental impacts

3

While we deliver the low carbon transition and reduce our own carbon impact, we must also prevent pollution, protect and enhance biodiversity, use resources sustainably and encourage our supply chain to optimise their environmental impacts.

Our Strategic Vision

The principles of a circular economy and efficient use of resources will be embedded in our business. The materials required for network construction and operation will come from sustainable sources. We will produce zero-waste, with the components of all end-of-life assets being reused or recycled into new products.

We will protect and continually enhance the biodiversity around our assets and support national and local strategies. Our decision making will incorporate the principles of Natural Capital Assessment to ensure that levels of natural assets are at least protected, if not enhanced.

We will have a net positive impact on the environment and the communities in which we operate.

Our strategic objectives are:

to divert 95% of waste from landfill by 2023, re-use or recycle 100% of waste by 2030 and achieve zero-waste by 2050.

to reduce water use 10% by 2023, 25% by 2030 and 50% by 2050.

Related Sustainability Drivers



Sustainable
Resource Use



Land and
Biodiversity
Improvement



Water
Efficiency and
Protection



Sustainable
Society

Preventing Pollution

RIIO-T2 Cost:

£11.0m

We operate and maintain linear infrastructure which is routed through, or adjacent to, a wide range of culturally or environmentally sensitive landscapes and structures, ranging from pristine to degraded habitats. While we provide the network connections and services that customers require, we recognise the need to minimise any negative effects these activities could have on the environment and communities as far as is reasonably practicable. Throughout the life of our assets, we not only meet the requirements of government policies and legislation but strive to move 'beyond compliance' by integrating fair and responsible environmental practices with socio-economic considerations.

In line with the requirements of ISO14001, we continuously review our environmental risks and impacts and target those of highest priority/impact for reduction. This process has informed the development of our RIIO-T2 programme of measures to prevent pollution. Priority impacts include: use of hazardous materials, oil leaks, construction site and substation drainage systems, and noise.

Many of our assets are designed to have a lifetime of over 40 years and therefore much of our network was constructed several decades ago, before the introduction of the high levels of environmental protection that we now build in as standard. We are progressively working to bring these older sites up to current standards. To support the development of our RIIO-T2 investment plan, a comprehensive programme of civil inspections was undertaken to inform a condition-based asset risk assessment, identifying a number of bunds and drainage systems requiring refurbishment and upgrade.

RIIO-T1 Performance

Over the RIIO-T1 period we have worked hard to achieve full reporting of environmental incidents, by both staff and contractors, and subsequently to drive down the number and severity of such incidents. With a peak in 2017, which coincided with our most significant programme of works for decades, we are now on a trajectory towards our goal of 0 regulatory interventions and 0 notifiable environmental breaches.

RIIO-T2 Commitment

We will target zero environmental regulatory interventions and notifiable breaches.	<i>By 2021</i>
We will deliver our RIIO-T2 programme of mitigation measures (oil containment) for pollution prevention, developed via a condition-based asset risk assessment process.	<i>By 2026</i>
We will implement Pollution Prevention Plans for all future projects, in RIIO-T2 and beyond.	<i>By 2026</i>
We will implement a programme to identify, risk assess and address high risk legacy land contamination.	<i>By 2026</i>
We will eliminate PCBs from our network in compliance with the relevant legislation and in line with the industry approach agreed with the Environmental Regulators.	<i>By end Dec 2025</i>

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

We do not propose any incentive mechanisms relating to pollution prevention. Where appropriate and justified, costs arising from pollution prevention activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Land and Biodiversity

RIIO-T2 Cost: £0.84m

We mitigate biodiversity loss most significantly through our actions to maximise the utilisation of our network and connect low carbon generation for societal decarbonisation. This leads to benefits in terms of climate change mitigation, avoidance of additional land use and reductions in pollution. While we do this, we also protect and enhance the ecosystems within which we operate, mitigating the ecological impacts of construction by aiming for 'no net loss' and avoiding the introduction or spread of invasive non-native species.

RIIO-T1 Performance

Our routing and environmental impact assessment process considers a range of environmental factors, including Biodiversity, alongside technical constraints and licence requirements. This process is currently under review and we are embedding biodiversity measurement in advance of RIIO-T2.

One of our key successes has been the award-winning Stirling Enhanced Landscape Mitigation Project, an ongoing, innovative project that has empowered community groups to assist in the design and delivery of local mitigation in the corridor of the SPT portion of the Beaulieu to Denny Overhead Line. A current lack of robust data on biodiversity and natural capital across our portfolio precludes the setting of biodiversity or natural capital net gain targets at this time. Our aim in RIIO-T2 is therefore to create a baseline dataset and develop, embed and trial a robust net gain methodology. This will enable us to set realistic, cost efficient targets for net gain whilst retaining the flexibility required to align our targets with Scottish legislation as it is developed.

For more detail on our current biodiversity activities and performance please see **pages 31-33** of our **Transmission Annual Sustainability Statement**.

RIIO-T2 Commitment

We will work collaboratively with our stakeholders, including the other Transmission Operators, throughout RIIO-T2 to develop and pilot a common approach and robust methodologies for delivering Biodiversity Net Gain alongside Natural Capital assessment and enhancement.	<i>By 2021</i>
We will pilot these biodiversity and natural capital assessment methodologies and associated tools on selected RIIO-T2 projects.	<i>By 2023</i>
We will embed these biodiversity and natural capital assessment methodologies and associated tools in our business decision making processes for projects and the management of existing sites.	<i>By 2023</i>
We will identify, and subsequently monitor and annually report, metrics to baseline and track the levels of biodiversity and value of natural capital on our sites and the achievement of our targets.	<i>By 2021</i>
We will work with our local communities, landowners and other stakeholders to deliver 'no net loss' in biodiversity and identify options for delivering 'net gain'.	<i>By 2026</i>
We will work with our local communities, landowners and other stakeholders to deliver a net positive impact in natural capital across our existing sites.	<i>By 2026</i>

RIIO-T2 proposed incentive and uncertainty mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposals for incentives aimed at maximising environmental benefit from operational land and delivering biodiversity net gain initiatives. Where appropriate and justified, costs arising from biodiversity enhancement activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Enhancing Visual Amenity

RIIO-T2 Cost:

£0.13m

Visual amenity is considered in the planning of new assets or replacement works. But in some cases, pre-existing transmission infrastructure has a direct visual impact upon the surrounding environment and the stakeholders who access it. This can be because settlements have developed around existing assets, people are accessing landscapes in new or different ways, or simply because visual amenity was not seen as a priority when certain historical assets were installed.

RIIO-T1 Performance

We have examined the visual impact of our network within the landscape areas eligible under the RIIO-T1 visual amenity incentive and collaboratively developed a range of visual amenity improvement initiatives. These co-created initiatives, largely focused on distracting or diverting landscape users from our assets, will be completed under RIIO-T1. Details of our Visual Amenity performance and initiatives to date are outlined on [page 32](#) of our [Transmission Annual Sustainability Statement](#).

RIIO-T2 Commitment

Where supported by visual amenity assessment and stakeholder engagement, and when cost effective to do so, we will deliver visual amenity mitigations for those existing assets not identified for upgrade or refurbishment during RIIO-T2. *By 2026*

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

We do not propose any incentive mechanisms specifically relating to improving the visual impact of our network. Where appropriate and justified, costs arising from visual amenity activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

Sustainable Resource Use and Waste Reduction

RIIO-T2 Cost:

£0.13m

We are working to embed the principles of a circular economy and will follow an appropriate, recognised standard, such as the BS8001 circular economy implementation framework.

In line with the waste hierarchy, 'reduce, re-use, recycle', our focus is on avoiding waste generation from the earliest design stage, keeping materials in use at the highest value for as long as possible, and managing any remaining waste to maximise its re-use or segregation for recycling.

Effective sustainable procurement processes and collaboration with our supply chain are essential drivers in achieving our sustainable resource use goals.

Annex 7: Environmental Action Plan provides detailed proposals for our biodiversity, visual amenity and sustainable resource use commitments, costs and performance profiles.



RIIO-T1 Performance

In 2018, 46% of waste from our major construction projects was diverted from landfill and we are on track to meet our 2023 target of 95% of waste diverted from landfill. We have introduced enhanced environmental requirements to our procurement processes.

For further details of our performance on sustainable resource use and waste reduction please see [pages 36-38](#) of our [Transmission Annual Sustainability Statement](#).

RIIO-T2 Commitment

We will embed circular economy principles where relevant throughout our business processes, considering whole life cycle environmental impacts. *By 2023*

We will divert 95% of our waste from landfill. *By Dec 2023*

As part of our revision of design processes, we will include considerations of operational and end of life stages with the aim of designing out waste.* *By 2023*

We will require project Waste Management Plans for all new projects in RIIO-T2 and beyond. *By 2026*

We will implement metrics to measure the sustainability of our resource use, with the aim of establishing a baseline to enable target setting during RIIO-T2. *By 2023*

We will set targets for recycled/reused materials as a % of total input materials to be achieved by end RIIO-T2, 2030 and 2050. *By 2026*

We will continue our work to minimise the environmental impacts of our use of aggregates (soils and stones) via collaboration with other TOs, our supply chain and membership on infrastructure resource optimisation groups** with the aim of identifying and implementing solutions to reduce the use and disposal of aggregates, including increased use of secondary aggregates. *Throughout RIIO-T2*

We will continue to collaborate with environmental/waste regulators, other infrastructure companies** and our supply chain to drive sustainable resource use and waste minimisation in order to meet our RIIO-T2 and Sustainability Goals. *Throughout RIIO-T2*

RIIO-T2 proposed incentive and uncertainty mechanisms

We do not propose any incentive mechanisms specifically relating to sustainable resource use and waste reduction. Where appropriate and justified, costs arising from such activities will be addressed within the scope of our proposed uncertainty mechanisms for Legislative, policy and standards and Energy systems for Net Zero.

*See related commitment to align with PAS2080 in Decarbonising our network and assets and supply chain collaboration commitments in Supply Chain Sustainability, which also encourage resource use reduction and waste minimisation.

**Via the Scottish Infrastructure Circular Economy Forum and Major Infrastructure Resource Optimisation Group.

Supporting the Net Zero transition

4

The energy generation system is changing, moving from a traditional centralised model reliant on fossil fuels, to a decentralised Net Zero model focused on low carbon renewable generation.

Demand for electricity is also changing, with the UK and Scottish Governments setting ambitious targets to decarbonise sectors such as transport and heat. Our network must be prepared for these changes in demand and generation. While we drive this transition, we must ensure that none of our customers are left behind, recognising that those communities and customers who are least likely to have access to low carbon vehicles or heating will frequently also be the most vulnerable in society.

We have developed our plans to align with the Scottish Government's Energy Strategy and ensure we are playing our part in meeting the ambition for Net Zero greenhouse gas emissions by 2045.

What we are doing to support the transition

Taking a whole-systems approach to network planning that delivers the most efficient overall solutions for society, taking heating, transport and distribution network impacts into account. Please see **'Whole System Planning'** for more details.

Adopting innovative approaches and technologies to accelerate the connection of low carbon technologies. Please see **'Innovation Built-In'** for more details.

Supporting the accelerated connection of low carbon generation and demand connections, including developing non-build solutions. Please see **'Load Related Expenditure'** for more details.

Carrying out frequent and detailed analysis of generation and demand scenarios and developing reinforcement and boundary upgrade projects as required. Please see **'Load Related Expenditure'** for more details.

Related Sustainability Drivers



Sustainable Resource Use



Climate Change Resilience



Carbon and Energy Reduction



Land and Biodiversity Improvement

Introducing our Net Zero Fund

RIIO-T2 Cost:

£20m

Network companies are a key enabler for GB to meet its Net Zero and low carbon targets, not solely through investing in our networks, but by also facilitating low carbon projects that benefit our communities and Britain's electricity system as a whole.

RIIO-T1 Performance

Our two-year, £20m RIIO-T1 Green Economy Fund is currently supporting 33 diverse projects to deliver thousands of tonnes of annual carbon savings, create over 40 local jobs, and directly support over 2,300 vulnerable customers.

RIIO-T2 Commitment

For RIIO-T2 we have proposed a £20m 'Net Zero' Fund so that we can use our central and impartial role within the energy system to ensure local communities, including those identified as 'vulnerable', are financially supported to maximise the social, environmental and economic benefits of local energy solutions. The Net Zero fund will focus on facilitating practical, low carbon initiatives with tangible outcomes that benefit local communities and help Britain on the path to Net Zero. This fund builds upon our existing Green Economy Fund which has supported initiatives which have delivered demonstrable benefits for the people of Scotland and support Scotland's ambitious green energy plans and local economic growth (details of our existing Green Economy Fund projects can be found on our website).

Engagement and Benefits

We have engaged widely with stakeholders including the Scottish Government and consumer energy groups on this proposed fund as part of a public online consultation and via bilaterals. In the round, the fund has received an overwhelming amount of positive support, and as a result of feedback from our stakeholders, we will clearly demonstrate how this fund will benefit vulnerable communities and consumers in particular to mitigate the resulting 2p per annum bill impact.

SP Energy Network's definition of a Community in Vulnerable Circumstances

A community and its citizens who are disadvantaged and less able than an average community to plan for, cope with, or recover from adverse situations, which are either temporary or permanent.

For example, if we support our communities in vulnerable circumstances to connect new low carbon heating solutions, this will result in more cost-efficient energy bills as well as the related health benefits associated with properly heated community facilities and homes. Studies have also shown that the associated health benefits limit use of NHS services and therefore wider savings are made. Overall, we estimate that this fund will deliver at least £3 worth of social benefits for every £1 invested.

Given the fundamental role of electricity in today's society and our unique position, we know that these investments will quickly and cost-effectively aid the UK and Scottish Government to achieve their Net Zero ambitions with numerous low-carbon projects that will provide scalable learning, reduce community vulnerability, maximise local benefits and further the UK's leading role in low carbon solutions at a global level.

Introducing our Net Zero Fund continued

Using SP Energy Networks' well-established and strong voice across our communities, the Net Zero fund will also ensure more communities understand and therefore access the wide-ranging potential economic benefits from Smart energy systems in a Net Zero future. For example, in funding projects that can provide flexibility services or peer-to-peer trading. Many of these more innovative services have already been tried and tested in a number of communities (particularly across Scotland's highlands and islands) with support from Scottish Government funding, but are yet to become commonplace across the country or Britain as a whole. In this respect, we feel our central position as Transmission and Distribution network operator will allow us to build on the wealth of knowledge and experience in the communities we serve and socialise the benefits of such learning, including to those more vulnerable communities who need them most.

Not only will local communities see an increase in local income and more cost-efficient energy bills, but local energy schemes also go some way to mitigate the large-scale investment needed to overcome current and future constraint costs. A £20M Net Zero fund also provides invaluable practical project learning which may delay or reduce altogether the cost to the consumer of larger scale reinforcement or network costs.

We have consulted with our stakeholders on the final criteria for the fund to ensure that it will directly and indirectly support our communities in vulnerable circumstances. We propose to report on fund activities every year to ensure transparency for all of our stakeholders and the sharing of best-practice as we collaborate across industry to address the climate emergency.

Our recent 'Scotland's Race to Net Zero' event discussed the challenges we face in the race to meet Net Zero targets. It also recognised the benefits of our existing Green Economy Fund and the wider societal impacts associated with a Net Zero future.

Warmworks Scotland

"We believe that a pot of funding like the Green Economy Fund should continue to include funding for initiatives/projects that generate low carbon outcomes and help to tackle fuel poverty. The over-subscription to the Green Economy Fund would indicate that there is scope for a pot of funding like this to be expanded in RIIO-T2."

ESP Scotland

"This funding is critical and will make a difference to low carbon communities as our climate is facing the biggest environmental challenge our generation has ever seen."

Maximising environmental benefit from non-operational land

RIIO-T2 Cost:

£0.1m

We often replace old substation assets with newer versions that take up less space, or remove redundant assets if they are no longer required. The resulting vacant land represents a number of opportunities to maximise environmental benefits, including the installation of renewable technologies.

We have recently undertaken a study to understand the scale of opportunity that these areas of land may represent, including options for enabling community energy groups to use the land for free to site solar PV installations. Our study identifies up to 20 sites initially, which conservative estimates suggest could support upwards of 4MW of new renewable generation.

Our stakeholders have emphasised the value of us enhancing biodiversity at our sites where operationally appropriate to do so. Therefore we will include the requirement for the successful energy groups to also deliver and manage biodiversity enhancement initiatives on these sites over the lifetime of the lease.

RIIO-T1 Performance

Our experience of working with 33 green community projects via our Green Economy Fund, and working with a wide range of local communities to deliver over 30 habitat creation, public access and landscape enhancement projects near our network investment projects has provided in-depth insight into the needs of our local communities and a drive to do more to support the development of hyperlocal energy solutions.

RIIO-T2 Commitment

We will release unused non-operational land to local community energy projects where possible, allowing them to use sites for free to generate and deliver energy to their local communities.

Throughout RIIO-T2

RIIO-T2 Proposed Incentive and Uncertainty Mechanisms

Please see Category 3 within 'Output Incentive Proposals' for details of our proposal for an incentive to maximise environmental benefit from non-operational land. We currently do not propose any uncertainty mechanisms specifically relating to this activity.

SoulRiders

"Based in Glasgow, and with three councils across Scotland declaring a climate emergency, I believe drastic new, innovative measures are required to tackle the issues we are facing. These measures need to perpetuate economy and not disrupt economy, and at the same time improve social & green environments."

Maintaining a safe and resilient network is at the forefront of everything we do. We make sure it cascades all the way through our business into every work activity our employees and contractors deliver, and thus through all our interactions with the public.

The stigma around mental health stops many people from getting help. Our ambition is by the second year of T2, we will train 1-in-50 of our people to become Mental Health First Aiders. But we will not just maintain this number – we will actually increase the support throughout the price control period.

We will train at least 2% of our staff as mental health first aiders by year two of RIIO-T2.

+2%

We will achieve the transition to the new International ISO 45001 SMS by 2020.



We will deliver 100% of our annual public safety and awareness programme.

100%

Health and Safety



Consumer Value Proposition

Reduced incidents and absences will result in a more efficient workforce with high morale.

The health and safety of our workforce will have wider socioeconomic benefits for the area we serve. Ultimately, it will reduce impacts on our local NHS. The costs to the NHS for every short hospital stay is £3,894.

The Health and Safety Executive (HSE) has published a value of £8,400 for every non-fatal injury in the workplace. If we were to apply this across our workforce, this would equate to a loss of £5.9m. The HSE states that one fatal injury would cost society £1.7m. We cannot place a value on the safety of our staff. We will always strive to achieve zero harm.

We aim to train a minimum of 2% of our staff as mental first aiders. Reducing mental health problems within our workforce could have a consumer value of up to £3.3m over the RIIO-T2 period.

Using Willingness to Pay research, we estimate that our education programmes on electrical safety will have a consumer value of £380,000 over RIIO-T2.

Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

With over 4,000km of overhead lines alone, we operate thousands of high voltage assets spread over public terrain. As such, we have a considerable responsibility to keep our people – and external contractors working with us – free from harm, and minimise the risk of members of the public accidentally coming into contact with our equipment.

We pride ourselves on our excellent track record and our rigour and leadership in retaining a world-class level of safety performance. Despite having reduced our Total Recordable Incidence Rate (TRIR) by 50% in RIIO-T1, we will not become complacent; continuous improvement is a key focus area for our company in the next price control period. To take our approach one step further, we have engaged with our stakeholders, including the Transmission User Group, throughout the development of this plan, listening to feedback on how we can improve our existing activities – and ensuring our comprehensive public safety education programmes continue to keep members of the public safe around our electrical equipment.

How and why we have engaged with our stakeholders

Our equipment operates at very high voltages. As such, health and safety standards hold a special status within our company, one that underpins all of our activities, from office-based roles to engineers operating under challenging weather conditions. As a Transmission Owner, we also adhere to strict legal and regulatory rules surrounding the safety of our people and stakeholders, which is overseen by the Health and Safety Executive (HSE).

HSE is the UK government agency responsible for the regulation and enforcement of workplace health, safety and welfare. Because of this, we have targeted much of our health and safety engagement with the HSE, specifically on how we can improve and build upon our existing activities which have reduced incident rates in RIIO-T1.

In addition to engagement with the HSE, we have also considered insight from our stakeholders, encouraging them to share ideas on improvements; complete an annual survey; and get involved in a number of industry consultations.

This included trialling new protective personal equipment (PPE) and involvement on a variety of industry working groups focused on health and safety best practice across the electricity industry. We also looked at lessons which could be learned from other sectors.

What our stakeholders have told us is important to them

We do not compromise on health and safety – it is our number one priority. Through our engagement activities, we have learned that stakeholders share our values. The consistent message from stakeholders is clear – they agree safety should continue to be the number one priority for SP Energy Networks. Through our Willingness to Pay exercise, we know stakeholders agree with our approach, and do not want us to compromise on safety in order to reduce costs. Additionally, stakeholders have told us we should focus more on mental health, specifically the mental wellbeing of our employees.

How stakeholder feedback has shaped our plans

As a result of stakeholder feedback, we are proposing to report annually on the health and safety initiatives we will deliver. To respond to the challenge from our stakeholders, including the User Group, on mental health, we have committed to train at least 2% of our workforce as mental health first aiders by year 2 of the RIIO-T2 price control period.

Why these changes are important

The health and safety of anyone affected by our activities is of vital importance.

Health and safety is at the heart of our business. It is considered in everything we do. Our commitment to the highest standards of safety ensures the protection of our employees, our contractors, our network customers and members of the public at all times.

Organisationally, focusing on health and safety is the right thing to do. Our reputation as a responsible employer depends on our ability to keep people safe. Our CVP illustrates the positive wider benefits good health and safety performance delivers, such as the reduction of accidents and absence as well as a happy and sustainable workforce.

Our health and safety culture

Visible leadership on health and safety within our network is clear in the commitments detailed in our health and safety policy, which is signed and endorsed by SP Energy Networks', Chief Executive Officer.

Our Health and Safety Operating Plan details our goals and objectives – it is developed annually, endorsed by the CEO and Executive Management team. This plan is reviewed regularly, so we can make sure that enhancements are being delivered. In addition, every meeting in our business begins with a health and safety contact. Meetings are dedicated to reviewing health and safety performance and are scheduled weekly and monthly.

Health and safety communications on incidents and lessons learned, are published by the business and the wider industry in order to share findings. Improvements are identified by our internal processes and new initiatives are rolled out where these are required. For example, new training needs can be added to our staff training programmes.

The safety of our staff cannot be comprised by a reduction in costs. We have therefore submitted a business plan which will ensure we have the necessary funding to ensure the health and safety of our staff.

As part of our willingness to pay studies, it is clear that our staff's safety is a priority for consumers.

Health and Safety Matters

A consistent message across our organisation

Our commitment to health and safety is underpinned by our business-wide branding, "Health and Safety Matters", which is visible on all communications and employee work clothing.

We have also developed a core health and safety message through our five Health and Safety Essentials. Clear, simple and easy to remember, these are our take on important health and safety messages that are visible across the business.



HEALTH & SAFETY ESSENTIALS

Responsibility within the organisation

Day-to-day management of health and safety rests with line management, who are fully trained and therefore skilled in delivering their responsibilities.

Line management are also given professional support and guidance in health and safety by a professional team that includes qualified health and safety managers, as well as engineers providing compliance auditing. This team also includes Occupational Health professionals who provide Statutory Health surveillance activities and Health and Wellbeing initiatives.

Our Commitments

We will achieve greater than 95% delivery of our Health and Safety Operating Plan Objectives year-on-year.

We will train a minimum 2% of our staff as mental health first aiders by year 2 of RIIO-T2.

Encouraging Health and Wellbeing

Our safety culture is extremely important to us. We carry out 'Safety Stand-Down sessions', where staff stand down and senior management brief them on the latest safety rules, with over 1,500 employees and contractors being addressed. These take place three times per annum. 'Safety Stand-Downs' ensure that all of our staff take time out of their day to remind them of the importance of ensuring that all staff remain aware of their surroundings to prevent future accidents. Attendance of all sessions is monitored by our Health and Safety team. During our October 2019 Stand-Down, we reminded all staff of the importance to:

Stop

Engage your mind before your hands or feet. Be conscious of your surroundings as well as the task at hand.

Look

at your workplace for hazards.

Assess

the effect that those hazards have on you, your colleagues and the general public.

Manage

those hazards by taking immediate corrective action or stopping work if you feel it is unsafe.

Compliance with health and safety legislation

Compliance with all UK health and safety legislation is a necessity, so our health and safety management system is independently audited and is currently certified to the British Standard OHSAS 18001.

In 2019, we began a programme of transitioning to the new international health and safety standard, ISO 45001. However, we view this as a minimum requirement, and go far beyond basic compliance in our efforts to reduce potential harm in our activities.

All of our major construction activities comply with the Construction, (Design and Management) Regulations 2015 and even when the project is not notifiable to the HSE under CDM, we use CDM 2015 as the benchmark for good engineering and construction practice.

Our Commitments

We will continue to subscribe to and support all industry initiatives and KPIs published by the Energy Networks Association (ENA).

We strive to achieve zero Regulatory Enforcement Notices from the UK Health and Safety Executive.

We will achieve the transition from the BS OHSAS 18001 SMS Standard to the International ISO 45001 SMS by year 1 of RIIO-T2.

Performance and track record

We have a comprehensive suite of both leading and lagging health and safety performance indicators. We aim to reduce our accident and incident rates year-on-year. Our Health and Safety performance is reported to our CEO, Executive team and workforce for transparency.

We measure the performance of our own staff and contractors, and treat them equally in our drive to improve health and safety performance. Our headline performance statistic of Total Recordable Injury Rate (TRIR) shows a reduction over time for both our employees and the contractors we engage.

The Total Recordable Incidence Rate (TRIR) is one of our key health and safety performance measures. It is a measure of occupational health and safety. It combines the actual number of defined recordable incidents and total work hours of all employees within a defined employee group. TRIR is calculated by multiplying the total number of recordable incidents by 100,000, and then dividing that number by the total number of man hours worked in a given period. Our TRIR for employees in 2018 was 0.16, and for our contractors was 0.34. Over the RIIO-T1 period, staff and contractor TRIR has reduced by over 50%. We already have very low levels of employee and contractor accidents, however, we can always do better, and always aim for zero harm.

We strive to achieve high levels of health and safety performance, but we do recognise that when accidents and incidents occur they should be thoroughly investigated and analysed, with lessons learned being implemented and shared around our business and the industry. Our leading indicators include a wide ranging internal operational audit program, near miss trend analysis and evaluation, and an occupational health screening programme.

Managing operational risk and reducing harm

Reducing risk and potential harm is vital. Our activities are fully risk-assessed, and the comprehensive training programmes delivered at our in-house training centres guarantee the competence of our staff.

When selecting contractors, we undertake a thorough analysis of their health and safety management systems and performance. All equipment used in our activities is certified and maintained to the manufacturer's recommendations. An operational compliance team audit the activity of both ourselves and our contractors to a defined annual programme, to test the risk reduction controls implemented during our operations. Any lessons learned from these audits are shared with the wider business and, where appropriate, integrated into our training programmes.

Our Commitments

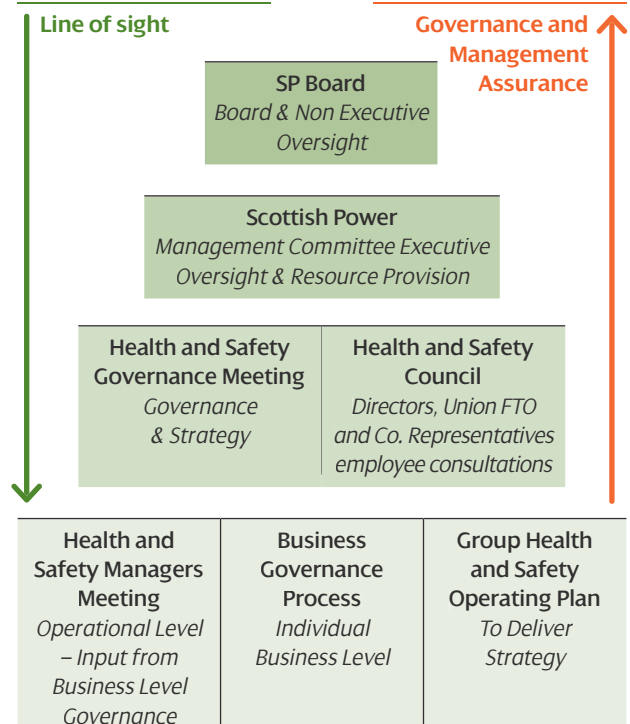
We will continue to deliver 100% of our annual Electrical and Plant Authorisations programme. This includes initial and refresher training testing and ensuring the competence of our employees.

We will deliver 100% of our annual health and safety legislation and Operational compliance audit programme, communicating findings both internally and, where appropriate, with the wider industry.

Assessing risks (health and safety)

We have introduced the Activity (or role-based) Risk Control assessment. These assessments identify hazards associated with roles such as jointers and linesmen, as well as control measures including training and education – all with the aim of ensuring only trained and competent staff are authorised to undertake work-related activities.

Health and Safety Corporate Governance Structure



Trained, competent and authorised staff

Only trained and authorised staff can work on, or nearby our network. Training needs are identified annually, with the majority of training delivered by both internal and external trainers at our two training centres. Trained staff are formally authorised and hold 'authorisation certificates'. The authorisation process is administered and managed by our Authorisations Team.

Safety Rules (managing safety on our network)

We operate the 4th Edition (Electrical & Mechanical) Safety Rules which sets out safe working procedures for achieving safety from our system (electrical apparatus and mechanical plant) for authorised and competent staff to work on.

Guarding physical and mental health

We strongly recognise the "health" in health and safety, and take measures to promote healthy living and wellbeing for our staff. We plan and fulfil all our statutory health surveillance requirements, and have an annual programme for delivery that is measured and monitored.

Going beyond statutory requirements, we promote fitness and health as a lifestyle choice with initiatives such as the "Daily Mile" lunchtime walks programme. Our Daily Mile initiative was rolled out via our staff online portal and leaflets, providing our staff with information on the benefits of walking a mile every day, as well as suggested routes near the office. We also provide our staff with access to gym facilities to encourage physical fitness.

Crucially, we recognise that mental wellbeing is of equal importance to physical wellbeing. In 2018, we started training volunteer staff from across the business as mental health first aiders.

We have made a commitment to train a minimum 2% of our staff as mental health first aiders by year 2 of RIIO-T2. Our first aider volunteers are screened for suitability using a screening process developed by Occupational Health. 2% is our minimum target and could be supported further by volunteers in the future.

We have a confidential helpline that staff can use during times of need or distress. We also have self and managerial referrals to counselling services for both staff and their family members to support them in areas of stress, grief, debt and mental health.

Reduction of Potential Musculo-Skeletal Injury

The Dorsavi biometric body tabs are being used throughout the industrial teams in ScottishPower to assess the impact of physical work on the body.

Initial studies demonstrate that movement is good for the body and encourages the individual to stay active and maintain a healthy weight. It also indicates where tasks could lead to long-term injury as a result of working habits, which will push the business to identify strategies to improve working practices, and reduce the overall impact of wear and tear on the body.

Protecting the public

We don't just value the safety and wellbeing of our staff members, but also members of the public. We therefore invest heavily in communicating the potential risk of interacting with the electrical network.

For example, we provide teachers with educational programmes such as "PowerWise" to be used in awareness-raising lessons in schools.

Our staff volunteer to participate in safety events in the communities where they live under the banner of the "Crucial Crew". We also work closely with the agricultural community to provide information on maintaining clearance between farming activities and the electricity network, and have significant visibility at agricultural shows.

Our Commitment

We will continue to communicate and educate the public on safety from the network through multimedia platforms. We will deliver 100% of our annual public safety and awareness programme through the following channels:

"PowerWise" classroom safety education programme – delivering safety awareness to schoolchildren of potential harm from exposure to electricity.

"PowerWise" website – providing specific health and safety modules for teachers to deliver to their pupils.

"Crucial Crew" Community Safety events – engaging with the community on health and safety.

Fixed Safety Education Centres risk factory, safety central and dangerpoint – significant footfall of visitors is measured annually and published.

Deliver a minimum of five safety demonstrations at agricultural community shows per year – working with the agricultural community in reducing potential risk from electrical infrastructure and contact with farming activities.

Encouraging Health and Wellbeing

The Daily Mile started in a Stirling Primary school in 2012 when the teachers noticed that a group of 11 year olds could not run round the school playing field. The pupils decided to walk for 15 minutes every day and averaged 5 laps in 15 minutes = 1 mile – so The Daily Mile was born.



We were the first company to roll this initiative out to our staff. We promote physical activity as part of a wider health and wellbeing programme for our employees reducing absenteeism, keeping people economically active for longer, and increasing our productivity and prosperity.

Engaging with regulators and the industry

As a member of the Energy Networks Association, we contribute to improving industry health and safety standards.

We also engage directly with the UK Health and Safety Executive in reviewing our own activities and developing safer working methods in the industry, all with the aim to further manage and control potential risk.

We share best practice with others. We are a member of the SHE Group as well as Occupational Health Group and we are represented on a number of other working groups with the ENA such as Asbestos and Compliance. We also run a number of Contractor Forums and Working Groups where we collaborate with our suppliers – such as the Working at Height Forum; Site Vehicle and Plant Forum; Underground Cable Forum; and bi-annual contractor forums where we take a day out to meet with all our suppliers and discuss areas for improvement and new initiatives. This is a two way communication, with the contractors presenting their ideas as well as us presenting ours.

Engaging with our people

We recognise the positive impact that engagement with trade union appointed safety representatives and employees can deliver.

Safety representatives, have their rights set out in our Safety Representatives Charter. During 2018 and 2019, these employees received internal awareness training and were invited to participate in a number of consultative forums and working groups.

Employees are encouraged to put forward ideas, are encouraged to complete an annual survey (The LOOP) and have the opportunity to get involved in a number of consultations. For example, the development and review of activity risk control assessments.

It is widely recognised that taking time out to visit worksites, observing working practices and carrying out behavioural based safety interventions can lead to positive changes in behaviours. This will ultimately stop or minimise unsafe acts and conditions resulting in injury. Our supervisory staff attend Coaching Safety training, and an electronic behavioural-based awareness training course is currently being developed for all staff.

Control of Heavy Plant Vehicle Movements



The Site Vehicle & Mobile Plant Safety (SVMPS) Forum initiated by SP Transmission, is a clear example of a proactive, forward-thinking approach to health and safety in the workplace. The forum was shortlisted for a health and safety award at both the Utility Week Awards in 2018 and the Network Awards in 2019.

We recognised the rising issue of vehicle and plant incidents, and wanted to ensure staff and contractors were acting in the safest possible way. A SVMPS Forum was created, bringing together 17 partner contractors and representatives from the National Grid to help define appropriate safety practices.

The benefits created by the SVMPS Forum can be felt industry-wide, and are making a real impact on the health and safety of anyone working in the utilities business. Since the Safety Critical Rules from the SVMPS were implemented, vehicle and mobile plant incidents on SP Transmission sites have fallen by 40%.

The project resulted in a unified approach to site safety between a major industry operator, in partnership with the various contractors who work with it. The agreed rules were cascaded throughout our business in 'Safety Stand-Down sessions', where staff were stood down and senior management briefed everyone on the rules, with over 1,500 SP Transmission employees and contractors being addressed.

The processes and rules developed by this forum can be universally applied to any site, acting as a model for others in the industry to follow. We have an enthusiasm to share this work as best practice and have presented the processes of the Forum to the Energy Networks Association, openly sharing the lessons learnt and the agreed rules with other Distribution Network Operators.

13,000 Safety Training
Hours per annum

13,000



The electricity transmission network only forms one part of the overall energy system. To ensure we are facilitating **a sustainable, Net Zero future**, it's increasingly important to coordinate all the parties involved – going beyond just the customers connected to the electricity network. In RIIO-T2, this collaboration will continue to put us at the centre of creating an integrated energy system – one that provides value for money and flexibility for the future. This ambitious plan ensures we are **keeping network users and consumers at the heart of our decisions**.

SP Distribution, *Pg 57*

The Distribution Network Operator in the same region as ourselves, SP Distribution is one of the main parties we have coordinated with.

1

Other network operators, *Pg 57*

To ensure a consistent approach, we have worked with other gas and electricity network operators to plan for the future.

2

Other TOs and the ESO, *Pg 58*

Being connected to SSEN and NGET, coordination with the other transmission owners and the ESO is essential to ensure an efficient transmission network across Great Britain.

3

Market participants, *Pg 59*

The connection of generation is one of the largest drivers of expenditure on the network, and coordination is essential to ensure it is connected efficiently.

4

Other stakeholders, *Pg 59*

As we plan our network we include Government and Local authorities, as well as a range of other parties.

5

Whole System Planning



Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

The energy system is evolving at an unprecedented rate. SP Energy Networks and our Transmission business have a central role to play in facilitating this change and preparing the UK for a Net Zero future. To plan for the future we need to work together with traditional stakeholders – including network users, Ofgem and the Scottish and UK Government – as well as less familiar industry sectors and new market entrants. Robust and strategic stakeholder engagement is vital to inform our plans to take a whole system approach.

How and why we have engaged with our stakeholders

Given the strategic nature of whole system planning, we continue to engage via bilaterals and/or stakeholder panels with local authorities as well as national and UK Government. To explain and discuss each area of our RIIO-T2 plan we have also attended relevant industry events, such as All Energy, throughout our RIIO-T2 planning phase. In addition to our ongoing joint-engagement with SP Distribution, our senior managers and business area leads have also spoken directly with those parties impacted by our RIIO-T2 plan and with relevant industry representatives from other sectors such as heat and transport. We particularly engage to establish where we can coordinate our plans with other Transmission Owners (SSEN and NGET), National Grid ESO, generators and current and future customers connected to our network.

We have used the expertise and experience of the Transmission User Group to understand how best to prepare for a whole system future, and how current and future consumers may engage in the emerging energy landscape. This feedback has also been combined with consumer willingness-to-pay surveys, qualitative workshops and our consumer acceptability surveys.

What our stakeholders have told us is important to them

Stakeholders such as the Scottish Government have identified the need to ensure that our plans are efficient and coordinated with other parties. They know this includes working with other organisations beyond electricity distribution and transmission.

Ofgem has supported this view with their expectation that our business plan needs to show how we are embedding such an approach in our longer-term planning. The User Group has also challenged us to make sure we maximise opportunities, particularly across distribution and transmission, to minimise required expenditure.

Through our willingness-to-pay and acceptability consumer surveys, consumers have told us they value money being spent on preparing for the future by investing in innovation and renewables, and playing a leading role in mitigating climate change. Consumer representatives, such as Citizens Advice Scotland, reaffirm our own position that we must be vigilant against investment now that proves redundant in a few years' time due to whole system changes.

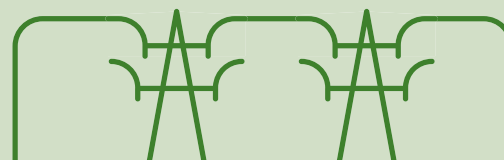
How stakeholder feedback has shaped our plans

Our engagement has identified opportunities we can build on throughout the RIIO-T2 period. This includes working with local authorities as they develop local heat plans and energy efficiency strategies, and ensuring our plans reflect theirs.

We have also started to work more closely with other parties across the energy sector, including SGN – the gas network operator in central and southern Scotland – to ensure consistency in our planning. To reduce costs and make sure that we are doing the right thing for consumers, there is strong support for greater coordination with SGN and a range of other parties, including those involved in transport and heat. We have incorporated this feedback into our plans.

Why these changes are important

We recognise that there will be different views on the most effective routes to a whole system approach. We are confident that the changes we have made to our plan, as a result of our stakeholder engagement, have allowed us to better consider and coordinate our options while remaining flexible enough to address emerging pathways to a Net Zero future.



Our approach

We own and operate both the distribution and transmission networks in Central and Southern Scotland. We have the advantage of seamless planning across the electricity network from power station to plug.

From the future energy scenarios we've created, we've modelled the potential energy flows at the interface between the distribution and transmission network. Our energy scenarios are aligned with the National Grid System Operator 2019 Future Energy Scenarios, but we've modelled the impact of these down to individual substations. We don't expect any single energy scenario to be correct in practice, but we've used the range of projections they provide to frame and test the flexibility of our plan to make sure it can adapt to a range of realistic outcomes. These scenarios also examine the interaction between the gas and electricity systems as well as other changes in the transport and heating sector that may impact us.

We've coordinated with a number of key parties to achieve our whole system approach, and have made every effort to coordinate our plan from the outset, to reduce uncertainty in the price review period.

There will still be risk and uncertainty. Through uncertainty mechanisms, our plans can flex to accommodate this, but we will work to help achieve consensus on the whole systems policy.

We will continue to work with Ofgem and others to make sure that the whole systems policy is implemented in a way which respects our various licence and statutory obligations and delivers consumer benefits.

Assessing the costs of whole system planning

Through whole system coordination, different approaches by different parties may be taken to address emerging issues. Options can include whether it is distribution or transmission who undertakes work, a commercial solution or new assets being required, or the timing of when a project is progressed.

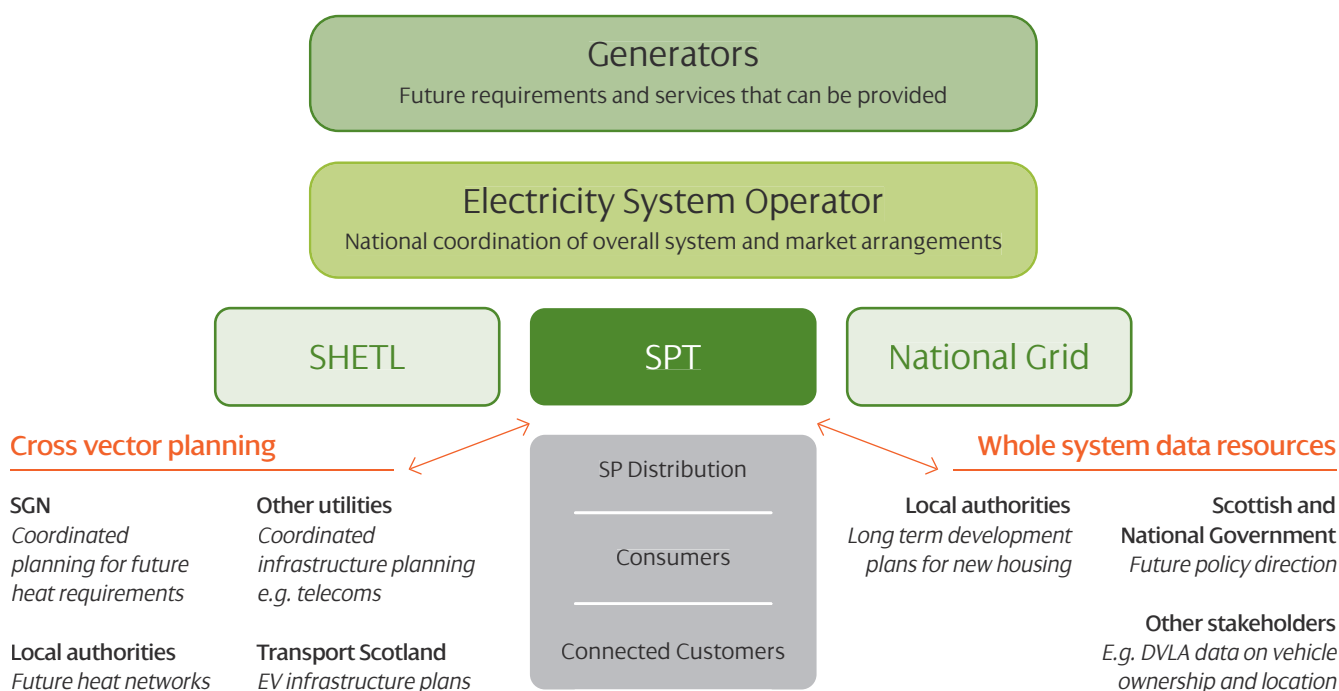
These trade-offs need to be evaluated to identify the most cost-effective option. To make this evaluation, we have used a cost benefit analysis (CBA) approach to ensure a fair comparison is made. We have worked closely with Ofgem to develop a method of calculating the longer-term costs and benefits consistently.

This approach has been used across all our projects where competing options are available. A CBA is also undertaken by the ESO to evaluate projects as part of the Network Options Assessment process. We have engaged an independent specialist to make sure that we have undertaken the analysis consistently and in accordance with the agreed methodology. The inclusion of CBAs in the investment planning processes increases our confidence in our decision making process.

CBAs are not always appropriate. For many projects we have an obligation to undertake work, like connecting a customer to the network. It may be possible to carry out this work in different ways, and where this is the case, we would use a CBA to inform our decisions.

We have not identified separate consumer value propositions for whole systems as the expenditure and benefits are included as part of our load and non-load areas.

We are central to the whole system transformation



Coordinated planning with SP Distribution

1

As a first step, we've ensured that SP Distribution's plans for the remainder of RII0-ED1, and current thinking for ED-2, are coordinated with our transmission plans.

Substation upgrades

We have jointly identified a number of sites on the boundary between transmission and distribution where the available capacity for additional embedded generation is restricted due to voltage, thermal or fault level constraints.

Working together, and where appropriate in conjunction with the ESO, we have identified sites where a distribution or transmission solution would both be viable.

These options have been tested using a cost benefit analysis. This enables us to identify the most economical approach to minimise costs and risk to consumers in the long term – we have considered conventional and innovative means of addressing the issues.

A more flexible system

The increasing levels of distributed generation in Scotland are leading to greater flows of power from the distribution network onto the transmission network. As well as upgrading some of our assets to deal with this, we are also looking at smarter ways for us to operate across distribution and transmission.

In South West Scotland we are developing a coordinated approach spanning distribution, transmission and the ESO, to manage more than 2.5GW of generation. We have assessed the different options to provide this capacity and are implementing an extensive active network management system, utilising real time control systems on both the network and with generators.

This system will operate across almost one third of our network area, comprising 15 substations and coordinated generation connected to both distribution and transmission levels. This is a collaborative project between SP Distribution, SP Transmission as well as the ESO. It has required extensive planning and coordination with generation customers in the region to ensure it meets their needs. This has been supported through regular stakeholder forums to provide updates and shape the design of this initiative.

Co-creating with other network operators

2

The electricity network is extensively interconnected, and coordination is vital. As heat is decarbonised, the interactions between gas and electricity are only going to increase.

Ofgem required network companies to collaborate to agree common factors with a bearing on the Business Plans. The licensees developed a Common RII0-2 scenario that enabled whole system impacts of the business plans to be assessed.

The focus of this work was on the key drivers that would trigger investments in the networks that will have a material impact on licensees' business plans. This work has been referenced in our Load Related Expenditure section and details the SPT-specific scenarios we have developed.

Open Networks

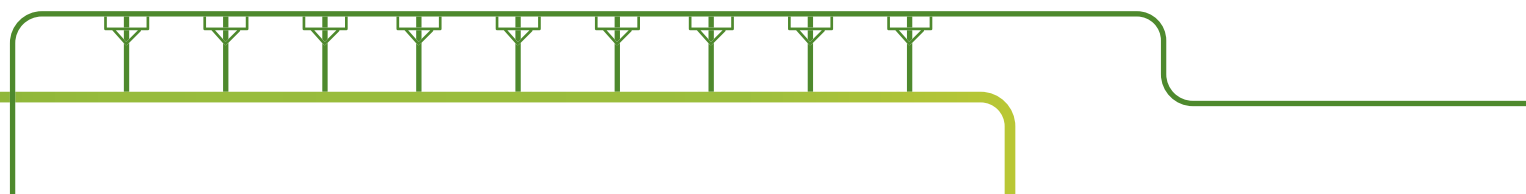
We have worked with the other electricity network operators as part of the Open Networks project. This is a major energy initiative led by the Energy Networks Association that will transform the way our energy networks operate, underpinning the delivery of the smart grid. It brings together nine of the UK and Ireland's electricity grid operators, respected academics, NGOs, government departments, Ofgem and other interested parties.

The Open Networks project is ongoing, and learning from this will be embedded in our business as the project develops.

Working across sectors

We have worked with SGN on the interactions between the gas and electricity networks in central and southern Scotland. One of the major challenges for gas distribution networks has been the increase in small gas generation plants which are seeking to connect to the network. The purpose of this plant is to provide electricity at peak times in response to various market incentives. This technology has an impact on both the gas and electricity networks. We are continuing to work with SGN to understand ways in which we might work effectively together.

We are also involved in a joint project with SGN in the East Neuk of Fife. This mainly focuses on the interactions between the gas and electricity networks. However, it will also have a bearing on the transmission network, and provide insight into the potential impact at a larger scale across our network area.



Coordinating with other TOs and the ESO

3

We work closely with the other transmission owners and the ESO. This ensures our planning of the transmission system is coordinated and complies with the standards that govern the design and operation of the network.

This coordination work is supported through various joint forums and planning frameworks:

Joint Planning Committee (JPC)

Our activities are coordinated with the other transmission owners and the ESO through the Joint Planning Committee (JPC). This group meets quarterly to discuss investment plans, the status of any joint projects or programmes of works and considers the impact of changes to various industry frameworks and codes.

ESO Future Energy Scenarios

The annual production of the Future Energy Scenarios is used as the basis for evaluating major transmission upgrades, and used by us as the basis for our RIIO-T2 plan. We actively support the ESO in producing these scenarios by sharing our insights and planning information, to make sure they reflect our network and customers.

Electricity ten-year statement

Every year, we collaborate with the ESO to produce a review of the planned changes on the transmission network for the next ten years. This allows other interested parties such as generators and customers to understand our engineering plans for the network.

Network outage planning

Planning for outages on the network requires careful planning and coordination with the ESO, customers and other TOs. Outages are required on the transmission system to carry out works in a coordinated way, whilst maintaining system security.

Network access policy

This policy covers the planning approach taken by the TOs and the ESO. It describes the necessary consultation and stakeholder engagement required to access the network and a joint network, access policy is developed across all three TOs. This policy clarifies what the ESO and other stakeholders can expect from the SP Transmission regarding how our actions affect the availability of the transmission network.

£190m

of our expenditure is justified through the NOA process

Network Options Assessment (NOA)

This is one of the most notable whole system activities which has a major bearing on our RIIO-T2 plan. Using the national Future Energy Scenarios, the generation and demand backgrounds are used to calculate what level of power is required to be transferred across the network boundaries for each scenario for the next few decades.

Each transmission owner proposes projects that could address the issues emerging from this analysis. Where projects span two or more license areas, the TOs work together to develop these. The ESO then performs an economic study of all the proposals to identify the least worst regrets approach and provides an indication whether projects should be progressed or put on hold. The TOs then work together with the support of the ESO to fully justify the works on the system.

We have engaged with the ESO on our proposals for RIIO-T2 to ensure that they are coordinated. The ESO is carrying out a number of pathfinder projects to look at alternative means for addressing voltage, stability and constraint issues on different parts of the network. We have aligned our RIIO-T2 plans with these developing projects as much as possible at this point in time.

As we have developed our plan, we have considered commercial alternatives for some of our projects where these are viable. We have evaluated these options through a cost-benefit analysis to consider which approach is the most cost effective for consumers with the support of the ESO. Over the course of RIIO-T2, we will continue to review our plan to consider alternative approaches that may emerge.



Coordinating with generators and other connected customers

4

In our view, working with electricity generators presents one of the largest opportunities to deliver substantial benefits through whole system planning.

From the large amount of generation we've connected over the course of RIIO-T1, we have extensive experience in effective planning with generators, in particular renewable generators.

As well as providing points of connection, we have also established a number of innovative control schemes with generators. These allow for increased operational control of the transmission network and generators connected to it. They have been developed with the ESO to provide a coordinated approach that offers the greatest value in their operation of the network.

Engagement with generators has also been one of the key influences to make sure our plan is coordinated with these customers. In RIIO-T2 we also have a number of schemes which are designed to assist with the connection of renewable generation.

These include:

The Generation Export Management System in south-west Scotland to maximise the utilisation of the transmission and distribution networks in that area.

Harmonic filters on the transmission system which, compared to previous approaches, provide a cost-effective and coordinated solution. This work has support from generators and will help to manage harmonics across the network while minimising costs to consumers and generators.

Future flexibility

SPEN are currently tendering for 95MW of flexibility services, which will mitigate the need for reinforcement. This is primarily for the distribution network, however it will also help to manage the future impact on the transmission network. A range of different customers will be able to participate in this to deliver such services. This approach will continue through the RIIO-T2 period.

Coordinating with other stakeholders

5

To help create a truly coordinated whole system approach, we have worked with the Scottish Government in their development of a Network Vision for Scotland for both gas and electricity.

The Scottish Government identifies that to achieve their long-term energy plans, they need organisations to work in partnership, and deliver networks that support wider social and economic aims.

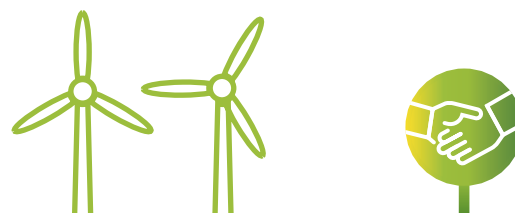
We have worked extensively with the Scottish Government in the development of this strategy by sharing our own views and experiences openly.

We have met with a number of local authorities and collated the data they have published on future plans. In many instances these are very broad and cannot be mapped directly onto individual parts of the transmission network. This is an area we will continue to work on as they develop Local Heat and Energy Efficiency strategies to allow us to consider what Local Area Energy Plans may look like.

Leading the transition to Net Zero

The National Infrastructure Commission and Infrastructure Commission for Scotland have identified a number of steps that are required to deliver Net Zero. We have and will continue to engage with these organisations to ensure we are aligned with their vision which extends beyond only the electricity and energy systems.

This ongoing collaboration will help us to lead the way in supporting effective whole system solutions which contribute to achieving government targets of Net Zero emissions.



Scottish Government Network Vision:

www.gov.scot/publications/vision-scotlands-electricity-gas-networks-2030/

Applying a whole system approach in practice

Westfield grid supply point is a substation with planned works in RIIO-T2. This is one of the interface points between the distribution and transmission network in Fife, in the east of Scotland. To develop the most cost-effective approach and examine the changes that may take place at this site to achieve Net Zero, we have taken a whole system approach and sought to include elements of Local Area Energy Planning.

For projects such as this, we consider the longer-term requirements of this site by analysing the historic trends in this area such as generation connection applications, the current status of the site, and reviewing the future energy plans in the local area. We have worked extensively with SP Distribution to do this and have drawn on a range of other data from stakeholders such as the local authority and generators, as well as engaging with them on their plans.

Westfield GSP provides supplies to 20,000 customers and has a winter peak demand of 31.5MW. In recent years 21MW of wind generation and 11MW of small scale thermal generation has connected to the distribution network. Because embedded generation normally exceeds demand, this site is exporting power to the transmission network throughout the year. A further contract for 55MW of generation has also now been accepted by a customer. This additional generation cannot connect due to fault level exceeding the rating of the equipment which would be unsafe. A solution to mitigate the problem is now required.

Conventional approach

At this site, the lowest cost approach is for SP Distribution to install a bus-section reactor to address the immediate fault level problem and allow the contracted generation to connect. This would cost approximately £4.07m in the short term. However, this would not address further changes across the whole system, such as further growth in generation or other changes to demands on the substation. Should further generation emerge, the transformers would need to be replaced, making the bus-section reactor redundant.

The asset condition data from the transformers estimates between 15 and 21 years remaining before reaching end of life. By 2040, we would have to revisit the site to replace the transformers. The cost to revisit the site for all these works would total £7.01m and could delay further connection of new generation.

Minimising costs for consumers at Westfield GSP

Conventional approach:

2021-26 expenditure – £4.07m

Total capital expenditure by 2050 – £11.08m

NPV – £15.64m

Most efficient whole system approach:

2021-26 expenditure – £5.41m

Total capital expenditure by 2050 – £5.41m

NPV – £19.70m

Additional benefits – increased headroom for new generators to connect to the network.



Coordinated whole systems planning

Working with SP Distribution, we assessed the various factors that affect this site when our plan was built. This included future changes in demand and generation and the condition of the assets.

Future demand changes

These are informed by our Future Energy Scenarios to identify the factors that may change over time. It is also supported by stakeholder input including data from Fife Council on future housing projections, a review of any plans for future district heating networks, DVLA data on EV uptake and other local insight by SP Distribution.

Future Energy Scenarios

Demand Projections

	2018	2026	2040
Electric Vehicles	50	332-1,462 (+0.2-1MW)	10,248-19,431 (+5.3-15.3MW)
Heat Pump Installations	No known installations	78-420 (+0.1-0.9MW)	244-3,282 (0.4-3.7MW)
Demand changes (Peak demand)	31.5MW	29.9-35.6MW	27.2-36.6MW

Future generation changes

A review of all contracted connections was made to identify the additional capacity and timeframes that are required contractually. Additionally, a review of other levels of interest was also taken into account to reduce the risk of any increased capacity being consumed as soon as it is created. In the example of Westfield this includes:

Contracted requirements of 55MW by 2022/3.

High levels of historic interest in this site. From speaking to developers who have previously applied for connections in this area, there continues to be strong interest due to favourable planning conditions but current network conditions are limiting interest due to the timescales to connect and costs. Over the last five years, this site has had 27 applications for generation totalling 120MW. Applications have slowed recently due to the long lead time for connection and high connection cost as a result of the reinforcement required.

Projections in our Future Energy Scenarios for various generation technology including solar PV, CHP, controllable generation such as small gas turbines and wind generation.

Future Energy Scenarios

Generation Projections

(MW)

	2018	2026	2040
Wind	20	20-23	21-52
Solar PV	0	1-32	2-37
Storage	0	0	0
Controllable	11	11	11
CHP	0	1-23	1-23
Total	31	33-89	35-123

From this we have a high confidence that any additional capacity that is created will be consumed by generators in a short period of time.

Coordinated whole systems solutions

From assessing these factors, a range of solutions that could be deployed by SP Distribution or SP Transmission have been considered. In the example of Westfield, some of the solutions that were considered included:

No intervention – not accepted due to contractual requirement not being met.

Active network management – would not address the fault level issue and would constrain any future generation.

Transformer upgrade to meet SP Distribution's contractual requirements – fault level would be addressed but would not create any additional capacity beyond this.

Bus Section Reactor including 33kV switchgear replacement – fault level would be addressed but would not create additional capacity beyond this.

Transformer upgrade – to create additional capacity and as an enabler for additional generation.

Various other innovative solutions such as fault current limiters, but none of these provide sufficient long-term capacity.

A solution ready for the future

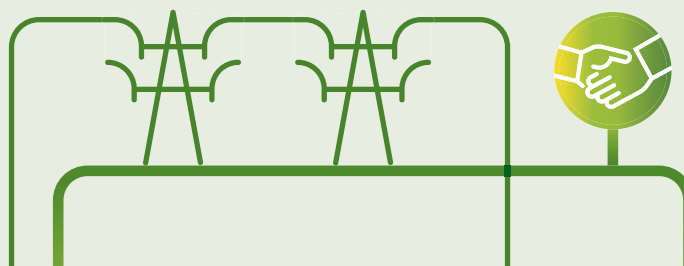
For Westfield we have drawn on the evidence and support from stakeholders to create additional capacity and to reduce the long-term costs for this site. We are planning to upgrade the existing transformers with SPD, which has a higher cost in the RII0-T2 period, but offers greater consumer value in the longer term.

Implementing these forward-thinking solutions will prepare the network for future generations – and allow us to make a smooth transition to becoming a Net Zero society.

Managing the risks of uncertainty

This expenditure is ahead of a contractual need, but based on the engagement and feedback from stakeholders, we view this to present a low risk of stranding. Generation developers have highlighted that the risk of not creating capacity and having to replace new equipment prematurely is far higher than new generation not materialising.

Based on the evidence from different parties, we support this view. The cost benefit analysis of the different approaches justifies the investment to create additional capacity as the most cost-effective approach in the long term.



Whole system planning in RIIO-T2

Where information is available, we have sought to take a whole system approach to building our RIIO-T2 plan, but we realise there is further work to be done. In RIIO-T2 we will continue to engage with consumers, network users and wider stakeholders to get a view on the impact of our plans and any other factors we need to consider.

To enhance our planning, we have identified a number of parties where further coordination is required. For some of these stakeholders, it will involve sharing new sources of data which we have never had to consider, such as Electric Vehicle registrations or charge point installations. In other areas there will be more active planning to coordinate investment.

Local authority development plans – local authorities develop plans that identify projections for new properties and where these will be located. This will aid in future projections for demand growth, and make sure the optimal investments are undertaken.

Local authorities Local Heat and Energy Efficiency Strategies (LHEES) – the Scottish Government has issued guidance to local authorities on appraising the impact of heat and energy efficiency. This will improve longer term planning for heat needs which we can account for in the planning of the electricity network to meet these plans.

Transport Scotland – we share information and planning assumptions with Transport Scotland, but we have identified the need to work more closely to ensure that national transport plans for EV charging – as well as the electrification of other vehicles – can be proactively met.

SGN – a range of future opportunities have been identified to ensure longer-term coordination across the gas and electricity network. Key areas of interaction include new gas generation sites as well as evolving heat requirements.

DVLA – initial engagement has already commenced to understand what information could be shared on electric vehicle registrations, allowing us to target investment in the network.

From working with these stakeholders and other parties, we will be able to co-develop our plans to make sure the longer-term changes can be accounted for, and the optimal approach can be taken to address the changes that emerge as soon as possible.

Supporting carbon-free operation of the grid by 2025

The ESO has set a target to have a network which can operate with zero-carbon by 2025. In Central and Southern Scotland we are well on the way to this milestone, with 97% of all generation we have connected being from zero-carbon sources. We are working with the ESO on a number of projects that will enable us to go further and meet their target.

A pathfinder project assessing the impact of these changes on the stability of the network is one of the main challenges. We have included an uncertainty mechanism for synchronous compensation in our plan. This allows us to install any synchronous compensation that may be required in addition to stability services procured by the ESO, at the right time and location, to ensure successful zero-carbon operation of the network.

The Network Options Assessment process is continually evolving and a number of new projects are being progressed through this process annually. Over RIIO-T2 we will continue to support the ESO and other TOs in the process to ensure that our plans respond to the changes.

We are also undertaking an innovative Generation Export Management System in RIIO-T2 which will continue to evolve over the course of the price review. This is a collaborative project between the ESO, SP Distribution and SP Transmission to connect greater volumes of generation through proactive management of the power they are exporting – as opposed to building further infrastructure. This also required collaboration with a range of market participants across southern Scotland, in particular different types of generators, connected to both distribution and transmission. Projects such as this will be critical to connecting more generation to meet the 2025 target, and minimising the overall cost to customers. Further details of this project are detailed in our load-related expenditure section.

Supporting the DSO model

As SP Distribution evolves to become a Distribution System Operator, we will continue to work closely with them to look at what other opportunities arise. We expect this emerging model will create new opportunities to coordinate commercial services for flexibility as demonstrated by the current tender we are running for 95MW of flexibility services. This will likely change the need for further reinforcement as the management of demand, generation and storage becomes further embedded in the distribution network.

Working with the ESO

97% of all generation we have connected has a zero carbon source

97%

Over the next decade we expect to see major changes to the way the network operates. The transition to a **sustainable, Net Zero future** will require us to connect more renewable generation and ensure the system operates to the same high standard. The electrification of heat and transport will also increase demand, and change the way that electricity is consumed.

Enabling this evolution is the core aim of our load related expenditure. This section sets out the changes we anticipate, how we expect to accommodate them and the impact this will have on how we invest our funding.

Generation connections, [Pg 71](#)

Facilitating the connection of new electricity generators to the transmission network, and the upgrades to make sure the power can get to its final destination.

1

Boundary upgrades, [Pg 75](#)

Increasing the capacity of our network at the points where it connects with Scottish Hydro Electric Transmission to the north, and National Grid to the south. This enables increasing amounts of generation connecting across Scotland which needs to be transmitted to England and Wales through the SP Transmission network.

2

Reinforcements, [Pg 79](#)

As generation and demand patterns change in our network, we need to make sure the network is compliant with the relevant standards, and that it's prepared to meet future changes. If we don't, this can lead to problems with the voltage on the network, the capacity of assets, and the way the network copes with faults and other events.

3

Demand connections, [Pg 83](#)

New or upgraded connections to the transmission network for SP Distribution and other users who consume power, such as Network Rail and other major electricity users.

4

We present detailed analysis and comparison of activity levels against RII0-T1 in [Annex 19: Investment Plan Additional Analysis](#).



Load Related Expenditure



Consumer Value Proposition

Our baseline plan will directly connect 900MW of renewable generation, create capacity for 800MW of embedded generation and increase the capacity for additional renewable generation to be transferred across Scotland and Great Britain.

*Reducing GHG emissions by
1.6Mt p.a. with a value of*

£81m p.a.

Reducing the average annual constraint costs the ESO would incur by £152m by the end of RIIO-T2 as a result of our boundary upgrades we are completing in the period.

£152m p.a.

Ensuring transmission network capacity for the connection of 130,000 new electric vehicles which we anticipate could require to be charged through the network by the end of RIIO-T2. In doing so, we will contribute £3.7m per year in value by the end of RIIO-T2.

£3.7m p.a.

An overview of our planned investment and bill-related breakdown across load

Generation connections

£109.3m

Demand connections

£116.2m

£540.1m

*Total planned expenditure
across four key areas*

Boundary upgrades

£190.2m

Reinforcement

£124.4m

32p

*of the average
annual domestic
customer's bill*

Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Stakeholder engagement for load related expenditure makes sure that our plans are reflective of evolving requirements of consumers, network users and wider stakeholders. These changing needs include the new renewable generation that may be connecting to the electricity network and changing demand patterns from new technologies such as electric vehicles.

Of course engagement in this area is also heavily linked with our whole system, future energy scenarios and innovation discussions as we act strategically to facilitate a rapid transition to Net Zero.

How and why we have engaged with our stakeholders

We have engaged directly with consumers and consumer representatives through the TO-wide Willingness-to-Pay survey as well as in our own, qualitative consumer survey. We also confirmed our load expenditure plans with consumers, businesses and consumer across Great Britain through our acceptability research. We have engaged bilaterally with network users – primarily generation developers who have connected previously or are contracted to connect in the future. We have also reviewed our approach and plans with key policy makers such as the Scottish Government to make sure it corresponds with their views on the future direction of energy policy. We also reviewed our plans with trade bodies such as the Association of Decentralised Energy, making sure that our plans considered their requirements.

We have published a range of future energy scenarios which looked at the different pathways that may evolve. This was shaped by stakeholders through workshops, a webinar and online consultation. The use of these different channels allowed us to get feedback from directly impacted network customers as well as other parties who had an interest and knowledge of this area.

What our stakeholders have told us is important to them

Through our engagement, we know that consumers value our role in addressing climate change through enabling renewable generation and future transport needs. We received strong support from the User Group and network users for the investment approach we have taken. Building on National Grid's Future Energy Scenarios to shape our plan is a valuable approach to consider the range of uncertainty in the future. There were different views on the rate of change that we may see through RIIO-T2, for example the rate of uptake of electric vehicles and timing of new renewable generation connecting to the network. Therefore, the need for flexibility was also highlighted to ensure that we can respond to whatever changes materialise.

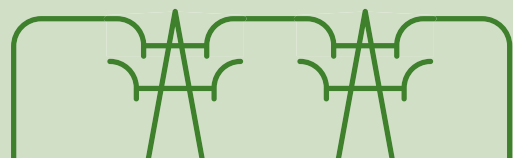
How stakeholder feedback has shaped our plans

Based on feedback from consumers and consumer representatives, we have detailed how we are addressing climate change mitigation and more renewable energy as efficiently as possible in this chapter. The feedback received from our stakeholders including the Transmission User Group has reinforced our approach to load-related expenditure: that is, to only include investment with high certainty. Where we don't have the same confidence, we will implement mechanisms that provide additional funding to undertake works only when confidence is at a suitable level. We enlisted a range of informed stakeholders to review our approach to determining those projects with high confidence, and have confirmed that it is suitable.

We have also reviewed our baseline projects and only included those we have the greatest confidence in. As a result we have reviewed our generation connections and removed the synchronous compensation that we had outlined in our draft plan based on the views from stakeholders due to various options to address this need.

Why these changes are important

The stakeholder feedback we have received has provided us with confidence that our investment strategies and decisions for RIIO-T2 are robust, justified and what is needed to ensure we are facilitating the path to Net Zero. Input from consumers, network users and wider stakeholders alike makes sure that our plans can accommodate future requirements of connected customers as well as new market entrants, while simultaneously ensuring that consumers are not paying to reinforce the network too early or when it is not required.



Planning for the future

We can't be completely certain how the transmission network will develop for a Net Zero future. We must create a business plan flexible enough to meet the needs of customers in a cost effective and efficient way, whatever the future brings.

Load related expenditure

Load related expenditure details the work we plan to undertake to accommodate changing customer requirements.

This includes:

Connection of new generation to the network.
Boundary upgrades at the points where we connect with SSEN to the north and NGET to the south.
Reinforcement to ensure our network continues to operate efficiently to the necessary standards.
Connection of new demand on the network.

We plan for the future with different scenarios

Together with Baringa Partners and Element Energy, we've developed four scenarios for the SP Transmission network area. These scenarios are based on the four National Grid Future Energy Scenarios 2019 but we have revised them at a granular level for our network area to understand what this means for us.

These scenarios help us model the future requirements of the transmission network in line with potential changes. We've developed a plan that is flexible enough to meet the wide range of uncertainties outlined in the scenarios.

The future energy scenarios are framed by two drivers of change; the level of carbon reduction that is achieved by 2050, and the level of decentralisation of the energy system. It is important to note that the 2019 FES does not include a Net Zero scenario, as the Climate Change Committee recommendation was made after publication. **We consider the impact that Net Zero might have on page 69.**

Using scenarios to build a flexible plan

We need to make sure our plans adapt to meet customers' needs. Our scenarios provide us with a framework to test the range of flexibility we need to be prepared for. We have used our scenarios to stress-test our plans, and make sure they can meet the requirements of each scenario.

For our plan, we've made sure:

the expenditure is justified for each of the scenarios,
the regulatory mechanisms have flexible means of adjusting the allowances to reflect this uncertainty.

As we're already aware of many of the generation connections in the future, we've used these to support the scenarios. Reviewing these future connections has allowed us to take a more robust view of which generation we have a greater confidence in connecting to the network. This helps to provide more certainty in our plans.

The National Grid Future Energy Scenarios already contain a spatial breakdown within our licence area. However, this breakdown is generally based on simple GB-wide proxies. A key focus of our analysis has been to tailor the scenarios to our area. This was undertaken through a number of routes, including use of supplementary data sources, refinement of the methodology to disaggregate to the key nodes on our network, and feedback from stakeholders.

To develop our plans, we have used our highly detailed models of the electricity network to examine future issues that may arise. We've then updated the models to study the different scenarios and identify where problems on the network may arise, including changes to the generation make-up and demand profiles.

Full details of how we have assessed this are detailed in the relevant engineering justification papers for each project.

Listening to our stakeholders

We have continued to review our assumptions with consumers, network users and wider stakeholders following the publication of our first draft business plan and refreshed our scenarios using the FES 2019. A broad range of stakeholders and customers were involved in this process, with particular emphasis on those most likely to be directly impacted by our plans.

Where views were provided by stakeholders on some of the ranges that the future energy scenarios covered, we have used these views as a sensitivity to test our plans. We did not change the ranges to ensure consistency with the national FES.

Full detail of the energy scenarios are available in **Annex 15: RIIO-T2 Central and Southern Scotland Electricity Scenarios 2019.**



A detailed overview of the process we have taken and the views of stakeholders is included in **Annex 14: Baringa SPT Future Energy Scenarios Analysis.**



The drivers of supply and demand

Knowing how energy demand and supply could evolve helps us understand the reinforcements we may need to make to our network. Here is an outline of what we expect to see.

How we think electricity demand will evolve

Over the last ten years, demand for electricity has fallen, due to changes in the industrial landscape and major progress in energy efficiency. However, demand is set to increase as we move towards more electric transport and heating more buildings by electricity.

We think demand changes in the coming years will be driven by:

Electric vehicles – we anticipate up to 20% of vehicles in Scotland will use electricity by 2030. That's around 610,000 vehicles which could require up to 406MW of power at peak times, less than 10% of additional demand. To minimise the impact on the network, we will need to manage some of this demand flexibly, for example, by delaying charging electric vehicles until an off-peak time overnight.

Heating – using electrical heat pumps to heat buildings is currently quite rare, but it may become more popular in the future, particularly in new build and off-gas grid properties. We don't expect this to impact demand by much in RIIO-T2. However, it's a very difficult area to predict: electrical heating is just one of the approaches the UK could take to meeting the Net Zero target.

Domestic demand – we're using less electricity in our homes for things like appliances, lighting and other consumer goods, due to improving energy efficiency and 'behind the meter' generation such as rooftop solar panels. We expect further reductions as our homes become more energy efficient and people are incentivised to shift electricity use to off-peak periods.

Industrial and commercial demand – demand from shops, offices and industry has also reduced due to improved efficiency and behind the meter generation. Economic factors will mean this trend is likely to continue, with the exception of a small number of energy intensive industries.

Population changes – demand from each consumer is reducing but our population is increasing. We expect population growth in our area to be modest and not have a big impact. A 2% growth in population is forecast by 2026 according to the ONS.

Overall, we expect new demand to grow relatively modestly through the RIIO-T2 period and on to 2030, although we see it accelerating rapidly after this point. However, it is the flexibility of new demand, particularly from electric vehicles, which will play the biggest part in whether peak demand increases.

How we think electricity supply will change

Changes to generation is one of the largest drivers of expenditure for electricity transmission. Scotland is regularly generating more power from renewable sources than it consumes which means the transmission network plays an important role in linking these generators with the sources of demand across Great Britain.

There are three main factors for our network:

Wind generation – the steady growth in wind capacity on our network is likely to continue, based on projects currently being developed. Growth in transmission-connected wind, both onshore and offshore, is expected to more than double in capacity across most scenarios, largely due to offshore wind – a prediction most of our external stakeholders agree with.

Solar PV – solar photovoltaic (PV) generation is set to increase, including small-scale building rooftop schemes and larger scale solar farms. However, we expect it will have a minimal impact in winter in Scotland, and a relatively low impact in summer when we experience peak and minimum demands on our network.

Energy storage – storing electricity can help with the management of peak demand and network constraints. At present, storage capability is largely limited to pumped hydro. We're now seeing a greater interest in large scale batteries connecting to the distribution and transmission network. We anticipate it having a low impact on the transmission system over the RIIO-T2 period.

We will also be impacted by some of the changes that take place in other parts of the network across Great Britain. New nuclear generation in England and Wales, an increasing number of interconnectors with other countries and other forms of generation such as gas will all have an impact on the operation of our network as they meet demand when renewables are not available.

Other changes we expect to see

In addition to changes to energy demand and supply, there are other transitions which may materialise during the RIIO-T2 period:

The emergence of **Distribution System Operators (DSOs)** is likely to play a significant role, developing rapidly following the next Distribution Price Review in 2023. In the long term, this could change the supply and demand seen by the transmission network.

The Scottish Government has identified a potential role for **hydrogen** in the future energy mix, using it to decarbonise by substituting methane for heating, or as fuel for transport. We view this as having a low impact in RIIO-T2.

The closure of existing generation, in particular the nuclear generation at Hunterston. The loss of this generation will create some capacity for new generation, but without mitigating reinforcement, will also significantly impact the operability of our network.

Overall, there is a wide range of uncertainty in the expected levels of demand and supply in the longer-term. The most rapid changes are expected to happen from the late 2020s onwards – after the RIIO-T2 period.



A consistent view of the future

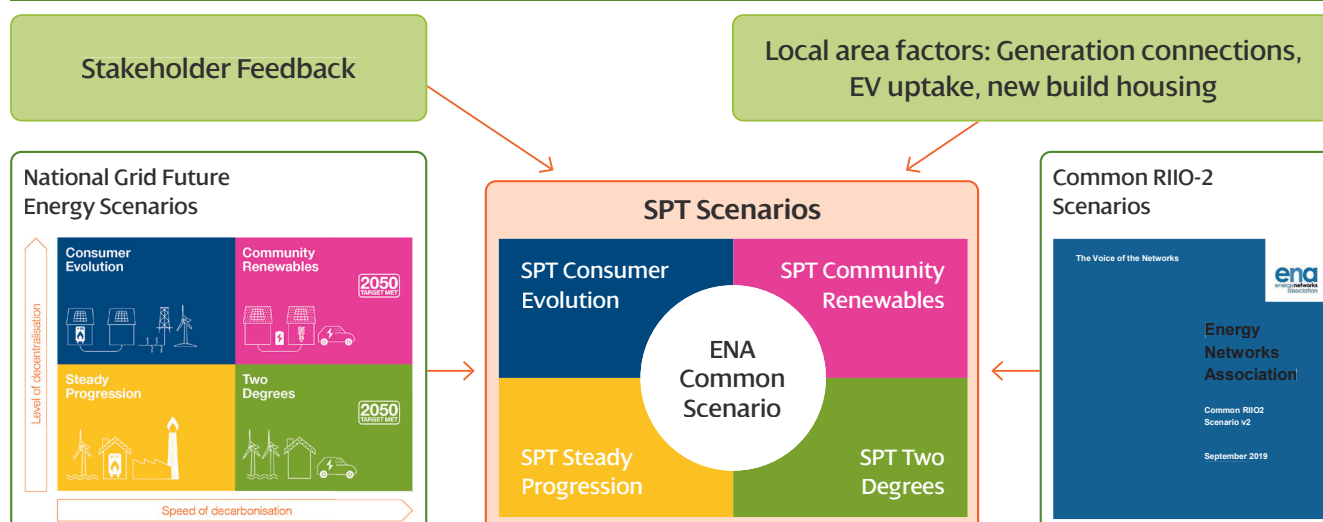
We have worked with the other network operators across gas and electricity to develop a Common RIIO-2 Scenario. This sits within the overall framework we have developed, and helps to consider the dynamics of a scenario across the different sectors.

Our baseline plan is based on high certainty projects and across all of the most relevant areas, is aligned or below the common scenario. We expect that the out turn will be higher than this, and will use uncertainty mechanisms to flex our plan to meet the emerging needs.

The ENA Common RIIO-2 Scenario can be found at: <http://www.energynetworks.org/news/publications/reports/>

Key Drivers	SPT 2017 starting point	SPT 2026 levels from our baseline plan	Common view of 2030 range for SPT		Notes
			Low	High	
Offshore wind – <i>Transmission connected</i>	0.0GW	0.45GW	1.0GW	2.5GW	Additional generation is still uncertain and is funded through uncertainty mechanisms.
Onshore wind – <i>Transmission connected</i>	2.9GW	4.4GW	4.6GW	5.5GW	High probability projects in RIIO-T2. Includes 600MW of generation to connect by the end of RIIO-T1.
Nuclear	2.2GW	1.2GW	0.0GW	0.0GW	Alignment with Common view. Torness nuclear power station is expected to close in 2030.
Distribution Generation	1.6GW	2.1GW	2.4GW	2.9GW	Reflects updated ENA common scenario.
Other generation – <i>Transmission connected</i>	0.3GW	0.3GW	0.1GW	0.2GW	Differences due to assumptions around existing site closures, differences have low impact.
Interconnectors	0.5GW	0.5GW	0.5GW	1.0GW	Moyle interconnector only.
Storage – <i>Transmission connected</i>	0.44GW	0.44GW	0.5GW	0.8GW	Additional storage will be funded through uncertainty mechanism.
Electric Vehicles	5,157	Up to 158,000	680,000	720,000	Significant uptake expected in period from 2026-2030 as government targets get closer.
Alternative heat	5,252 dwellings	Up to 67,000 dwellings	80,000 dwellings	164,000 dwellings	Low materiality to transmission.
Peak demand	3.3GW	3.4-3.5GW	4.1GW	4.2GW	Range of scenarios considered as high and low demands have different impacts on the network.

Integrating the scenarios and feedback



Facilitating Net Zero for customers

Both the Scottish and UK governments are now progressing legislation to require a Net Zero target for carbon emissions by 2045 and 2050 respectively.

Preparing for Electric Vehicles

We predict increased peak demand of up to 406MW due to EVs in our area by 2030. But spread across our network, the average impact is only 4.5MW per GSP and does not exceed 12MW at any GSP. Combined with growth in embedded generation, our network can easily absorb this additional demand without further investment in RIIO-T2. We forecast that the impact of EVs won't impact the transmission network until later in the 2020s or early 2030s.

These targets represent a step change in the levels of decarbonisation required compared to the previous targets which are reflected in our scenarios. We have a role to play in the actions we undertake which are detailed in our Environmental Action Plan, but also have a role in facilitating the changes our customers make. The full implications on the electricity network of the changes that would be required to achieve this target are still not clear, and we expect that many of the most significant changes that may be required will not take effect until after the RIIO-T2 period.

The Committee on Climate Change (CCC) have identified the key changes that need to be undertaken in their UK Net Zero scenario for their report '*Net Zero – The UK's contribution to stopping global warming*' and the steps they view as being required before 2030.

Some of these changes are not anticipated in the RIIO-T2 period and not modelled through the future energy scenarios in the near term, but we are confident that our plan has the flexibility through uncertainty mechanisms to accommodate any of the changes that may emerge.

Committee on Climate Change scenarios for Net Zero

	CCC Net Zero greenhouse gas scenario for 2020s	Our actions in RIIO-T2
Electricity	Largely decarbonise electricity: renewables, flexibility, coal phase-out	We have no connected coal or large gas generation. We plan to accommodate further volumes of renewable generation, most of which stakeholders have indicated will be on and off-shore wind.
Hydrogen	Start large-scale hydrogen production with CCS	Through our work with SGN, there are trials being undertaken in our network area with hydrogen but these are still at an early stage. We do not anticipate this leading to a major impact on the transmission network in the RIIO-T2 period.
Buildings	Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)	Improving building, appliance and lighting efficiency will reduce demand, which is what we have explored through our scenarios. The decarbonisation of heat could take many different pathways such as heat pumps, communal heat networks or other energy sources such as hydrogen. We expect this transition to be focused on new build properties in the RIIO-T2 period due to changes in government policy and building standards.
Road transport	Ramp up of EV market, decisions on HGVs	Scotland has set a target for an end to the purchase of new petrol and diesel cars by 2032. We have considered a range of uncertainties in this area such as the means of charging vehicles and rate of uptake to inform our plans. We do not expect this to have a material impact on the transmission network in RIIO-T2, but we will see an impact by 2030 and beyond.
Industry	Initial Carbon capture and storage (CCS) clusters, energy and resource efficiency	Improving industrial energy efficiency will also reduce demand, partly offsetting the increases in demand from vehicles and heat. The electrification of some industrial processes in place of fossil fuels and installation of renewable generation on site may also improve efficiency. From customers who have taken this approach to date, this can require upgrades to the electricity network to allow surplus power to be exported.
Infrastructure	CCS clusters, decisions on gas grid and HGV infrastructure, expand vehicle charging and electricity grids	We will continue to work with other infrastructure providers and decision makers including SGN, Transport Scotland and the Scottish Government to ensure that our plans are aligned.

Assessing our options

Our energy scenarios are one of the indicators we have used to identify where changes to the network will be required. Once we have identified an issue, we then consider how we go about addressing this.

We use our engineering experience and detailed knowledge of the network to identify a range of options and then assess these using a cost benefit analysis (CBA). A CBA is not always applicable, but we use this as an indicator on the best course of action to take. As part of our CBA, we also consider the different scenarios to look at the sensitivity between different solutions.

We have assessed the long term requirements of the assets we are installing to ensure that there is sufficient capacity for future changes. This is a balance to make sure that excessive capacity is not created which results in stranded assets, but reduces the risk of having to re-visit the site in the near term. We have analysed this by looking at the sensitivity of upgrade works in the different scenarios, to understand at what point in time further capacity would be required and the additional costs. These sensitivities are considered through the CBA model. Due to the growth in generation, the risk of stranding of assets is deemed to be low.

Preparing for Net Zero: case study

At Newarthill Grid Supply Point, additional generation contracted to connect is resulting in a fault level constraint. A number of options have been considered to address this safety issue and the constraint it creates for new generators. The lowest cost solution would address the present issue, but no additional capacity would be provided beyond this.

From engaging with stakeholders and looking at historic levels of applications for this site, there is substantial interest in further connections at this location – we have received more than 100MW of connection applications in the first six months of 2019. For an increased upgrade at this site with an associated cost increase from £6.41m to £8.62m, an additional 120MW of capacity can be created. Should this increased capacity not be provided at this site, the cost of re-visiting the site to increase the capacity would result in a total project cost of more than £13m over the course of RIIO-T2 and T3.

This approach is one example of how we have considered where anticipatory investment is of value to prepare for Net Zero and presents a cost effective low risk option for consumers. We have weighed up the evidence and feedback that further investment is probable in the near future to make sure our expenditure is future proofed without creating undue risk.



Our licence obligations

The design of the electricity transmission network is governed by a range of standards and regulations which we have a licence obligation to meet. When we study the future network, we need to ensure that it meets all of these requirements. These help to ensure safety, consistency in the way that the network is designed and a level playing field for all parties.

Some of the key documents include:

Security and Quality of Supply Standard (SQSS) – setting out criteria and the methodology for planning and operating the National Electricity Transmission System.

Grid Code – technical code for connection to and development of the National Electricity Transmission System.

Electricity Safety, Quality and Continuity Regulation (ESQCR) – legal requirements for the safe and secure operation of the electricity network.

System Operator-Transmission Owner Code (STC) – defines the relationship between the transmission system owners and the transmission system operator.

Standards review

BEIS have appointed a group of industry experts to review existing industry engineering standards. The impact of any recommendations is unknown, and initial conclusions are not expected until early 2020. The ESO is proposing a review of the SQSS in their RIIO-T2 business plan. We don't expect any changes to take place until we are part way through RIIO-T2.

To accommodate any changes that this has on our business plan, we are proposing an uncertainty mechanism for changes to standards to take account of any financial impacts their reviews may have.

You can find full details of our CBA approach in **Annex 8: Cost Benefit Analysis**.



Expenditure on generation connections

1

Connecting new generation to the transmission network requires investment in new infrastructure. It may also lead to the need to reinforce the existing network, allowing additional power to flow. Infrastructure can include overhead lines, cables or substations as well as innovative solutions such as active network management.

The equipment and capacity is entirely dependent on the location and size of the generation seeking to connect.

However, there is a high level of uncertainty over future levels of generation connections, with numerous factors affecting site development. We have engaged with a wide range of stakeholders to inform our views on future generation and cross-checked these against the future energy scenarios.

For each of the dominant technologies, we have summarised this feedback and referenced it against the Energy Networks Association Common RII0-2 Scenario analysis.

Onshore wind

By the end of RII0-T1, we expect to have approximately 3.5GW of onshore wind connected to the SP Transmission network.

The ENA Common RII02 Scenario report anticipated between 4.6GW and 5.6GW of onshore wind by 2030 which is marginally higher than our baseline view. In RII0-T2 we have a high confidence that 900MW of additional onshore generation will connect to the transmission network. We expect further generation will also connect, but the volumes, types of projects and locations are far less certain. We believe that this is a credible out-turn for the end of RII0-T2 based on discussions with generation developers. Stakeholders have also highlighted the likelihood of repowering existing windfarms as they approach end of life. From speaking to existing customers and examining the relevant sites, we expect this to have a low impact in RII0-T2.

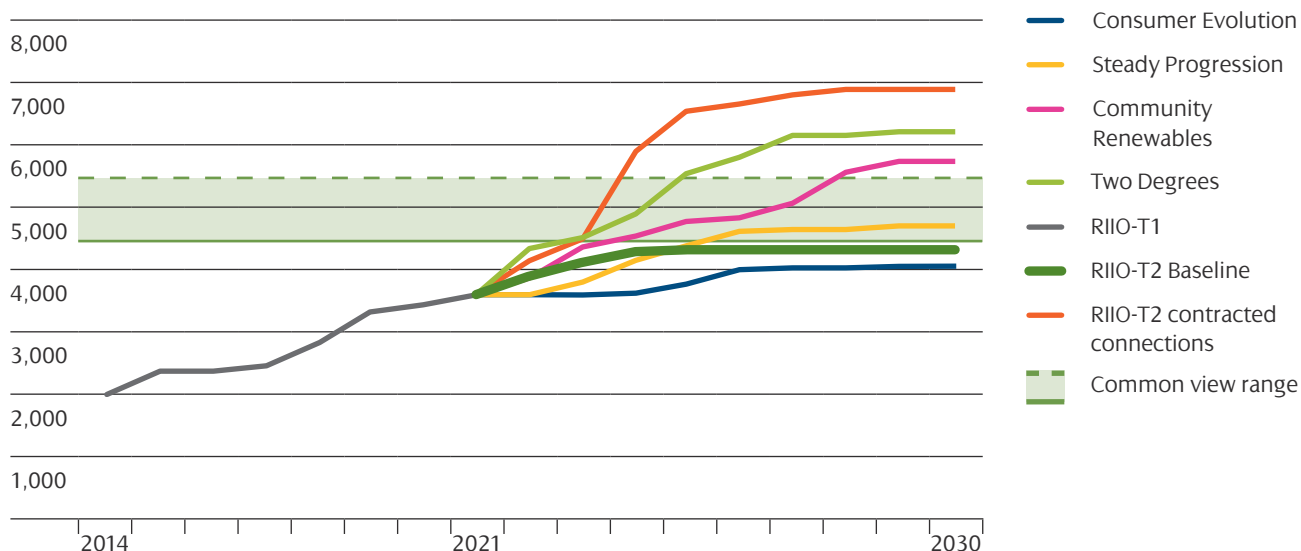
Offshore wind

We have 2.2GW contracted for connection in RII0-T2, plus 450MW in construction which will be energised at the start of RII0-T2.

These projects present unique challenges in the amount of capacity they contribute. Due to their scale and connection requirements, we have identified the costs but have treated them as an uncertainty in our plan. To minimise the risk, we are proposing a different uncertainty mechanism to accommodate these compared to onshore wind. The ENA report has forecasted 1–2.5GW to be connected by the end of 2030, which is consistent with our planning assumptions.

SPT connected onshore wind generation 2014–2030

(MW)



Distributed generation

By the end of RIIO-T1, we forecast to have 1.9GW of generation connected to the distribution network in our area, of which 1.3GW is wind and the remainder comprising of solar and various other sources.

Approximately 300MW of additional distributed generation is contracted to connect to the distribution system, requiring upgrades to the transmission network to allow it to connect and export. This includes wind, solar, gas generation and storage. From engagement with stakeholders, we expect this to rise further as new projects develop in RIIO-T2. This is consistent with the ENA Common scenario.



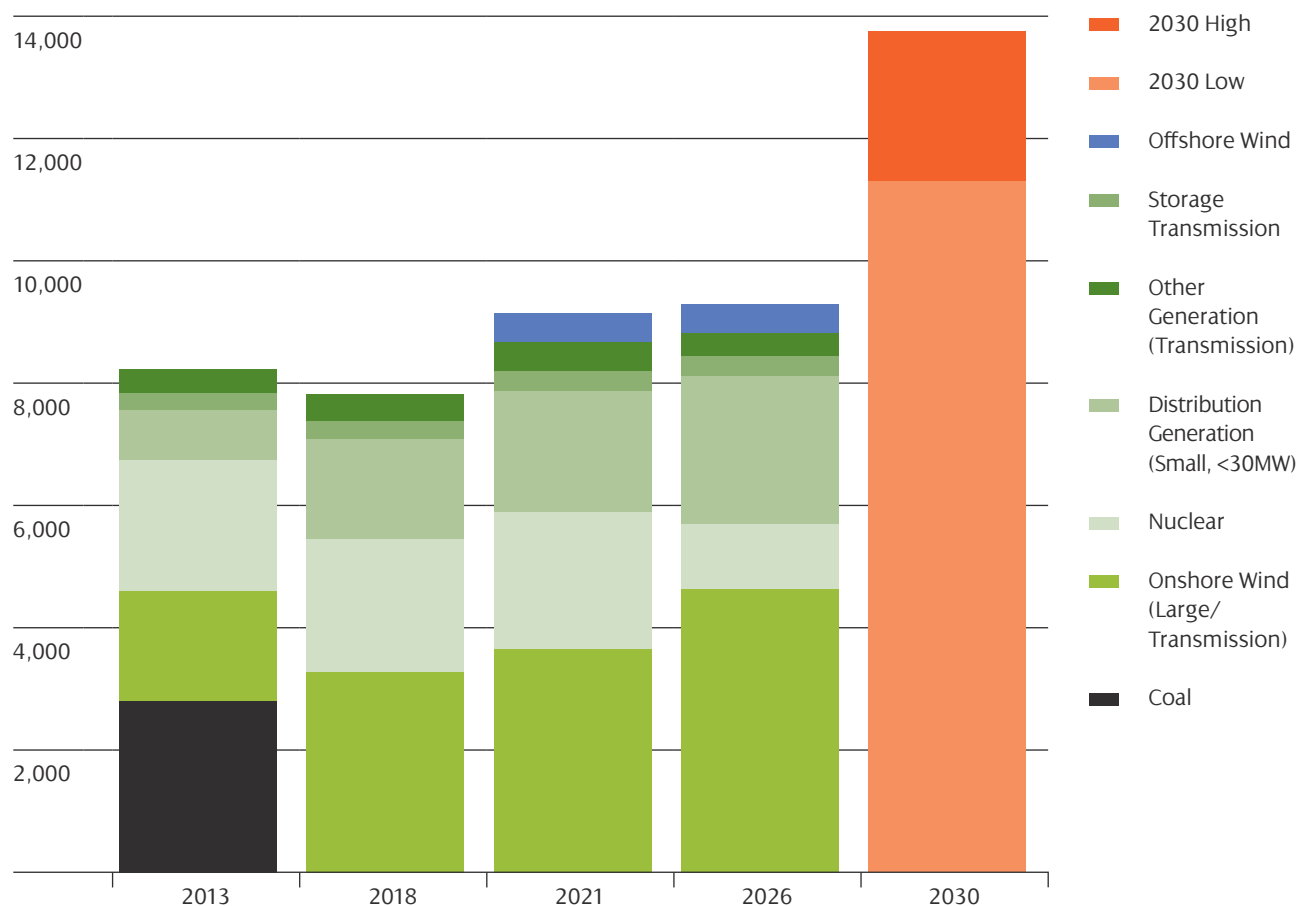
Other sources

By the end of RIIO-T1, we forecast to have 440MW of pumped hydro, 33MW of conventional hydro generation and 2.25GW of thermal generation, mainly from the two remaining nuclear generators.

We have contracts for hydro and pumped storage facilities and have factored these into our plans. Other forms of storage and PV have been identified as a potential technology which will grow in the RIIO-T2 period but at present there are no projects considered to have a high probability of connecting in RIIO-T2. From discussions with relevant stakeholders, where these do emerge, they may be co-located at known generation sites and utilise the existing grid connection. This means they'll require little in the way of reinforcement and investment from us. We have had limited interest in storage-only sites connected to the transmission network. Any other technology or generation is funded by an uncertainty mechanism the same way as onshore wind. The funding mechanism has no bearing on individual customer projects. These assumptions are all consistent with the ENA Common Scenario.

Generation capacity scenarios in Central and Southern Scotland

(MW)



Funding of generation connections

Our baseline plans

We play an important part in supporting new generation on the network. However, the generation that connects is dependent on customers, so it can be difficult to be certain exactly how the infrastructure costs and volume will change over time.

On top of the energy scenarios, we've also created our own process to consider the engineering, commercial and financial uncertainties for new connections to help understand the probability of them connecting to the network. This was implemented in RIIO-T1 and has been recognised by our stakeholders as a fair and prudent approach. We have further improved this to consider other measures to help build our confidence on the conversion of connection applications into projects. We now consider developer track record, local authority planning environment, consented and development status.

All of these factors help provide an indicator of the probability of a connection progressing. These criteria were reviewed with a number of generation developers as well as the Transmission User Group who supported them as well justified indicators.

A high confidence view

This robust identification process has allowed us to assess and understand future generation connections which will form part of the baseline submission. From this exercise we have identified 900MW of generation projects that we have a high confidence in delivering in RIIO-T2. At the moment, we have 5.6GW of generation with a contracted connection application in the RIIO-T2 period. However, our experience shows us that a large portion of that figure is highly uncertain.

Industry changes

The way that users are charged for accessing the system is currently under review. The future charging and access reforms may impact on customers connected to the network. We are involved in this review and will monitor the impact that this may have on projects. Other aspects of the connections process are also under review including the queue management process for future connections. We don't anticipate this to have an impact on the plan as any changes will be accommodated through the uncertainty mechanism.

Our baseline expenditure plans for generation connections

£109.3m

Generation uncertainty mechanism

Our baseline plan of £109m of expenditure provides an allowance for those projects with the highest confidence, but we expect the actual expenditure will be different based on new connection applications and changes to existing contracted generators.

These changes will be accommodated through the uncertainty mechanism. The proportion of charges which are paid for by the connecting generator may also change as these are project specific. For the generation connections uncertainty mechanism, we have refined the RIIO-T1 approach by building on the learning from the wide range of projects connected to the network.

Ensuring a fair mechanism for all parties

We have modelled and analysed several different volume driver approaches to understand which approach would represent the most efficient option. To do this we used the Future Energy Scenarios (FES) for sensitivity analysis.

The mechanism will be set at a rate to efficiently fund us for the works required to connect a generator to the grid. This represents better value and lower risk for consumers than a large ex-ante baseline allowance, where the full amount may or may not be used.

The volume driver will work symmetrically. It does this by adjusting revenues depending on the actual output connected and the capacity we have created.

So, if we deliver more than the baseline output, the mechanism will provide additional revenue at an efficient rate to cover the cost for additional projects. If we deliver less than the specified output, the mechanism will recover the allowance at the same efficient rate.

To accommodate outliers which don't fit this approach such as offshore wind farms, we are also proposing different treatment for a small number of outliers which will have a ring-fenced value agreed for them.

Accommodating Net Zero

To achieve Net Zero, greater volumes of renewable generation are likely to be required than the upper Future Energy Scenarios currently consider. We have not only tested our plan using our scenarios, we've tested them to consider what we would need to do if all the contracted projects materialised to make sure that we have a means of funding them, and the resources to deliver them. We have used all of our contracted projects to inform the mechanism and ensure it can flex to meet those future requirements.

Further details of the mechanisms can be found in **Annex 20: Uncertainty Mechanisms**.



Our baseline outputs in RIIO-T2

Over the course of RIIO-T2, our baseline plan is to deliver the connection of 12 new generation sites with a total capacity of 900MW, at a cost of £40m. On top of this we will create 2,027MVA of new network capacity across a further 13 projects to allow the power generated to be transmitted to other parts of the system, at a cost of £69m.

A large proportion of these costs are paid for by the generators that are connecting to the network. Generators have the option of paying for their proportion of the costs through either a capital contribution when they connect to the network or through annual charges over the life of the assets. The rules for who pays for which parts are set out in the Connection and Use of System Code (CUSC).

The total cost for all work in our baseline plan is £114.9m, but of this £5.6m will be paid upfront by generators. The cost of our baseline plan is £109m over the RIIO-T2 period. Of this, £30m is paid for by connecting generators through annual charges whilst the remaining £79m is recovered by transmission charges to all customers.

In doing this, we will need to build:

- 63km of overhead lines
- 3km of cable
- 10 new transformers and 34 circuit breakers.

Doing things differently

We have embedded innovative approaches in our connection projects to apply the learning and development gained in RIIO-T1. This includes High Temperature Low Sag (HTLS) conductor, which increased capacity in our overhead lines, allowing us to transfer more power on our network at lower cost. We now offer this regularly on new connection projects. It provides a benefit to customers by reducing costs and allows projects to connect faster.

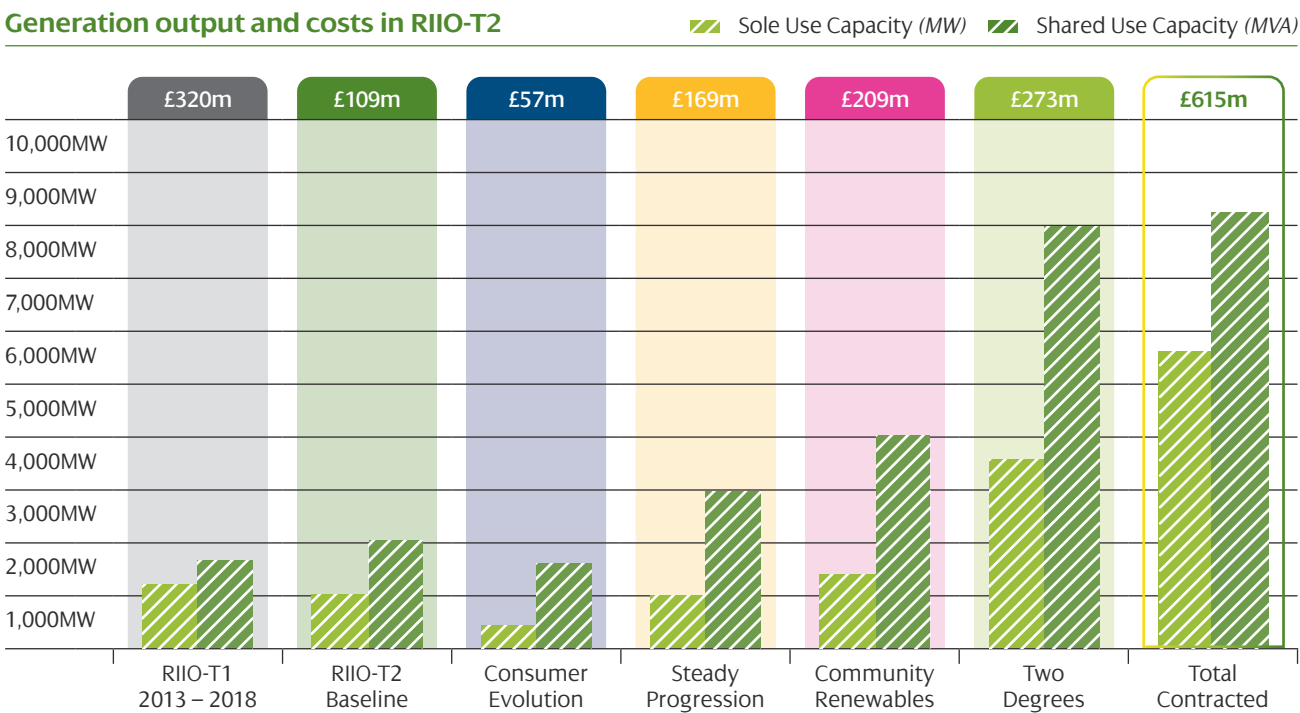
What's more, we're making greater use of flexibility with our existing assets. An example of this is through our load management schemes, which allows the connection customer faster access to the network on a non-firm basis potentially ahead of further network reinforcement. We're expanding the use of this approach through our generation export management system project, which will allow more generation in South West Scotland to connect at a fraction of the cost of conventional approaches.

Competition in connections

Our baseline portfolio of projects comprises of 5 projects which range in value from £360k up to £25m. None of these projects meet the competition criteria for either late or early competition models.

We will continue to engage with all our stakeholders on the range of connections that our present regulatory and licence conditions allow for.

Generation output and costs in RIIO-T2



Efficient boundary upgrades

2

The landscape of generation is changing. Fossil-fuelled generation consisted of a small number of large stations, but today's renewable intermittent generation is located remotely and very widely dispersed where renewable resources are greatest.

This has led to much higher power transfers across each of the GB transmission owner areas. These upgrades are required to meet the needs of consumers and network users.



Playing a key role in Great Britain

The full GB transmission network is divided into different zones by a number of defined network boundaries. This allows us to analyse the power flow requirements of the network, making sure energy can be delivered to where it is required. We share network boundary B4 in the north with SHE Transmission, boundary B5 divides our network area in two, and we share boundary B6 in the south with NGET.

Located between two transmission networks, our transmission system is not only essential for our own customers, but to customers to our north and south. We have to make sure that access to the wider transmission network is available to all connected parties.

At times of high wind, large power flows from north to south are inevitable. We have seen the energy imported over B4 triple from 3000GWh per annum in 2016 to 9,000GWh in 2018. This is forecast to significantly increase as further renewable generation connects in the north of the country.

South-to-north flows are vital when the wind is not blowing. As older generation has been removed from the network, this flow is essential to meet demand in Scotland, giving customers the same high levels of reliability that every GB consumer has come to expect.

An economic and efficient approach

To help ensure that the most economic solutions are being delivered onto the system, the ESO carries out the Network Options Assessment (NOA) annually. Using the national Future Energy Scenarios, the generation and demand backgrounds are used to calculate what level of power is required to be transferred across the network boundaries for each scenario for the next few decades.

Each transmission owner proposes projects that could address the issues that are emerging from the ESO's analysis. Where projects span two or more licence areas, the TOs work together to develop these. The ESO then performs an economic study of all the proposals to identify the least worst regrets approach and provides an indication of whether projects should be progressed or put on hold. The TOs then work together with the support of the ESO to fully justify the works on the system.

These projects will vary from minor works that will allow for small increases to individual boundaries in the near-term, to large multi-million pound projects that will span multiple boundaries, increase capacity significantly and take many years to deliver.

To increase the capacity of the network boundaries we plan to spend

£190.2m

Accommodating greater transfers

The current amount of reinforcement carried out by the TOs means that the existing boundaries have capabilities that are generally in line with the calculated required transfers. High levels of wind generation are set to connect within the next few years. This means the transfers are forecast to increase above the current capabilities across all three of our network boundaries by 2024, and economic assessment has shown that major reinforcements are required and justified.

To meet these required transfers we have various projects, some of which are in conjunction with SHET and NGET. These projects build on the existing assets to increase capabilities to facilitate the connection of the high level of renewable generation that will be required to meet the UK and Scottish Government targets for renewable generation.

By 2028, there will be a requirement for two new 2GW HVDC links connecting Scotland and England, one of which will connect to our network. Works are currently being progressed on these links between all three TOs and the ESO to ensure that the best options are delivered for the future of the system, with development works for these projects already underway.

We expect further projects will need to proceed in the RIIO-T2 time-frame to accommodate the wider systems changes for Net Zero. These will most likely incur the majority of their costs in the RIIO-T3 period but we have included a provision of £18.2m pre-engineering costs. This is based on the additional projects we have identified for the next NOA process to ensure they can progress in a timely manner.

How we have assessed the need

The economic assessment by the ESO is an iterative, annual process. Projects will continue to be created and assessed within NOA as they progress and become more defined in scope. This will make sure the network is developed in-line with the evolving needs of GB consumers.

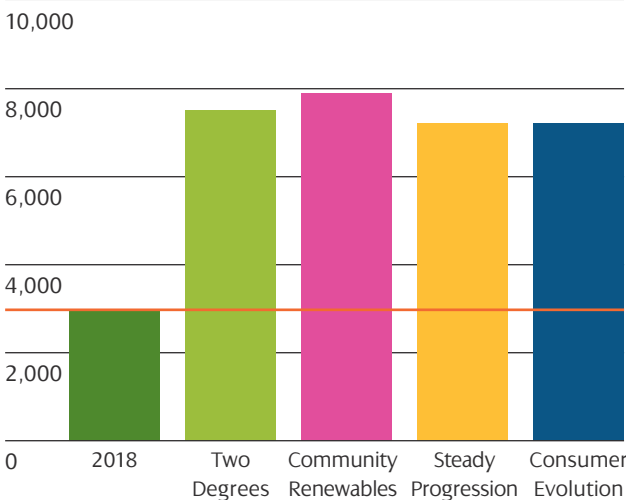
The fourth NOA report was published by the ESO in January 2019, detailing its recommendations on projects to be progressed for the next year. These were largely consistent with the previous year's results, providing a consistent message that large reinforcements are economically justified and are required on the system in the coming years.

The reinforcements recommended will lead to a large increase to the system's ability to transfer power from SHET's area to ours over B4, and from ourselves to NGET via B6. Currently, the boundary capability between SHET and SPT is around 3.2GW. The recommendations from NOA would see this capability almost double to 6.1GW. The boundary capability of B6 is also identified as needing to increase from its current value of 6.6GW to over 10GW.

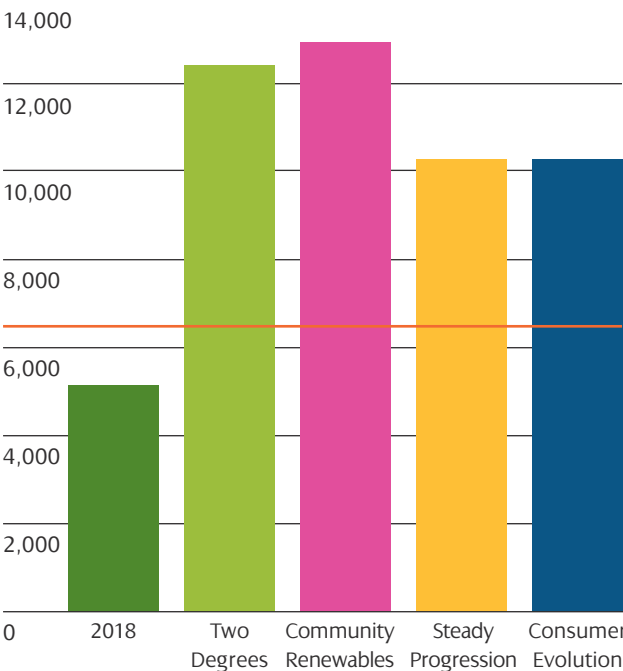
The following graphs show the boundary requirements calculated between ourselves and SHET (B4) and ourselves and NGET (B6) in the north to south direction by 2030. They show that the requirement significantly increases on both boundaries in this time, based on all four scenarios. This will require large reinforcements to facilitate these power flows through our network area.

B4 Peak Transfer Requirements 2030 (MW)

— Current capacity



B6 Peak Transfer Requirements 2030 (MW)



Boundary upgrade projects — a summary

Each of the following projects have been indicated by the ESO as needing to proceed, and must be delivered in the years quoted to deliver the best economic value to the GB consumer.

Hunterston East – Neilston 400kV reinforcement (HNNO)

Total value: £23.4m

This is a reconfiguration of the existing network around Hunterston and Neilston, and the installation of a new 400/275kV supergrid transformer at Neilston. These works are proposed to increase the fault level around Hunterston following the closure of the nuclear power station. This will enable significantly improved utilisation of the Western HVDC link connected at Hunterston East in the absence of local generation. The loss of Hunterston nuclear power station will drop the fault level in the area to below the minimum operating conditions for the WHVDC, reducing the capability by 500MW, unless these works are completed ahead of the closure. The works are currently scheduled for completion in line with the declared nuclear station closure in 2023.



East Coast Onshore 275kV Upgrade (ECU2)

Total value: £12.5m

The existing 275kV circuits that cross the B4 boundary on the East Coast will be re-profiled to run at a higher temperature. This will allow higher current to flow, increasing the transfer capability of this boundary. The majority of the works are within SHET's area. We need to re-profile two double circuits to increase the capacity between Kincardine and the SHET border and between Longannet and the SHET border, through Westfield, Mossmorran and Glenniston. Within these circuits there are two cable sections that require uprating to match the new capability of the overhead line circuits. We will work closely with SHET to achieve the current delivery date for this project of 2023. Studies have shown that an additional 800MW of capacity can be realised over the B4 boundary as a result of this project.



East Coast Onshore 400kV Incremental Reinforcement (ECUP)

Total value: £39.5m

This is a joint project between ourselves and SHET, and builds on the 'East Coast Onshore 275kV Upgrade (ECU2)' by upgrading the 275kV infrastructure on the east coast for 400kV operation. As in ECU2, the majority of the works are carried out within SHET's area, with the installation of new supergrid transformers at Alyth, Fetteresso, Kintore and Rothienorman, and upgrade of the existing 275kV overhead line circuits between these locations and to the SHET/SPT border. From this border, we will need to upgrade the double circuit to Kincardine substation to 400kV, and install four supergrid transformers to accommodate the higher voltage into our existing network. This uprating increases the boundary B4 capability by 400MW, which is additional to the 800MW from ECU2. We plan to complete this work in 2026.



Denny to Wishaw 400kV reinforcement (DWNO)

Total value: £146.1m (£19.2m in RIIO-T2)

DWNO establishes a new 400kV central corridor through our network, increasing the capability of the B5 boundary by around 800MW. The project will create a double circuit operating with one side at 400kV and the other at 275kV, making use of existing infrastructure where possible. The new circuit will require the construction of 17km of overhead line between Bonnybridge and Newarthill. In addition, various existing circuits will be modified to create the corridor, with reconductoring required on two circuits to provide higher capacity. The upgrading will be aligned with the non-load programme for completion in the RIIO-T3 period. On top of overhead line works, modifications will take place at various substations to accommodate the new circuit. This project has a delivery date of 2028.



Eccles Voltage support and real time rating system (ECVC)

Total value: £95.3m

This project gives a boundary uplift of up to 280MW on B6 ahead of the closure of Torness power station, which is currently expected to be in 2030, and maintains the current boundary capability once this has closed.

ECVC is included in our RIIO-T2 business plan to be delivered by 2026. This is required as an enabler to the Eastern Link which is to be delivered in 2027. The NOA process has recognised this need, having indicated via the NOA 2018/19 to progress the development on the basis of this being required by 2027. This project also provides additional value due to the system strength that the solution offers, which has been in decline due to the decreasing amount of synchronous generation on the system. System strength is not considered as part of the NOA process at present.

This project involves the installation of two hybrid synchronous compensators at the existing Eccles 400kV substation. This project is building on the learning from our PHOENIX project to trial the benefits of a hybrid synchronous compensator.

Additionally, a real-time rating system on the existing thermal 'bottle necks' at Moffat to Harker and Gretna to Harker 400kV overhead line circuits is included to maximise the benefit.

Windyhill – Lambhill – Longannet 275kV circuit turn-in to Denny North 275kV substation (WLTI)

Total value: £6.7m

These works will establish new 275kV circuits to link into the existing circuits which pass by the substation. To do this we will install two new switchbays at Denny North substation and connect these into the existing circuit.

This project is considered as 'enabling work' for several projects within the RIIO-T2 programme, including ECU2. Together with the system access restrictions, that's why it needs to be completed in 2022, two years ahead of the NOA recommendation. This project increases the B5 boundary capability by up to 120MW and reduces the constraint costs associated the switchgear replacement project at Windyhill.

Eastern HVDC Link from SPT-NGET (E2DC)

Excluded from baseline plan

This is the construction of a new 2GW HVDC cable connection from a new convertor station in the Torness area in our network, to a new convertor station at Hawthorn Pit in NGET's area, which provides an uplift on boundary B6. The project forms part of the wider Eastern Reinforcement project, which is a joint project between SPT, NGET and SHET. It has the support of the ESO to determine the most economic and efficient solution for large multi-boundary reinforcements. E2DC is being indicated as the most favourable option from our area to be delivered in 2027, coupled with a longer link from Peterhead in SHET's area to Drax in NGET's in 2029.

However, there are six offshore variations currently being assessed, as well as an onshore AC option over B6, to determine the best option to be delivered. This project is not included in our RIIO-T2 business plan and will be submitted through a Strategic Wider Works application, but we have referenced it to provide a complete view of all upgrades that are currently identified. Analysis will continue on these options, with an initial needs case due to Ofgem in early 2020 for the Eastern HVDC Link, which should by this time have a clearer picture of the best combination of offshore works.

Refer to **Annex 4: Strategic Reinforcements**.



How we plan for reinforcement

3

Reinforcing the network is required as we adapt to the changing generation and demand landscape around us as we move to Net Zero. These changes bring many new challenges that the network needs to deal with to maintain a safe and resilient network and meet the needs of consumers, network users and wider stakeholders.

End of nuclear

The closure of nuclear generation on our network will reduce the total generation by

-2.2GW

Our baseline expenditure plans for reinforcing the network

£124.4m

Our reinforcement plans have been modelled and are justified under all energy scenarios.

Refer to Annex 21: Strategic Investment Plan Load.



We understand the impact of generation

There are several ways in which new sources of electricity such as wind farms, solar panels and HVDC interconnectors differ from the large fossil fuel and nuclear power stations which are coming offline. Each of these differences has implications for how we design and operate the electricity system.

New renewable generators are generally **smaller and more distributed** than the generation they are replacing; this means that a larger number of generators need to be coordinated to deliver the same level of services that used to be provided by one or two large generators such as a coal plant.

A number of these smaller generators are **distribution connected**, meaning that we need to change the way we plan and operate the distribution networks as well as reviewing the interface between distribution and transmission. This is important in making sure we can use those generators, as well as other resources connected to the distribution network, to support the wider system.

Most new renewable generation is **intermittent**. This means that we need to find ways to make sure that the system can still operate and meet demand when the wind doesn't blow or the sun doesn't shine. The output is also uncertain, meaning we need back-up that is flexible and able to respond quickly to changing conditions.

Finally, wind, solar and HVDC interconnectors do not have the same **inertia** to support the system frequency. This creates new challenges for operating the system in a stable way. As well as delivering energy, power stations have traditionally provided a range of services to keep the system balanced and the networks operating efficiently.

Co-creating a network for the future

The changes required as a result of moving to a Net Zero electricity system will require close collaboration across various stakeholders, in particular with the ESO to ensure that they have the tools available to operate the system reliably and at the lowest cost. The ESO, has been undertaking a series of 'Pathfinder' projects to examine the role of non-network as well as network solutions to address system needs.

This year the ESO has been undertaking a stability pathfinder project to examine alternative means of securing the frequency, voltage and ability of the network to operate in normal conditions as well as during and after system faults. This project covers the needs across Scotland including the SP Transmission network. We have worked with the ESO on the needs that they have identified to ensure that our views are consistent with their modelling. As a result of this, we have included an uncertainty mechanism in our plan for a range of solutions that may be required depending on the outcome of the tenders which the ESO is planning to operate.

Building a network for Net Zero

In support of the ESO's ambition for a system that has the capability to operate with fully carbon-free generation, there are a number of challenges which we need to address to help achieve this goal. We already have a network with 97% of the generation connected being carbon free. The connection of further volumes of renewable generation and other changes create new challenges which we need to address.

Manage voltage: keeping voltage within statutory ranges ensures that the system is safe and that equipment connected to the network is not damaged. There is a range of options available to manage the network voltage: network equipment such as static compensators and reactors; renewable generators such as wind farms which have the capability to support voltage, even when it isn't windy; and the use of distribution-connected generators, demand and storage.

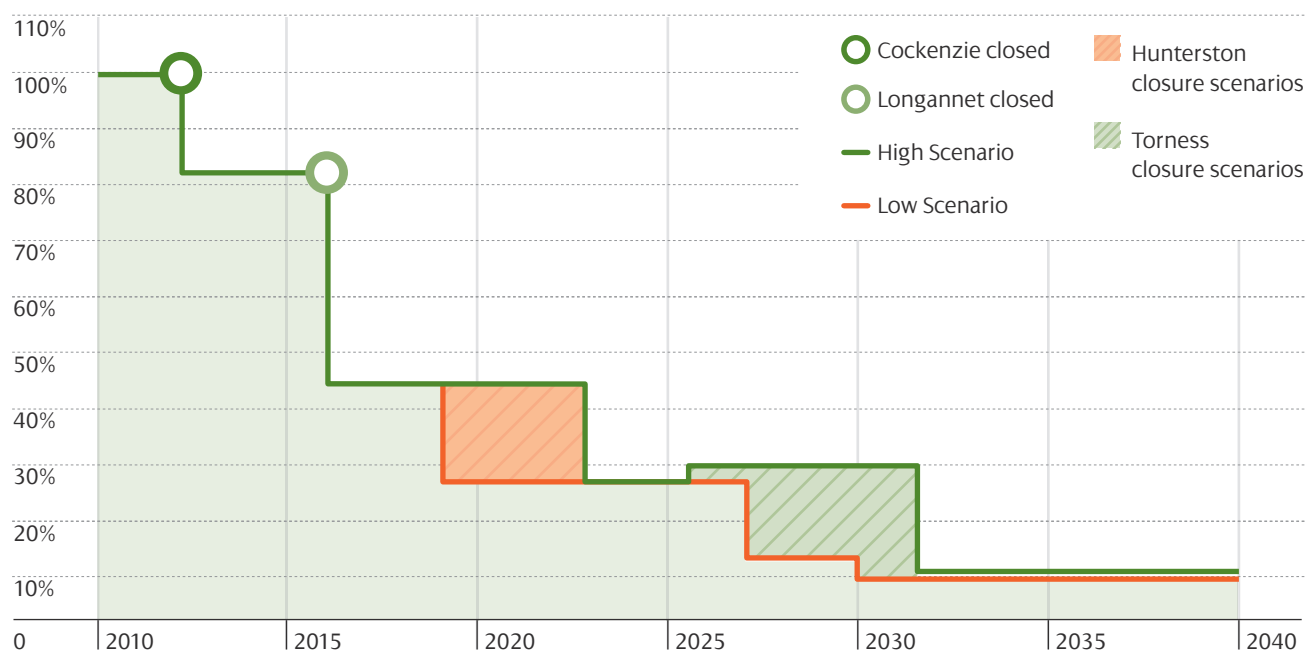
Maintain network reliability: fewer large synchronous generators and greater quantities of generation connected to the distribution network mean that the response to network faults is different. We also need to ensure that the network is designed to have the flexibility to allow for outages to undertake maintenance and other work on the network without compromising the reliability of the system.

Prepare for 'black start': we have never suffered a full-scale black-out across the whole British electricity system, and there have been relatively few major power interruptions in recent decades. However, if a black-out should happen, we must be able to provide a network capable of restarting quickly and safely. Large thermal power stations spread across the British electricity system have traditionally been at the heart of plans to 'black start' the system.

System strength: large fossil and nuclear generators provide 'inertia' which helps keep the system stable in the first few moments after a major fault. Networks have always played an important role in linking sources of inertia across the country. Wind turbines, solar panels, HVDC and related technologies operate differently and we need to find new ways of either replacing the lost inertia, or keeping the system stable through new techniques.

In RIIO-T2 and beyond, we are estimating the amount of synchronous generation to reduce significantly by 2030 as a result of increasing renewables and the closure of the nuclear sites. Analysis and experiences in other countries has shown that with low levels of synchronous generation, operability problems on the network start to emerge. This is consistent with our experiences following the recent temporary shutdown of Hunterston power station.

System inertia reduction in SPT network area since 2010



Reinforcement projects

— a summary

Our baseline reinforcement plans consist of a number of projects which are justified in all of our energy scenarios. If this landscape changes, we will also have a suite of uncertainty mechanisms to address any additional needs.

Branxton 400kV Substation

Total value: £93.3m (£30.3m in RIIO-T2)

Branxton is an important new 400kV gas insulated substation development on the eastern 400kV corridor of our network, near Torness. Its purpose is initially to enable the timely connection of the Eastern HVDC Link, but we also anticipate the connection of a significant amount of offshore wind generation from the North Sea. The new substation will also eliminate some of the thermal bottlenecks in our network around Torness.

Branxton will initially be built to accommodate four circuits to Torness, two to Eccles and circuits to Strathaven and Crystal Rig. Two bays to connect the eastern HVDC Link will also be included. Additional land and building space will be provided to accommodate six further connection points for offshore wind farms to ensure that the network is ready for some of the future changes for Net Zero. The additional bays will only be added to the substation when the need arises.

Voltage management

Total value: £30.1m

Shunt reactors and STATCOMS assist in managing the system voltage. A total of 515MVAR of reactors and compensation to address voltage non-compliance following the closure of Hunterston Power station and other changes in generation and demand profiles are required. We have worked with the ESO to weigh up the cost of this equipment with the commercial alternatives from third parties, such as generators, to provide support. These arrangements are still under development through pathfinder projects but from the cost benefit analysis we have undertaken, these assets are the most cost effective long term approach for consumers. We are treating these projects as price control deliverables.



Harmonic filters

Total value: £24.2m

Harmonics are a form of electrical pollution that is present on the electricity waveforms and comes from consumer appliances and network equipment. Due to the increasing amount of cable being added on the network to connect new generators and the number of converter-connected plant, harmonic pollution is increasing. The installation of six harmonic filters is required at Linmill, Moffat, New Cumnock, Black Hill, Margree and Newton Stewart to prevent voltage harmonics in excess of planning and compatibility limits on our 132kV network.



Circuit-rating management system

Total value: £4.7m

Assets have a capacity rating which is based on a number of assumptions, including the temperature at which they operate. We plan to create a new system which will use analytics and enhanced data processing to provide real-time assessment of asset ratings.

This will help to increase the network capacity, reduce operational costs to the ESO and facilitate higher volumes of renewable generation. For this project we're implementing the learning from a number of innovation projects that have been undertaken by different network operators over the RIIO-1 period.

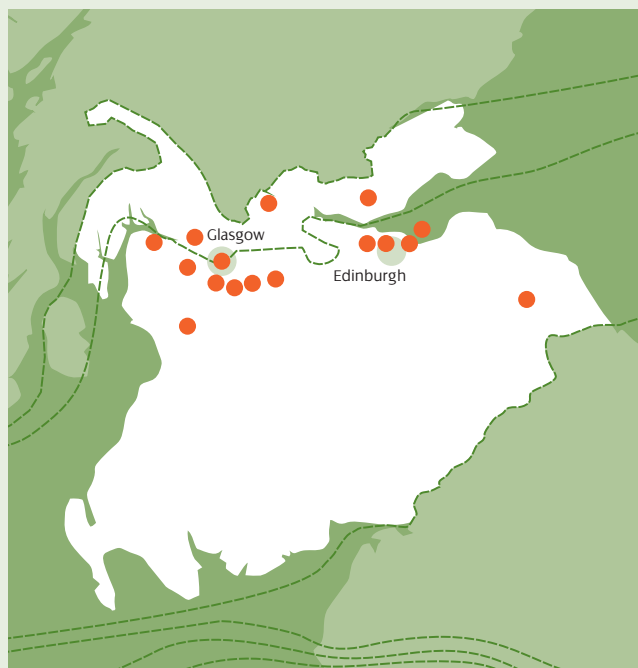
Facilitating black start

Total value: £15.6m

From our review with the UK Government and other stakeholders, we have identified that a number of steps can be taken to improve the operation of the network in the event of a partial or complete shutdown of the electrical network.

Through minor reconfiguration of the network and installation of new monitoring we can simplify the restoration process to allow it to happen faster. It's important to say we expect major interruptions to be rare occurrences, but the consequential cost of not having the ability to restore the system quickly is very significant.

In RIIO-T2 we are planning to spend £15.6m over the course of the price review to provide the ESO with the ability to reduce the time necessary to restore the network. This will include substation reconfiguration at 16 sites and the addition of point on wave switching for 30 circuit breakers.



Generation export management system for South West Scotland

Total value: £10.0m

Deployment of a smart control scheme to manage 2,750MW of generation in real time and minimise the cost and time to connect new generators in South West Scotland. This project is a collaboration between ourselves, SP Distribution and the ESO to develop an innovative scheme which is the largest of its type in Great Britain.

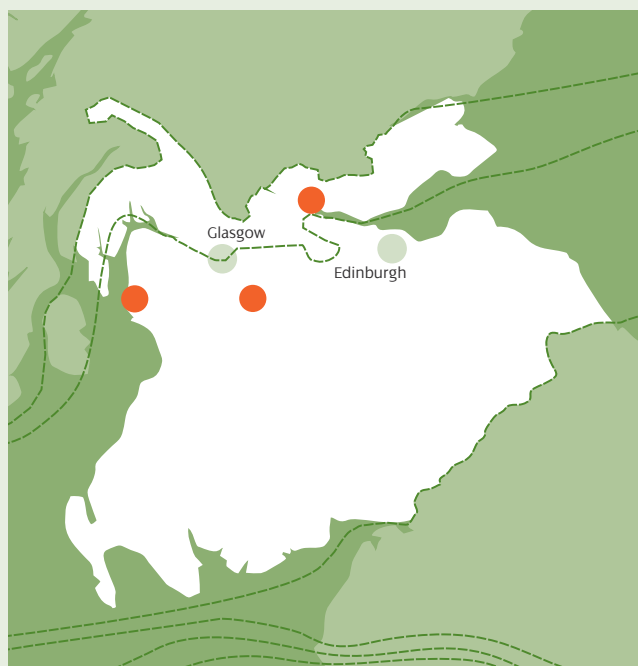
The ESO have confirmed this approach to be more economical than building new infrastructure to facilitate the growing amounts of generation. The system will ensure our network is compliant with the relevant standards by controlling generation on the transmission and distribution network in accordance with the commercial arrangements in place. This approach is building on the various active network management projects that SPD, UKPN and SSE have undertaken in RIIO-ED1.

Synchronous compensation

Excluded from baseline plan: Uncertainty Mechanism

In our draft plans, we identified the need for synchronous compensation to mitigate the loss of system strength and inertia, and to provide vital system support in the unlikely event of a black start. We still believe that this plan is essential for economic and stable operation of the network as power stations with synchronous generators close. As the ESO continues to progress with its Stability Pathfinder project, the outcome of this project could have a significant impact on the location and number of synchronous compensators that are required.

We have therefore included three synchronous compensation projects as part of an uncertainty mechanism. The uncertainty mechanism will provide funding to install synchronous compensation if there is a shortfall between the system requirements and commercial contracts placed by the ESO.



Anticipating demand expenditure

4

During RIIO-T1, we did not forecast any new demand projects. However, over the period we saw a number of new or modified connections from SP Distribution, Network Rail and other network customers.

From this experience, we have examined more closely the potential demand connections that are expected in RIIO-T2. While doing this, we've taken a coordinated whole system approach and considered the most economic and efficient approach to ensure we are meeting the needs of consumers, network users and wider stakeholders.

Our baseline expenditure plans for demand connections

£116.2m



What we've found

SP Distribution has identified that a number of their points of connection to the transmission network are exceeding their design limits, as a result of increasing amounts of distribution connected generation, increasing fault levels, or higher loading on the network. This has been coordinated with our own scenarios to ensure consistency in the forecasting approach. Failure to address these issues could result in the serious failure of our own or a customer's equipment.

In addition to this, two new points of connection are required by SP Distribution to create capacity for additional distribution connected generation to get access to the transmission network.

What we plan to do

These issues can be addressed either through SP Distribution, ourselves or jointly undertaking actions, such as the replacement of equipment. Where this problem arises on the SP Distribution network, but where expenditure is incurred by us, there is an established industry-wide process to govern the contribution that is made to the costs by SP Distribution or any other network customer who requires a connection.

We have considered all the sites where issues are emerging jointly with SP Distribution and identified options that either company could undertake to address the issues. Using the CBA framework developed with Ofgem, options across Distribution and Transmission, both build and non-build innovative solutions have been assessed for each site to identify the most efficient solution. The total expenditure on this is £124m, of which £8m is paid for upfront by the connecting customer. The baseline cost is £116m over the RIIO-T2 period, and of this, £65m is paid for by connecting customers through annual charges.

Ongoing flexibility for Net Zero

Other new demand connections can emerge, and we will use our demand uncertainty mechanism to ensure that funding can be adjusted to meet emerging needs. We will also look to use the Whole System Coordinated Adjustment Mechanism that Ofgem have outlined as a means of updating our plans as required over the course of RIIO-T2. This may be as a result of changes to demand beyond what the scenarios have estimated. Whilst we believe this to be unlikely, we don't know exactly some of the changes that Net Zero may create in the longer term.

Our approach to coordinating with other parties is detailed in the **Whole System Planning** section.



Completion of RIIO-T1 crossover projects

Total value: £49.2m (£37.5m in RIIO-T2)

A number of schemes commenced construction within RIIO-T1 and are currently forecast to cross over into RIIO-T2. These are the reinforcement of the network from Kendoon to Glenlee via the extension of 132kV circuits; the increase in thermal capacity at Newton Stewart GSP with the installation of a second 132/33kV transformer at the site and; the installation of another 275/132kV transformer at New Cumnock substation. All these works are to increase capacity on the network to facilitate embedded generation across the south west Scotland area.



Fault level mitigation

Total value: £37.1m

Increasing levels of embedded generation on the distribution network has raised fault levels preventing the connection of additional generation. In order to facilitate the transition to Net Zero and the associated generation uptake, we've worked with SP Distribution to identify suitable sites for reinforcement.

Transformer replacement to address fault level will also take place at Newarthill GSP, Kilmarnock Town GSP, Charlotte Street GSP, Port Dundas GSP, Westfield GSP, Strathaven GSP and East Kilbride GSP. In total, this will create 350MW of distributed generation capacity.

New GSP substations

Total value: £18.4m

Where generation uptake has been so much that the distribution network is at capacity, SPD have requested the creation of two new GSPs.

These are proposed for the Lanarkshire area with one connecting into Coalburn 132kV (Lesmahagow GSP) and another at Moffat 132kV (Moffat GSP), in total providing 300MW of distributed generation capacity.

Network rail connections

Total value: £14.6m

We've worked collaboratively with Network Rail to ensure that all upcoming schemes for the electrification of the rail transport system in our area is covered by the RIIO-T2 plan.

This includes two contracted projects. Network Rail have indicated that a further six may be required to achieve the Scottish Government's plans in this area which will be funded through an uncertainty mechanism.

Supporting SPD load works

Total value: £6.0m

Various minor works at five substations to support SP Distribution switchgear upgrades. These works enable the connection of additional embedded generation on the distribution network where it is currently limited by the switchgear.

Thermal capacity

Total value: £2.9m

Transformer upgrade to increase thermal capacity by 80MW due to additional distributed generation at Redhouse GSP.

The assets in our network vary in age and condition. Our experience and expertise are essential for proper asset stewardship, **allowing us to adapt our world-class, resilient network** for a Net Zero future.

The strategies for all of our assets – from our high voltage overhead lines and transformers to smart control and monitoring systems – are summarised in this section, alongside the process we have used to prioritise and compile the investment plan.

Managing risk is a big part of our plan - from reducing the risk of our lead assets by an ambitious 72% (compared to no intervention) to significantly increasing our operational telecoms networks' resilience and capability.

However, we need to balance this with longer-term customer needs and impacts on the network. By looking at the long-term cost to consumers, we make sure our plan is the best value for current and future consumers.

Our plan will **increase efficiency through constant innovation** and keep the costs of the components of our plan (known as Unit Costs) at or below the efficient RIIO-T1 levels. However, there are additional requirements (such as re-building overhead lines) and different scopes of work (such as relocating other network assets and working in more complex environments like nuclear power stations and petrochemical plants) when compared to RIIO-T1. This means that, overall, the costs for overhead lines, cables and circuit-breakers will be higher in RIIO-T2.

Some individual projects in this section also have expenditure in RIIO-T1 or RIIO-T3. The costs shown are the total for each project, rather than those forecast for the RIIO-T2 period.

Overhead Lines, *Pg 93*

Towers, conductors and fittings are the lead assets that comprise overhead lines. We describe how we manage each of these through their lives and our plans for co-ordinated investments.

1

Underground Cables, *Pg 98*

Our network of cables is small compared to overhead lines but they play a vital part in the security of supply. We have planned investments to make sure they remain reliable.

2

Substation Lead Assets, *Pg 100*

Substations contain both lead and non-lead assets. The lead assets are circuit breakers.

3

Transformers and Reactors, *Pg 106*

These lead assets play an important role in the network. Transformers connect parts of the network together and are often the interface to our customers. Reactors are increasingly important for keeping the network operable as the energy system transition progresses.

4

Substation Non-Lead Assets, *Pg 108*

The non-lead assets are other electrical plant, protection, control, telecoms and smart monitoring, and civil works and buildings.

5

We present detailed analysis of activity levels and costs for the two RIIO periods in *Annex 19:*

Investment Plans Additional Analysis.



Non-load Related Expenditure



Consumer Value Proposition

Consumers, network users and wider stakeholders benefit by reduced network risk as a result of our plan. The monetised risk benefit over the life of the assets is £1.6bn higher than the baseline of deferring the investments.

£1.6bn

By using advanced modelling of asset condition, we have maximised the economic lives of our assets, avoiding £81m of investment in RIIO-T2.

£81m

By doing detailed designs and extensive planning, we have generated a net benefit of up to £5.7m of avoided network constraint costs.

£5.7m

An overview of our planned investment and bill-related breakdown across non-load

Transformers

£32.3m

Circuit-breakers

£124.2m

Reactors

£7.7m

Underground cables

£32.0m

Non-lead Assets

£126.5m

£542.5m

Total planned expenditure
across six asset groups

Overhead Lines

£219.7m

39p

of the average
annual domestic
customer's bill

Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Non-load related expenditure covers looking after the network assets and infrastructure we have. We need to engage with our industry stakeholders to make sure we have a good understanding of our suppliers and relevant manufacturing developments. We also need to be aware of technological advances and how 'new kit' may interact with our existing equipment – both now and in the future as we prepare for a whole system, Net Zero future. We also engage to increase awareness of the considerations that make up our non-load investment decisions so that new and existing network users and consumers alike can understand our approach and feel empowered to review and comment on the trade-offs we have made in setting out our non-load investment decisions.

How and why we have engaged with our stakeholders

Non-load investment and NARM (the Network Asset Risk Metric) require a degree of specialist knowledge to understand. However, we have a responsibility to make sure we seek broad feedback on our non-load investment. So we have engaged with stakeholders who have some knowledge of the energy sector or asset management, but who did not necessarily have prior knowledge of transmission or non-load investment planning within a regulatory environment. We engaged with stakeholders who are directly impacted by our plans, people who have a strategic interest in our investments and representatives of end consumers. We also presented stakeholders with the high-level aspects of our non-load investment decisions: total costs, outputs and consumer bill impact to establish their perception of our final plans. We established and attended seminar sessions to create discursive spaces with a focus on audience participation, used round-table sessions to maximise interactivity and get more meaningful feedback than is possible at presentation-style sessions. This allowed the agenda to be flexible and engagement could be steered towards the stakeholders' priority areas.

What our stakeholders have told us is important to them

Our stakeholders agreed with our detailed approach to building our non-load investment plans but were clear that they didn't want us to focus too heavily on the individual assets, preferring we take a whole systems view instead. They agreed with our proposed approach that we must provide evidence that the assets' condition justifies investment, in addition to its risk value. They also said we should not allow assets to fail so that financial consequences are avoided because these are significant for transmission assets. They acknowledged that the in-depth approach we must take is complex and difficult to review in detail but agree with our decision making processes for non-load investment.

How stakeholder feedback has shaped our plans

In response to the conversations and feedback from our stakeholders, we are ensuring that we have highlighted how our investment decisions avoid the replacement of assets that won't be needed or will not be suitable in a whole system future. We have also created a detailed evidence base for our plan to improve transparency of our investment decisions. We carefully considered whether an intervention is needed or, if we defer investment, can the condition can be managed. We have detailed the cost benefit analysis used to make these considerations, showing how we have taken forward projects that are fully justified. We have also related our intervention decisions to associated consumer benefits so stakeholders (including consumers) can quickly see the trade-offs between the costs and the social and environmental benefits in context. We acknowledge that this is a complex business investment area and we have therefore worked with external copywriters to help make our plan as clear as possible.

Why these changes are important

To cost-effectively prepare our existing network for a whole-system, Net Zero future we must invest in the right assets at the right time. Our decisions must also be informed by meaningful stakeholder engagement. To do this, we need to provide stakeholders with information that's clear – despite the technical nature of the subject – so that consumers, network users and wider stakeholders feel empowered to understand, challenge and co-create our non-load plans.



Understanding our assets

Here is a breakdown of our assets, how they work, and why we need to monitor them closely.

Why is it important to monitor assets?

Assets are built with an anticipated design life. As they approach and pass these, their condition can deteriorate. Keeping an eye on this is important, as their deterioration can cause an increased risk to the reliability of the network.

We need to make sure that interventions to manage any risks are effective, timely and deliver value for money to consumers. To do that, it's vital our long-term strategies are underpinned by a detailed knowledge of asset condition and deterioration mechanisms.

Why do assets deteriorate?

Assets deteriorate due to stresses they are exposed to, such as:

mechanical, such as the vibration experienced by overhead line components

thermal, as experienced by transformers and cables

electrical, as experienced by circuit breakers

environmental, caused by wind, moisture and pollution.

How is asset condition determined?

While longer exposure to stresses leads to greater deterioration, not all assets are subject to the same degree of stress. The ability of individual assets and families of assets to withstand these stresses also vary. For this reason, our assessment of an asset's health is not solely based on its age, even though time is a factor. We need to understand each asset's condition and be able to forecast how that asset will perform for the remainder of its life.

Do we consider all assets in the same way?

While the same fundamental principles apply whatever the asset type when defining a strategy, the considerations differ.

Deterioration mechanisms apply mostly to the high voltage assets, but the network is becoming increasingly reliant on electronic and software systems and obsolescence is often a factor.

These include:

protection systems to detect and remove short-circuits when they occur

smart network management schemes and asset condition monitors

telecommunications systems which enable all of these applications.

Asset types

We understand the vital roles that all types of our assets play in the safe and reliable operation of the network. In the regulatory framework, though, assets are grouped in to lead and non-lead categories.

Lead assets

The electricity transmission sector's common monetised risk framework lets us quantify the risk of many individual assets, known as lead assets. It helps us identify and prioritise any assets that may need intervention, to develop a clear view of when this is likely to be required and to co-ordinate interventions with other works.

Circuit-breakers, transformers and reactors, underground cables, overhead line towers conductors and fittings complete the lead asset category.

Non-lead assets

These are equally important for the safe and efficient operation of the system. These assets are not yet covered by this framework, but their interaction with the lead assets is a critical factor in investment planning. We consider the condition and importance of the non-lead assets in the same way as lead assets, even though they aren't part of the monetised risk framework.

Disconnectors, instrument transformers, and common infrastructure such as post insulators and busbar systems are in this category. Ancillary systems and civil and buildings infrastructure are included too. Protection, telecommunications and smart control systems are also non-lead assets.



NARM: how we assess the risks of our lead assets

How do we measure the risk presented by each asset? We use a methodology called NARM: Network Asset Risk Metric. It's how we calculate asset risk from health, and the consequences of that asset failing.

We have worked collaboratively with Ofgem and the other transmission owners to develop NARM over the last five years. This methodology allows us to accurately and consistently quantify the risk of each type of lead asset.

Our lead assets

Circuit-breakers
Overhead line conductors
Overhead line fittings
Overhead line towers
Reactors
Transformers
Underground cables

Risk – how we work it out

We calculate the risk of each lead asset by combining the asset health (as a probability of failure) with a measure of the financial consequences of these failures. This gives a risk figure in monetary terms. The figures are generated by the mathematical models we use as part of our investment planning.

Asset health – how we work it out

We determine the health of assets using the operating conditions, operational experience and the information we record. The methodology incorporates a mathematical model to forecast future health and probability of failure.

Calculating consequences

When we calculate the consequences of an asset failing, we need a detailed understanding of its importance, and how it interacts with other assets to create the network.

To assess the potential impacts of each asset failing, we also consider safety, environment and finance. We give monetary values which reflect the costs of the asset failing – these consequences are unique to each asset.

Multiplying the probabilities and consequences of failure produces the monetised risk measure (denoted r£) that is consistent for all types of lead asset. This measure is how we – and Ofgem – determine progress against our proposed plan.

When we refurbish or replace an asset, we see an improvement in its condition, and its monetised risk is reduced. We can think of this reduction in risk as a benefit. The total of all of these benefits is the size of output we are committed to deliver.

Total network risk

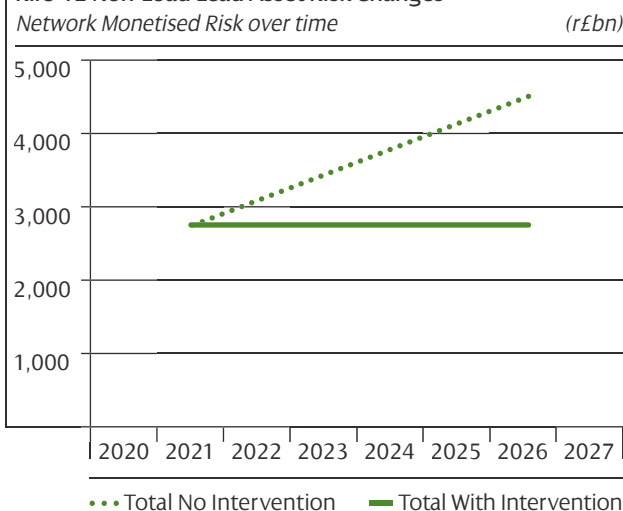
When we produce our plan, we keep a view of the total level of network risk, and how it changes over regulatory periods.

We start by calculating the total network risk for the start of the RIIO-T2 period. To do this, we add the risk values of all the existing lead assets, and make changes reflecting the work we know is still to be completed in RIIO-T1. We then use the asset models to produce a forecast of condition in April 2021.

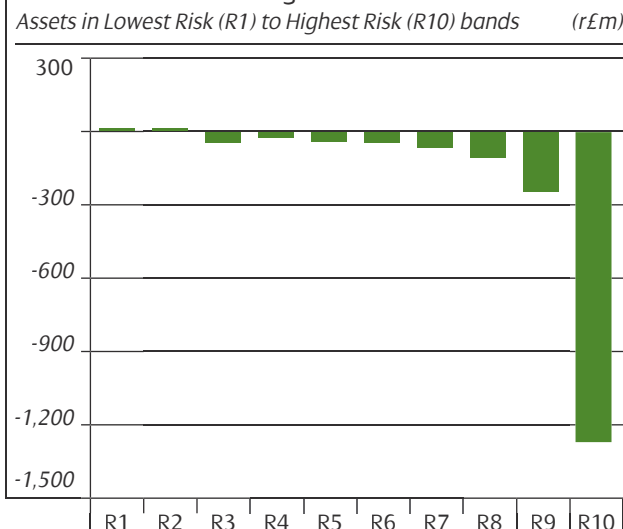
NARM allows us to generate a forecast of network risk for March 2026, assuming we do not undertake any works (the 'without intervention' risk value).

To calculate the risk at the end of the period when we deliver our planned lead asset work, we deduct the value of the plan's interventions from the 'without intervention' value. This gives us the 'with intervention' risk value.

RIIO-T2 Non-Load Lead Asset Risk Changes



RIIO-T2 Network Risk Changes



Risk value by condition of asset

The risk values of all our assets increase over time. Our network is made up of assets in varying conditions, ordered here by our assessment of their condition.

New and good condition assets – most of our assets are in this category. These assets will have increased risk at the end of RIIO-T2 but won't need investment during this period beyond routine inspection, testing and maintenance. This will mean that the overall risk value for these types of asset will be higher at the end of the period.

Assets in poorer condition – there is a smaller number of these, and we may need to intervene on some of them, but we mainly plan to do this in RIIO-T3 or beyond. Their contribution to the total network risk will generally increase. Our aim is to maximise their life while examining the risks of their failure, to get the right balance for consumers. Assets in this category are assessed individually so that we make the right intervention at the right time.

Assets that are (or are becoming) unable to perform to their required capability – this is our smallest category of assets. Our plan is mostly comprised of assets in this category which are those with the greatest likelihood of failure. The risk value of assets in the previous category moving in to this one will be less than the risk removed by our plan. Therefore, the total risk value of assets which are in this category at the start of RIIO-T2 will be reduced by the end.

Assessing the risk of our non-lead assets

An important aspect of managing risk is to make sure we treat non-lead assets just the same as lead assets. Because they don't form part of the NARM methodology, we have proposed an output incentive for these assets in the **Output Incentive** section. We have developed asset models for non-lead electrical plant and we propose that this incentive will use monetised risk.

Non-lead assets perform important functions in our network and the impacts of their failure can be as severe as the failure of a lead asset. Later in this section we explain how we make sure non-lead assets get the right interventions at the right time.

Our network risk objective

We are committed to maintaining the exceptional levels of reliability our connected customers currently experience. The occasions when we experience incidents that contribute to unreliability are rare. They can be caused by lead assets' condition issues but there are two other significant factors.

Many of the most significant loss of supply events that have been experienced in the UK and overseas have been caused by non-lead asset failures. The most frequent events are caused by weather effects such as storm force winds or icing affecting overhead lines.

Because of the additional factors, reliability doesn't follow a direct relationship with the value of lead asset network risk. To make sure reliability isn't compromised by the performance of lead assets, we plan our interventions on the assets posing the greatest threat to reliability. We optimise the interventions in our plan to get the best value for current and future consumers.

As it's our number one priority, assets that would present an unacceptable risk to safety are a key part of the optimisation process.

Non-lead assets are not yet included in the NARM methodology but we identify and optimise our interventions using the same principles as for lead assets.

The value of network risk at the end of RIIO-T2 results from this detailed assessment of our asset base. This approach to setting the objective has received strong support from our stakeholders.

The benefit of our plan

We have determined the optimum set of interventions to manage network risk.

Without these, the total network risk of lead assets on the system at the end of RIIO-T1 would increase by 72%. When we calculate the benefit of our plan, the total network risk will be 0.8% higher at the end of the period than at the start, because the reduction in risk as a result of our interventions is marginally less than the increase due to deterioration of the rest of the asset base. We look forward to working with Ofgem to identify the most effective way for these plans to be reflected in the terms of our licence drafting.

The monetised risk benefit of an intervention is measured over the lifetime of that intervention. This is known as Longer Term Risk Benefit (denoted Lr£) and our plan results in a benefit of Lr£29.1bn.

Our plan strikes the right balance between costs for current and future consumers, and the level of risk on the network. If we were to reduce the levels of intervention in our plan, we would not address known threats to reliability. Equally, more interventions would lead to assets being replaced too soon. We have focused our attention on extracting the maximum value from the existing assets, while making sound asset management decisions to control the risk of failures.

You'll find more information on network and asset risk in **Annex 3: Non-lead Strategic Investment Plan**.



Investment planning

Reaching the most positive outcome for consumers lies at the heart of our investment planning process. To achieve this, we balance the cost to current and future consumers with the potential consequences of not intervening at the right time. Our approach is continually evolving and it has moved on during RIIO-T1. Here's an overview of how that's done.

Beyond business-as-usual monitoring

Our business-as-usual operations collect data and information on asset condition that we need. However, to make sure that we have the most up to date picture, we have undertaken a significant exercise to gather all of the data we need to define our plan. This involved detailed inspections and reviews of all our substations and in-depth reviews of all maintenance records.

We've used non-invasive techniques to understand the condition of overhead line conductors and, where possible, removed sections of conductor for forensic analysis. We have also dug down to the foundations to check their condition. This gives us confidence that we have the most accurate view of all our assets for effective investment planning.

We forecast accurately

Using mathematical models we have for each of the assets, we can:

forecast how they deteriorate

estimate how long it will be before their condition gives us reason to take action.

As assets are unique, individual items, these forecasts do not produce exact dates of when they will begin to fail. However, they do provide a good indication of when we will need to consider our next move.

These models are detailed and capture the major factors of deterioration. This means we are able to pinpoint which parts are causing concern and find the best way to deal with them. We don't just rely on the model; we use the knowledge and experience of our expert engineers. They check and validate what the models are telling us and what has worked best when we've faced these issues in the past.

Well-informed, long-term strategies

Taking all the information on current condition and the forecast condition over time and enriching this with our long experience of keeping our assets in good working order, we can create long-term strategies for each and every asset.

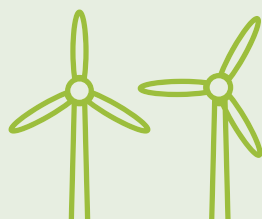
Our strategies are informed by our long-term view of the future, more information can be found in Planning for the future in our **Load Related Expenditure** section, **Pg 63**. We keep the need case for the existing assets under continual review. We take a whole system view of our activities and we examine if there is another way to provide the same function that might be more efficient overall. Once we are sure that there's still a need for the asset, we check that it has the right capacity and characteristics for the future. Any decisions to intervene make reference to these checks to ensure that we meet current and future needs in the most efficient way.

We will know how closely and how often we need to monitor and check them, which components or sub-systems are most likely to be problematic and when we'll need to consider some work to keep them in service or replace them.

These long-term strategies will give us the best opportunity to make the right investments in the right assets at the right time. By planning ahead, we can take a system-wide view and optimise the planning of our interventions to minimise disruption and costs to consumers.

You can find further information on investment planning in **Annex 3: Strategic Investment Plans – Non Load**. There you will also find information on our outlook for non-load investment in RIIO-T3.

You can find more information on the engineering process in **Annex 3: Strategic Investment Plans – Non Load**.



We identify assets that need a closer look

We have described the concept of monetised risk of assets in the Network Asset Risk Metric section. When we calculate the risk for each asset, we find that good condition assets can have relatively high risk values because the consequences of their failure are high. Equally, assets that are significantly deteriorated can have relatively low risk values due to their function in the network. So it's important to look at both parts to decide what steps to take next.

The impact of failure is related to the asset's location and function in the network. So, in many ways, it's fixed. This means that when deciding what assets should be considered for intervention in a time window – in this case, RIIO-T2 – we have to look at their condition.

We can categorise assets into three general groups:

Good condition – these may be relatively new assets, mid-life assets with no issues for the foreseeable future, or even assets nearing or beyond their design lives and in better condition than expected due to their function, duty and environment.

Intermediate condition – these are likely to be assets approaching the end of their design lives with no particular design or operational issues, mid-life assets in a harsh environment or with challenging duty, or even newer assets in which unforeseen design or operational defects have affected condition.

Poor condition, approaching end of life – often assets that are beyond their original design lives. It's common for some types of assets to need replacement components during routine maintenance, and often manufacturers end supply of these components, meaning the assets are no longer operable. Some assets may be in this category due to their environment, duty, or severe design defects. While rare, it's not unknown for relatively new assets to be in this category as a result of manufacturing or design flaws revealed in service.

The first step in the process is to identify the good condition assets. These do not need any investment, even if the impact of their failure is large. We can safely exclude these from our planning for the time being, although we will keep them under continual review.

The poor and intermediate condition assets are then examined in more detail, and we ask the following:

Do we still need the asset now and in the future?
Can the same function be carried out in another way?

What is the source of concern over their condition?

Can the condition or the consequences of failure be managed if we don't intervene?

What other associated assets might need to be improved or replaced?

Are there any consequences of asset failure that we need to change?

We prioritise effectively

This review results in a first stage work plan to manage the assets that will be at the end of their operational lives by the end of RIIO-T2. We use the asset models to identify these and verify the outputs by a detailed engineering review. We then undertake a detailed engineering exercise to map the intervention options for each asset, determine which are feasible, and generate costs. Each option undergoes a Cost Benefit Analysis (CBA) to determine which produces the best outcome for consumers.

The starting point of the CBA is that we won't intervene until the end of RIIO-T3. While this is not practical in many cases, it's a good way to test if the other options have benefits. The result is a second stage plan that contains all interventions that are justified by asset condition and that provide more consumer benefit than if they were deferred.

The third stage plan is created by an initial assignment of priorities to the intervention projects. The highest risk assets in each asset category are given highest priority. We refine this by assessing the intervention needs of the non-lead assets which can change some priorities.

We know that there are practical limits to the amount of work we can do in RIIO-T2. We produce detailed plans to work out what parts of the network we need to access, for how long and when. This, along with the capability of our supply chain partners and our own resources, sets the limit on what interventions we can complete in the RIIO-T2 period.

A deliverable plan is created by deferring the lowest risk assets from the third stage plan until RIIO-T3. To finalise the plan, we check for opportunities to coordinate with other works to maximise efficiency and make use of system outages.

Before we defer interventions, we make sure that the risk of failures and potential consequences are manageable and that we have contingency plans in place. Finally, we have looked ahead to RIIO-T3 and verified that overall, the deferrals will result in an acceptable network condition.

Justifying our investments

We have created a more detailed, accurate and up to date bank of information on our assets' condition than ever before. This gives us confidence not only in the inclusion of interventions in our plan but also in those that can be delivered at a later date. As a result we can be confident that consumers will benefit from the improvement in network risk and that our expenditure is justified.

In the following sections, we provide details of the investments to maintain a safe and resilient network. For each of the projects that we describe, the investment decision packs can be found in **Annex 1: Investment Packs**. These present the evidence to support the need case and details of the options we have considered. We present the structured process to select the option with the greatest consumer benefit which is informed by relevant CBAs.

You can find more information on monetised risk in the **Network Asset Risk Metric** section on Pg 89.



You can find more information on Cost Benefit Analysis in **Annex 8: Cost Benefit Analysis Process**.



Overhead lines

— lead asset strategy

1

In this section we describe the strategies for managing the three types of lead assets that comprise overhead lines. We provide details of how we plan to co-ordinate works that are the right balance of investment and risk.

A system within our network

The majority of our network is overhead line with a total length of 3,740 circuit km, roughly the distance between Glasgow and the North Pole. These are predominantly steel towers, with the oldest routes dating from the 1930s but there are also some wood poles. Overhead lines are vital to transmit power from where it is generated to where our connected customers are. They are important in maintaining a secure supply so it's vital that they remain reliable.

We can think of overhead lines as a system made up of three major components:

Steel towers (sometimes known as pylons) and their concrete foundations

Conductors are the wires that carry the power. They are attached to the towers by fittings.

Fittings, which are the insulators that attach the conductors to the towers and other components to control vibration.

Component life

Our overhead lines operate at 132kV, 275kV and 400kV, with a small number of 33kV routes – mainly to renewable generation sites – and 25kV to railway supply points.

The investment strategies for overhead lines are influenced by the different average expected lives of major components.

These averages are:

Towers: approximately 80 years (*this includes foundations*)

Conductors: 50 to 60 years

Fittings: 30 to 40 years

Component life is strongly influenced by environment. Salt and industrial pollution reduces the lives of conductors and causes tower steelwork to require more extensive treatment. Wind-induced fatigue can reduce the life of conductors and fittings, but more sheltered routes can be expected to have longer than average lives.

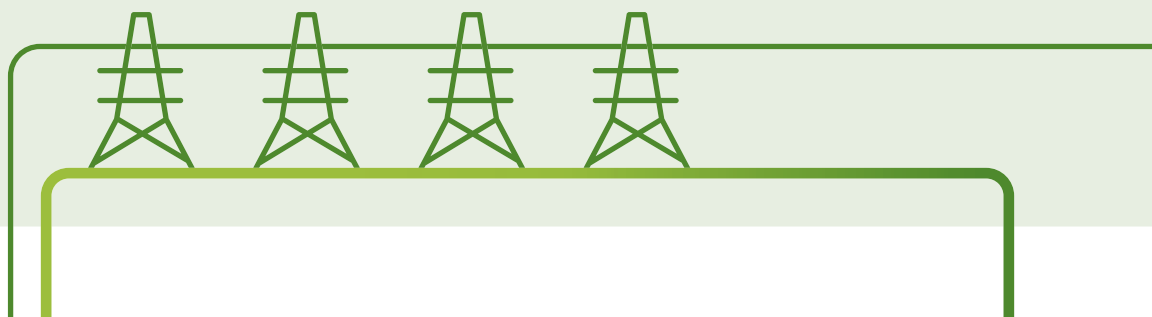
Conductor configurations and behaviour

The conductors are configured differently depending on the application. The majority of the 275kV and 400kV network use a two-conductor, or twin, 'bundle' to increase the power transfer capability. On some routes there is a four-conductor – or quad – bundle, and there is also a very small length of triple bundled conductor. The 132kV network is mainly configured with single conductor.

These configurations behave differently in normal operation. Quad bundles, while being very effective for power transfer, have a history of not being able to control conductor vibration and oscillation well. The components added to quad bundles to control these effects wear out more quickly than for other configurations, and are not as effective as we would like. This leads to a lot of conductor damage, which requires the circuit to be removed from service. Twin conductors also experience these effects, but it's normally less severe, except on very exposed routes. Single conductor systems are the least affected in this way.

Total investment in Overhead lines (OHL)

£219.7m



Key developments in conductor systems

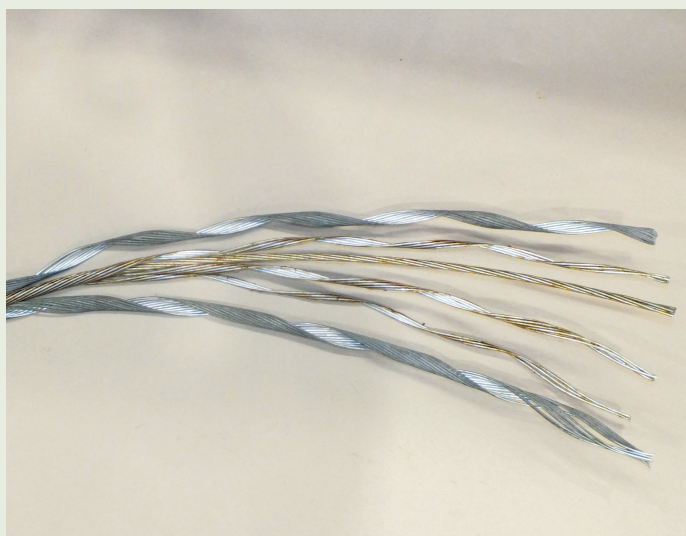
There are two main types of conductor on our system. They have very different characteristics and need different strategies to manage their condition.

Before the mid-1980s, aluminium conductor steel-reinforced (ACSR) conductor systems were used.

Before around 1969, only the steel reinforcing core was coated with protective grease to delay corrosion from moisture and pollutants ingress.

Experience from forensic analysis of decommissioned conductors supports the theory that core-only greased conductors deteriorate at a faster rate than those with all inner layers greased.

From the mid-1990s onwards, all aluminium alloy conductor (AAAC) predominates. This type is less prone to corrosion but is more susceptible to loss of strength through fatigue as it doesn't have a reinforcing core.



Our understanding of conductor corrosion

All ACSR conductors suffer from corrosion of the steel core with the fastest rates being observed in the smaller types, Horse and Lynx – with core-only grease followed by Zebra. Fully greased conductors generally corrode more slowly, with the larger Zebra conductors expected to have the longest life.

Assessing condition to maximise life

Our strategies for investment are strongly influenced by the condition of the conductor. We may need to replace parts suffering from corrosion or fatigue, or to maximise conductor life by replacing the components – known as fittings – which will cause fatigue as they deteriorate.

The individual strategies for each individual overhead line are affected by what works have gone before in their lives, with the different expected lives of the major components playing a big part in this.

Using evidence from previous interventions and an extensive programme of condition assessments, we have created a methodology to quantify the condition and expected lives of overhead line components. This takes component type into account, as well as the environmental conditions that have an influence on the expected life. This methodology has been reviewed and challenged by a world-leading expert to make sure that it is accurate and strikes the right balance between risk and cost.

There are two main conductor types we plan to replace:

175mm² 'Lynx' conductor, mainly on the 132kV system; and

400mm² 'Zebra', mainly on the 275kV and 400kV systems.

Our overhead lines also use a protective earth wire which is of type 70mm² 'Horse' on most of the 132kV network, and Lynx or Zebra on the 275kV and 400kV networks.



Overhead lines

— strategy for each system

The 132kV system

The 132kV overhead line network was mainly constructed between the 1930s and late 1960s, with a small number of extensions in the 1970s and 1980s, until more recent extensive expansion due to the transition to renewable generation sources.

The earliest routes have been re-conducted, but those from the 1950s and 1960s generally use the original core-only greased ACSR conductor, mainly Lynx.

In RIIO-T1, there was a limited programme to refurbish three strategically important routes (CL, CK & V) which form part of the interconnection to SHE Transmission and National Grid respectively. The plan was limited to allow focus on the more strategically important 275kV and 400kV routes. The relatively small 132kV programme in RIIO-T1, and the expected life of the conductor, has led to more routes being considered for intervention in RIIO-T2. The shorter life of fittings means that they have already been replaced on a number of routes.

Our extensive inspection programme for towers and fittings lets us determine the condition of routes historically known to have a deteriorated condition. For conductors, where possible, we have used non-intrusive measurements to quantify condition, and we have also removed samples of the conductor for forensic analysis. This has given us a complete picture of the 132kV overhead line network condition.

132kV strategy as part of RIIO-T2

The strategy for RIIO-T2 is to replace the conductors and earthwire where we have evidence that their condition has reached the point where further loss of strength would lead to unacceptable safety and network availability risks.

Where the fittings have significant life remaining, we will retain them as this is the most economical option. We expect the towers to have enough remaining life to justify keeping them and replacing the conductor. However, we will need to do some remedial works, treating corroded steelwork where we can and replacing individual steel bars that can't be repaired.

Extensive inspection helped us discover that the foundations of towers of a design known as PL16 were not installed as they should have been in the 1950s and 1960s. While the towers have given good service despite this, we will need to take action in certain situations. We have undertaken a quantified risk assessment of each affected route and proposed remedial works at a small number of high-risk locations (at road crossings for example). This will result in an average of 17% of foundations being upgraded on the routes we are refurbishing.

The 275kV system

The earliest parts of the 275kV system date from 1960, and the condition of the components led to a refurbishment programme being initiated in RIIO-T1. The RIIO-T1 programme targeted the routes with the most significant condition issues, focusing on strategic parts of the network that support the economic transfer of energy and security of supply to the whole of Scotland.

The evidence we gathered during this programme validated the condition information we had and increased our data sources. Like the 132kV network, we have added to that with a programme of inspection, testing and sampling to create an accurate view of network condition status.

275kV strategy as part of RIIO-T2

Our strategy is to replace conductor and earthwire where there is condition-based evidence that intervention can't be deferred. This is primarily due to a manufacturing defect of a particular batch of conductor installed in 1966.

We will refurbish towers using the same approach as for the 132kV network. The foundations don't have the same installation issue, but our experience in RIIO-T1 shows that we will need to refurbish 10% of foundations on average, including at critical tension towers.

The works on the 275kV network are mainly minor refurbishments focusing on fittings where the conductor has significant remaining life. These routes have a fully-greased conductor type, and our condition assessments have determined that there is no need to replace these until RIIO-T3 or beyond.

The 400kV system

The 400kV system was first constructed in the early 1970s for the connection of Hunterston Power Station and was extended in the 1980s when Torness Power Station was commissioned. More recently, the network has extended to increase power transfer from the north of Scotland, to England and Wales.

These overhead lines are a combination of new build routes from the 1970s onwards and older routes that originally operated at lower voltages and have since had their voltage increased.

400kV strategy as part of RIIO-T2

Our strategy for 400kV is to replace conductor systems which have deteriorated due to:

Corrosion – mainly core-only greased Zebra and Lynx on routes where operating voltage has increased

Fatigue – on the routes which have been exposed to harsh environments (mainly fully greased Zebra and Lynx), particularly in quad bundle configuration

There are also routes from the 1980s expansion whose fittings are showing evidence of poor condition. The strategy is to replace those that are causing damage to the AAAC conductor.

Overhead lines

— investment plan

We have used Cost Benefit Analysis to test the scope and timing of the options and verify that this programme has the right balance of costs and benefits for consumers.

We update all our condition data in a co-ordinated programme to make sure our investment planning process is shaped by the latest information.

We have used the asset strategies and followed the planning process to establish a prioritised programme of interventions.

The programme is summarised over the following pages. Major and minor refurbishments are described separately and identified by network voltage.

Our major refurbishments are 34% less than in RIIO-T1 (adjusted for the 8 year length of RIIO-T1) and minor refurbishments are 4% higher. The increasing bank of condition evidence has given us confidence that we have focused investment where it is most needed. While the number of routes that need major refurbishment is greater than in RIIO-T1, they are on average much shorter. While this results in less activity, we don't get the same economies of scale that longer routes provide. Differences in the scope and complexity of works also contribute to the higher costs than in RIIO-T1. However, the main difference between the two periods is the 132kV rebuild works.

Rebuild on the 132kV system

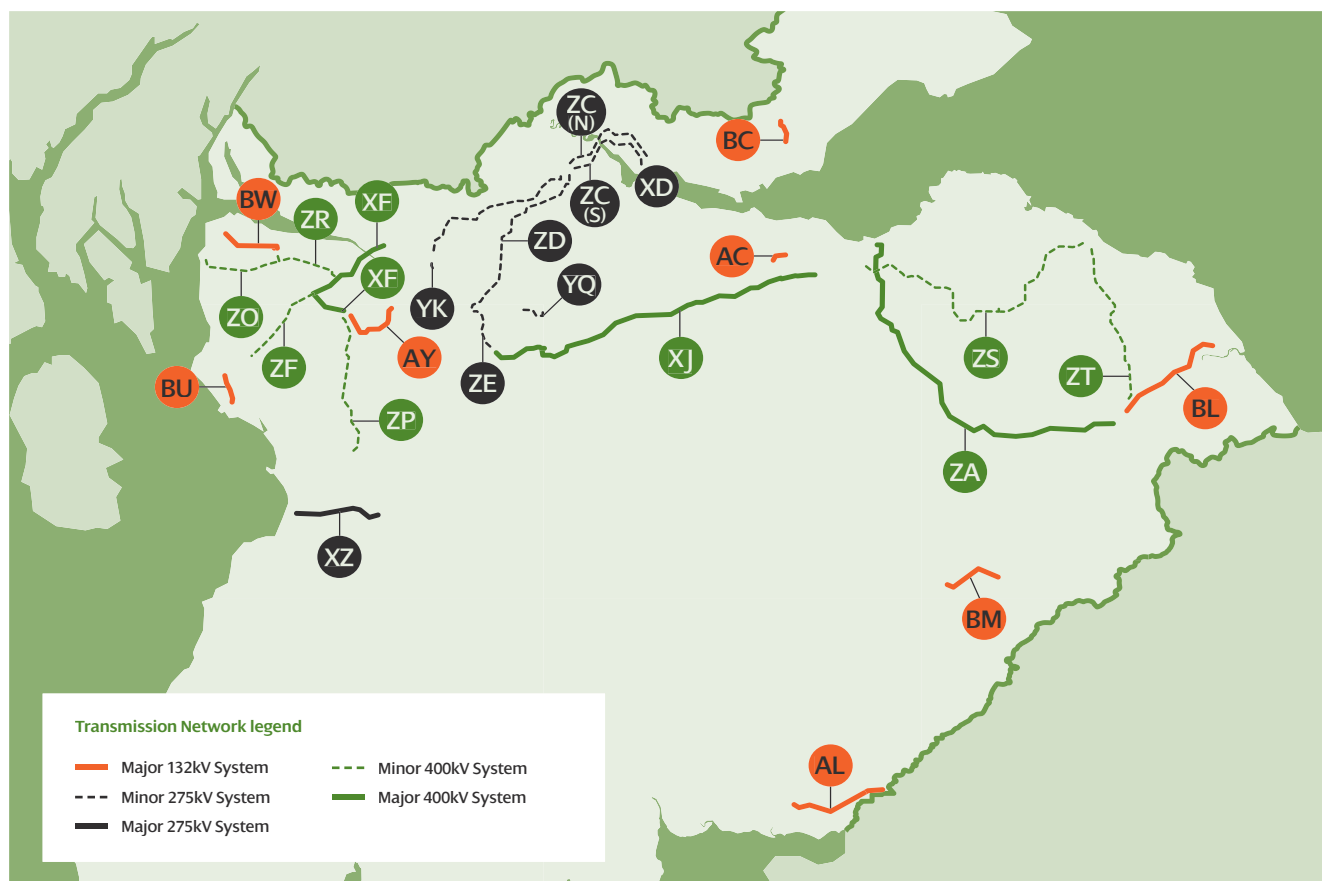
In RIIO-T1, we initiated a project to manage the condition of overhead lines on the single circuit R (between Glenlee and Tongland) and S routes (between Tongland and Dumfries). This project is closely associated with the Kendoon to Tongland reinforcement scheme.

These routes were built in the early 1930s, and the most cost-effective approach is to build a new double circuit overhead line between Glenlee and Tongland. We are still in the process of extensive engagement and consultation with the local communities. The project is due to be completed in 2024 at a cost of £46.61m, with £40.79m of that in RIIO-T2.

The G Route scheme to replace a steel tower line dating from 1929 with a wood-pole line commenced in RIIO-T1 and will be completed with £2.96m of expenditure in RIIO-T2.

Continuous improvement

Our business-as-usual innovation for overhead lines is both technical – such as reducing the impact and costs of tower accesses and use of LiDAR data – and process. Examples of this are allocating and combining work packages and reducing outage times through new working methods.



Overhead lines Investments

Minor	Route	Area	Conductor /Earthwire	Circuit Length (km)	Planned Completion (Year)	Total Cost	Monetised Risk Benefit
275kV	ZD & ZC(S)	Lanarkshire & Falkirk	N/A	103	2025	£8.38m	Lr£2,505.70m
	ZE	Lanarkshire	N/A	30 Towers	2026	£1.81m	Lr£647.9m
	YK	Glasgow	N/A	8.12	2024	£0.74m	Lr£611.38m
	YQ	Lanarkshire	N/A	6.88	2026	£0.42m	Lr£29.2m
	ZC(N)	Falkirk & Fife	N/A	37.64	2026	£4.33m	Lr£422.19m
	XD	Fife	N/A	4 Towers	2023	£5.17m	Lr£309.6m
400kV	ZP	Ayrshire & Renfrewshire	N/A	55.1	2026	£4.51m	Lr£3,257.36m
	ZF	Ayrshire	N/A	35.12	2022	£2.72m	Lr£2,737.49m
	ZT	Lothian & Borders	N/A	68.52	2025	£2.85m	Lr£612.67m
	ZS	Lothian	N/A	108.14	2025	£8.62m	Lr£1,231.02m
Major							
132kV	BM	Borders	Lynx / Horse	2.6	2024	£1.0m	Lr£2.84m
	AL	Dumfries & Galloway	Lynx / Horse	28.62	2024	£8.88m	Lr£77.71m
	BC	Fife	Lynx / Horse	14.28	2023	£4.43m	Lr£142.86m
	BL	Borders	Lynx / Horse	43.14	2025	£10.16m	Lr£599.05m
	BW	Inverclyde	Lynx / Horse	15.1	2026	£4.37m	Lr£39.05m
	AC	Lothian	Zebra / Lynx	2.98	2025	£1.41m	Lr£16.5m
	AY	Renfrewshire	Zebra / Lynx	25.22	2025	£9.12m	Lr£1,429.96m
	BU	Ayrshire	Zebra / Keziah	17.14	2024	£5.12m	Lr£253.63m
275kV	XZ	Ayrshire	Zebra / Lynx	18.8	2023	£6.50m	Lr£266.55m
400kV	ZA	Lothian & Borders	Zebra / Zebra	131.64	2023	£44.66m	Lr£1,873.64m
	ZO, ZR & XF	Inverclyde & Renfrewshire	Zebra & Totara /Lynx	35.76	2023	£17.51m	Lr£3,418.17m
	XH & XJ	Lanarkshire & Lothian	Zebra /Lynx & Keziah	147.32	2026 (indicative)	£39.13m	Lr£3,326.29m

The timing of the XH and XJ route project is uncertain as the works are similar to those needed for a reinforcement triggered by a generator connection. We will ring-fence this project as a Price Control Deliverable and we will only trigger the associated allowance if the works are needed in the RIIO-T2 period.

Although the exact scope of work varies from route to route, when we describe major refurbishments this typically involves a combination of:

Replacement insulators, spacers and fittings

Replacement earthwire fittings

Limited steelwork replacement

Tower Strengthening

Tower Painting

Major and minor foundation upgrades and repairs

Replacement aircraft warning lights

Phase conductor replacement

Earthwire replacement

Minor refurbishments will generally not include replacement of phase conductors or earthwire.

Underground cables

— *lead asset strategy*

2

In this section we describe our strategy for managing the two main types of underground cables. We detail our investment plans, which will avoid any environmental and reliability impacts of deteriorating cable systems.

Types of underground cable

407km in circuit length and dating from the late 1940s, our underground cables are of two main technology types. We also own 196 circuit kilometres of the Western Link HVDC cable which is mainly sub-sea.

Fluid-filled: These cables use oil in the insulating system and require oil tanks and management systems at the ends of the cable and at intermediate points along the cable length.

XLPE: The other cable type is known as XLPE (after the cross-linked polyethylene insulation system). This was introduced in the 1990s and is a much simpler construction than fluid-filled.

Fluid-filled cable is no longer widely available to buy, and new installations are of the XLPE type.

Fluid-filled cables

Fluid-filled cables are generally reliable but are prone to oil leaks, particularly where the cables are terminated and at positions where cable sections are jointed together. These need to be repaired to avoid environmental impacts and electrical failure.

Other than damage by other parties, most faults occur at joint positions. The exception to this is one particular type of cable installed in 1954, where the design has led to significant deterioration along its length and its replacement is being planned.

We have undertaken a significant programme of condition assessment of our fluid-filled cables and cross-checked the data with our maintenance records to determine the condition of each cable and the locations of any deteriorated components.

In RIIO-T1, we did not plan major works on our cable network. We had just completed the replacement of very unreliable gas-compression cables and our fluid-filled cables didn't need intervention at that time.

The current and forecast condition of some of our fluid-filled cables is the reason for the increase in activity in this area. Our detailed condition evidence means that we are confident that the routes identified for investment in our plan are the right ones.

XLPE cables

XLPE cable terminations have suffered from a high rate of failure. This is partly due to flaws in the earliest designs and some quality issues in installations. The technology is evolving, and measures have been taken to improve both aspects.

How we're making improvements

Fluid-filled cables

Our strategy for fluid-filled cables is to maximise their lives as far as possible. This means we are focusing on upgrading and replacing the oil management systems and repairing and reinforcing the joints, which are the main source of reliability issues.

We will also refurbish the earthing systems to ensure the safe operation of the cables.

The exception to this is the 1954 installation noted opposite. While this route has not yet shown the same deterioration as the other of the same type, our knowledge of the mechanism gives us cause to believe that reliability issues will arise.

XLPE cables

XLPE cables are expected to give reliable service for many years to come, but the high failure rate experienced in RIIO-T1 has caused uncertainty around the terminations. We have changed our surveillance procedures on these terminations to seek to detect any issues prior to failure.



Total investment in
underground cables

£32.0m

Underground cables

— investment plan

We need to undertake refurbishment work on a small number of routes – the scope of which is consistent with our strategy for this type of cable system. We have assessed our network of fluid-filled cables and determined that all but one route are likely to give reliable service for many years to come. Here's an overview of our plan.

Underground Cable Investments

	Route	Scope of Work	Circuit Length /No. of Joints /No. of sites	Planned Completion (Year)	Total Cost	Monetised Risk Benefit
275kV	Portobello — Shrubhill 1 & 2 Edinburgh	Refurbishment	14 Joints	2023	£4.71m	Lr£549.25m
		Hydraulic system replacement				
		Joint plumb reinforcement				
		Bonding and earthing refurbishment				
132kV	Braehead Park — Erskine 1 & 2 Renfrewshire	Refurbishment	23 Joints	2024	£5.02m	Lr£142.47m
		Hydraulic system replacement				
		Joint plumb reinforcement				
		Bonding and earthing refurbishment				
	Galashiels — Hawick Borders	Refurbishment	6 Joints	2024	£2.29m	Lr£27.44m
		Hydraulic system replacement				
		Joint plumb reinforcement				
		Bonding and earthing refurbishment				
33kV	Currie — Gorgie 1 & 2 Edinburgh	Replacement of cable systems	10.4km	2026 (indicative)	£9.59m	Lr£369.48
	Sealing Ends	Replacement of 132kV cable sealing ends	60 Sealing end sets	2026	£7.89m	N/A
33kV	Switchboards	Replacement of 33kV cable sections to new switchboard locations	20 sites	2026	£3.95m	N/A

Notes on our plan

The 132kV cable system between Currie, Gorgie and Telford Road substations was installed in 1954. The cables have copper reinforcing tapes which have corroded significantly on the Gorgie to Telford Road section. This has led to fluid leaks along the length of the cable itself and it is not feasible to repair this defect. We have already commenced a project to replace this cable system. The project will complete in the RIIO-T2 period with a total cost of £10.24m as we work with stakeholders to find the best route for the new cable.

We know the Currie to Gorgie section uses the same cable design, but has not yet exhibited the same issue. We have included a project to replace this section of cable in our plan, but it will be a ring-fenced Price Control Deliverable. If the cable remains reliable and we don't need to do the work in RIIO-T2, the associated allowance will not be triggered.

We also own 33kV cables at the interface with the distribution system, and work is required to divert or replace these cables when the distribution network operator (DNO) replaces the jointly-owned 33kV switchgear. We have worked closely with the DNO and have included the costs of the works associated with their plans occurring within the RIIO-T2 period.

We have experienced an unusually high number of failures of 132kV cable sealing ends in RIIO-T1. We have included a project to replace remaining units which are the same generation as those which have failed. Again, we will ring-fence this project as a Price Control Deliverable and if the sealing ends remain reliable we won't replace them and the associated allowance will not be triggered.

Substations lead assets

— *asset strategies*

3

Our substations connect different parts of the network. They allow power to be directed around the network. We have smart systems to protect, automate, control and monitor the network and you'll find these in our substations.

There are many different types of asset in our substations. We have strategies for each and we plan and co-ordinate our activities to create the most efficient plan.

Substation types

We own and operate 156 substations, that vary greatly in size and volume of assets. As part of our strategy we grouped them into two categories:

Air-insulated substations (AIS) – substations whose high voltage components are exposed and insulated by their distance from the ground. These are the most common type on our network. Almost all of our investments in this section are in existing substations of this type.

Gas-insulated substations (GIS) – substations whose high voltage components are enclosed in aluminium pipework and insulated by sulphur hexafluoride (SF₆) gas. Alternative insulating gases are now becoming available.

Assets within substations

In this section, we have grouped the substation assets and we'll describe the strategies and investment plans for each in turn. The asset groups are:

Circuit-breakers – Lead assets that control the circuits and stop short-circuit currents caused by faults.

Electrical assets – There are other electrical assets, such as disconnecting switches and measurement transformers that are also essential for the safe and reliable operation of the network.

Protection, smart control and monitoring systems – Protection systems continuously measure the electrical behaviour of the network and act very quickly to detect faults that might arise. We also have equipment to automatically or manually control parts of the network. To improve our understanding of how the network is operating and how the assets are performing, we have a wide range of sophisticated monitoring systems. All of these systems need a reliable telecommunications system and we have our own private network for this.

Civil assets – An essential part of our network. The most obvious assets are the structures that support the electrical assets and the buildings that contain the smart systems but they all play their part in providing a safe and resilient network. Drainage systems, transformer bunds, fencing and security systems are the other main types of civil assets.

Total investment in lead substation assets

£164.2m



Our strategy for substation circuit-breakers

We're prioritising replacement of bulk oil and air blast circuit breakers that are in poor condition and we have limited capability to keep operational. We're also working with manufacturers to find alternatives to SF₆.

The condition of the population of circuit-breakers within our network is best understood by categorising them by technology type:

- Air blast circuit-breakers
- Bulk oil circuit-breakers
- Hydraulic/pneumatic SF₆ circuit-breakers
- Spring mechanism SF₆ circuit-breakers

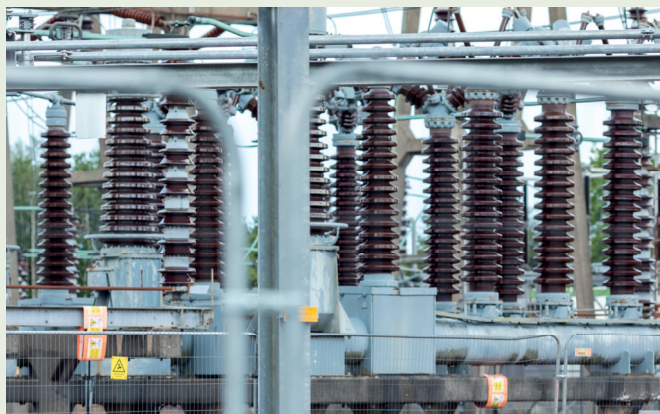
As a result of our improved understanding of condition issues and the prioritisation process, we're replacing fewer bulk oil and air blast circuit-breakers in our RIIO-T2 baseline plan than we did in RIIO-T1 (adjusted for the 8 year period of RIIO-T1). The interventions that are necessary in RIIO-T2 have scope and complexity differences that increase costs when compared to RIIO-T1. We also plan to increase our efforts to minimise SF₆ leakage.

However, the level of activity is similar to RIIO-T1 due to replacements and refurbishments we're doing on hydraulic and pneumatic SF₆ circuit-breakers – which developed condition issues during RIIO-T1.

We own and operate 156 substations, that vary greatly in size and volume of assets

156

Air blast circuit-breakers



Air blast circuit-breakers of types OBR 30/60, OIBR80, Frame-R and GA6 have all been assessed. We have found that all types have reliability and obsolescence issues, which limits their remaining useful life. The lack of manufacturer support, unavailability of critical spares and operational costs associated with ongoing maintenance indicate that these types are included in a replacement programme. We have examined the possibility of a further round of refurbishment of these circuit-breakers, but there are no viable options due to a lack of manufacturer support.

Bulk oil circuit-breakers



JW420 and OW410 bulk oil circuit-breakers were designed in the 1950s, and are now experiencing significant failure modes, so their remaining life is limited. The failures are the result of fundamental components degrading. These include, but are not limited to, stress cracking of support structures, current carrying contacts becoming misaligned, moisture ingress to the high-voltage bushings and unsupported and irreplaceable components. Any of these issues could lead to a catastrophic failure of the plant, and other network operators have experienced such failures of the 275kV JW420 type. These failures present safety and environmental risks. We have undertaken a detailed inspection of all JW420 circuit-breakers, in addition to routine inspections to ensure that we can keep them in service in the short term before being replaced during RIIO-T2.

SF₆ circuit-breakers

Since the first units were installed in the 1980s, this type has mainly been reliable. In recent years though, the earliest types' hydraulic or pneumatic mechanisms have experienced reliability issues. These types were supplied by a number of manufacturers and we now need to plan interventions to address this issue.



Our spring-mechanism SF₆ circuit-breakers are relatively new and have, to date, exhibited few issues that would justify any kind of intervention. The main area of concern to date has been gas tightness, and – given the relative simplicity of the operating mechanism – this is expected to be the case for the foreseeable future. In addition to routine inspection, testing and reactive defect management, we have a comprehensive repair and replacement plan for circuit-breakers and other equipment should they exhibit gas leaks above their design limits.

Alternative gases

SF₆ is a gas that has many times the global warming potential of CO₂ – our commitment to using alternatives will be crucial in helping to meet government targets in the move to Net Zero emissions.

Now that alternatives are becoming available, we will use these in preference to SF₆ for applications where they are viable and market ready. We expect this to be the case for 132kV circuit-breakers and GIS substations. Additionally, some components of 275kV and 400kV GIS substations are likely to be available with SF₆ alternatives and our plans include this technology. In addition to giving a clear signal to the market, we will continue to work with suppliers developing innovative solutions, helping to improve industry knowledge and leverage the benefits from SF₆ alternatives.

The management of SF₆ is also discussed in **Annex 7: Environmental Action Plan**.



Our strategy for substation circuit-breakers

Prioritising replacements

Our strategy for circuit-breakers is to replace the poorest condition, highest risk circuit breakers, which are air blast and bulk oil. These types have shown that they are approaching end of life due to performance, lack of manufacturer support and unsuitability for further refurbishment or life extension. The removal of these assets from the system will be prioritised by risk and the availability of system access.

The next priority type of circuit-breakers are the hydraulic and pneumatic mechanism SF₆ circuit-breaker population. These circuit-breakers are constructed using SF₆ as the insulation and arc interruption medium and use either a pneumatic or hydraulic energy source to open and close the mechanism. While the actual circuit-breaker interrupters are in good condition, the area of deterioration is within the hydraulic and pneumatic mechanisms. Failures are caused by corrosion and failure of dynamic seals and have led to mal-operation of the plant to either open or close. In addition, they are now increasingly unsupported by the manufacturers as the introduction of more reliable, lower cost spring mechanism designs caused the manufacture of pneumatic and hydraulic mechanisms to cease some years ago.

Where we can source the replacement components, we will deliver a programme of mid-life intervention to replace unreliable hydraulic and pneumatic mechanisms. Our interventions will prevent this failure mode causing early end of life of the circuit-breakers. These have been assessed on an individual asset basis and a cost-benefit analysis has been completed to determine where this course of action will be more beneficial for consumers than replacement. This strategy is most effective at 400kV.

Substation circuit-breakers

— investment plan

Our strategy explains the issues associated with the limited serviceability of our air-blast and bulk-oil circuit breakers. We have assessed these in detail and plan to continue the replacement programme we started in RIIO-T1.

We have prioritised the air-blast type because we have limited ability to keep them in good working order. We plan to replace the remaining units in RIIO-T2. These are located at Hunterston 400kV and 132kV substations, Longannet 275kV substation and Windyhill 275kV substation.

While there are operational issues with bulk-oil circuit-breakers, we have a greater ability to keep them operational for a short time beyond the end of RIIO-T2. This means we will need to monitor their condition more closely in the meantime. We will continue to replace this type of circuit-breaker, but over a longer time frame than we will for air-blast.

In RIIO-T2, we plan to replace the units at Westfield 275kV, Glenrothes 275kV and Devol Moor 132kV. We expect to complete the replacement of bulk oil circuit-breakers during RIIO-T3. The units remaining on the system after the end of RIIO-T2 are at two 132kV substations. In both cases, we have considered the best way to do this work while addressing the condition of non-lead assets.

We have analysed the ongoing operability of our air-blast and bulk oil circuit breakers. We have the ability to keep them in service until they are replaced as defined in this strategy.

The issues with the pneumatic and hydraulic mechanisms of early SF₆ circuit-breakers have reached a stage where routine repairs of the pneumatic and hydraulic mechanisms are no longer effective. We plan to refurbish the mechanisms or replace the circuit-breakers. We have considered these on a case-by-case basis and provide details below.

As we explain in our SF₆ strategy, we plan to begin removing this potent greenhouse gas from our AIS substations and specify alternative gases for new AIS circuit-breakers and GIS substations. This has been enabled by experience gained during our RIIO-T1 innovation¹ projects. We can only do this where there are alternatives available. Our work with the equipment manufacturers indicates that it is unlikely this will be possible at voltages above 132kV before the end of RIIO-T2, with the exception of some components of higher voltage GIS substations. We provide details of this programme over the following pages.

We will use our digital substation solution at off-line build substations as we transition this key RIIO-T1 innovation project into business as usual. We also plan to explore the use of Low-Power Instrument Transformers at these sites. This would be the first time this technology has been used as business as usual following our successful RIIO-T1 innovation project².

We have considered the reuse or remediation of existing electrical and civil assets during the optioneering of interventions. The environmental benefits associated with carbon and resource consumption, and waste reduction through reuse or remediation was fundamental to the decision making process.

We have identified that we need to add to our strategic spares holding to make sure that we have sufficient coverage for unexpected failures. Our plan includes the purchase of one 132kV unit using an SF₆ alternative, one 275kV unit and a 400kV disconnecting circuit-breaker. The total cost will be £0.45m

The investment plan summarised across the following pages is the result of an extensive optioneering and detailed engineering process. The options selected and their inclusion in our business plan are fully supported by cost benefit analysis.

¹ https://www.smarternetworks.org/project/nia_spt_1604

² <https://www.smarternetworks.org/project/spten02>



Our circuit-breaker projects

– a summary

Hunterston substations

Hunterston 400kV substation's air-blast circuit-breakers have operational issues that are becoming more pronounced as they age. The manufacturer has stopped supporting them and we have a limited stock of vital components. It is unlikely that we can continue to operate them much beyond the end of RIIO-T2. In co-ordination with the closure of the power station, our plan is to reconfigure the network by extending the nearby Hunterston East substation (constructed in RIIO-T1 to enable connection of the Western HVDC Link) by two bays, refurbishing and relocating the 400/132kV transformers. This allows the existing substation to be decommissioned, avoiding the need to replace seven circuit-breakers, two switch-disconnectors and associated non-lead assets.

At Hunterston 132kV, there are significant electrical and operational issues with the eight GA6 circuit breakers. In addition, severe access restrictions for routine maintenance is affecting the reliability of the non-lead assets. Due to space restrictions, it is not possible to replace this switchgear in-situ. A new seven bay Gas Insulated Substation (GIS) is due to be built nearby. As we explain in our SF₆ strategy, this will be specified with an alternative insulating gas. We will also apply our digital substation technology at this site. We have worked closely with EdF, owners of the power station to co-ordinate these works, meeting their requirements while minimising costs.

Total cost: £37.01m

Monetised Risk Benefit: Lr£111.18m

Windyhill substation

Windyhill 275kV is a key node in the network. Its 10 air-blast circuit-breakers are increasingly difficult to keep operational with escalating maintenance durations which require outages of the main interconnected system. We have considered re-building the substation bay-by-bay (replacing the circuit-breakers but retaining and refurbishing some of the non-lead assets) and building a new GIS substation in the grounds of the existing site.

A key factor is the costs for constraining generation during long outages required to do this work. We have worked with National Grid ESO to forecast these costs, which are greater for the AIS options than for GIS. We considered these with the capital costs of each option in a cost benefit analysis, and found the most economical solution to be the off-line GIS option. We will specify that the gas insulated busbars use an alternative insulating gas to SF₆ in line with our strategy for SF₆.

Total cost: £43.64m

Monetised Risk Benefit: Lr£536.01m

Longannet substation

Longannet power station has closed but the substation remains an important part of the network. We examined a large number of options to re-configure the network and remove the need for the substation. All of the options had a negative impact on the network's capability in areas with a strong need to reinforce.

We have performed extensive engineering design of the various options to replace the air-blast circuit-breakers and the non-lead assets which are all significantly deteriorated. We have analysed rebuilding in-situ and five off-line build options.

The in-situ option is the least economical due to the cost of refurbishing the building, the severe electrical and space constraints of the 1960s design and the extensive network outages required throughout, what would be a seven-year programme of works.

We have identified an economically preferred option that requires measures to mitigate flood risk. However, a number of other complex environmental and spatial constraints in the immediate surroundings means that siting and design requires careful consideration.

The wider area is also subject to a significant local authority led master-planning exercise to inform regeneration. We have started a detailed engagement process with stakeholders which will inform a detailed appraisal of all options. We hope to complete the development in 2027 but will be working with stakeholders, the local authority and the wider community to seek a full range of views on the plans.

A new reinforcement option has been submitted to this year's Network Options Assessment which would need Longannet to be changed to 400kV operation at an additional cost of £29.08m. This is likely to require the new substation to be GIS and the incremental costs are included in the scope of the NOA project.

This project is included in our plan, but it will be a ring-fenced Price Control Deliverable. The associated allowance will only be triggered when there is certainty over the timing, and the needs of the NOA project.



Westfield substation

Westfield 275kV substation is a major supply point for Fife and a key part of the eastern connection to the SHE Transmission area. We plan to replace the seven bulk oil circuit-breakers. We included retaining and refurbishing the major civil structures and refurbishing the non-lead electrical assets in our optioneering process. However, the costs of this would be higher than rebuilding the substation in-situ and have significantly longer outages which impact the capability of major system boundary B4.

We also considered an off-line build GIS but this would also be more expensive. In this case, there were no savings in outage durations due to the substation layout. We will use digital substation technology at Westfield. A new reinforcement option has been submitted to this year's Network Options Assessment which would need Westfield to be changed to 400kV operation at an additional cost of £5.5m which is included in the NOA project. Because of this uncertainty, we are proposing to ring-fence this project as a Price Control Deliverable. The associated allowances will only be triggered when there is sufficient certainty over the right solution.

Total cost: £17.41m

Monetised Risk Benefit: Lr£38.99m

Pneumatic & hydraulic SF₆ circuit-breakers

132kV Type A: We considered the costs of replacing the mechanism or purchasing a new circuit breaker. We have considered both SF₆ and alternative gases and propose to replace two units at Kilwinning, three at Meadowhead and six at Torness with alternative gas circuit-breakers. We do not need to intervene on non-lead assets at these sites.

132kV Type B: We plan to replace six of this type of circuit-breaker at Mosmorran with an alternative gas equivalent. The mechanisms need to be replaced but the manufacturer can't offer this service. We have also experienced significant deterioration of the non-lead electrical assets – in part due to the substation being located at a major petrochemical works. We will co-ordinate these works to maximise efficiency and minimise outages.

275/400kV Type C: We plan a mixture of replacements and refurbishments of this type of circuit-breaker. Our analysis shows that it's more economical to replace 275kV designs so our plan will replace one unit at Newarthill and three at Strathaven 275kV. Refurbishment is the right option for the three units at Strathaven 400kV.

Torness 400kV substation: The GIS substation at Torness was commissioned in 1986 and the circuit breaker mechanisms are now experiencing deterioration. We expect to have enough spares to maintain these only until the end of the RIIO-T2 period. To ensure that the eight circuit-breakers remain operable, we plan to replace the mechanisms by 2024 with the close co-operation of the power station owner.

Total cost: £13.62m

Monetised Risk Benefit: Lr£290.82m

Devol Moor substation

Total cost: £8.47m

Monetised Risk Benefit: Lr£38.32m

Devol Moor 132kV substation's four bulk oil circuit-breakers will be replaced with new alternative-gas AIS live-tank circuit breakers, in line with our SF₆ strategy.

The non-lead electrical assets are significantly deteriorated. We have examined refurbishment costs and replacement costs of disconnectors. The most economical option is to replace the disconnectors.

We have tested the concrete structures to establish their condition – using experience from a RIIO-T1 innovation project – and found it is economical to retain a number of these. This will result in approximately 500m³ of concrete from being classified as waste when it leaves site.

33kV circuit-breakers

Total cost: £8.01m

We also own 33kV circuit-breakers at the interface with the distribution system. There are works required to replace these when the distribution network operator (DNO) replaces the jointly-owned 33kV switchgear. We have worked closely with the DNO and have included the costs of the works associated with their plans during the RIIO-T2 period.

We will replace 40 circuit-breakers at a cost of £8.01m. As 33kV circuit-breakers are non-lead assets, there is no monetised risk benefit attributable to these works.

Greenhouse gas reduction

Total cost: £4.77m

We will continue to proactively manage our population of SF₆-filled assets. The programme of repairs, refurbishments and replacements will reduce our emissions of SF₆.

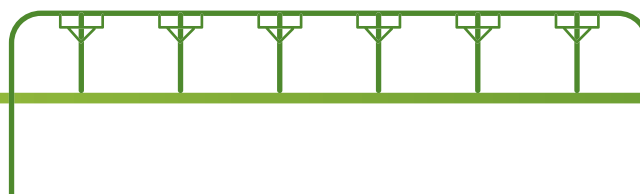
In RIIO-T2, we will refurbish and replace 55 circuit-breakers and other plant items.

Glenrothes substation

Total cost: £1.81m

Monetised Risk Benefit: Lr£43.62m

Glenrothes plays a key role in supplies to the local area and also form part of the eastern interconnection to the SHE Transmission area. We plan to replace the one bulk-oil circuit-breaker and associated non-lead electrical and civil assets.



Transformers and reactors

— *asset strategy*

4

Transformers and reactors have similar constructions and very similar operational requirements, so it makes sense to consider their strategies together.

This section describes how we assess the condition of these lead assets. We explain the condition factors that we need to be aware of and how we plan to invest.

Their role in our network

Transformers and reactors have very similar operational requirements but play very different roles in the network.

Transformers connect parts of the network that operate at different voltages. They are often the interface to our distribution system customers and the connections at renewable generation sites.

Reactors are used to control network voltages or to change power flows. This makes them very useful as the energy system transitions to low-carbon generation.

Replace before failure occurs

With transformers and reactors, it is particularly important to replace before failure takes place. The potential consequences due to large volumes of flammable insulating oil and the length of time it takes to replace them means that a detailed understanding of each individual transformer is needed.

Our normal practice is to assess the condition annually by sampling and analysing the oil. The presence of dissolved gases in the oil can be used to assess the activity in the main tank and the tap changers. Internal visual inspection is not performed on site because it is not very effective and attempting it could allow moisture and other contaminants to cause irreparable damage. For this reason, dissolved gas analysis (DGA) is an important tool.

We also assess the external condition, and the issues tend to be oil leaks and corrosion. There are known issues with bushings following in-service failures, and tap-changers can also suffer from reliability problems.

In addition to the normal inspection processes, we have undertaken a full, in-depth review of the entire transformer and reactor population. This has been verified by external transformer specialists, and we are confident that we have a sound understanding of each individual transformer.

Bruce Peebles transformers

The main exceptional factor is a non-repairable design defect in a particular variant of Bruce Peebles transformers, which led to in-service failures before RIIO-T1.

Following forensic analysis of units of this transformer type replaced in RIIO-T1, it has been confirmed that all the units demonstrated signs of failure at the known defect location. Based on this finding and the technical understanding that remaining units are of an identical design, these transformers are subject to enhanced monitoring.

We have identified which transformers of this type are at the highest risk of failure and will replace them in RIIO-T2. We will monitor the remaining units closely and consider them for replacement based on the information we collect.

Understanding deterioration

Following the decommissioning of the other types of transformers in RIIO-T1, forensic analysis has found that, in some cases, the active part of the transformer did not deteriorate as much as the condition data suggested it would. This is due to several issues, such as design characteristics, lifetime loading and maintenance regimes.

This information has improved our understanding of asset deterioration, and has led to the introduction of a transformer refurbishment programme. Transformers are candidates for refurbishment if the condition of the core and windings is suitable for continued service but present issues with components such as the tap-changer or cooling systems.

The addition of the monetised risk methodology to our historical assessment of transformer condition brings an enhanced holistic review that identifies when a transformer requires intervention based on the weighting of the model inputs.

As well as age, the model inputs include, design characteristics, lifetime loading, oil analysis, and maintenance regimes.

This weighting allows us to identify when an intervention is required. Review of the individual weighted elements then allows the determination of the intervention required.

A cost benefit analysis is undertaken for each transformer or reactor to inform whether refurbishment or replacement would be more beneficial for consumers.

Transformer investment

Investment in reactors

£32.3m £7.7m



Transformers and reactors

— investment plan

During an extensive review of our transformers' and reactors' condition, we identified need for the following works. We have engaged an independent specialist to verify our decision-making criteria remains in line with modern standards and practices. A second specialist also conducted the review of our proposed assets to validate the required works. The reports can be found in **Annex 23: Our Assurance Framework** and **Annex 1: Investment Packs** respectively.

The transformers and reactors identified for replacement have been assessed to have limited remaining lives due to deterioration of the insulation or irrecoverable condition issues. This assessment is consistent with the output of the asset models. In this case we have not considered refurbishment due to the significant life limiting issues. In other cases we have considered both replacement and refurbishment. Based on the condition evidence we have compiled, we are confident that the reduced rate of replacement does not result in unnecessary risk, allowing consumers to benefit from the lower costs.

We will replace three times as many transformers in RIIO-T1 than are in this plan (adjusted for the 8 year length of RIIO-T1). We needed to replace 8 shunt reactors in RIIO-T1 but plan to replace only 2 in RIIO-T2. Our lower cost refurbishment plan is a new activity in RIIO-T2, meaning that the overall level of activity is about the same as RIIO-T1.

Transformers and reactors investments

Transformers	Route	Scope of Work	Number of Units	Planned Completion (Year)	Total Cost	Monetised Risk Benefit
400kV	Torness SGT1 & SGT2	Refurbishment	2	2025	£1.44m	Lr£134.94m
275kV	Shrubhill SGT1 (Bruce Peebles)	Replacement	1	2024	£3.94m	Lr£139.55m
	Neilston SGT1	Replacement	1	2025	£3.72m	Lr£47.35m
	Giffnock SGT1	Replacement	1	2026	£5.87m	Lr£37.59m
	Windyhill SGT3	Refurbishment	1	2024	£0.7m	Lr£35.08m
	Grangemouth SGT1	Refurbishment	1	2025	£0.57m	Lr£79.02m
132kV	Devol Moor T2A	Replacement	1	2025	£3.47m	Lr£69.31m
	Kendoon T2	Refurbishment	1	2026	£0.61m	Lr£15.97m
	Inverkeithing T2	Refurbishment	1	2023	£0.64m	Lr£32.7m
	Saltcoats T2C	Refurbishment	1	2025	£0.46m	Lr£54.86m
	Carntyne T1B & T2B	Refurbishment	2	2024	£1.14m	Lr£79.12m
	Partick T1	Refurbishment	1	2026	£0.48m	Lr£28.66m
Reactors						
400kV	Torness Shunt	Replacement	2	2024	£7.80m	Lr£23.79m
275kV	Longannet	Refurbishment	2	2026	£3.06m	Lr£9.85m

Notes on our plan

The Longannet series reactor refurbishments will be co-ordinated with the circuit-breaker replacement project and ring-fenced as a Price Control Deliverable, so the associated allowance will not be triggered should it be delayed beyond RIIO-T2.

As we will have a smaller order book than in RIIO-T2, we need to add two strategic spares and to complete some civil works for their storage. One of these will be a 132/33kV 90MVA unit and the other will be 275/33kV 120MVA and the total cost will be £2.48m.

Substation non-lead assets

— *asset strategy*

5

The good condition of civil assets is key to maintaining safe and secure sites for both staff and members of the public, and ensuring the longevity of our asset base. Here are the key considerations involved.

What civil asset condition investment covers

Investments to manage civil asset condition includes the replacement and refurbishment of transformer oil containment systems, fences and walls, buildings, heating and lighting systems, drainage systems and structures that support the electrical assets.

To prioritise assets for intervention, qualified civil engineers have undertaken an intensive condition assessment of all transmission civil assets and developed a condition-based approach. This has progressed into a programme of civil works to ultimately extend asset life and avoid the need for replacement in the near future which would need significant investment.

The design intent for structures supporting an electrical plant was to avoid the need for intervention altogether, based on the understanding that the structure would be replaced with the electrical plant when necessary. Thanks to a better understanding of both concrete and steel structures, these approaches are being adapted. The strategy now involves consideration of extending asset life to provide the best value for consumers.

Proposals for substation buildings

There are two options where other planned work has been proposed: the retention and reuse of the existing building, or the design and construction of a new building to house the associated equipment.

Installation of a new building allows for an offline build and installation of associated equipment – this ensures a modern, functionally-designed building that meets current environmental and planning standards. It also provides an environment specifically designed to house any internally-installed equipment for its lifetime.

When we re-use existing buildings, interventions will be required to bring these buildings in-line with current standards. These works will include LVAC systems, lighting, and air conditioning. In addition, any remedial works the building requires will be undertaken to address structural issues. Any works required will be assessed using CBA to provide the best value for money.

Our civil asset base contains buildings at all our substations, of which only a small percentage are being worked on as part of planned project work.

A proactive investment strategy

From the RIIO-T2 period onwards, we have developed an investment strategy to allow pro-active interventions, based on our recent condition assessments. Our civil assets have all been assessed and given a condition-based health index (health index 1 is new and health index 5 is end of life). Proposed works for RIIO-T2 will see the removal of health index 5 deficiencies, either when we are undertaking other work or as part of a civil works programme – whichever CBA determines to be the most economical. All remaining issues (health index 4 and 3) will be risk-assessed and addressed if they reach a health index 5 and before they present any safety risks.

Total investment in civil assets during RIIO-T2

£48.14m



A brief history of how civil structures have evolved

It started with concrete

Before 1980, we built civil structures with concrete which we believed would not require any maintenance. It was thought that the structures would be able to support the asset for its lifetime and would be replaced along with the plant when it was changed. Improved knowledge of how concrete ages has made intervention possible. This enables us to extend the life of the concrete structures and reduce the costs associated with changing the plant.

We have undertaken detailed assessments of concrete structure assets, learning from our RIIO-T1 innovation project¹. Using CBA, we have determined the most cost-effective methods to employ at sites to decide whether to replace or remediate structures. Our inspection and maintenance regime runs alongside this. All concrete structures have a minor intervention strategy to extend their lifespan until replacement is more economical.

Then came steel

Steel structures were used as an alternative to concrete structures from the 1980s. These structures were designed and built with galvanised steel to ensure a typical 40-year life cycle. These were in line with the expected plant life and so, like their concrete counterparts, were assumed to be replaced along with the plant.

The first steel structures built in the 1980s are approaching the end of their design life. We have developed a minor intervention strategy to extend their lifespan until replacement is more economical.

How we work with both

The condition-based assessment that we have undertaken has allowed us to develop a detailed understanding of the condition of concrete and steel structures.

The proposed programme for RIIO-T2 will undertake a detailed investigation of the assets assessed to determine which course of action is best suited to deliver the best value.

Oil containment systems

Transformer and reactor oil containment systems are essential in ensuring environmental compliance in normal operation, and particularly in transformer failure scenarios.

Through condition-based assessments, we have reviewed all of our transformer and reactor oil containment systems and categorised them using the standard health index methodology. Any oil containment systems which are non-compliant with modern standards will have new fully-compliant systems installed. Oil containment systems that are damaged and assessed as health index 4 will have individual assessments and repairs undertaken to ensure full compliance. We have prioritised the works to target the sites with the greatest environmental sensitivity first.

Substation Security

Substation fencing is the first line of security and ensures that the public and equipment are kept safe from potential dangers and damage. As with all assets, degradation takes place with time – particularly in terms of rusting, vandalism and third-party damage.

The condition-based analysis of these sites has identified that wholesale fence modernisation is not required, but for optimum safety, we must keep on top of targeted remedial repairs and replacements.

All substations have existing security measures in place to make sure the company meets the legislative requirements detailed in the Electricity Safety, Quality and Continuity Regulations. There is a large asset base of transmission substations across the network, and whilst perimeter fencing and gates deter access into a substation, in recent times it has been identified that these cannot be solely relied upon.

We have been installing substation electronic security systems for a number of years and found that this additional layer of protection against either unauthorised or inadvertent entry protects both the public and company assets. To date, integrated security systems have been constructed in transmission substations, and we propose to continue rolling out these security systems as well as refurbishing older systems which will have reached end of life during RIIO-T2.

The sites that require security measures have been included within the scope of this project and the criteria used to apply integrated security measures is based on risk founded on the importance of the substation, and the history of third party interference.

We will also refresh and enhance fire detection systems at our substations so that they meet current standards.

¹ https://www.smarternetworks.org/project/nia_spt_1606

Civil and buildings

— investment plan

We have completed a full condition assessment of our sites where we know, thanks to inspections, that we have civil condition issues.

Refurbishing our concrete and steel structures will maximise their lives and future interventions in electrical assets will be more efficient as a result. We will refurbish 17% of our concrete structures and 1% of steel.

We have engaged with the Scottish Environment Protection Agency (SEPA) on our prioritisation of transformer bund upgrades and replacements. We will upgrade the bunds and drainage systems at 29 of our 156 sites as a result of this prioritisation and will continue this programme in future periods. We have co-ordinated these with our transformer replacement and refurbishment works. We will continue to explore new and innovative ways of upgrading the systems, minimising the use of new materials and the creation of waste.

We have a project to rationalise one of our city centre sites to manage the condition of civil and building assets from the former power station and to reduce the visual impact of the site.

We also have a project to improve the Cockenzie indoor AIS substation building at the site of the former power station.

We plan to improve the energy efficiency of around a third of our substation buildings at a cost of £2.76m. This will involve improving the insulation and installing more efficient heating and lighting systems. We have prioritised the sites where the biggest improvement can be made. We will co-ordinate the works with the building refurbishment programme.

How we're making improvements

Work Programme	Activity	Planned Completion (Year)	Total Cost
Refurbish substation structures	228 concrete and 105 steel structures at 81 sites	2026	£6.20m
Substation Building Refurbishment Programme	Buildings at 48 substations	2026	£5.25m
Oil Containment System Refurbishment	29 sites	2026	£10.38m
Cockenzie building improvement		2022	£6.30m
Partick Grid Site Rationalisation		2024	£2.96m
Fire & Security Enhancements		2026	£14.29m

You can find more about how we plan to improve the energy efficiency of our substation buildings in **Annex 7: Environmental Action Plan**.



Substation electrical assets — investment plan

There are a number of electrical assets and instruments involved in the effective operation of our transmission network.

Instrument transformer types

There are two types of instrument transformer construction in use in our network:

Sealed for life units

The sealed for life units, as the name suggests, require no maintenance and have no interventions possible. These units will be replaced with their associated circuit-breakers on a case-by-case basis where it is the most economical option, or if end-of-life failure modes develop.

Oil insulated units

The oil insulated units are inspected for oil levels and topped up as required to ensure optimal performance. These units will be monitored and any leaks identified and managed as required. The instrument transformers will be replaced on a condition-based approach, supported by condition and oil analysis.

Polychlorinated Biphenyls

This is a substance that was used in some electrical equipment in the past and is now banned. New requirements mean that if the equipment was made before 1987 and contains more than 50 millilitres of oil, we need to assume that it is contaminated unless we can prove that it is not. Results to date give us confidence that the equipment that can be tested is not contaminated. However, there are a number of instrument transformers whose designs mean that the oil can't be tested. To comply with the Persistent Organic Pollutants Regulation, we need to assume that they are contaminated and dispose of them by the end of 2025.

We plan to replace 127 voltage transformers and 29 current transformers at a total cost of £1.67m. This is in addition to the 79 voltage transformers we will replace as part of our circuit-breaker replacement works.

How we're making improvements

We are undertaking minor replacement works on non-lead electrical assets due to poor condition, with planned costs of £1.12m over the period. This includes the replacement of current transformers at Cockenzie 275kV at a cost of £0.92m. Replacement is necessary as analysis of the oil shows significant deterioration of the insulation.

We have one larger replacement project at Glenniston 132kV (which also includes protection works) at a total cost of £2.84m.

Disconnectors and earthing switches

Disconnectors and earthing switches are essential to the operation of a transmission network, and as such there is a large population of plant within our network. These must be managed effectively for reliable network operation.

We have assessed the costs of refurbishing this type of plant and have determined that this approach is not the most economical, particularly when interventions are planned on associated equipment in the substation. The replacement of these assets will be based upon the condition assessment of the equipment to determine whether they will continue to perform reliably.

Our business plan includes costs of £5.02m to respond to faults on substation non-lead assets.

GIS Monitoring Systems

GIS substations are very reliable, but early failures can be predicted by the presence of an electrical phenomenon known as partial discharge (PD). We will roll out PD measurement and gas trending on existing GIS substations. This will allow us to understand the degradation of the GIS and develop a condition-based assessment criteria for the equipment. This will work with the ongoing maintenance regimes created in line with the manufacturers' recommendations and the growing understanding of equipment performance.

This project will be completed in 2026 at a cost of £2.76m.



Smart control and monitoring

— investment plan

We control our network in real time using a centralised system known as an Energy Management System (EMS). This takes place at our control centre which communicates with equipment at every substation (Remote Terminal Units or RTUs) using our telecommunications system.

How we're enhancing our network

We currently manage our network using an EMS originally installed in 2006. It was refreshed in 2016 on an architecture delivering performance improvements and third-party support efficiencies. This platform is now obsolete and manufacturer support is time-limited, so we are progressing its replacement.

The current platform satisfied the functional requirement for the traditional suite of EMS applications and latterly for a reduced set of power analysis applications. It replaced a system installed in the mid-1980s, scanning a population of RTUs using a legacy proprietary protocol. This protocol was delivered on the EMS platform to allow backwards compatibility with the then installed RTUs and remains in use today for the majority of sites.

There has subsequently been a move to adopt industry standard protocols for communications to RTUs at new sites, with around a quarter of the RTUs using the international standard protocol. The EMS replacement will require upgrades to the remaining RTUs to implement the international standard protocol. We will also refresh other aspects of substation control, including those with unsupported operating systems in line with our strategy for cyber security.

We operate a large number of devices to monitor and record asset condition and system behaviour. This lets us pinpoint live network issues and conduct detailed post-fault analysis.

By integrating the measurements from across our network (known as WAMS) with the EMS, we can provide control engineers with enhanced visibility of the operation of the network. This is becoming increasingly important as new sources of generation connect and energy transfers across our network increase.

As we said in the transformers section on page 106, we will fit on-line monitoring systems to the remaining Bruce Peebles transformers on the network. This will allow us to maximise their remaining lives and help to determine the right time to intervene.

Total investment

£13.59m

How we're making improvements

We have a number of initiatives to improve visibility, control and asset condition monitoring. We have summarised these in the table below.

Work Programme	Planned Completion (Year)	Total Cost
EMS Replacement	2026	£6.25m
RIIO-T2 System Monitoring Modernisation	2026	£3.77m
RTU/HMI Replacement	2026	£2.27m
System Health Map	2026	£0.43m
EMS-WAMS integration	2026	£0.75m
On-Line Dissolved Gas Analysis	2026	£0.12m

Upgrades and improvements underway

Parts of the monitoring system are now almost 25 years old and there are often no spare components available. We will upgrade this equipment where we can, or replace it where necessary due to unreliability or obsolescence to ensure we continue to provide adequate network coverage.

We will integrate the data from all of our system monitoring equipment into a single platform, which we call a System Health Map. This will deliver a software platform, working within operational timescales. This will aggregate and display distributed monitoring data from within our transmission system – presenting the data from all of our transmission assets, comparing the values against predefined limits (such as ER G5/4 for harmonics). The outcome will be actionable information regarding system status and health. There will also be a defined architecture and methodology for integrating future applications into the platform in the future.



Protection systems

— *asset strategy*

Protection systems detect short-circuit faults and initiate the opening of circuit-breakers to safely disconnect the faulted components. They are vital for the safe operation of the network and must perform reliably to avoid widespread network disruption. Here's how we operate them.

The evolution of protection equipment

Operated by measured electrical quantities, the original devices used in protection systems were categorised as 'electro-mechanical', and commonly known as relays. They provided a good service but could only remain accurate with intensive maintenance. They were also physically large and because each device could only perform one function, there was complex inter-wiring.

The availability of reliable electronics in the 1980s led to this type of device becoming standard. Although more flexible, their lives were shorter and when they failed, there was no monitoring in place to alert the operator.

The introduction of micro-processor-based devices known as numerical protection in the early 1990s has, with data communications technology, revolutionised the design and operation of protection systems. Enhanced monitoring off-sets the shorter lives of these devices.

The protection and control methodology is to replace equipment before failure – this approach solidifies network security and availability. The electronic protection relay has a manufacturer's warranty of five years, with an expected life of 10-15 years.

Our strategy for protection equipment

Our strategy for protection equipment is informed by our asset health methodology, which details the steps to condition assess protection equipment and produces a health index for each type of relay. This health index ranges from 1 for relays with no issues and good reliability, to 5 for devices that fail to operate when required or operate erroneously, causing network disruption.

Due to the nature of protection equipment (construction, components and technological advancements), the categorisation of health is based on historical performance as there are no measurable quantities to indicate condition – unlike transformers, for example. The proposed investment strategy targets the health index 5 equipment.

Paving the way for fully digital substations

Advancements in communications technology and software tools have led to new approaches to protection design being applied, based on an international standard called IEC 61850. This allows highly reliable communications systems to replace most of the electrical wiring in a substation, saving time and money. We were pioneers in this field, installing our first systems in 2008. We have expanded our application of the technology and we will have three complete substations of this type by the end of RIIO-T1.

The evolution of this type of design has now reached the interfaces to the high voltage equipment. We've also achieved the UK's first live installation of this technology using equipment from multiple vendors. We developed this as a RIIO-T1 innovation project (FITNESS) and it has proven to be highly successful, advancing the industry's knowledge and encouraging other vendors to develop their products. We call this approach Digital Substations, and will apply it to all new and off-line build substations in RIIO-T2.

This will make sure that:

consumers benefit from the reduced costs

we leverage the environmental sustainability benefits that come from smaller substation footprints and lower usage of materials such as concrete and copper cables

We have made provision for enhanced cyber security at our digital substations. To maximise the benefits of the technology, we will create a facility to allow testing to be completed off-site before deployment. The cost of these two initiatives is £2.12m.



Protection systems

— investment plan

The devices identified in the strategy will be replaced through a series of programmes. These will be planned throughout the period to take advantage of outages planned for other works where possible. The total cost of the programmes is £11.86m. The plan also includes costs of £0.31m to respond to protection, control and smart monitoring system faults.

First generation electronic relays

One type of first generation electronic relays has been identified as health index 5 and is at its end of life. This is based on known component failures making them unable to operate.

Due to the number of these relays on our network, we need to develop a deliverable programme of works. Therefore the RIIO-T1 investment programme prioritised all feeder Main Protection relays of this type for replacement. We will continue replacing the remainder of the population, and complete their removal by the end of RIIO-T2.

Circuit-breaker fail

Circuit-breaker fail is a critical function that keeps the network stable and available. Incorrect operation – either through failure to operate or operating when not required – can have significant and potentially cascading effects through the network.

These schemes are constantly evaluated, and the applicable policies reviewed to ensure they are effective and compliant. Through this process of evaluation and review, we have found that some of the schemes within our network do not meet these requirements. The majority of schemes that don't align with our current policy are being replaced under the major switchgear replacement projects. The remaining schemes have been identified and targeted for replacement during the RIIO-T2 price control period.

Busbar protection

Similar to circuit-breaker fail schemes, busbar protection is a critical function. The majority of the schemes which are at the end of their lives rely on older electromechanical relays and are being replaced under the major switchgear replacement projects. Any remaining schemes that aren't replaced as part of the switchgear replacement programme are included in a programme for delivery under the RIIO-T2 period.

How we're making improvements

Protection Programme	Device or Scheme Volumes
First Generation Electronic Relays	284 relays
Circuit-Breaker Fail	17 schemes
Busbar Protection	1 scheme
Auto-transformer Protection	2 schemes
Signalling Equipment	13 schemes
Mesh substation auto-reclose	6 schemes

Auto-transformer protection

Another programme addresses the protection schemes for large auto-transformers. These transformers were originally installed with a single protection scheme but over time it's been acknowledged industry-wide that two independent forms of protection should be put in place. This will be applied to a small number of transformers with a single protection scheme. Where the existing protection is in acceptable condition, then a second protection will be added. Where the current protection is health index 4 or 5, the full scheme will be updated.

Protection signalling systems

To ensure that faults are cleared in accordance with the requirements of transmission systems operation, signalling equipment is used to enact circuit and plant disconnection at remote substations. The performance of this equipment is constantly monitored through real time systems, with performance assessed post fault through expert system analysis.

This ongoing assessment has allowed the detection of problematic equipment. There is one type which is an outlying performer and it fails regularly, requiring manual intervention to remedy. This leads to circuits being unavailable until the issue can be resolved.

These will be replaced within two work streams:

1. where there are primary plant works with associated devices these will be replaced along with any other protection upgrade;
2. through a dedicated protection programme to address units outside the scope of any other programme.

Mesh substation auto-reclose

The first generation of these schemes used proprietary ways of communicating between devices. As they have begun to fail, we've found that their replacements are not compatible. This has led to challenges in keeping the right level of network coverage. We will need to replace those schemes with failing devices and we will work with vendors to find a more sustainable solution.



Operational telecoms

— investment plan

The operation of the transmission system is dependent on telecommunications for protection, control and monitoring. Because of this, we need to ensure that the services we use are reliable and secure. Here's how we do it.

Complete control for optimum service

We have our own private telecoms network which mainly uses our own optical fibre network. This allows us to maintain complete control of the transmission system. We have a small number of legacy systems using copper cables which are becoming increasingly unreliable. The cables carry critical traffic and if they are unreliable, it affects the reliability of the transmission network. The copper cables are also limiting new applications, such as active network management, that a low-carbon energy system requires.

The new applications are designed to more actively manage the network and take advantage of new techniques for network performance measurement and visualisation. This means that the telecommunications network is more important than ever.

How we're moving forward

Our strategy is to deliver an all-optical solution, moving services away from copper cables to improve reliability and enable the solutions needed in the future.

We will also improve resilience in two ways:

By enhancing the infrastructure needed for the main transmission system – predominantly 275kV and 400kV networks to further reduce the effects of telecoms equipment failure.

By making sure that the telecoms network is available when we need it if there are events that lead to widespread loss of supply. These will be achieved by improving parts of our network with limited diversity of communications channels, or where the essential power supplies are not resilient.

We will also replace hardware where we have no replacement parts or support from the manufacturer. The new hardware will be designed to allow enhanced cyber security applications.

How we're making improvements

Our programmes of work to improve resilience, upgrade obsolete and unsupported equipment, and enable new services for smart applications will run through the RII0-T2 period. These works need to be carefully co-ordinated to ensure there is no risk to supplies as new systems are installed and systems transferred. The cost of these works is £40.48m.

The resilience programme achieves a more robust network by providing additional diversity of communication channels, through additional fibre routes and increasing the redundancy and resilience of the active communications equipment. The programme will deliver enhanced cyber resilience to our telecoms network.

Work Programme	Planned Completion (Year)	Total Cost
All Optical Network	2026	£13.02m
Telecoms System Resilience	2026	£19.4m
Fibre Modernisation	2026	£0.75m
Telecoms Modernisation	2026	£7.3m



To maintain and **adapt our world class, resilient network** is about much more than simply looking after assets such as lines, cables and transformers. It's also vital we consider other factors, such as flooding, land, buildings and IT. This section explains our approach.

Engineering and Corporate Support, [Pg 119](#)

To deliver our outputs and secondary deliverables efficiently, our front-line staff and contractors rely on an extensive network of support staff and services.

1

Buildings and Plant [Pg 122](#)

Our buildings and vehicles play an important part in delivering the resilient service our customers expect.

2

IT and Telecoms, [Pg 123](#)

Our IT and telecoms strategy represents a combination of 'Business as Usual', infrastructure and application refurbishments, and investments to support future innovation.

3

Network Operations, [Pg 125](#)

A safe and reliable network depends on rigorous processes and highly skilled people to inspect and maintain our assets.

4

Land, [Pg 127](#)

An approach is needed to what land we should own, sell and what should remain with the existing owner.

5

Flood Mitigation, [Pg 129](#)

How we will safeguard the reliability of our network, and make sure substations remain resilient to the impacts of climate change.

6

Maintaining Cyber Security, [Pg 130](#)

The threat from cyber attacks is continually evolving. As an industry, we need to anticipate and respond.

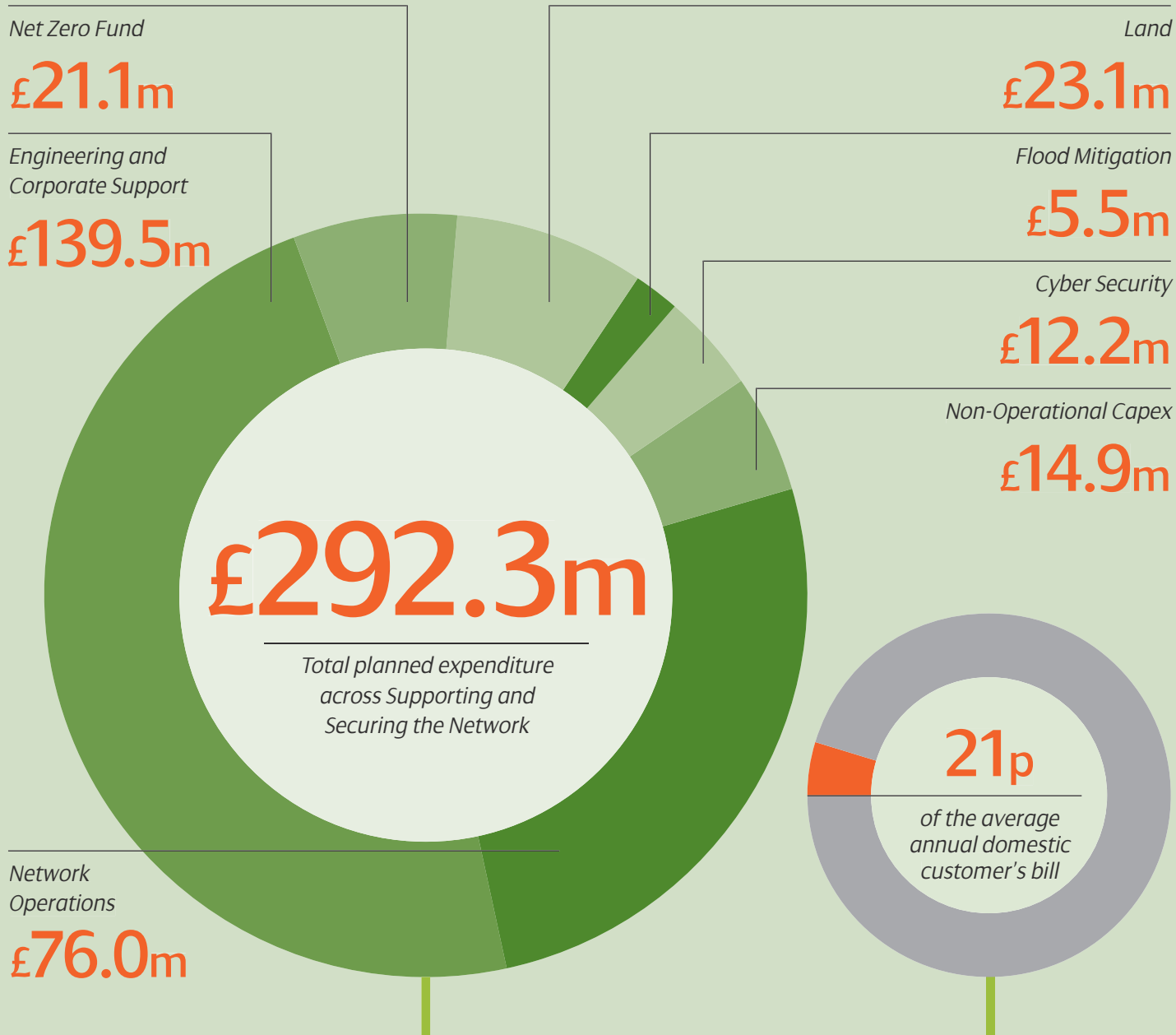
7

Supporting and Securing our Network





An overview of our planned investment and bill-related breakdown



Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Supporting and securing our network means making sure that we can run our business efficiently and be resilient to changing circumstances. We also engage to increase awareness of the considerations that make up our operational and resilience activities – this means network users and consumers understand our approach and feel empowered to comment on the trade-offs we have made in setting out our investment decisions.

How and why we have engaged with our stakeholders

Due to the sensitive nature of our resilience plans – particularly cyber resilience – we have focused our efforts on the User Group and shared more information than would be possible with wider groups. We have engaged extensively with the Transmission User Group, making them aware of our network operations needs and how we strive to improve efficiency and the quality of our activities. We have also engaged on our proposed level of support services for indirect costs that are integral in the delivery of the outputs set out in our plan.

What our stakeholders have told us is important to them

The User Group asked to ensure we make the best use of new technologies such as drones for the benefit of network users. They also asked us to provide more clarity on our cyber security and provide them with a more complete picture of our activities in this area. They have acknowledged the importance of support activities in the delivery of our plan, but again requested additional detail on what services these costs will provide on an annual basis.

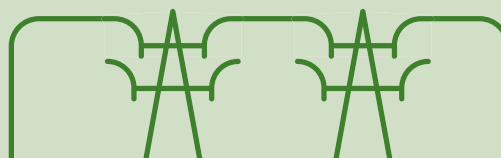
How stakeholder feedback has shaped our plans

In response to the conversations and feedback from the User Group, we are making sure to highlight how our operational plans compare with how we currently operate and explain what changes the future will bring. We have created a detailed analysis to demonstrate that we can respond adequately to events but that we do so efficiently.

We know that we can deliver the benefits of increased cost efficiency to our network users and consumers through constant innovation and the application of whole system solutions. This is why we have highlighted how new technology can improve our asset knowledge and provide safety benefits in a way that is cost-effective for consumers. We have updated our plan to more clearly show that our business-as-usual investments have cyber security built-in from the start. We have also ensured to provide further detail on our Indirect costs – including how they compare to past activity and on how they interact with other deliverables within the wider plan.

Why these changes are important

To cost-effectively prepare our existing network for a whole system and Net Zero future, we must make sure our network is reliable and resilient. Our day-to-day work of monitoring, maintaining and repairing network assets is the cornerstone of a reliable network. The threat to our network from cyber-attacks is evolving and increasing – it is crucial that we use the investment outlined in our RIIO-T2 plans to ensure we evolve and keep ahead of the threat.



Engineering and Corporate Support

1

To deliver our considerable outputs and secondary deliverables efficiently, our frontline staff and contractors rely on an extensive network of support staff and services.

What are indirect costs?

Indirect costs can be referred to as either Closely Associated Indirect costs (CAIs) and Business Support costs (BS). We thoroughly reviewed our costs in these areas to make sure our support staff services are efficient and cost effective. Then we compare our costs to available industry costs.

Ofgem currently describes indirect costs as activities that generally don't involve physical contact with system assets, yet play an integral role in the delivery of direct activities.

Indirect Cost Allowances equate to 22% of Total Allowances in RIIO-T1.

Indirect costs are currently forecast to be £273m in RIIO-T2, which equates to 20% of Total Expenditure.

Indirect costs RIIO-T2 (£m)							
	21/22	22/23	23/24	24/25	25/26	Total	Average
CAI	34.8	34.2	33.9	33.4	32.9	169.2	33.8
BS	21.1	20.9	20.9	20.6	20.5	103.9	20.8
Total	55.9	55.1	54.7	54.1	53.3	273.1	54.6

Our process

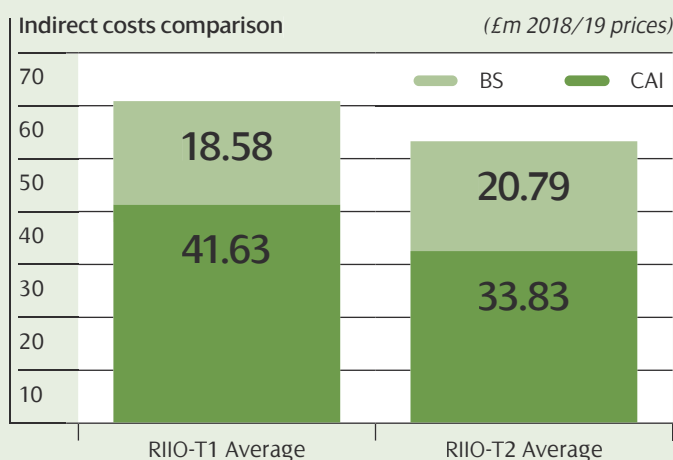
In SP Transmission, indirect costs are reported across three separate cost categories:

Total Indirect Costs (Totex / Gross Indirects)	£273.1m
Costs relating to investment activity (Capex / Capitalised Indirects)	£133.6m
Costs within controllable operating expenditure (Opex / Net Indirects)	£139.5m

For RIIO-T2, the focus has shifted from reporting on the Capex and Opex split of Indirects to reporting indirect costs at a Totex level. This negates any variation due to individual capitalisation policies used at a particular point in time as these do not necessarily affect TO's performance.

It therefore makes sense to compare Indirect costs for RIIO-T1 & RIIO-T2 on a Totex / Gross basis to ensure a fair comparison.

Refer to **Annex 36: Engineering and Corporate Support**.



Comparison across Price Controls

As the RIIO periods will be across a different number of years, we have chosen to focus on the annual average across each period, which can be seen above.

At a total level, Indirect costs will currently be c£5.6m lower in RIIO-T2 than they were across the RIIO-T1 period.

Due to their nature and the delivery model outlined in our Delivering our Plan chapter, CAIs are linked to the level of activity being undertaken and so can flex depending on the volume of work that is required to be delivered over a price control period. This is usually the main driver for costs across time.

Also our Operational training expenditure is due to substantively increase in RIIO-T2 from (£0.8m pa in RIIO-T1 to £2.3m pa in RIIO-T2) to ensure we have the correct skill sets to continue to deliver our future outputs. Business support costs are largely unaffected by movements in our capital investment programme. These costs are generally by their nature fairly remote from direct activities of any sort, Capex or Opex, and are more typically a reflection of the size and scale of an organisation. Forecasts of business support costs ought to be more predictable than other parts of the plan so far, as they are more generally fixed in nature.

However, these support costs may fluctuate due to changes to our network. For example, we will incur additional insurance costs in RIIO-T2 in relation to our HVDC link that would not have been present during the construction phase in RIIO-T1.

It is also worth noting that due to changes in reporting, the RIIO-T2 value above contains costs that are not contained within the RIIO-T1 equivalent. For example we now include Pension deficit payments (£0.5m pa) within indirect costs whereas they would be excluded from RIIO-T1 value. Furthermore we have also included costs in relation to new RIIO-T2 initiatives such as those costs to deliver our Environmental Action Plan (£0.5m pa).

Further to this, we have endeavoured to identify and deliver efficiencies wherever possible, to make sure that our support costs represent value to consumers. As a consequence, our Indirect costs are forecast to fall across the RIIO-T2 period at both a CAI and BS level.

Engineering Support – Closely Associated Indirect (CAIs)

Closely Associated Indirects as the name suggests are those activities that are directly involved in co-ordinating and supporting the operational aspects of the network operator.

These can be split broadly into two types – Engineering related activities and General operational support:

Engineering Activities include project management and delivery, engineering design and planning of the network and management of the network on a day to day basis through the control room.

General operational support includes Stores and Logistics, Vehicle management and Operational IT, as well as health and safety and training functions.

Closely Associated Indirects Breakdown:

We are currently forecasting to spend £169m in RIIO-T2 (Compared to £338m in RIIO-T1).

80% of these costs are labour related and will support the business, with c. 400 FTE per annum ranging from engineers to graduates and apprentices.

The largest proportion of CAI costs are in relation to engineering activities of design, project management and general engineering management (77%).

Corporate Support – Business Support Costs (BS)

Business Support (BS) costs include activities provided centrally that our front line staff and contractors rely on. These may be centralised within SP Energy Networks, within ScottishPower, or in some cases within the Iberdrola Group. These costs include the following cost categories: Human Resources, Non-Operational Training, Finance & Regulation, CEO, IT & Telecoms, and Property Management.

Business Support Cost Breakdown:

We are currently forecasting to spend £104m in RIIO-T2.

These costs are equivalent to c. 80 FTE as well as an array of professional services that the business requires to function such as Treasury, Legal and Audit.

The largest individual proportion of BS costs are in relation to Financial and Regulatory activities such as statutory, regulatory and internal performance reporting (29%).

RIIO-T2 Engineering and Corporate Support Expenditure

£139.5m

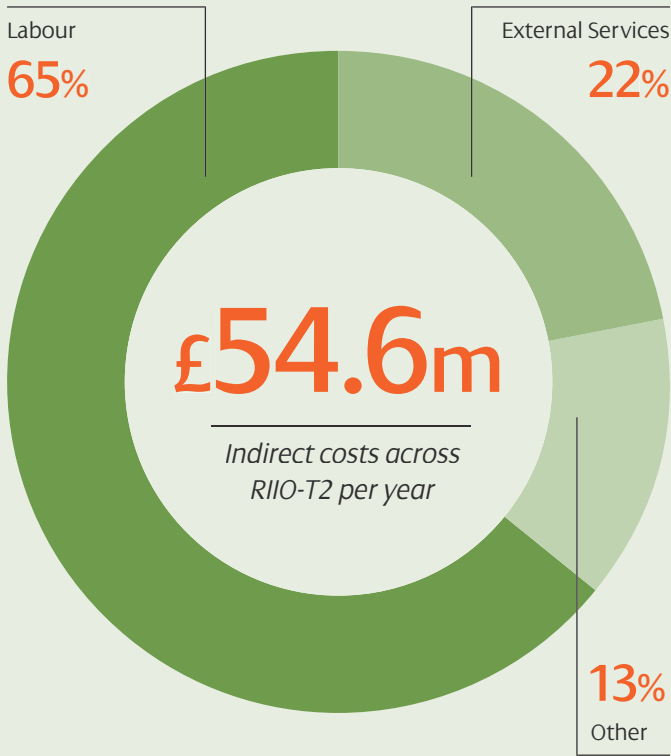
What does £54.6m of Indirect Costs provide per year? Currently our average annual total indirect costs for the RIIO-T2 period are £54.6m. These costs can be split into three main categories:

Labour related expenditure – Labour costs currently represent 65% of the total indirect costs above (£35.4m). This is equivalent to 480 FTE which are from a broad range of backgrounds and activities including engineering, accountancy and admin. This cost includes the full cost of the employee, encapsulating pensions, national insurance contributions, standby and overtime.

External Services – These currently represent 22% of total indirect costs above (£12.1m). They are any activity or service that cannot be provided either internally or at a group level by the FTE above. For example; consultancy/ technical services, various association fees (ENA /IET) subscriptions and insurance.

Other – Remaining 13% represents charges from the Iberdrola group (such as IT related charges) and Wayleaves costs.

Indirect costs breakdown (£m)	
	RIIO-T2 Average
Labour	35.4
External Services	12.1
Other	7.2
Total	54.6



Our vehicles

ScottishPower is committed to decarbonising its fleet of vehicles. We have further enhanced our sustainable ambitions in September 2019 by signing-up to The Climate Group's EV100 initiative. EV100 is a global initiative bringing together forward-looking companies committed to accelerating the transition to electric vehicles (EVs) and making electric transport the new normal by 2030. The agreement will see Iberdrola and ScottishPower fully electrify their vehicle fleets in Spain and the UK by 2030, subject to local EV market conditions. Our target is to deliver this as quickly as possible and to be the first fully electric fleet in the Iberdrola group by delivering EV100 by 2026, but with our business and operational needs at the forefront of our mind. Currently, 4% of ScottishPower's fleet is electric (EV or PHEV); this includes one small electric van in the SP Energy Networks fleet and 31 electric pool cars that are available to all SP Energy Networks employees.

A project team supported by internal senior stakeholders has been established to build on our current electric fleet and focus on the transition to a more sustainable and environmentally friendly commercial fleet within the SP Energy Networks business. Using telematics data and key operational levers, the project team has identified 52 small vans (5% of SP Energy Networks fleet) that could transition to electric in 2019 based on current EV technologies; this number increases to 104 with the launch of new medium van technology in late 2020. The cost increase associated with the EV technology can be offset, in part, against the fuel saving and ScottishPower predicts the average annual cost increase is in the region of £2000 per vehicle. The project team expect to place orders for the small vans during Q4 2019, for delivery in Q1 2020 and are working closely with the resource and planning teams to ensure a smooth transition. In addition to this, we have already rolled out 26 EV charging points across our SP Energy Networks sites to ensure that we have sufficient capacity for our commercial EV fleet to date and plan on installing a further 72 by 2026 to help facilitate the move to full electrification at a capital cost of £0.8m, included as part of our non-operation capex expenditure.

Whilst we are on our journey to electrify our fleet our telematics system is being used to provide a vast amount of intelligence, which enables us to identify trends and opportunities within our current fleet to reduce our environmental impact – both in relation to EVs and fuel consumption. Vehicle idling, acceleration, and harsh braking are all being monitored closely as we are very clear on the relationship between poor driver behaviour and increased fuel consumption, and this data is being used to develop initiatives such as a driving Net Zero MPG campaign and bespoke training programmes aimed at improving driver behaviour and reducing our carbon emissions.



*Additional expenditure
to electrify our fleet*

*Total fleet expenditure
across RIIO-T2*

£0.5m £7.1m

Non-Operational Capex

— Buildings and Plant

2

Our buildings and plant play an important part in delivering the resilience and system operability service our customers expect. Here's how we make it happen.

Building projects

Our building projects team works on all aspects of the end-user requirement, from building resilience and plant replacement – through to internal fit-out and full new-builds.

The team works with our technical support framework to develop detailed designs, specifications and quantifiable schedules to support our in-house procurement specialists, working together to secure the best market value for the delivery of these works.

Our standardised specifications reflect industry best practice. We regularly review and update them to reflect innovation, and deliver the most cost-efficient and sustainable solutions. This is how we reduce the long-term financial costs associated with maintaining our sites.

Our proactive management and rationalisation of our office space means we are only proposing one capital project for the RIIO-T2 period at our Cambuslang site to accommodate the creation of an SP Transmission Centre of Excellence.

The Buildings Projects Team carried out various options appraisals to ascertain the most efficient future development of the site to meet with current and future requirements of the business.

Our technical support team, in consultation with our external quantity surveyors, established that the most economic and efficient solution was to develop an upper mezzanine level to the stores/warehouse section of the existing facilities, providing a further 100 workstations and associated storage and ancillary supporting facilities. These options reflected the company-wide approach on sustainability and innovation and therefore provides a BREEAM 'Very Good' rating and allows for energy efficient heating, lighting and Building Management Systems controls.

Once complete, this £1.8M capital project, will bring the Cambuslang facility into line with the ScottishPower standards for office accommodation and provide a flexible environment which allows staff to engage and collaborate to help drive forward solutions to support the continued growth of the SP Transmission business.

Building operations

Our building operations team is made up of qualified technical staff from mechanical and electrical disciplines. They work with our framework providers to deliver planned preventative maintenance (PPM) and reactive maintenance across the portfolio.

This maintenance work allows us to annually record an accurate estimate for running and maintaining each site. If we identify failings in a site's systems or building fabric, we work with the projects team to deliver the necessary programme of work.

Our building operations framework provider records the data from each site. The data is entered onto a database which monitors energy performance of the systems on each site, highlights areas of concern, and allows our engineers to recommend remedial or replacement works before significant faults occur.

Together, this work makes sure we comply with all statutory and compliance regulations. It also allows the projects and building operations team to deliver cost-efficiently, sustainably and using innovative practices.

Currently SP Transmission occupy premises within Glasgow city centre, Cambuslang and Kilmarnock. These properties are leased on terms which are efficient and appropriate for business needs.

Plant

Detecting a phenomenon known as partial discharge (PD) can provide valuable information about the condition of high voltage equipment. We have used mobile detection units extensively in RIIO-T1 to manage and mitigate risk. The increasing use of PD monitoring meant that we had to hire additional trailer-mounted equipment which comes at a high cost. We plan to replace our existing end-of-life and obsolete equipment and purchase additional units at a cost of £0.3m to ensure we can meet the operational needs for PD detection.

The proportion of expenditure relating to Buildings (including EV chargers) and Plant is

£2.9m

You can find more information on our Business needs in **Annex 29: Estates**.



Non-Operational Capex

— IT and Telecoms

3

Our IT and telecoms strategy represents a combination of 'Business as Usual', infrastructure and application refurbishments, and investments to support future innovation. These innovations include digitisation of information and processes, management of big data volumes, data analytics, and Building Information Management (BIM).



Our IT capability

ScottishPower IT provides commercial, planning, operations and technical architecture expertise and specific project delivery resource. Our project delivery is managed and governed by ScottishPower IT, with development and integration of solutions being provided by external parties. Development work is put to competitive tender where possible to ensure the best solution is provided at the most competitive cost. During the RIIO-T2 period we will continue the transition to a new Target Operating Model (TOM), developing additional technical capabilities internally and reducing dependencies on external parties to drive further efficiencies.

Working across the business

ScottishPower IT delivers a corporate IT service across all of ScottishPower's operations, and we have a dedicated team focused specifically on supporting SP Energy Networks. Where possible, we work to develop solutions that apply across the entire SP Energy Networks business, sharing costs among the different network businesses.

Global best practice

We work centrally to establish a common set of approaches across the group, always taking account of specific local requirements. Global practice groups operate with representatives from all parts of Iberdrola's network businesses to capture the best practices from across the group. They are used to create standards, processes and solutions.

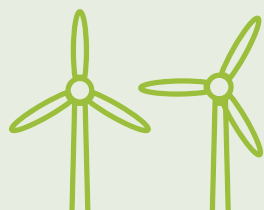
Strategic approach

Our strategy is to provide solutions to enable the growing electrification of the economy. This includes connecting more renewable energy, more storage capacity and backup energy, and more smart grids – delivering a safe, sustainable and competitive energy model. The management of larger volumes of data, increasing automation and enhanced analytics are the IT tools that will facilitate this transformation.

There are two main parts to our IT and non-operational telecoms strategy: **digitisation** and **advanced analytics**.

Total Expenditure across RIIO-T2

£12.0m



Digitisation and big data platforms

Big data allows us to gain deeper insights about our operations – finding new efficiencies and creating innovative new approaches. Digitisation allows this to happen, and also allows us to transform our processes by automating manual operations.

Here are the eight main focus areas of our strategy:

- Develop digital platforms to improve interactions with internal and external users. This improves the way we capture, record, analyse, present and report data.
- Consolidate IT solutions around key asset management platforms, together with increased and enhanced data capture across a wider base of business operations. This will enable the delivery of better information to support our business decisions.
- Capture more data on more SP Transmission assets including geospatial data, time series data, additional measurement points and video data. We will do this using sources such as internet of things devices, drones, edge computing and social media. Together, this work will further refine our decision-making process.
- Introduce robot process automation to allow for the rapid processing of large data volumes.
- Expose more information closer to the point of consumption, through the widespread adoption of mobile platforms, the development of focused applications, and technologies such as virtual and augmented reality.
- Adopt secure cloud-based solutions where these represent the most efficient approach.
- Improve our building data framework by implementing Building Information Model (BIM) Level 2, including full 3D modelling of our assets. This will allow us to establish a digital place where our data comes together for collaboration – known as a Common Data Environment.
- Maintain a secure IT environment to respond to the ever changing cyber threat landscape. The drive to become a digital organisation is heavily reliant on stable IT solutions which need to be secured against the threat of a cyber attack. **Our Business IT Security Plan can be found in Annex 24: Business IT Security Strategy.**

Project: BIM Integrated Solutions
Cost: £3,050,000

Project Description:
To ensure collaboration between all parties on a common data environment so that we will be able to plan new assets more effectively, build at lower cost and operate and maintain assets more efficiently.

Advanced analytics

- Advanced analytics will allow us to know more about our operations, faster than current technology will allow. Here are the six main focus areas of our strategy:
- Automatic processing of large data volumes by developing analytical solutions which provide insights into our operations at a level currently not possible.
 - More process automation by implementing a data exchange layer using enterprise service bus technologies.
 - Improve asset condition assessments by using broader and deeper data sets, helping us make better decisions on operations, maintenance, replacements and upgrades.
 - Deliver system monitoring and dynamic rating calculations by enabling data transfer from network monitoring points. We will develop solutions that will allow us to capture real-time information to inform optimal network operation.
 - Develop solutions to support transmission asset operation and maintenance in the light of a more actively-managed distribution network.
 - Introduce machine learning and artificial intelligence to provide new insights and aid decision making.

Project: Asset Condition Based Decision Support
Cost: £750,000

Project Description:
Capturing and recording of additional asset condition information from the sensor technologies deployed on the network and propagation of mobile applications to automate manual data capture and improve the information available in the field.

You can find more information in **Annex 24: Business IT Security Strategy.**



Network Operations

4

Efficiency. Continuous improvement. Planning for the future. Here are just some of the ways we keep costs down and the quality of network operations up, at all times.

We have strong teams

Our teams operate, maintain and repair our substation, overhead line and cable assets. This work ranges from fixing a gutter on a substation building to operating and maintaining the Western Link HVDC system. These activities require people with a diverse range of skills to ensure they are carried out safely, in an appropriate manner and to ensure consumers receive best value for the money we spend.

We review to improve

To ensure our plans for these activities deliver the best possible value for the consumer, we have carried out a wholesale review of our maintenance policies. This has allowed us to identify key areas where we believe we can be more efficient. These savings are now embedded into the plan.

It has also allowed us to identify areas where we needed to bolster our activities to ensure we manage our assets more efficiently in the longer term. As a truly global business, we've taken the opportunity to challenge our new policies internally and externally. We want to make sure our plans are truly efficient and not just incremental improvements on long-held beliefs.

We keep a close eye on costs

We have also made sure we fully understand where the costs for our maintenance activities are generated. By looking at all our maintenance activities and deriving the costs from the bottom up, we've identified areas where we can be more efficient. Compared to RIIO-T1, there are new needs due to new technology such as series compensation. Our network has also grown, which means there are greater inspection and maintenance activities. While our unit costs for comparable activities are the same or less than in RIIO-T1 we need to do more so our overall costs have increased.

Total expenditure as part of RIIO-T2

£76.0m

You can find more information on how we've done this in **Annex 3: Non-Load Strategic Investment Plan**.

Substations

We own and operate 156 substations, some of which are very large with many assets, and some of which are much smaller. Here's a breakdown of how we run them.

We meet our obligations

We have a comprehensive inspection and maintenance policy to ensure we are meeting these obligations and fully understand the condition of our assets. This comprises monthly inspections of all our substation assets and tailored maintenance regimes depending on asset type and its construction. The SP Transmission network was developed over many years. So we have to be sure we can operate and maintain equipment installed in the 1960s, which no longer has any support available from the original manufacturer, as well as modern state-of-the-art equipment. We therefore need to ensure our staff are equipped with the knowledge and experience required to meet this challenge.

We maintain equipment

Our maintenance regimes are set with the goal of keeping our assets in an appropriate condition and operating to our specifications. With an extensive asset base, breakdowns do happen from time to time, so we need to be able to repair our equipment to ensure maximum availability. For equipment which is still supported by the original manufacturer this is reasonably straightforward. However, for assets where manufacturers' support is no longer available, we endeavour to find replacement components to maintain assets in service without complete replacement. These need to:

meet the appropriate electrical and mechanical specifications

have been tested to ensure compliance with the relevant regulations or standards.

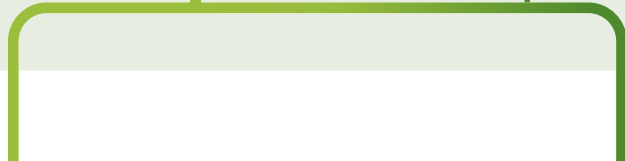
Where replacements are not available, spares are recovered from assets being removed from the system. Our Network Operations team specialists need to understand the failure mechanisms associated with different assets, to make sure we have the equipment and services available to carry out repairs in the most timely and cost-effective manner. To maintain our substations at an acceptable level we need to consider the following:

Our substations almost always include a building containing protection and control assets, telecoms and other critical infrastructure, so we need to maintain a large number of buildings and other civil structures.

They almost always have outside areas, so we need to manage the vegetation in these areas, both for operational reasons and to be a good neighbour in the community.

We need to ensure no unauthorised access can occur within substations, for the safety of the public, our staff and our assets.

All assets which form part of the transmission system, from protection relays to circuit breakers to Series Compensation platforms, must be maintained to make sure they remain fit for purpose, and ensure efficient and secure supply.



Overhead lines

Most of our network is made up of overhead lines with a total length of 3,740 circuit km. Our aim for our overhead lines is the same as for our substations: to make sure they operate safely and securely. Here's how we do it.

We monitor asset condition

Our comprehensive inspection and condition assessment policy, that ensures we fully understand the condition of our assets, consists of:

annual inspections of all our overhead line assets

a condition assessment regime so we understand the condition of individual components on each route

What assessment includes

Overhead line condition assessment comprises steelwork condition for towers, conductor, insulators, fixtures and fittings and may lead to a more detailed climbing inspection if required. We will make greater use of unmanned aerial vehicles, or drones, where it avoids people working at height or it is more effective. We carry out additional testing on our conductors, dependent on their construction.

Aluminium Conductor and Steel Reinforced (ACSR) 40 years & older

For these kinds of assets, we carry out non-intrusive corrosion testing of the steel core on approximately 1% of our network per year. This is followed up by intrusive testing if an issue is detected. A small overall percentage tested can be considered representative for a route constructed to the same specification at the same time.

All Aluminium Alloy Conductor (AAAC)

While none of our population has yet reached 50 years of age, when the time comes we will carry out destructive testing on 1% of these conductors to quantify their condition.

In addition to our condition assessment activities, we carry out inspections of our overhead lines. This consists of:

thermal inspection of our conductors – we do this every two years on each route

visual inspection by foot and helicopter for vegetation, changes in land use and conductor and fitting damage that might have occurred – each year, we inspect 50% of routes on foot and 50% by helicopter.

Results of these inspections inform our maintenance activities. We also have a tower painting programme, driven by condition assessments. We also manage vegetation and third parties working in the vicinity of our overhead line network.

We will enhance our monitoring with aerial ground clearance surveys and will survey our network every five years to provide detailed information on the asset base. This will detect age-related sagging of conductors, which may affect statutory clearances, and any issues with verticality of towers. We will integrate the survey data with our overhead line design software to provide a full digital model of our network.

Cables

We own and operate 603 circuit km of cable (can be found in the **Non-load Expenditure** chapter, Pg 98). Through comprehensive inspection and maintenance, we aim to make sure these assets operate safely and securely – and are fit for purpose. This is what's involved.

We carry out tests

Unlike substation and overhead line assets, the majority of our cable assets cannot be visually inspected. We inspect all our visible cable terminations monthly as part of our substation inspections. The remainder of the cables' condition has to be established by testing. This includes carrying out testing on the outer metallic sheaths of all our cables and testing the cable bonding arrangement as these are typically the first indicators of the cable deteriorating. We test each cable every three years.

We provide extra maintenance for fluid-filled cables

Fluid-filled cables require additional maintenance compared with cross-linked polyethylene (XLPE) cables to avoid environmental impact and keep them operating reliably. A fluid-filled cable has a tank system that is used to maintain the fluid pressure on the cable section. The pressure in this tank system is monitored, so the monitoring equipment needs to be checked annually to make sure it's correctly calibrated. Fluid-filled cables are also prone to leaking at termination and jointing position, we need to be able to top up the fluid levels and identify and repair leaks. Our fluid-filled cables are very reliable because we test them regularly and manage fluid leaks appropriately.

We keep a close eye on 132kV XLPE cables

Our 132kV XLPE cable population has suffered from many failures of terminations, so we have begun to carry out routine partial discharge monitoring of all our XLPE terminations in addition to visual inspection and sheath testing.

We monitor nearby activity

To make sure our cables continue to be reliable we need to patrol our cable routes for any excavations or interference nearby and give guidance where appropriate to others digging in the location of our cable networks.

Western Link HVDC Scheme

The Western Link HVDC scheme is a 2,250MW scheme operating at 600kV. HVDC schemes contain many components and sub-systems that are specialised and not used elsewhere in the transmission network. For this reason, we have outsourced the majority of the maintenance of the scheme to specialist contractors. This includes routine maintenance, inspection and defect repairs of the converter station equipment. The inspection of submarine cables is also outsourced due to the specialised equipment and skills required. This means that we have certainty of the costs for the RIIO-T2 period.

Other Expenditure

— Land

5

What land should we own? What should we sell?
And what should remain with the existing owner?
This section explains our approach, the risks
we face and how we mitigate them.

Our infrastructure land rights are the
responsibility of two departments;
Estates and the Land & Planning Team.

Estates

We continually review how we use our non-operational estate, identifying opportunities to make sure we're making the best and most cost effective use of our portfolio. This includes pinpointing sites that we don't need anymore, and achieving the best possible disposal result for our business. To do this, we employ a highly experienced team of Chartered Surveyors.

By the same token, this team manages our freehold and leasehold interests on our behalf. This involves making sure the correct rights are in place, and that all transactions to acquire land are at market value and meet our operational requirements. Our estates team advises and leads on any substation land requirements for SP Transmission.

We prefer to have freehold ownership of our substation sites. However, we sometimes enter into lease agreements. These allow us to occupy and access land for a time period agreed with the landowner. Where we need to purchase land to complete the investments in our plan, we include the costs of this in the overall funding for the project. Where we negotiate a lease, the annual payments are included as operating costs in our business plan.

Total expenditure as part of RIIO-T2

£23.1m

Land & Planning

In the majority of cases, our infrastructure and land access requirements are across land owned by third parties (not owned by SP Transmission), this applies particularly to overhead lines and underground cables. In these instances, the Land & Planning team are responsible for securing land rights and consents to provide the appropriate rights to install, operate and maintain this infrastructure. These rights are formed within two main agreements;

Servitudes

These land rights provide us with permanent rights for overhead lines and underground cables, recorded against a property's title and on the Land Register. This level of security means we have the right to access the equipment for inspections, maintenance and future improvement works. To make sure we have the most secure rights, we have developed a strategy to obtain deeds of servitude for our most important assets.

Servitudes are vital to make sure we can access our assets when we require, in order to maintain high levels of reliability and to allow us to modernise and upgrade. We plan to increase our number of servitudes in the RIIO-T2 period through negotiation with landowners, our plan includes costs of **£6.1m** for the five-year period. This is lower than the equivalent average annual expenditure in RIIO-T1 of £1.6m.

Wayleaves

Wayleaves are personal agreements with landowners and occupiers, giving us rights for overhead lines and underground cables.

Given the significance and importance of our transmission network, we always prefer to negotiate a more secure land right known as a servitude.

We generally pay the landowners and occupiers for wayleave rights with an annual payment, although in some cases we make a one-off payment.

The payments are calculated to match the owner or occupier's loss due to our equipment being on their land. The payments allowance has increased by an average of 6% every year, and our business plan includes costs for these rights. Our current forecast of annual costs for 2020 is around £700,000, which we review every year.

Wayleaves are personal agreements, so our land rights do not automatically transfer to the new owner if the land is sold. We identify any transmission circuit assets that still rests on a wayleave, or where we have identified that a wayleave may no longer be valid due to change in ownership of the land. Wherever possible, we look to secure a servitude instead. This is part of our 'Appropriate Land Rights' process.

There is an ongoing review across Great Britain which may lead to some significant increases in the wayleave payment rates. This is why we are proposing a mechanism, known as a re-opener, to revisit our allowed costs. If these revised costs increase by more than our predicted annual allowance uplift, we will seek agreement from Ofgem to increase our revenues to cover the additional cost of these payments. If the costs decrease, we propose that our revenues are decreased accordingly.

Rates

Like other businesses, we pay business rates. Our main rateable asset is the cables. However, many of our assets are not rateable.

These include:

- transformers
- switch gear
- fixtures and fittings
- vehicles

The RIIO price controls recognise that network businesses do not have direct control of the level of business rates they pay. That is why rates are treated as a pass-through item. Costs are built into our price control allowance, but with a two year delay.

Energy network operators collectively engage with the rating valuation agencies through the Energy Networks Association (ENA). Together, we can speak with the strongest voice, mitigate any rates cost increases, and reduce the cost of the negotiations. SP Transmission is represented on the ENA by Chartered Surveyors from our estates team, as well as by our network and regulatory planning team. Our estates team has extensive experience in this field, particularly in negotiations and the consequent challenges and appeals.

Injurious affection

Injurious affection is where our activities interfere with the legal rights held with an area of land, but we have not acquired an interest in the land.

Our team of Chartered Surveyors deals with all these claims, as well as all development loss claims, working to mitigate them as far as possible. This team review each claim when we receive it, as well as carrying out due diligence. If appropriate, we then instruct our appointed agent to carry out a formal site inspection, valuation and further due diligence prior to negotiating a settlement. This results in the production of a legal instruction pack.

Our estates team reviews each legal instruction pack, which is subject to our formal authority process. Finally, we instruct appointed solicitors to formalise, document and register the equipment rights.

This process results in a thorough appraisal of all claims submitted to ensure only valid claims are settled and costs are fully mitigated.

Our current estimated cost for injurious affection in RIIO-T2 is £1.7m.

There are certain circumstances where we may be required to remove or divert existing assets (eg Overhead Lines). We have included an estimate of works for RIIO-T2 (£15.3m).

These are areas of significant uncertainty and consideration is being given to an uncertainty mechanism to deal with changes.

Estimates of Rates Liabilities – 2026

	RIIO-T1 Forecast			RIIO-T2 Forecast				
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Rates RV Rateable Value	£70,000	£70,000	£70,000	£70,000	£70,000	£70,000	£79,000	£85,000
Total UBR*	£35,420	£35,020	£34,610	£34,200	£34,890	£34,690	£34,530	£36,970

*Uniform Business Rate – is a multiplier used to calculate business rates liability. The UBR increases annually with an inflationary uplift.

The above table is a forecast of the rateable value for SP Transmission assets following a revaluation at 1 April 2022 and 2025. We have applied an assumed uplift in the Uniform Business Rate, which has also been applied to calculate the actual rates payable.

This table makes no account for any changes in the network from the 2017 revaluation information. The data assumes there are no significant capital programmes, upgrades or additions to our network, or any other kind of major investment.

You can find more information on how we've done this in:
Annex 29: Estates.



Other Expenditure

— Flood Mitigation

6

The risks from flooding are of growing concern as a consequence of the unpredictability of climate change. This part of our plan sets out how we will safeguard the reliability of our network, and make sure substations remain resilient to the impacts of climate change.

Background

We have identified a major risk to the reliability of the electricity network from flooding. The three types of flooding are:

- pluvial (rainfall)
- fluvial (river)
- coastal

It's vital we protect electricity substations from the risk of flooding. If the electricity supply fails for an extended period, core infrastructure sectors would not function, including:

- water supply
- health care
- transportation
- communication
- emergency services

Where we are now

The Energy Network Association's Engineering Technical Report ETR 138, 'Resilience to Flooding of Grid and Primary Substations', details the electricity industry requirements relating to the protection of substations from flooding. These requirements are also reflected within Scottish Planning Policy.

During RIIO-T1 we carried out projects to mitigate the risks from fluvial and coastal flooding at a number of substations. However, when ETR 138 was first published, before the RIIO-T1 settlement, it did not include pluvial flooding. Mitigation against pluvial flooding is now a requirement of the current version of ETR 138.

What flood mitigation investment covers

The Scottish Environment Protection Agency (SEPA) continually revises the flood mapping for Scotland as more information and data becomes available. Using the latest SEPA modelling information for pluvial, fluvial and coastal flooding, we have reviewed the impact of flooding across the network. We make sure that the network is resilient to 1 in 1000 year flooding events.

We see a strong need to undertake further works, specifically associated with pluvial flooding. This will supplement the projects completed in RIIO-T1, and further reduce the risk to the network from flooding. One project to protect a major substation from coastal flooding which was initiated in RIIO-T1 will complete in the RIIO-T2 period.

We have carried out desktop studies using SEPA's latest flood models, and identified 10 sites which are at risk from pluvial flooding. During the RIIO-T2 period we will undertake detailed assessments at these sites, and implement measures which will mitigate the flooding risk to the network.

What it will cost

To mitigate against flood risk we are proposing to spend £5.5m in RIIO-T2. We have made a proposal for an uncertainty mechanism in RIIO-T2. So, if updated flood risk information requires us to do additional works, there will be a re-assessment of our allowed costs. While the evidence indicates that it is unlikely, we also propose that our allowed costs are re-assessed if we need to do less work.

Average costs

RIIO-T1: Average costs on an annual basis over RIIO-T1 period were £3.53m.

This was associated with major construction works to mitigate flood risk, mainly at Kincardine.

£3.53m

RIIO-T2: Average costs on an annual basis over RIIO-T2 period is £1.1m.

These works are to mitigate surface water flooding.

£1.1m

Total cost for flood mitigation

£5.5m



Maintaining Cyber Security

7

The threat from cyber attacks is continually evolving. As an industry, we need to anticipate and respond.

The transmission network plays a vital role in the daily lives of our customers and the wider economy. The safe and efficient operation of the system relies on a diverse range of operational technology to control, monitor and protect the assets. As the network becomes smarter, the number of these systems will increase. Protecting these critical systems from external threats is part of our core activity.

An essential part of the UK infrastructure

The Network and Information Systems Directive (NIS) has recently been introduced, and we have been designated an Operator of Essential Services.

Under these regulations we are required to assess our current cyber security maturity as measured against the Cyber Assessment Framework. We made a draft submission to Ofgem in February 2019. Following assessment of this, we submitted the final plan to address any identified areas for improvement in April 2019.

Ofgem, as the Competent Authority, set a baseline Cyber Assessment Framework in June 2019 and further guidance in September 2019. Our Cyber Resilience Plan to meet these requirements can be found in **Annex 32: Cyber Resilience Plan**.

Investing to protect

Ongoing investment is required to maintain a proportionate and appropriate level of cyber security across critical national infrastructure systems and the associated systems on which these depend.

The cyber threat can impact the fundamental service we provide. A cyber attack could compromise our electrical infrastructure, including the recovery from an incident. Incidents elsewhere in the world have shown how a cyber-attack could result in disruption to supplies.

An additional factor that we consider in our cyber resilience plans is our customers' data. We have processes and systems in place to protect this data and make sure we comply with the General Data Protection Regulation (GDPR).

Working as part of the Iberdrola group of companies, we contracted a third party consultancy to carry out a cyber security audit. The audit was based on the structure and question set of the National Institute of Standards and Technology (NIST) guidance document from the United States – this was identified at the time of audit as the most mature guidance. We then created a proposed remedial plan which we are developing further to refine the identified scope.

Following this and the introduction of the NIS directive, we've undertaken a further gap analysis which has identified work under this directive, some of which will be an ongoing requirement and is included in our business plan.

Our plan has three main components and we have categorised these in line with the latest guidance from Ofgem.

The Business IT Security Plan defines the business-as-usual activities for our business systems. As SP Transmission is part of a wider group of companies, the business IT security activities are co-ordinated across the group.

We have made provision for the cyber-security related refresh and update of operational systems. This ensures that we have the most up to date security provisions in place.

A Cyber Resilience Plan was submitted to Ofgem in April. We have updated this following Ofgem's further guidance in September 2019. The Cyber Resilience Plan can be found in **Annex 32: Cyber Resilience Plan**.

Our plan currently includes expenditure of £12.2m in the RIIO-T2 period. This will allow us to meet the requirements of business as usual refreshes and includes the cyber resilience activities needed to comply with the NIS directive based on the current understanding of the agreed baseline standard. We have included work that we definitely know we need to do, and we are confident that the technology has matured to allow this to be reliably introduced. An example is the periodic upgrade of firewalls. We know that this is a certain requirement: the technology is mature and the scope of work is definitive.

This is an area of rapid change, and there is uncertainty surrounding how our approach might need to adapt. The uncertainty revolves around the unknown nature of threat developments, and the changes in technology that could result from this. We note that there is an uncertainty mechanism with a re-opener in the middle of the RIIO-T2 period. This will allow our plans to adapt to regulations, but the mechanism needs to allow for changes in technology.

Our plan currently includes expenditure of

£12.2m



You can find more information on how we've done this in: **Annex 32: Cyber Resilience Plan**.



We first implemented a dedicated Stakeholder Engagement Strategy in 2013 and since then we have made significant changes, through continual improvement, using lessons learned and a desire to continue to evolve. We have demonstrated continuous improvement in stakeholder survey results year on year from 7.4/10 at the start of the RII0-T1 period in 2013, to 8.3/10 this year, demonstrating experience of taking on board feedback, analysing the impact and making positive changes and **keeping network users and consumers at the heart of our decisions.**

We have proposed to retain our existing User Group. We think this is vital: they will assess our performance against our ambitious commitments and bespoke and reputational incentives. This focus makes sure we stay transparent, and provides external vigilance throughout the price control period.

To ensure our strategy is robust, consistent and delivers value for money for consumers, network users and wider stakeholders, our strategy has been structured in three parts.

Our mission statement

Laying out our ambition
– what we want to achieve.

1

Our principles of engagement

Statements explaining how we engage
– what we want to be known for.

2

Our approach to engagement

A series of steps that show how
we start, deliver and close our
engagement activities.

3

Ranked in the top 16% of companies assessed globally – by AccountAbility, the owners of the AA1000 Stakeholder Engagement standard.

Awarded 'Team of the year' at the Utility Week Awards – for our industry-leading Stakeholder Engagement team.

Continuing to Engage with our Stakeholders



Our Enhanced Stakeholder Engagement Strategy

Over the last year, we took the opportunity to build on strong previous performance by continuing to improve the way that we engage.

Co-creating our strategy

When creating our new Stakeholder Engagement Strategy, our stakeholders were at the heart of all decision making. During our Strategic Stakeholder Panels, we worked with our stakeholders to co-create, develop and test each step of our new strategy, ensuring every piece of feedback was taken on board.

The AA1000 standard for stakeholder engagement is globally-recognised. Our new strategy embeds, at its core, the four principles of the AA1000 stakeholder engagement standard – Inclusivity, Materiality, Responsiveness and Impact. These ensure we engage at all levels, with a specific focus on those who are hard to reach, determine the most relevant and significant issues for us and our stakeholders, and act on the outcome of our engagement – making the necessary changes to our business and then measure the results.

Not only does our strategy align with this, we have asked the owners of the standard AccountAbility to conduct an annual audit of our Stakeholder Engagement strategy, governance, activities and communications.

AccountAbility evaluates maturity in stakeholder engagement processes and embeddedness, identifying four maturity stages for an organisation. The assessment involves director and senior manager interviews, demonstrating senior manager buy-in and engagement, as well as a robust evidence check.

In addition, we have engaged Sia Partners, who are experienced in the utility industries and the gas and electricity regulatory market. They provided expert advice and guidance, recognising best practice globally.

Full details of our strategy is available in **Annex 28: Strategy for Engaging Stakeholders in RIIO-T2**.



How we know we are focusing on the right topics?

Last year we conducted an in-depth study with end consumers. We did this to make sure we were focusing on the topics that matter to them, and that we were representing the key values they expect us to hold.

We held six discussion groups ranging from non-adopters of new technology, early adopters, future stakeholders and participants aged 60+. We looked for key themes/points arising, asked why these were important and discussed what those mean for them, their local area and their families.

We tested a series of messages with innovative 'dial testing' to capture real-time reactions and sentiments, to see what themes received a positive reaction from participants. Based on this research, we structured our engagement approach around three strategic themes: **Better, Future, Quicker**.

Better

A sustainable network – that enables clean growth and better public services. As a transmission operator we have a critical role to play - preparing for an increase in renewable generation connections and the decarbonisation of heat and transport.

Future

A resilient network – to allow our local communities to thrive under our changing energy mix, maintaining a focus on resilience is vital if we are to provide a safe supply to consumers and network users across GB.

Quicker

An innovative network – we are continually improving our service to stakeholders through innovations such as digital substations, faster connections and more active management of the network.

An overview of our planned investment for ongoing stakeholder engagement:

Transmission User Group

£0.3m

Research costs

£0.2m

Resourcing costs

£1.8m

Support costs

£0.8m

Total expenditure

£3.1m

Costs are outlined in this chapter only to provide transparency of the total cost of our ongoing RIIO-T2 stakeholder engagement. All of these costs are included within the 'Proposed Expenditure and Outputs' section of this Business Plan.

Our mission statement

1

'Our engagement places our stakeholders and customers at the centre of what we do. With a tailored and locally focused approach, we will prioritise their wants and needs in a consistent manner across our business. We will deliver safe, reliable services, sustainable value, and a better future, quicker.'

The mission statement defines our engagement; what it will deliver and how we will be different. This ambition builds on our current strengths, while consciously focusing on what will make future engagement valuable and effective for consumers, network users and wider stakeholders.

Our principles of engagement

2

The five principles in our strategy allow us to be responsive to our stakeholders and to maintain up-to-date understanding of their needs, as we continually look to improve our approach year on year during RIIO-T2.

Inclusive We engage all consumers, network users and wider stakeholders, with a specific focus to ensure those who may be hard to reach are given a voice.

Authentic Our engagement works to understand the significant issues affecting consumers, network users and wider stakeholders, before acting on them in a meaningful way.

Tailored The approach we take to engagement ensures that each initiative is planned and delivered in the most appropriate way for the specific purpose and stakeholders in question.

Value for money An inherent focus, we ensure efficient spending on engagement activities, aiming to maximise the overall consumer benefit.

Innovative We aim to better our approach each year, continually looking for new methods to improve how we engage and deliver against wants and needs.

Our approach to engagement

3

The approach consists of a series of sequential steps that detail how we plan, review and close all our engagement activities. Our new approach ensures we identify consumer, network user and wider stakeholder wants and needs, and that everything we do is value for money.

Our approach incorporates and builds on the best practice methods learned in RIIO-T1 and feedback from experts to help improve our planning and consistency of our stakeholder engagement.

The Key Steps of Our Strategy

Step 1: Defining the purpose

Step 2: Identify and map stakeholders

Step 3: Tailoring the Engagement

Step 4: Engagement

Step 5: Capturing Feedback

Step 6: Determine Wants and Needs

Step 7: Develop and Prioritise Actions

Step 8: Act

Step 9: Close Feedback Loop

Plan

Review

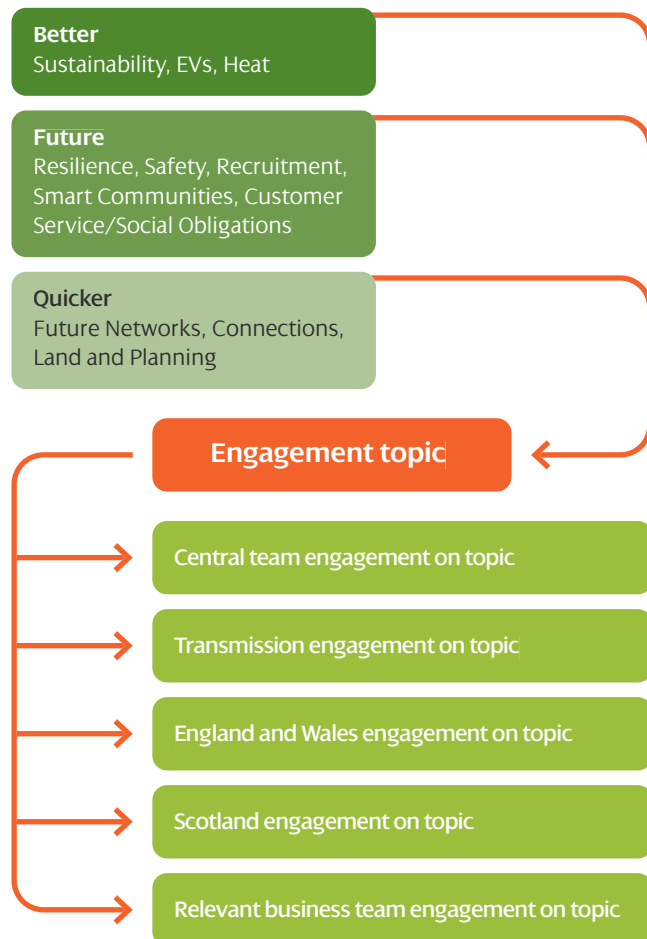
Full details of our strategy is available in **Annex 28: Strategy for Engaging Stakeholders in RIIO-T2**.



Step 1: Defining the purpose

We operate with one business-wide engagement plan under our three themes, with eleven clear topics. These will be tested and refined with stakeholders on an annual basis.

Engagement broken down by topic:



Each topic is owned by a senior manager, responsible for engagement across the whole business. This approach will provide a central view of engagement throughout the RIIO-T2 period and will ensure we minimise duplication and identify gaps early in the planning process.

An example, in practice, from RIIO-T1

We identified and mapped key stakeholders, impacted by our Transmission resilience plans, including the NHS, Police Scotland, Transport Scotland, Network Rail and various local authorities for knowledge sharing and to provide the opportunity to influence our emergency plans, using gap analysis to review hard to reach groups. Through engagement our 'Protected Customers' list was reviewed and revised and worked with each organisation to review their resilience to a major event.

Step 2: Identifying and mapping our stakeholders

With a clear purpose defined, we identify the key stakeholders best placed to provide the insight required. To do this, we need to understand the knowledge levels of our stakeholders on the engagement topic.

We use an industry leading system 'Tractivity', which has over 4,000 stakeholders registered, categorised into 15 groups and 56 sub-groups, which help us identify their specialist expertise and knowledge levels. We continually update the data to ensure correct information is stored.

End Consumers

It is challenging to engage end customers about Transmission. Often because reliability is high and they have a more direct relationship with their distribution company and energy supplier. However, through our strategy, we ensure we identify and map customers correctly, tailoring both our messaging and our engagement methods accordingly.

We intend to engage end consumers in three main ways:

- Engaging with consumer groups who can represent our consumer's interests.
- Engaging with consumers at the time when they are impacted by one of our transmission projects.
- Conducting more innovative market research with end consumers.

From experience, we are confident we can derive value from these activities. We have learned a lot through extensive engagement with end customers – including co-creation workshops on how to explain complex engineering and financial concepts in ways which our customers will understand and an innovative digital slider tool, which lets customers prioritise investment against bill impact.

We will present the findings from end consumer engagement and associated actions to our enduring User Group. This ensures a commitment to act on feedback.

Hard to Reach Stakeholders

Identifying and prioritising a broad and inclusive range of stakeholders is key to our engagement planning approach. We will employ a range of methods to reach out and seek new relationships, both for those we know about and those we don't. These methods include but are not limited to:

- Seeking referrals from existing stakeholders.
- Attending relevant community events on a regular basis.
- Reviewing government database of national charities and non-profits, particularly useful in identifying trusted third parties.
- Performing on-line research and making direct contact.

Gap Analysis

Through lessons learned in RIIO-T1, our process makes it easier for us to identify gaps in our engagement. Tractivity allows us to operate more innovatively. With robust data and transparent engagement across our organisation, we are able to take steps to address these gaps confidently.

Step 3: Tailoring the Engagement

To ensure maximum value is gained from each event and from key learnings in RIIO-T1, we tailor three distinct aspects of the engagement:

1. Tailored content, before, during, and after the event

This reduces stakeholder fatigue which was highlighted as a key learning from RIIO-T1.

2. Tailored methods, to reach a wide and varied stakeholder and customer base

We have listened to our stakeholders and were mindful of variances in stakeholder's level of knowledge and how they like to hear from us, which will continue throughout RIIO-T2.

3. Tailored communication, including invitations, briefings, outputs and next steps

We will invite and brief stakeholders and consumers with information tailored to their knowledge level.

Example methods of engagement:

No knowledge



Emails, Social Media

Some knowledge



Focus groups, Surveys

Good knowledge



Conferences, Exhibitions

Expert knowledge



Panel meetings, Partnerships

Step 4: Engagement

The result of our planning phase is an inclusive, tailored and value-for-money engagement event, ready to be delivered. To ensure that our engagements are facilitated well and deliver the intended results, we have taken guidance from the AA1000SES accreditation on the formal identification and management of risks.

AccountAbility said in their most recent Healthcheck:

"SP Energy Networks appears to consider the views of stakeholders on what mechanisms are the best to enable their effective engagement, in particular considering factors that may impede the ability of stakeholders to engage such as capacity to travel or resource availability", and

"Interviews indicated numerous examples of where the business has considered the most appropriate method to meet the capacity of stakeholders and also fit the purpose of engagement."

Step 5: Capturing Feedback

Our engagement process, and subsequent business decision making, will continue to be driven by the feedback we receive from our stakeholders. This feedback remains crucial in designing and delivering services that are right for those affected by any area of our business, which will be embedded throughout RIIO-T2.

We have built on the foundation of our approach to data – as well as Tractivity, our Stakeholder Management System, and used internal learnings and feedback to make improvements to both. We have listened to our Tractivity users to make sure the system is easy to use and quick to input stakeholder feedback – and we'll continue to do this. Tractivity has been successfully embedded with our senior managers, resulting in valuable feedback being tracked and outcomes being delivered.

Step 6: Determine Wants and Needs

This step is central to the effectiveness of the overall strategy. Without a clear understanding of the wants and needs of our stakeholders, we cannot measure the effectiveness of the actions, outputs and outcomes we deliver. This will be tailored each year, as our stakeholders wants and needs change over time.

Step 7: Develop and Prioritise Actions

We aim to provide efficiency through all services – a principle that lies at the heart of everything the business delivers. Demonstrating this value rests on our ability to measure potential outputs and prioritise accordingly. Although this is something we have always done, we have recently focused on adding structure to our approach. This better justifies where and why we have acted for our stakeholders.

Step 8: Act

While feedback is the output of the 'Plan' phase, actions are the output of the 'Review' phase. Each step, from capturing feedback, determining wants and needs, to developing and prioritising actions, leads to a list of actions for the business to complete that will lead to better services.

Each of these actions is recorded and monitored, providing visibility of the full process from engagement conducted, to feedback collected, and action taken.

An example, in practice, from RIIO-T1

Our stakeholders said that whilst harmonic compliance is the responsibility of windfarm developers, it could be better for the network operator to provide a solution. If harmonic levels are allowed to get out of hand, the impact could range from a minor annoyance to equipment damage, or anything in between. We held a workshop, tailored to developers, specifically on the issues of harmonics, explaining a very technical subject to stakeholders in a way to help them understand. We identified a technical solution, and shared with other Transmission operators. Resolving issues on behalf of renewable generators, to the benefit of society.

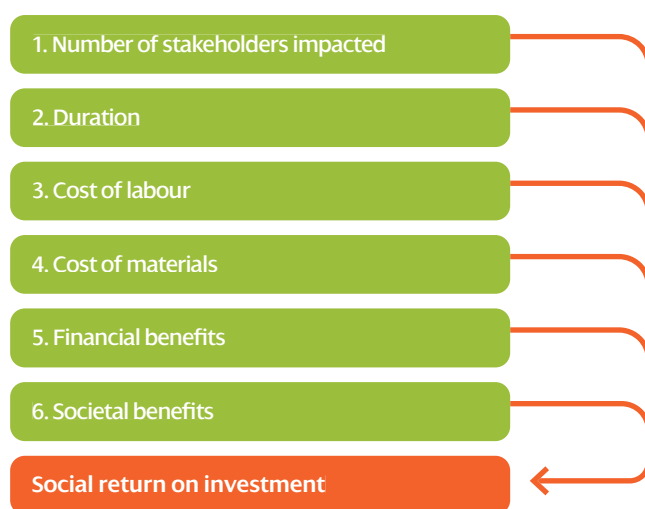
Step 9: Close Feedback Loop

With our engagement complete, our feedback collected, and our actions taken, the final step of approach is to close the feedback loop. This step consists of three parts:

1. Measure the value and impact at all levels of the business

We have developed a ground-breaking new measurement tool. This tool models the financial costs and benefits used in a traditional Cost Benefit Analysis but also includes the estimated financial value of qualitative 'social' benefits we've delivered.

We estimate the value of social benefits by using industry-standard proxy data (from respected sources such as HSE, Social Value Bank etc). The tool is designed to utilise the results of willingness-to-pay studies, when proxies are not available. This ensures that the assumptions we make are as accurate as possible and verified with our stakeholders.



Our new Social Return on Investment (SROI) tool allows us to quantify and forecast the costs and benefits of initiatives over time. The tool allows us to demonstrate, for each pound we spend on a service, the net benefit created for consumers.

We can also use the tool to compare different investment options in advance of decision making. This helps us to decide which option to select, providing an unprecedented level of maturity in directing investment. This approach allows us to justify, internally and externally, which projects to scale up or close down, maximising the value for money we deliver for consumers.

2. Identify how and where we can improve our approach

To 'close the loop', we review the impact of feedback – whether it's improving our understanding of our stakeholders or improving our tailoring – and build it into our approach going forward.

3. Reporting

We have a comprehensive monthly process for reporting to our CEO and executive team to enhance the visibility of engagement that has taken place, resulting in successful buy-in. We also share summarised reports externally to ensure we report back to stakeholders on the action we have taken.

Ongoing role for the Transmission User group

The purpose of the independent user group is to provide formal challenge and input to our RIIO-T2 Business Plan. The group represents consumers, network users and wider stakeholders.

We intend to maintain this group throughout the RIIO-T2 period. They will influence business decision making over this period, ensuring commitments are delivered and assessing performance in key incentives.

In order to ensure the group remains representative, we intend to work with the chairperson to conduct a review of membership before the start of the RIIO-T2 period. This will involve engaging with the chair, current members and external representatives and advisors from groups who have engaged with the user group over the business planning period, for example, the Scottish Government and Citizens Advice Scotland. We will also assess the format and frequency of meetings, adjusting accordingly as the group formalises its new remit.

We will continue to engage and collaborate with our fellow network operators through established best practice sharing groups – and share our progress with the user group.

Engaging on our Digitalisation Strategy

As a proactive leader in the adoption of digital technologies and data, we are leading the way in digitalising the energy system, providing a modern network to meet future demand. This ensures better value for consumers by cost effectively optimising the network, increasing safety and reliability and better targeting our investment programme.

We have created a holistic Digital Strategy, which not only highlights the digital and smart data projects already underway in the company, but establishes an overall framework that can be followed to make sure it is in the best position possible to initiate and respond to digital changes within the industry. The strategy outlines the vision we have for the future of the networks industry, including the key capabilities it will require going forward.

This is not a static document, but has established protocols to ensure its continuous refreshing throughout the RIIO-2 period. We recognise the digital future of the networks industry is still subject to much change and there is a continuous requirement to engage with key stakeholders and then to adapt based on the feedback we receive.

This Digital Strategy is in accordance with Ofgem's request for information on Modernising Energy Data and Digitalisation initiatives within the September 2019 RIIO-2 Business Plan Guidance, as well as the recommendation actions of the Energy Data Taskforce of June 2019. The strategy can be found at www.spenergynetworks.co.uk

Performance commitments

We have created the following performance commitments. Each year we will publish a transparent report on our progress. We will also update our enduring User Group on our progress.

Annual performance healthcheck

AA1000SE is a globally-recognised standard for stakeholder engagement. We ask the owners of the standard, AccountAbility, to conduct an annual audit of our Stakeholder Engagement strategy.

Commitment: Achieve a score of 51% or above, 'Advanced status', on AccountAbility maturity framework each year, following evidence check and senior manager interviews.

Annual programme of engagement

We have developed a comprehensive engagement programme, including Strategic Stakeholder Panels, Stakeholder Conferences and topic specific working groups. In 2018/19 we recorded 310 engagement events in Transmission. For RIIO-T2 we intend to embed this programme into Business-as-usual. Our strategy offers the flexibility to expand our engagement as new topics emerge.

Commitment: Embed an annual programme of engagement in our business, allowing stakeholders to see 100% of engagements on the SP Energy Networks website and, if applicable, register to attend. At an executive level, we will hold three director-led Strategic Stakeholder Panel meetings and one Stakeholder Conference per annum.

Reporting on performance

In order to ensure transparency for our stakeholders, we will report on our performance – not just in terms of the engagement itself, but highlighting the recording and tracking of action taken on feedback and how the action taken has led to societal benefit.

Commitment: We will report annually on our latest engagement performance, including social return on investment generated by our stakeholder initiatives. Target a 5% improvement in the societal benefits achieved year-on-year throughout the RIIO-T2 period.

New digital collaboration tool

We intend to take lessons learned from our current stakeholder online community to launch a brand new collaboration tool for our stakeholders. We will customise this to their wants and needs.

Commitment: Launch a new fit-for-purpose online tool, which gives our stakeholders easy access to a collaboration and engagement platform where they can easily engage with relevant content. Achieve a 70% satisfaction rate through annual smart surveys to make sure online community is still fit for purpose for our stakeholders.

Supporting vulnerable consumers

We are committed to deliver tailored support that consumers want and need in the most cost-effective and efficient way possible. Our approach is to deliver this through our Scottish distribution licence, where we already have a direct relationship with the 2m households in our area.

We do not believe a specific consumer vulnerability programme should sit at a Transmission level and therefore do not wish to apply for any extra funding to support this. We look to support our vulnerable consumers through our partnership with our Distribution company, and therefore is not included in our Transmission plan to ensure unnecessary additional costs are not passed onto consumers.

We are clear that this is the appropriate way to target activities to support vulnerable consumers through strong engagement, a wide range of services to support the needs of our consumers as well as our network of partnerships so we can deliver services to those consumers most in need. By doing this in our Distribution Strategy where we hold the direct consumer relationship, we can ensure costs are not duplicated and that we are delivering for consumers in the most efficient way.

SP Energy Networks Vulnerability strategy mission statement:

"SP Energy Networks aims to be a service leader in the UK. We will strive to minimise the impact we have on our communities and provide bespoke support to our customers in vulnerable situations. We will do so by offering the appropriate support to those who need it the most, in cost effective ways."

Our distribution-led services and partnerships support consumers in a variety of situations such as Low Income, Fuel Poverty, Social Isolation & Resilience. Our measurement tool allows us to make the right choice when establishing new partnerships and services and gives us the understanding of the value our services deliver so we can continuously improve our strategy.

Our staff are trained and accredited annually and we have built in-house training capabilities to ensure training can be fully tailored with the input from expert partners and consumer bodies.

On page 47 of our plan we introduce our proposal to establish a Net Zero fund, which will facilitate low carbon initiatives, with a specific focus on communities in vulnerable circumstances. This is one way in which our stakeholders have told us we can support vulnerable communities as a Transmission operator.

Further information on our incentives available in the chapter **Output Delivery Incentive Proposals**, Pg 147.



Uncertainty is on the rise. The rate of change and the bold ambitions that need to be achieved to **create a sustainable Net Zero future** are leading to more change, faster than ever before.

As we set out in our RIIO-T2 plan, we expect a number of aspects to keep changing **to be able to adapt our world-class resilient network**. Here, we'll show how our plans can adapt and respond to this uncertainty. We have considered the trade-off of including expenditure in our baseline plan or through an uncertainty mechanism, to ensure customers are not committed to funding works that may not be required.

Energy system uncertainties for Net Zero, *Pg 140*

As a result of the decarbonisation of the energy system, there are a range of uncertainties which are likely to emerge. This suite of mechanisms provide us with the flexibility to adapt to the changes that a move to Net Zero may require.

1

Legislative, policy and standards uncertainty, *Pg 143*

External changes from government, regulatory bodies or other authorities will require us to change our plans. These are driven by third parties and cannot be forecast at the time of creating the business plan.

2

External financial uncertainties, *Pg 144*

There is an established means of treating financial uncertainties such as changes to rates, taxes and fees which we are obliged to pay. Changes to these are out with our control and can change at any time.

3

Real price effects and ongoing efficiency, *Pg 145*

Over the price control period, the cost of delivering our services will evolve. The price changes in our input costs, relative to inflation, are referred to as Real Price Effects (RPEs). At the same time, the efficiency of how we deliver our services will also evolve. This section details how we have treated these factors.

4

Managing Uncertainty



Uncertainty mechanisms explained

Over the RIIO-T2 period, we expect the energy landscape will continue to change, and our plan will need to change with it.

Most aspects of our plan are relatively predictable, such as when we need to replace assets as they approach end of life, the maintenance we need to undertake, and making reinforcements where the need is clearly justified. For these areas, we can set out the efficient costs to undertake the work. These aspects are funded through our baseline plan.

However, some areas are less certain. This uncertainty is due to legislative changes that we need to comply with, new contractual requirements from network customers, or due to project needs and costs being unclear. There are many factors out with our control that can influence some projects. Agreeing funding for these now isn't reasonable, as they may not materialise. Instead, they are funded through a suite of arrangements called uncertainty mechanisms.

To accommodate these external uncertainties, the projects we undertake and our expenditure may need to change. Uncertainty mechanisms will increase or decrease our allowances according to emerging new requirements. This protects network customers and consumers as they won't need to pay more where we don't need to undertake an activity, but equally, it provides extra revenue when we have additional work that is essential.

Our approach to uncertainty

A number of uncertainty mechanisms were used in RIIO-T1 to adjust our allowed revenues. This was the first time uncertainty mechanisms had been used extensively, partly due to the longer price review period, but also due to the changes that were expected.

From RIIO-T1, we have identified which mechanisms did and didn't work successfully, helping us to improve our plans for RIIO-T2. We have also undertaken far greater planning and engagement for RIIO-T2 to justify our plans and understand the different types of uncertainties.

In RIIO-T1, all transmission owners had different consumers and mechanisms. We have shared experiences and learned from this to adopt a more consistent approach moving forward.

Our plans for RIIO-T2

We have identified a suite of mechanisms to provide the flexibility for our plans to be able to respond to these changes. Full details are included in our Uncertainty Mechanisms Annex. We have grouped the different mechanisms into three areas:

Energy system uncertainties for Net Zero

Legislative, policy and standards changes

Financial uncertainties

Different types of mechanism

Uncertainty mechanisms are used for a variety of different reasons and can operate in different ways. Some of these are mechanistic whilst others require greater involvement from Ofgem.

There are five types of mechanism:

Volume drivers – calibrated at the start of the price control, these automatically adjust the revenue we recover to cover the costs that can reasonably and efficiently be expected when a defined volume of activity is delivered. An example of this in RIIO-T1 is for generation connections. We recovered a fixed amount of funding for each MW of generation which we connected to cover the costs associated with the connection.

Reopeners – these are forward-looking revenue adjustments. They are triggered either by a threshold being reached or at a set point in time. They allow for us to propose an adjustment to our allowances to deal with any uncertainty that couldn't have been anticipated at the start of the price review. They require agreement with Ofgem before an adjustment is set.

Unit cost allowance – a schedule of efficient unit costs are agreed with Ofgem at the start of the price review for predefined activities required to address the uncertainty. Revenue is provided in line with these unit costs based on predefined events being met.

Pass through items – we incur the required costs which would be assessed by Ofgem after the event once data on actual expenditure is available. An example from RIIO-T1 is for business rates; changes to these cannot be predicted before the price review but are obligatory costs that we must incur.

Indexation – for costs which can be tracked utilising recognised indices. This adjusts our allowances in line with them.

More details can be found in **Annex 10: Real Price Effects**, and **Annex 20: Uncertainty Mechanisms** which includes Ofgem's summary table of the various mechanisms.



Energy system uncertainties for Net Zero

1

As a result of wider changes to the generation and demands connected to our network, we require to have the flexibility to adjust our plans accordingly. These mechanisms provide this flexibility whilst ensuring that we are incentivised to be efficient.

Generation connections

Why do we require a mechanism?

There are a number of uncertainties associated with new generation and demand:

The volume of generation – this is due to the incentives and planning landscape which is dependent on government policy, planning decisions and other economic factors.

Generation technology – we have seen rapid changes in the past such as the establishment of FiTs which led to major, rapid growth in solar. Onshore wind is continuing to progress subsidy-free in Scotland and offshore wind is being incentivised through CFDs.

Location – Scotland continues to see the largest growth in onshore wind, and has a high proportion of offshore wind. Within our network we have seen high concentrations in the Dumfries & Galloway area, as well as the Borders. The distance of these sites from existing network infrastructure will drive the costs associated with facilitating them on the network.

At present, we have 5.6GW of generation connections which are contracted to connect in RIIO-T2. From past experience, we know that not all of these will progress and that new projects will continue to emerge over the course of RIIO-T2.

Type and description of mechanism

An ex-ante forecast of generation has been made based on a detailed review of all projects to identify those with the highest probability of connecting. Many of these projects are already in construction or well progressed in terms of planning processes.

A mechanism is required which will allow recovery of efficient costs that are incurred to facilitate new generators as required through the course of RIIO-T2. These are high volume projects which can emerge and progress with little prior warning to the TO.

A volume driver is proposed which would allow the TO to recover revenue in line with generation projects progressing. This driver should be reflective of the costs we would expect to incur – which from our experience in RIIO-T1, the volume driver did not reflect. A volume driver that funds the costs associated with the increased capacity of the substations as well as the cost of new linear assets (km of OHL) is required.

When and how will it be used

The mechanism will be required for generation which is connected to the network and network capacity which is created above the agreed baseline allowance. In the event that the baseline of generation is not achieved, revenue allowances would be clawed back at the same rate, providing a symmetrical mechanism which is of lower risk to both customers and companies. Where projects are deemed to be an outlier to the mechanism, generally for larger projects, these will be subject to funding through a separate re-opener mechanism.

Lessons learned from RIIO-T1

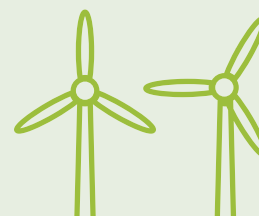
The volume driver used in RIIO-T1 differed between each TO. For SP Transmission, the mechanism was not reflective of the costs incurred.

For sole use connections, the driver didn't reflect the varying amounts of overhead lines required to serve remote sites, and was only based on the generation capacity. Therefore, if a generator connected adjacent to existing infrastructure, the allowance was the same as if it were 50km from the closest infrastructure – despite the costs being significantly higher for the latter case.

For shared use infrastructure, a unit cost allowance was created for a suite of different assets. Over the course of RIIO-T1, we found that other solutions – which were not defined in the unit cost allowance – offered the most economic and efficient approach but as they were not defined, no allowance was provided. This penalised SP Transmission by not covering costs for the most efficient solutions.

Financial impact

Our baseline of high probability projects will connect 900MW of new generation. An additional 4.7GW of contracted projects are committed to by customers. These projects are highly uncertain, but if all were to progress, the mechanism would be required to fund an additional **£506m**. We consider there to be a high likelihood that this mechanism will be used to increase revenues over RIIO-T2.



Major boundary upgrades – Strategic Wider Works

Why do we require a mechanism?

Major projects which increase the capacity to transfer power across Great Britain have a high capital cost, and have a number of other dependencies on them. A mechanism is required which will evaluate these projects, separately to the main price review, as the need case and proposed solutions evolve. At the time of submitting the RIIO-T2 business plan, some uncertainties around these projects will exist which prevent them from being included.

Type and description of mechanism

This mechanism would allow for within period revenue adjustment for projects with a threshold value of more than £100m and cannot be clearly defined at the time of publishing our business plans. These projects would be subject to a specific re-opener due to their scale and significance to allow Ofgem to undertake a review of the needs case and proposed solution. Ofgem are currently progressing a review of this mechanism which we are supporting.

When and how will it be used

Due to the nature and scale of these projects, there are a number of uncertainties, including the scope of the project and accurate cost details, which cannot be identified in advance of RIIO-T2 starting. For SP Transmission, the Eastern HVDC link would be funded through this mechanism.

Lessons learned from RIIO-T1

This mechanism has been used a number of times by SHETL and National Grid. SP Transmission developed one project under this framework but as it was less than £100m when the final assessment was completed, it was no longer eligible. We had no other means of funding this project as a result of this, which is why we are proposing a separate Net Zero transition reopener.

Experience has also shown that the current process can be extremely bureaucratic. The process should be reviewed in light of the experiences of both TOs and Ofgem.

Financial impact

The total value of the SPT-NGET Eastern Link subsea cable is estimated to be between **£1.7-2.5bn**.

Net Zero operability challenges

Why do we require a mechanism?

New issues are likely to emerge in RIIO-T2 such as voltage or harmonics which are non-compliant with the relevant standards. Extensive modelling has been undertaken to ensure our plans have the necessary solutions based on the FES, however these cannot cover every eventuality. Many of these issues will be instigated by the ESO due to the problems they risk creating in its operation of the transmission network.

Type and description of mechanism

An allowed unit cost for a range of solutions is proposed, including:

- 60MVar Shunt reactor
- 132kV Harmonic Filter
- Operational intertrip schemes

These would only be triggered based on an STC request by the ESO or fulfilling other relevant standards which is a licence obligation. Non build commercial solutions would also be considered involving other parties before this mechanism would be utilised.

When and how will it be used

A number of these solutions are already included in our baseline plan. These are only expected to be used should there be a significant change beyond what we have planned for through the energy scenarios. Without these, it is likely that the ESO would face additional operational costs in managing the network, the costs of which would be borne by all customers.

Lessons learned from RIIO-T1

These were not included by SP Transmission in RIIO-T1. We were requested to install a number of operational intertrips, but no funding was made available for these.

Financial impact

We currently have **£54.3m** in our baseline plan for these solutions. The need for this is contingent on unforeseen changes in the wider energy system.

Net Zero transition re-opener

Why do we require a mechanism?

The transition to Net Zero is likely to result in further changes to the demand and generation make-up across Great Britain. This mechanism is to specifically consider projects of less than £100m that may emerge during the course of the price review and cannot be addressed by the other mechanisms.

Type and description of mechanism

A re-opener is required on an annual basis to allow for consideration of new projects which emerge as a result of the annual NOA process, anticipatory investment opportunities which were not previously identified or the need for other solutions, as identified through the various pathfinder projects that are underway and cannot be identified as part of the business plan. This would only apply to projects less than £100m.

When and how will it be used

A re-opener window will be specified on an annual basis for projects to be proposed. We will provide a justification of both the needs case as well as the efficient solutions. This will be supported by evidence from the ESO or customers of the trigger for such a project.

Lessons learned from RIIO-T1

No mechanism was provided for this purpose in RIIO-T1. SP Transmission progressed one project through SWW which consequently was less than £100m and was therefore not eligible.

Financial impact

Four projects have been submitted to the NOA 2019/20 process which would fall into this category. The combined value is estimated to be around **£120m**.

Whole System 'Coordinated Adjustment Mechanism'

Why do we require a mechanism?

Through the course of RIIO-T2, the optimal approach to address needs may change between companies across gas and electricity, distribution and transmission. Ofgem have identified the need for means of supporting the reallocation of project revenues and responsibilities to the network(s) best placed to deliver those projects.

Type and description of mechanism

This mechanism has been proposed by Ofgem in their May 2019 decision document and is still to be discussed with companies.

When and how will it be used

Initial indications are that this would take the form of a re-opener in light of new information emerging and would ideally be triggered by two (or more) cooperating networks. We will continue to work with Ofgem to further define this.

Lessons learned from RIIO-T1

This is a new mechanism for RIIO-T2, but is required in response to the growing need to accommodate whole system approaches which emerge.

Financial Impact

This is a new mechanism that Ofgem have proposed. We are unable to estimate the financial impact of this mechanism.

Uncertain non-load projects

Why do we require a mechanism?

We have a number of non-load projects which have significant uncertainties associated with them, such as land purchases, or are interactive with new generation connections. We don't believe that it is appropriate to include these in our baseline with such high uncertainty at the start of the price review.

Type and description of mechanism

These projects will be included in our plan to allow the costs to be assessed by Ofgem, but excluded from the baseline. Should their need be confirmed, we will proceed with them and provide Ofgem with evidence as part of our annual reporting. We will propose Price Control Deliverables for each of the identified schemes.

When and how will it be used

We will agree the funding on an ex-ante basis with Ofgem, but it will be excluded from our base revenue. Should the work not be required or completed in RIIO-T2, our revenues will be adjusted accordingly.

Lessons learned from RIIO-T1

RIIO-T1 included a licence provision for similarly uncertain costs. This proposed mechanism is broadly consistent with this condition.

Financial Impact

We have identified £147m of projects which are in this category. These projects are supported by engineering justification papers.

Demand connections

Why do we require a mechanism?

Similar to Generation Connections, new demand connections which were not foreseen at the time of the plan being agreed can emerge through the course of a price review. A number of known projects are included in the baseline plan from close working with SP Distribution and Network Rail, but others which require funding may continue to emerge.

Type and description of mechanism

An ex-ante forecast of demand projects has been made based on detailed discussions with SP Distribution and Network Rail. A mechanism is required which will allow efficient costs that are incurred to facilitate further projects as required through the course of RIIO-T2. These can emerge and require progression in relatively short timescales and are driven by customer requirements.

A volume driver is proposed which would allow us to recover revenue in line with demand projects progressing. This driver should be reflective of the costs that a TO would expect to incur. A volume driver that funds the costs associated with the increased capacity of the substations as well as the cost of new linear assets (km of OHL) is required.

When and how will it be used

The mechanism will be required for demand connections which are connected to the network above the agreed baseline allowance. In the event that the baseline value is not achieved, revenue allowances would be clawed back at the same rate, providing a symmetrical mechanism which is of lower risk to both customers and companies.

Lessons learned from RIIO-T1

No such mechanism was included for SP Transmission in RIIO-T1 which resulted in us receiving no allowance, despite some of these projects materialising.

Financial impact

Our baseline includes £116m of expenditure. Network Rail have identified the potential for an additional six connections for rail electrification works, but these sites are still being finalised. The estimated value would be up to £40m of additional expenditure.



Legislative, policy and standards uncertainty

2

Changes to our operating environment can impact our plan by requiring us to comply with new policies or standards set by Government, Ofgem or other regulatory bodies.

Such changes can create additional costs that we need to incur to comply. We have considered the various options we may need to accommodate and are proposing a re-opener of the price control which covers these in two application windows. This removes potential overlap and reduces the administrative burden of multiple mechanisms. Some of these mechanisms are already under consultation with Ofgem and we will continue to work with them to ensure their coordination with this proposal.

Why do we require a mechanism?

There are a number of uncertainties associated with changes to our operating environment:

Climate change and environmental uncertainty:

It is currently unknown what Government policy will be implemented over the RIIO-2 period to accommodate legislative changes due to the government's commitment to Net Zero targets. We have seen recent changes to regulations over the course of 2019 relating to Polychlorinated biphenyls (PCBs) which has led to additional activity in our plan and we expect further changes to some of the regulations on other materials we use. These can have a material cost to accommodate and we are very often legally obliged to comply.

Brexit: The timing and impact of the UK leaving the European Union continues to be unknown. As a result of this process, additional costs may be incurred due to changes in import tariffs or other legislation affecting the costs we incur. These cannot be estimated at the time of the plan being developed.

Flood resilience: The effects of climate change are very uncertain. In response to a better understanding of future changes, the Scottish Environment Protection Agency (SEPA) frequently reviews their flood risk mapping. As a result of this, new threats from flooding can be identified at any time. We are required to ensure our critical assets are resilient to flooding events and because of updated guidance, additional activity may be required to meet this standard.

An allowance is included in our baseline plan for sites that have already been identified as being at risk. This mechanism would only be used where additional sites are identified due to new information being provided by SEPA.

Physical Security (PSUP): Because we operate an essential service, some of our assets can be classified by the UK government as Critical National Infrastructure. The affected sites can change when the responsible government body assesses the current situation. This assessment can lead to additional works being required at any point out with the business planning process.

Cyber security: The pace of change in this area makes it difficult to predict how our cyber defences will need to evolve. The threats are changing, and the technology available to us is developing rapidly. Works and activities to provide resilience to known threats are included in the business plan. The evolution of this threat is significantly uncertain and could lead to additional costs – the scope of which is unknown.

Energy Data Taskforce: As a result of the recommendation from the Energy Data Taskforce commissioned by BEIS and Ofgem, a new requirement for network operators to publish and implement a digitalisation strategy has emerged. The implementation of this will take place over a number of years and the costs of this are not yet known.

Wayleave review adjustment: There is an ongoing review across GB which may lead to changes in the wayleave payment rates which we make to landowners to match the owner or occupiers loss due to our equipment being on their land. The Scottish review is running to a later programme than England and Wales. It is based on an updated methodology and relies on different variable inputs from the review in the south.

Non-rechargeable diversions: Diversions triggered by landowners or developers can occur where no current valid land rights exist, due to historical land rights or no longer being valid as a result of the ownership of land being transferred. These are triggered by third parties and cannot be forecast at the start of a price review due to the level of uncertainty.

Environmental enhancements: Future environmental upgrades will be required for example, to deliver biodiversity quality commitments as a result of planning consent requirements, agreement with local communities or to deal with legacy land contamination issues.

The extent of these requirements are still to be defined and agreed with stakeholders including the Scottish Government. We do not believe it is in the best interests of the consumer to forecast such costs given that different sites have different needs for environmental improvements and new needs may emerge over the course of the price review.

Black start: The requirements on transmission owners to protect and recover against a major system interruption, known as a black start, are ongoing. Various standards relating to this such as System Defence and Restoration plans and other standards which may emerge. These may be triggered by regulatory bodies or the ESO.

Other uncertainties

3

Type and description of mechanism

Due to the uncertain nature and timing of these areas, it is proposed to address uncertain costs through a re-opener. The nature of the costs and volumes of activity that could be required are unknown, therefore the other approaches such as volume drivers are not appropriate.

A materiality threshold for these collectively is proposed at 2% of average baseline revenue in line with that applied in RIIO-T1. This equates to £5.58m of expenditure before the re-opener will be considered by Ofgem.

When and how will it be used

The justification for an adjustment will be made by SP Transmission with evidence based on the legislation, policy or standard that has triggered the new requirement. At the time of the re-opener, costs may be accrued up to that point, as well as a forward forecast of additional costs that are reasonably foreseeable. Two re-opener windows are proposed which would cover all of the above areas; at the midpoint of the price review as well as at the end.

Lessons learned from RIIO-T1

The only uncertainty that had provision in RIIO-T1 was for changes to Physical security requirements which was not utilised by SP Transmission. The other areas were not identified at that time as uncertainties. However, we have already seen several changes in the requirements of these areas over the period of creating the RIIO-T2 business plan which highlights the level of uncertainty.

Financial impact

We cannot estimate the total potential impact of these mechanisms as they are largely driven by external parties. Changes to policies and regulations are outside of our control. Any application for a re-opener would be subject to an efficiency test as part of the process to ensure the volume of work and the costs were reasonable.

Continued use of existing financial uncertainty mechanisms

Why do we require a mechanism?

There are a number of financial uncertainty mechanisms which Ofgem have identified from RIIO-T1 and will continue in RIIO-T2.

Type and description of mechanism

Ofgem have already outlined the approach which will be applied to each of these mechanisms as shown below:

Ofgem licence fee – Pass through

Business rates – Pass through

Inflation indexation of RAV and allowed return – Indexation

Cost of debt indexation – Indexation

Tax liability allowance – Re-opener

Pensions (*pension scheme established deficit*) – Re-opener

Cost of equity indexation – Indexation

When and how will it be used

Pass through items will be accounted for, if required, on an annual basis in line with our existing licence. Only justified items will be 'passed through' once costs have been incurred.

Lessons learned from RIIO-T1

This is consistent with the treatment in RIIO-T1.

Financial impact

Due to these mechanisms being pass through or indexation, we are unable to quantify the potential impact.

Real price effects and ongoing efficiency

4

Over the price control period, the cost of delivering our services will evolve. The price changes in our input costs, relative to inflation, are referred to as Real Price Effects (RPEs). The efficiency of how we deliver our services will also evolve over the period. The increase in productivity is referred to as 'ongoing efficiency'.

RPEs explained

RPEs reflect the differences in changes between two measures:

the inflation index that is used to update our revenues each year (CPIH); and

the changes in prices for several of the inputs we use to construct and operate our transmission network, affected by external factors outside of our control.

Traditionally, Ofgem compensated network companies for RPEs through the regulatory framework by providing fixed, upfront allowances. These 'ex-ante' allowances were based on forecasted differences between general inflation and the price inflation of relevant input price indices deemed to track network companies' costs – they were not based on actual results.

However, input price trends are unreliable and volatile, making it difficult to provide accurate forecasts. To mitigate the impact of the uncertainty of input price inflation in RIIO-2, Ofgem has proposed to update RPE allowances every year using the latest available input price indices.

We consider RPEs to be an ineffective way of reflecting the external input price pressures we face in the short-term, and indexing RPE allowances may therefore be fundamentally problematic.

For Detail on our proposal to offset RPEs against ongoing efficiencies, please see **Annex 25: Finance** and **Annex 10: Real Price Effects NERA Report**.

RPE Forecasts (Real Growth above CPIH) (%)

	21/22	22/23	23/24	24/25	25/26	Avg
Labour	1.2	1.2	1.4	1.3	1.3	1.3
Materials (opex)	1.7	1.7	1.7	1.7	1.7	1.7
Materials (capex)	1.1	1.1	1.1	1.1	1.1	1.1
P&E	0.1	0.1	0.1	0.1	0.1	0.1

Forecasts RPEs over RIIO-T2 based on average of indices from RIIO-1 (%)

	21/22	22/23	23/24	24/25	25/26	Avg
Combined Opex	0.68	0.71	0.77	0.77	0.77	0.74
Combined Capex	0.94	0.96	1.00	1.00	1.00	0.98
Combined Totex	0.93	0.94	0.99	0.99	0.99	0.97

Source: NERA analysis. For detail on the relevant indices and evidence of how these have been derived, please see Annex 10: Real Price Effects NERA Report.

Our view on RPEs and ongoing efficiency

The range of input price indices used for setting RPE allowances do not exactly capture the inputs used by network companies. They have also been found to be extremely volatile year-on-year, unlike network companies' actual costs. Indeed many network companies procure fixed-priced, or inflation-linked deals, with contractors shortly after a price control settlement is agreed upon, reflecting the economic conditions at the time of the determination. Taken together, the relevant indices do not track the short-term movements in network companies' input costs. The indexation of RPEs would increase risk for both customers and companies as a fluctuating RPE index would lead to increased volatility in consumer charges.

The relevant RPE indices are instead better used for observing the long-term input inflationary pressures that companies face, supporting the use of long-term average growth rates as the basis for setting ex-ante RPE allowances. There has been a long-run tendency for input price inflation to rise at a different rate than that of the CPIH. NERA's long-term average RPE forecasts for SP Transmission in RIIO-T2. Using an average of the three sets of input prices indices used to forecast RPEs in RIIO-1 suggests an RPEs increase of around 0.97% per annum (see Annex 10: Real Price Effects NERA Report).

Our costs of delivery will also be affected by the productivity improvements we can realistically achieve over the price control period. This means that any assessment of RPEs needs to be considered alongside assumptions about ongoing efficiency. Regulators, including Ofgem in RIIO-1, have recognised this link by assessing the two components of cost delivery in a consistent manner, basing both on long-term evidence.

Regulatory precedent has been to set ongoing efficiency assumptions on the analysis of long-term historic trends in productivity growth from comparative industries. These have generally been derived with reference to the EU KLEMS database¹ – an approach that Ofgem has proposed to continue to use in RIIO-2.

However, past experience of productivity improvement may not provide a reasonable guide to expectations of future productivity. Indeed as seen in the table, total factor productivity (TFP) growth² across UK industries has been at a near-stagnant level since the financial crisis. It can be argued that this has fed through into a slowdown in the energy industry's overall productivity growth. This would indicate an 'underperformance' against Ofgem's RIIO-T1 ongoing efficiency targets, likely offsetting any perceived gain in the RPE allowances in RIIO-T1. The outlook for productivity growth remains poor with the Bank of England reducing their forecasts to levels markedly less than those seen before the financial crisis. This outlook is also likely to remain sensitive to the form of the UK's withdrawal agreement with the EU.

Given the above, it would seem unreliable to assume that companies' are able to replicate productivity growth throughout RIIO-2 in line with those seen before 2008.

Bank of England estimates of annual total factor productivity growth

(Year %)

	98/07	08/10	11/14	15/19	19/22
TFP growth	1.0	-0.6	-0.1	0.2	0.3

Source: Bank of England August Inflation report, Table 3.D p. 19. Based on ONS and Bank of England calculations of quarterly averages for TFP growth.

Our suggestion – zero RPEs and a zero ongoing efficiency assumption

Considering the above, we believe that an RPE indexation approach may be problematic in practice. Current long-term average RPE forecasts match the long-term evidence of ongoing productivity improvement. This close link suggests a net adjustment of zero. As such, we believe that setting a zero RPE allowance and a zero ongoing efficiency assumption would be a pragmatic and simple approach for RIIO-T2. It would allow companies to hedge their risk exposure to changes in input costs, and would avoid volatility in revenues and customer bills. This assumption is favourable for consumers in light of the low outturn and forecast productivity growth in the UK economy. In **Annex 25: Finance**, we illustrate that an assumed 1% ongoing efficiency target is offset by forecast RPEs.

While the combination of a zero ongoing efficiency target and zero RPE allowance is appropriate in the current economic climate, there may be significant input cost pressures in the event of a detrimental exit from the EU. We have therefore proposed a re-opener for legislative, policy and standards changes which includes changes as a result of the UK leaving the EU.

Should Ofgem reject our evidenced proposal to offset RPEs against ongoing efficiency, an ex-ante allowance for labour costs must be implemented, given that these can be determined against recognised indices unlike our other costs which are related to commodities. Please refer **Appendix C of Annex 10: Real Price Effects NERA Report** for further detail on labour real price effects.

¹ The EU KLEMS Growth and Productivity Accounts dataset provides includes data on growth and productivity variables for most of EU28 countries and industries over different time periods. Available at: www.euklems.net/

² Total factor productivity growth refers to improvements in the efficiency with which both capital and labour are used to produce output.

More details can be found in **Annex 25: Finance**.

You can find more information on RPE Forecasts in **Annex 10: Real Price Effects NERA Report**.

Our Incentives package contributes towards a sustainable, Net Zero future; keeping network users and consumers at the heart of our decisions; and adapting our world-class, resilient network. We do all this, whilst ensuring a significantly positive Consumer Value Proposition. Our Output Delivery Incentives (ODI) are built on stretching targets, penalising us when we fail, and rewarding us only when we go even further than our targets in delivering what our customers and society want.

Informed by our stakeholder engagement and building on our experience from RIIO-T1, we've developed a strong package of ODIs.

Our incentives package includes:

Deterministic Financial Incentives – Reward or penalty is derived via pre-set targets and incentive rates.

Discretionary Financial Incentives – Based on assessment and recommendation from the Independent Transmission User Group to Ofgem.

Reputational Incentives – Reported to the Independent Transmission User Group as part of a Balanced Scorecard.

Common Outputs – These are determined by Ofgem and will apply to all network companies.

Bespoke Outputs – These are proposed by us and will only apply to our company.

For every incentive we have identified a set of commitments in direct response to the stakeholder feedback we have received. They are presented throughout this chapter and will be reported to the Independent Transmission User Group (User Group) on an annual basis to allow us to present our full regulatory year performance.

We have built our ODI Package around the three output categories proposed by Ofgem:

Category 1, Pg 151

Meeting the needs of consumers and network users

1

Category 2, Pg 155

Maintaining a safe and resilient network

2

Category 3, Pg 158

Delivering an environmentally sustainable network

3

Technical details including costs and associated resources can be found in [Annex 12: Output Delivery Incentives](#).



How we will implement our ODIs

Inputs

Our Stakeholders
Our Commitments
Our People

Outputs

Increased services and performance for our customers, stakeholders and consumers

Clear results that are material, controllable and measurable

Accountability and lessons learned

Feedback

User Group Assessment
Stakeholder Engagement
Balanced Scorecard of Metrics
Regulation

Output Delivery Incentive Proposals



Consumer Value Proposition

For every £1 invested implementing our incentives, they will deliver the following Social Return on Investment (SROI):

- Meeting the Needs of Consumers: £3.43
- Maintaining a Safe and Resilient Network: £4.19
- Delivering an Environmentally Sustainable Network: £2.00

SROI is a measure of the social and/or environmental value created for current and future network customers, stakeholders and consumers by our investments.

(See *Annex 30: CVP Assumptions* for details).

£9.62

Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

ODIs drive the priorities that our stakeholders have told us they want us to deliver in RIIO-T2. We therefore engage with stakeholders to both increase their understanding of what incentives are, and to obtain input and feedback on which incentives should be reputational only or rewarded financially. Ultimately, our goal for RIIO-T2 has been to identify the right incentives to help us maximise benefits for network customers, stakeholders and consumers as we continue to facilitate a Net Zero future.

How and why we have engaged with our stakeholders

Throughout 2018 and 2019, we hosted round table discussions and presented our RIIO-T2 incentive plans to consumers, network users and wider stakeholders at a number of large, well-established industry events. These include the National Grid Connection Seminars, our Annual Connection Summit and the OC2 (relating to land registry). New to RIIO-T2, we were also able to engage extensively with the Independent Transmission User Group at each phase of the development of our incentives proposals.

We held targeted discussions with developers and those connected to our network (our 'customers'). Discussions have also been targeted at consumer representatives and wider stakeholders including Citizens Advice and Citizens Advice Scotland, Community Energy Scotland, the Scottish Government, SHE Transmission, NGESO, NGET and Renewables UK. To obtain feedback from end consumers directly, we also conducted an online consultation in the spring/summer of 2019 and explained our incentive proposals in relation to our overall RIIO-T2 delivery plans during both our 'Willingness to Pay' and Acceptability consumer surveys. Direct quotes from stakeholders in relation to incentives can be found in **Annex 12: Output Delivery Incentives**.

83% of domestic respondents living within our licence area felt it was useful to incentivise companies to better deliver their targets.

83%

Willingness to Accept Study

For more information on Consumer Value Proposition, please see **Annex 30: CVP Assumptions**.

For details of our stakeholders' views on ODIs, please see **Annex 12: Output Delivery Incentives**.



What our stakeholders have told us is important to them

Consumers, consumer representatives and the Transmission User Group reinforced our understanding that even small increases to consumer bills can have an impact. Stakeholders including the User Group told us we need to work hard to maximise network availability and ensure more low-carbon generation is flowing on to the network and benefiting GB as a whole. Connecting and connected customers advised that an online platform is essential for facilitating connections. They believe we should be subject to a timely connection penalty to ensure focus on delivering connection offers remains high.

Stakeholders also told us they recognise that a financial reward is appropriate for driving superior performance in connections, stakeholder and environmental initiatives.

How stakeholder feedback has shaped our plans

We have identified a set of commitments for each incentive area based on stakeholder feedback. We have continually kept consumers in mind throughout the process, and have calculated a positive social return on our incentives package – demonstrating clear benefit to consumers, current and future network customers and wider stakeholders. Our incentive proposals have also been presented to consumers for acceptability as part of our wider 'Willingness-to-Accept' survey. Our consumer surveys make it clear that consumers' top priorities are reliability; connecting low carbon generation quicker; and recovering more quickly after power cuts.

Why these changes are important

The feedback we received from consumers, network users and wider stakeholders has informed our proposed incentives and commitments and will help us facilitate Net Zero in the most efficient way. Stakeholder input drives us to deliver a better level of service for connected customers – providing lower cost, low carbon and renewable generation to benefit all of GB. Their feedback has also challenged us to broaden our focus from demand customers to generation customers, new market entrants and emerging local energy models, so we can propose changes to improve network reliability for all network users now and in the future.

Why incentivise?

In 2010, Ofgem, introduced output incentives to support the low carbon energy transition that was being driven by global and UK climate change targets. Ofgem stated that incentives, *“encourage network companies to deliver in response to commercial incentives with the potential to earn higher returns if they innovate and outperform in delivering a safe, secure and low carbon energy sector and value for money”*¹.

RIIO-T1 Output Incentive Performance Highlights

Our incentives in RIIO-T1 have driven a step change in our performance in key areas that stakeholders value. For instance, since the start of RIIO-T1 'Energy Not Supplied' has achieved a 75% improvement, 'Customer Satisfaction' levels have risen 15%, connection offers are made on time in 99% of requests.

We believe it's vital for customers, stakeholders and consumers that we build on this performance in our incentives for RIIO-T2 and have developed a package based on strategic consumer surveys and stakeholder feedback as this chapter explains.

The Transmission User Group

We have proposed maintaining a Transmission User Group throughout RIIO-T2 as we see an important ongoing function for this type of external and independent input. That has a say in influencing business decision making over the period, ensuring commitments are delivered and evaluating business performance in key incentives. We intend to report progress on all our ODIs to an independent User Group and propose that it undertakes an annual appraisal of our performance in Discretionary Financial Incentives and Reputational Incentives.

1. <https://www.ofgem.gov.uk/ofgem-publications/51870/decision-docpdf>

Overall ODI package and annual assessment

We have built an ODI package that we believe is targeted, appropriate and balanced. It minimises the impact on consumer bills while being strong enough to drive performance for customers and stakeholders. This balance will help us make an essential contribution to achieving the low carbon energy system – a *better future, quicker* for all.

In each of the incentives described in this section, we have committed to report our progress to the User Group on an annual basis to allow them to review and feedback on our performance. This will ensure we have clear accountability to an external informed group of customer and stakeholder representatives who are well placed to assess our performance against our RIIO-T2 submission.

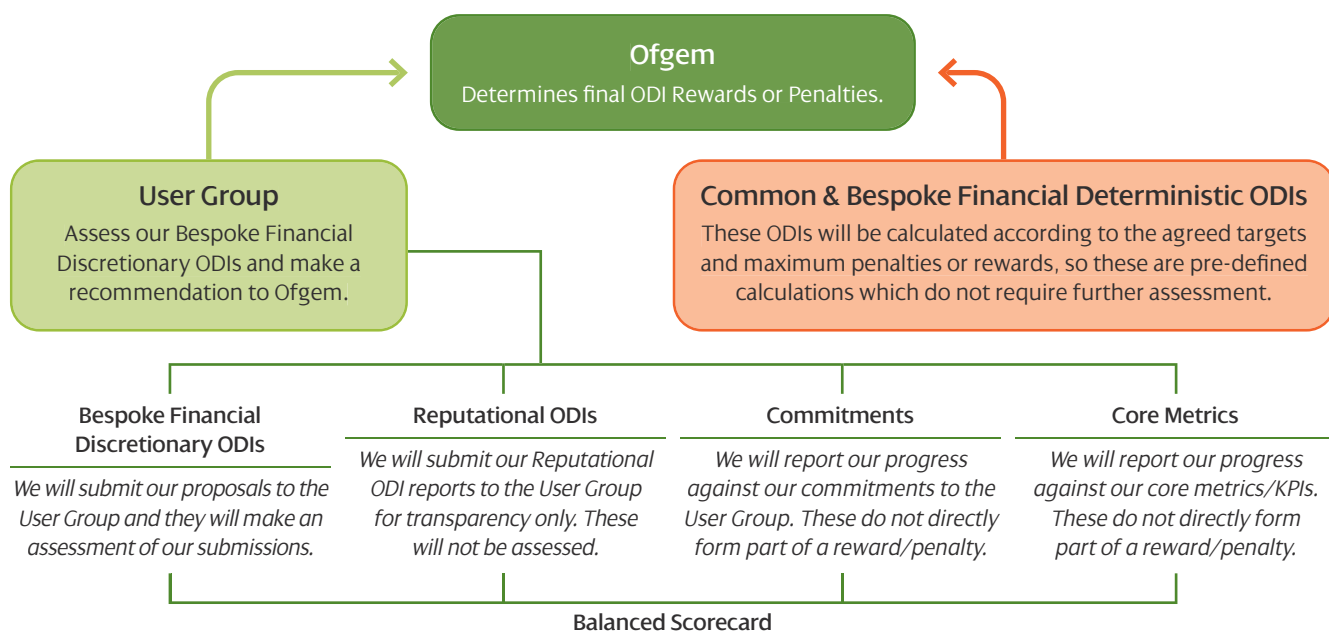
We will present a set of core metrics that demonstrate our year on year progress against Ofgem's Output Categories (please see **Annex 12: Output Delivery Incentives** for an indicative set of Core Metrics which we will finalise with Ofgem).

This overall performance report will be submitted to the User Group. This report will provide a strong, additional reputational incentive for our ODI package as a whole. It will also provide the User Group with information to conduct an assessment of our bespoke ODIs on low carbon incentives and enhanced stakeholder engagement which carry a limited financial incentive.

Ofgem overarching output categories
Placing the consumer experience at the heart of RIIO-2.



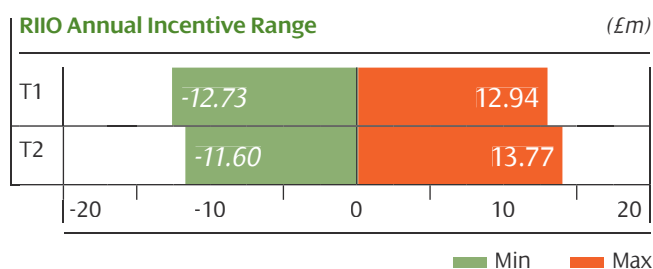
Annual User Group reporting process



Please see Annex 12: Output Delivery Incentives for our proposed ODI Balance Scorecard

Total Output Incentive Range Comparison

The chart below compares the output incentive ranges between RIIO-T1 and RIIO-T2. The risks associated with implementing our ODIs are commensurate or higher than those we experienced in RIIO-T1 in addition to setting tougher targets. This range is supported by our stakeholders who believe a strong incentives package will result in better outcomes for consumers. A breakdown of how each individual ODI we have proposed for RIIO-T2 contributes to this overall annual range is shown in the table below.

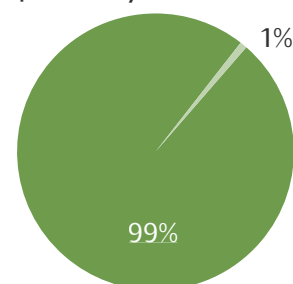


Our ODI package is designed to drive us to deliver above our current standards, setting more stringent targets so we raise the bar on existing performance levels for customers. We have incorporated the views of the User Group to ensure our targets are challenging. We have provided our detailed methodologies for our proposed ODI targets in **Annex 12: Output Delivery Incentives**.

Our stakeholders have asked us to show how the total incentives package relates to our overall investment proposals.

Maximum Incentives
Reward per annum

Totex



					Annual Indicative Reward/Penalty Range <i>(£m 2018/19 Prices)</i>	
Incentive Category	Output Area	Output Name	Incentive Mechanism	Output Type	Min	Max
1	Connections	Quality of Connections Survey	Financial (Deterministic)	Common	-3.45	3.45
		Quality of Engagement Survey	Reputational		—	—
		Timely Connection Offers	Financial (Deterministic)		-1.73	0.00
	Stakeholder Engagement	Delivery against our Stakeholder Strategy	Reputational	Bespoke	—	—
	Stakeholder Engagement PLUS	Black Start Resilience of Communities in Vulnerable Circumstances	Financial (Discretionary)	Bespoke	0.00	1.73
		Community Energy Schemes Capability				
		Stakeholder Engagement Performance Levels				
	Network Reliability	Energy Not Supplied*	Financial (Deterministic)	Common	-6.42	2.03
		Optimising Network Availability for Connected Generators		Bespoke	0.00	2.56
2	Safe and Resilient Network	Health and Safety	Reputational	Bespoke	—	—
		Successful Delivery of Large Capital Projects	Reputational	Common	—	—
		Non-Lead Asset Output Measurement				
		Network Access Policy (NAP)				
		Whole System ESO-TO Constraint Mitigation	Financial (Deterministic)	Bespoke	—	2.28
3	Environmental	Environmental Framework	Reputational	Common	—	—
		Minimising Electricity Losses	Reputational	Common	—	—
		Sulphur Hexafluoride (SF ₆) and other Insulation Interruption Gases (IIG) Leakage	Financial (Deterministic)	Common	TBC by Ofgem**	TBC by Ofgem**
		Maximising environmental benefit from non-operational land	Reputational	Bespoke	—	—
	Additional Contribution to the Low Carbon Transition	Maximising supply chain sustainability	Financial (Discretionary)	Bespoke	0.00	1.73
		Accelerating adoption of low carbon fleet				
		Delivering biodiversity net gain initiatives				
Annual					-11.60	13.77

Please see page 154 for details on our proposal for an associated 'Use it or Lose it'

*Please see page 154 for details on our proposal for an associated 'Use it or Lose it' ENS funding pot mechanism.

**In theory, a maximum penalty would be incurred when 100% of IIG leaks and a maximum reward received when 0% of IIG leaks. These are extreme values which would distort the indicative reward/penalty range.

(Excluding the SF₆ and IIG output as Ofgem will finalise the methodology for setting baselines, and hence the incentive financial range, at Draft and Final Determinations.)

Category 1: Meeting the needs of consumers and network users

1

Connections

Quality of Connections Survey

Common Financial Deterministic Incentive: -£3.45m to £3.45m

In RIIO-T1 we started with a general approach to engagement and measuring the satisfaction of all our stakeholders. As our experience grew over the period, we began to segment and differentiate between customers and stakeholders, and have now adopted more targeted approaches in our engagement. We will build on this in RIIO-T2 to drive increased levels of customer satisfaction and better stakeholder engagement.

Who are our customers

As a Transmission Owner, we design, deliver and connect new generation and demand sites to our network. We then operate our network to transport energy to and from these sites. The owners and operators of these sites are network users who are our customers because we are providing a direct output or service to them. In RIIO-T2 we are committing to delivering an increased level of service to them, that in turn will benefit all our stakeholders and consumers.

Measuring Customer Satisfaction

To measure our Network User (customer) satisfaction, we will sharpen and broaden our current customer survey approach. On an annual basis, we will conduct a series of surveys at key points, or "moments that matter" throughout the connections process from the early stages of a potential new connection to a fully commissioned, connected and operational site. These surveys will score our level of performance giving a more targeted assessment of our level of service. We have consulted with customers and identified the following moments that matter that are important to them:

Survey 1 – Pre-Application Engagement

Survey 2 – Application Process and Post Offer Review

Survey 3 – Project Development and Handover Meetings

Survey 4 – Project Delivery and Commissioning

Survey 5 – Outage Plans and Impact

Survey 6 – Operational Site Engagement

Quality of Engagement Survey: Stakeholders impacted by our new transmission investment projects

We will also conduct a second survey which will have a reputational impact only with no financial reward or penalty associated with it. The survey will target stakeholders impacted by our new transmission projects.

Throughout RIIO-T1 we have responded to stakeholder feedback from those impacted by our transmission projects in different ways. We will build on this engagement in RIIO-T2 and commit to reporting on how we have benefited those impacted by our new transmission projects to the ongoing Transmission User Group.

Our Commitments

We will build on our existing pre-application meetings and develop a range of pre-application connection engagement (PACE) services. We will examine the potential for co-designing with network customers at an early stage of the connections application.

We will develop a digitised online connection portal to facilitate early stage analysis by customers, pre-application connection engagement, online application and ongoing project management from pre-application to post commissioning.

As a measure of connection offer quality, we will report on the number and cause of post offer modifications that are attributable to our own actions.

We will improve the quality of our offers by providing:

- more detailed cost breakdown information
- milestone development and delivery plans
- clear explanation of protection schemes
- potential impact and degradation of network access.

We will review the current obligations which require our design, delivery and construction information to be incorporated into a connection contract between customers and the NGESE. We will work with the NGESE to identify if there are improvements that could be made.

For connected customers, we will provide earlier planned outage information, supplementing the formal processes provided to customers via the NGESE. We will seek to increase the number of outages included in the year ahead plan and reduce those added to our within year plan.

We propose to publish an annual connections performance report which will incorporate a range of information.

The Quality of Connections Survey

<i>Incentive Type</i>	Deterministic Financial
<i>Indicative Reward /Penalty Range</i>	-£3.45m to £3.45m
<i>RIIO-T1 Performance</i>	6.9 (Our average satisfaction score of connecting customers in RIIO-T1.
<i>Baseline</i>	Score of 7 out of 10
<i>Target</i>	9.0

The Quality of Engagement Survey

<i>Incentive Type</i>	Reputational
<i>RIIO-T1 Performance</i>	Score of 8.4 out of 10

Timely Connection Offers

Common Financial Deterministic Incentive: -£1.73m to £0m

In RIIO-T1 this incentive focused on the provision of timely connection offers for new connection applications. The volume of generation applications triggered by the low carbon revolution required a step change in how we resourced and organised our business to meet this challenge, achieving a 99% success rate.

Our customers have told us that we must keep our focus on providing offers on time. We remain committed to deliver 100% of offers on time in RIIO-T2. This is our existing business as usual standard and so is a penalty only incentive. Any offer that is provided late will result in a financial penalty to our business.

Timely Connection Project Delivery

We know from our customers that they want to connect their new generation sites as quickly as possible.

Our commitment is to be more transparent and accountable for our delivery performance, so we are proposing to report on our performance in achieving the agreed connection date.

We have forecast 1GW of low carbon generation to be connected in the RIIO-T2 period. Early delivery of these connections will decrease the density of carbon emissions from generation more quickly, delivering the low carbon energy future, benefiting all consumers and stakeholders. Therefore, we will report on the level of carbon reductions we are able to connect ahead of schedule to the User Group as part of our balanced scorecard.

This timely delivery commitment supports our ambition to play a full role in the low carbon energy transition. As the energy system transition accelerates, we need to build on our performance in RIIO-T1 and become even more innovative and focused on delivering on time and to budget. Especially as there could be no conventional and nuclear generation in Scotland by 2030.

"I think putting incentives on key goals is a brilliant idea. That takes care of quality assurance as well as it provides motivation for the service provider to give better performance."

Willingness to Accept Study
(Business consumer)

Please see **Annex 12: Output Delivery Incentives** for further detail on our Timely Connections Offer Incentive.



Target = Score for Maximum Reward.
Baseline = Starting point for achieving any reward.

Our Commitments

We will deliver every offer on time. We will report on our average time to offer.

We will agree the earliest energisation date and where we cannot meet the customer's preferred date, we will explain why it is the best date we can offer, providing them with a delivery programme.

We will measure and report our performance in achieving the agreed energisation date and demonstrate the increase in low carbon intensity achieved against a baseline across our full portfolio of new connections over the price control period.

Timely Connection Incentive

Incentive Type	Deterministic Financial
Indicative Reward /Penalty Range	-£1.73m to £0m
RIIO-T1 Performance	99% connection offers made within licence timescales.
Target	100% of connection offers made within licence timescales.

"Certainty on energisation dates is important to developers. Delays are frustrating so engagement is important at the earliest sign of delay. Key milestones achievement would be reassuring to have sight of."

Connections Forum,
October 2018

Stakeholder Engagement

We will report on our RIIO-T2 stakeholder strategy related activities as a reputational only incentive. However, we have identified opportunities to deliver value for stakeholders that go beyond our business as usual activities. This is why we have proposed Stakeholder Engagement PLUS.

Stakeholder Engagement PLUS

Bespoke Financial Discretionary Incentive: £0m to £1.73m

We want to exceed our already ambitious business as usual engagement for our consumers, network users and wider stakeholders, and are proposing this discretionary financial incentive to enable us to achieve this ambition. There are three elements to our Stakeholder PLUS proposals:

1. In the first, we conduct a programme of engagement with communities in vulnerable circumstances with the aim of contributing to an increase in their resilience during events which result in extended periods without supply (such as a Black Start event).
2. The second element to this incentive is where we support the capability of Community Energy Schemes (CESs) to interact effectively with the energy sector. For instance, when confronted with sector-specific issues (opportunities to participate in flexibility services) we would like CESs to have the ability to access support, make informed decisions and explore options.
3. The third element is comprised of an 'AccountAbility healthcheck', which will be conducted annually by the owners of the AA1000 standard, a globally recognised standard for stakeholder engagement. Within this standard, we aim to achieve a 'Mature' status score of above 76 out of 100. This has only been achieved by 7% of companies globally.

Stakeholder Engagement PLUS Incentive

<i>Incentive Type</i>	Assessment by User Group
<i>Indicative Reward /Penalty Range</i>	£0m to £1.73m
<i>RIIO-T1 Performance</i>	New Incentive
<i>Target</i>	<p>Our programme of engagement with communities in vulnerable circumstances contributes to an increase in their resilience during events which result in extended periods without supply.</p> <p>We contribute to increased capability of CESs to interact effectively with the energy sector.</p> <p>We aim to elevate up to three communities and engage with up to three CESs a year.</p> <p>Achieve a 'Mature' status in the AccountAbility healthcheck.</p>

Network Reliability

There are three financial elements to our proposals in Network Reliability. These are our Energy Not Supplied ODI, an ENS fund for short-term outage management to mitigate risks to demand customers, and an ODI for optimising network availability for connected generation. The two ODIs are financial deterministic and the fund is on a 'use it or lose it' basis.

Energy Not Supplied (ENS)

Common Financial Deterministic Incentive: -£6.42m to £2.03m

ENS is a measure of the volume of energy that was not transmitted through our network to demand customers, as a result of a fault on our transmission system.

In RIIO-T1 we have achieved an average annual ENS of 19MWh so far. This highlights the effectiveness of the incentive to achieve a considerable improvement in our performance as the RIIO-T1 target was set in 2011 based on our 10 year trailing average of 225MWh at that time. In RIIO-T2, we are proposing a more targeted approach to incentivising different aspects of our response to mitigate the risk of ENS, and in particular, include the impact on generation.

There are two elements to our ENS proposals:

1. ENS performance in respect of our long term design and asset management

We are proposing a baseline of 178MWh of ENS each year, which is the average of our 18-year rolling ENS performance and our current ENS target (225MWh). This incorporates more than a 20% reduction against our current target and strikes a balance between reflecting improved performance in RIIO-T1 and outage risks which we cannot control.

Our Definition of 'a Community in Vulnerable Circumstances':

A community and its citizens who are disadvantaged and less able than an average community to plan for, cope with, or recover from adverse situations, which are either temporary or permanent.

Please see **Annex 12: Output Delivery Incentives** for further detail on our Stakeholder Engagement PLUS Incentive.



2. ENS performance in respect of short term outage management and impact on demand customers

Due to the unique electrical and geographic characteristics of our transmission network, distribution customers are especially exposed to the risk of an ENS event from a transmission fault occurring at the same time as a planned outage on an adjacent circuit.

To mitigate the risk of no supply for consumers connected to our distribution network, we are proposing a targeted funding mechanism to allow us to invest in solutions to protect these consumers from extended periods of no supply. The value of this would be up to £1.50m per annum to be funded through a Use it or Lose it Pot*. The mechanism for this ENS fund is subject to agreement with Ofgem.

To measure our performance in this area, we will report on all instances of how we use this pot and the customer risk it is mitigating. We will also report, against our RIIO-T1 baseline, the associated Customer Interruptions (CI) and CML (Customer Minutes Lost) incurred from transmission faults.

Optimising Network Availability for Connected Generation

Bespoke Financial Deterministic Incentive: £0m to £2.56m

The User Group and stakeholders have also emphasised the need to optimise network availability for connected generation customers. There are three ways we can do this:

- 1. Applying dynamic line ratings to constrained areas of our network will provide better availability for generators on our network for short periods.
- 2. Providing additional services to reduce the duration of planned outages where generation is affected as well as demand.
- 3. Identifying alternative design or construction solutions at an early stage to mitigate the effect of major construction works on connected generation.

These approaches will provide increase low carbon flows onto our network for consumers and improve reliability and availability for generation customers.

We will also seek to improve the performance of existing Load Management Schemes to reduce the loss of supply events experienced by customers as part of this incentive.

*We have not accounted for this 'Use it or Lose it' funding in our baseline business plan, as this policy has not yet been determined by Ofgem. Therefore this is not included within our overall ODI indicative reward/penalty range.

More detail about our on-going RIIO-T2 engagement strategy can be found in **Continuing to Engage with our Stakeholders** section.



Network Reliability Incentives

We will document and publish our policy and approach to mitigating the risk of ENS for RIIO-T2. We will implement this policy to reduce the risk of ENS for transmission and distribution demand and generation customers.

We will mitigate the risk of ENS and Customer Interruptions (CI)/Customer Minutes Lost (CML) caused by our essential planned outages by targeted use of a funding mechanism up to a maximum value of £1.50m per year.

We will measure the impact of ENS on our distribution network in CML and CI in addition to ENS on our transmission network.

We will improve network availability for connected generation in respect of no supply and planned outage events and report on the potential increase in low carbon flow our actions achieve.

1. Energy Not Supplied

Incentive Type	Deterministic Financial
Indicative Reward/ Penalty Range	-£6.42m to £2.03m
RIIO-T1 Performance	Average ENS of 19MWh
Baseline	178MWh

2. Energy Not Supplied – Outage Management

Incentive Type	Use it or Lose it Pot*
Indicative Reward/ Penalty Range	Up to £1.50m
RIIO-T1 Performance	New Incentive
Target	Annual average CML of 64 and CI of 62,000 as a result of transmission faults.

Optimising Network Availability for Connected Generation

Incentive Type	Deterministic Financial
Indicative Reward Range	Up to £2.56m
RIIO-T1 Performance	New Incentive
Baseline	We receive a reward when we find ways to avoid curtailment of generation in a constrained network, up to 256,000MWh of additional low carbon generation.

Category 2: Maintaining a safe and resilient network

2

We are proposing five incentives in this category:

Health and Safety

Successful Delivery of Large Capital Projects

Network Access Policy (NAP)

Non-Lead Asset Output Measurement

Whole System ESO-TO Constraint Mitigation

Maintaining a safe and resilient network is fundamental to what we have always done. But the low carbon energy system transition brings new challenges such as the increase in smaller renewable, intermittent generation that we need to face.

Health and Safety

Bespoke Reputational Incentive:

£0m

Please see our 'Health and Safety' Chapter for details on our business as usual activities.

Our Commitment

We want to be more transparent and accountable to consumers, network users and wider stakeholders and share our experience, learning and initiatives in a more focused way and so we will report annually on the health and safety initiatives that we deliver. This will include updates on performance and track record, how we are managing operational risk and reducing harm.

"Security and safety of supply must remain untouched, and of high priority, throughout all of the changes the energy industry is facing".

Stakeholder Panel
2019



Successful Delivery of Large Capital Projects

Bespoke Reputational Incentive:

£0m

What we've learned

We recognise the value that we deliver as a network company, and that successful delivery of our major projects is crucial to the electricity system and consumers.

Our proposals

We will increase our transparency and performance in relation to the delivery of our large capital projects. The User Group will conduct an annual assessment of our performance.

Our Commitment

We will identify delivery milestones in large capital projects and report on our progress against these milestone dates to the User Group.



Networks Access Policy (NAP)

Common Reputational Incentive:

£0m

What we've learned

The RIIO-T1 NAP was a reputational incentive that led to a step change in the engagement we have with the system operator (NGESO). It enabled the successful delivery of the huge number of network outages we needed to take to deliver our essential investment plans. We have delivered thousands of system outages every year, with increasingly complex outage patterns and interactions associated with them.

Our proposals

We will optimise the delivery of our essential network outages, working jointly with other network owners and the ESO. We will provide better reporting, better third-party engagement and better performance monitoring of our outage related activity. The User Group will conduct an annual assessment of our performance.

Our Commitments

Better Reporting: We will work with the other TOs through the NAP group to develop a more transparent approach to reporting to consumers, network users and wider stakeholders.

Better 3rd Party Engagement: We will work with the other TOs through the NAP group to clearly document the roles and responsibilities for the ESO and TOs in respect of engagement with third parties. We will also clarify procedures around outage planning notifications where required.

Better Performance Monitoring: We will work with the other TOs through the NAP group to identify relevant KPIs. We will also include these metrics where relevant in an annual report to the User Group.

A Single NAP: We commit to working through the NAP industry working group to agree the proposed changes to incorporate arrangements for creating a single joint NAP. Please see **Annex 12: Output Delivery Incentives** for our milestone plan which describes the process to be undertaken by the TOs that will enable the draft NAP to turn into an approved GB NAP ready for implementation on the 1st April 2021.

For more information, please see **Annex 35: Consolidated Network Access Policy Proposal**.

Please see **Annex 12: Output Delivery Incentives** for further details.



Non-Lead Asset Output Measurement

Bespoke Reputational Incentive:

£0m

Transmission network assets are categorised according to two groupings. Lead assets are defined as circuit-breakers, transformers, reactors, underground cables and overhead line towers, conductors and fittings. Non-lead assets are all other types of asset. For example, instrument transformers, civil structures and buildings, control and protection equipment.

Investment in lead assets is governed by the Network Asset Risk Metric (NARM) which defines a monetised risk output and a mechanism to adjust revenues for a company's performance that is either higher or lower than the output target. There has been significant effort by the TOs and Ofgem to develop the monetised risk methodology to allow a single target to be set for the different asset categories.

Currently, there is no equivalent output for non-lead assets and the monetised risk methodology has not yet been applied to them. It is acknowledged that the very large number of different asset types – from a concrete structure to the network's central control system – and the wide range of associated costs present some practical difficulties in setting a single output target.

However, we have recently developed monetised risk models for some electrical non-lead assets and we propose to set a target for these for the RIIO-T2 period. We will report on performance against these targets and propose them for inclusion into the formal NARMS Methodology.

Our Commitments

We will report annually on each non-lead asset project. This report will track progress on output volumes and expenditure against our business plan commitments.

We will produce a justification pack – using the RIIO-T2 template – to document any necessary variances from our business plan.

We acknowledge that this is just a first step towards greater transparency and accountability, so we propose that an industry-wide working group should be established to develop a more quantitative methodology to assess performance in non-lead asset investment.

"Honestly, the need for there to be a way to maintain the network is more important than saving a little money here and there."

Willingness to Accept Study
(Business consumer)

Whole System ESO-TO Constraint Mitigation

Bespoke Financial Deterministic Incentive: Up to £2.28m

What we've learned

Constraints costs are an inevitable part of the transmission system. Eliminating constraints would require building larger capacity networks. When transmission operators require access to the network to carry out essential work, constraints can increase.

We work hard to mitigate these costs, but we believe we can do more if we are incentivised to provide infrastructure solutions that reduce the risk of high constraints.

Our proposals

This incentive builds on existing licence and regulatory arrangements that provide funding for TOs to mitigate the risk of high constraint costs associated with network outages.

Throughout the price control period, changes to the background generation or issues that arise once delivery begins could change the assumed constraint impact of a project.

The aforementioned existing mechanisms present an opportunity to trigger economic assessment of options of outage patterns that present a high risk of constraint costs.

The incentive to drive this additional activity will be based on the forecast £m of constraint costs avoided through the provision of our services. We anticipate the possibility of agreeing two high value constraint cost mitigation solutions with the NGEESO per year. We propose capping the incentive reward at £2.28m per annum based on the consumer benefit of achieving forecast reduced constraint costs of £22.8m.

Incentivising the ESO-TO process

We propose to incentivise this process due to the significant benefits that can be achieved for consumers through reduced constraint costs. Reports from the ESO estimate that annual constraint costs in Scotland and the Cheviot (B6) boundaries can be as high as £210m.

Our Commitments

Working with the ESO, we will identify potential high risk constraints on our network and implement solutions as part of the ESO-TO constraint mechanism to reduce the risk of high constraint costs being incurred.

We will demonstrate our performance under the Whole System ESO-TO Constraint Mitigation incentive comprising benefits, details and cost for every opportunity we have identified and progressed to implement a solution to reduce the risk of high constraints.

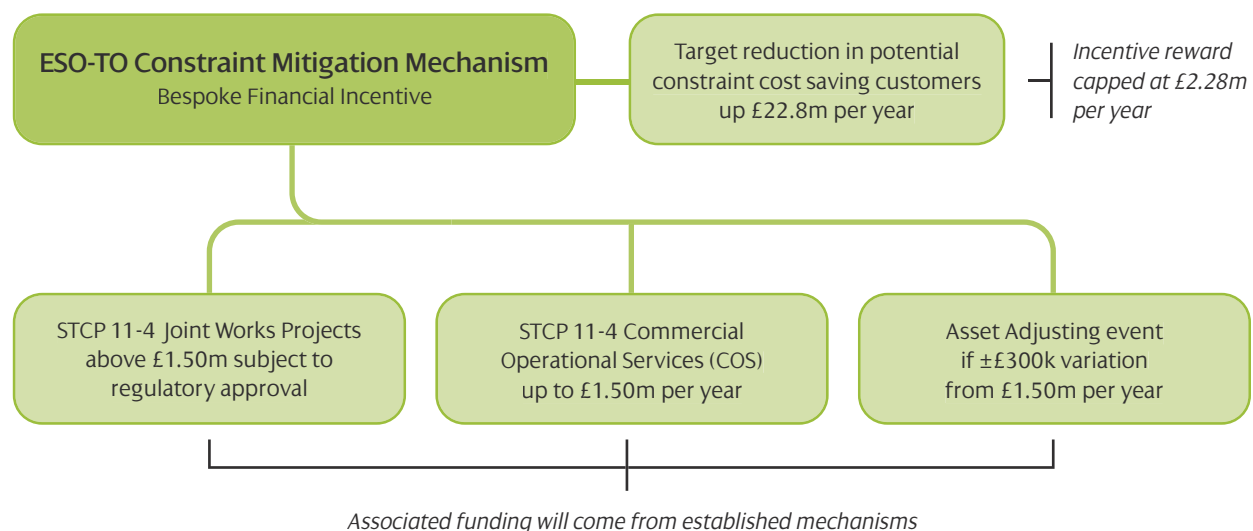
Whole System ESO-TO Constraint Mitigation

<i>Incentive Type</i>	Deterministic Financial
<i>Indicative Reward Range</i>	Up to £2.28m
<i>RIO-T1 Performance</i>	New Incentive
<i>Baseline</i>	£0m Potential Constraint Costs Avoided
<i>Target</i>	£22.8M Potential Constraint Cost Avoided

The purpose of this incentive is to encourage industry to use the existing mechanisms available (as shown below) in a targeted way in order to reduce constraint costs for GB consumers.



Whole System ESO-TO Constraint Mitigation Mechanism



Category 3: Delivering an environmentally sustainable network

3

This incentive category includes the outputs and wider price control measures we will take to reduce the adverse impact of our networks and business activities on the environment, and to support the transition to a low carbon energy future.

Environmental Framework

Common Reputational Incentive: £0m

We have established an Environmental Action Plan that will deliver the following outputs:

- Decarbonising the energy networks – with a focus on business carbon footprint and embedded carbon in networks.
- Reducing networks' environmental impacts.
- Supporting the transition to an environmentally sustainable low-carbon energy system.

We will publish an annual environmental report in line with future common metrics and methodologies agreed with other TOs, which will include:

- Business carbon footprint (BCF) and embedded carbon.
- Other environmental impacts including pollution to the local environment, resource efficiency and waste and biodiversity loss.
- Contribution to the low carbon energy transition.

Additional incentives are included in this category:

- SF₆ and other insulation and interruption gases (IIGs) leakage
- Electricity losses from the transmission network
- Additional contribution to low carbon transition.

Minimising Electricity Losses

Common Reputational Incentive: £0m

What we've learned

Transmission losses arise when electricity is transported across a network. Factors affecting losses include the materials and design of assets on the network, the distance electricity travels, and the voltage at which the electricity is transported. Losses are expected to increase in future as an increasing number of decentralised renewable generation is connected to the transmission network.

Our proposals

We propose to integrate reporting of the initiatives we are taking to mitigate the losses on our network within the Environmental Action Plan and annual reporting framework.

Our Losses Strategy detailing our approach to minimising controllable losses is located within **Annex 7: Environmental Action Plan**.

Sulphur Hexafluoride (SF₆) and other Insulation Interruption Gases (IIG) Leakage

Common Financial Deterministic Incentive: TBC by Ofgem

What we've learned

During RIIO-T1, a symmetrical financial incentive was implemented to drive transmission operators to reduce leakage rates from, SF₆ assets operating on the system. We have been able to deliver a lower leakage rate than the target through effective management and mitigation approaches.

Our proposals

We will continue to mitigate the leakage of SF₆ gas from our assets and work with the industry to identify alternative insulation and interruption technology.

Sulphur Hexafluoride (SF₆) and other Insulation Interruption Gases (IIG) Leakage

Incentive Type	Common Financial
Indicative Reward Range	Ofgem will finalise the methodology for setting baselines, and hence the financial range, at Draft and Final Determinations.
Baseline	To be determined by Ofgem
RIIO-T1 Performance	21,500 tCO ₂ e

More detail about these are included within **Annex 7: Environmental Action Plan**.

Please see **Annex 7: Environmental Action Plan** for further detail on our Sulphur Hexafluoride (SF₆) and other Insulation Interruption Gases (IIG) Leakage strategy.

Driving efficiency through innovation and competition

Managing uncertainty

Enabling whole system solutions

Delivering an environmentally sustainable network

Meeting the needs of consumers and network users

Maintaining a safe and resilient network

Giving consumers a stronger voice

Track record in delivering

Maximising Environmental Benefit from Non-Operational Land

Bespoke Reputational Incentive:

£0m

What we've learned

We often replace old substation assets with newer versions that take up less space, or remove redundant assets if they are no longer required. The resulting vacant land represents a number of opportunities to maximise environmental benefits, including the installation of renewable technologies. We have recently undertaken a study to understand the scale of opportunity that these areas of land may represent, including options for enabling community energy groups to use the land for free to site solar PV installations.

Our study identified up to 20 sites initially, which conservative estimates suggest could support upwards of 4MW of new renewable generation.

This initiative will promote pathways and realise opportunities for community-driven Low Carbon Generation (LCG) schemes. Furthermore, the initiatives under this incentive are not at a scale that would impact the commercial roll-out of mainstream LCG.

Our stakeholders have emphasised the value of us enhancing biodiversity at our sites where appropriate to do so. Therefore we will include the requirement for the successful energy groups to also deliver and manage biodiversity enhancement initiatives on these sites over the lifetime of the lease.

Our Commitment

We will deliver environmental benefits from non-operational land and report annually on the generation connected and biodiversity improvements delivered.

Maximising Environmental Benefit from Non-Operational Land

<i>Incentive Type</i>	Reputational
<i>RIO-T1 Performance</i>	New Incentive
<i>Baseline</i>	0 Sites

Additional Contribution to the Low Carbon Transition

Bespoke Financial Discretionary Incentive:

£0m to £1.73m

In our **Environmental Action Plan (Annex 7)** we have identified a range of initiatives to reduce the environmental impacts. We propose three additional initiatives that go beyond our business as usual baseline proposals. These additional initiatives present opportunities to deliver environmental and low carbon benefits, but are particularly challenging due to our intention to take a leadership role, or because our work is at an early stage and quantifiable targets and costs are evolving.

Additional Contribution to the Low Carbon Transition

<i>Incentive Type</i>	Financial Discretionary
<i>Indicative Reward Range</i>	£0m to £1.73m
<i>RIO-T1 Performance</i>	New Incentive
<i>Baseline</i>	0

1. Maximising supply chain sustainability

What we've learned

Our recent life cycle assessment pilot indicates that activities in our supply chain may represent over 70% of the total carbon impact of our network and operations. This initiative will help us to drive additional environmental improvements by allowing our supply chain partners to apply their expertise and experience to our projects.

Our procurement processes focus on ensuring the lowest cost for consumers. Therefore, we will include environmental impact reduction requirements in our specifications and contracts as far as possible, including carbon metrics and a request to explain how they have minimised the environmental impacts associated with their bids.

We also propose to introduce in our tenders requests to suppliers to identify additional environmental impact reduction options, with associated quantified costs and benefits, that they can deliver beyond their core bid. This incentive would reward us for delivering through our supply chain, new or different activities that reduce environmental impact, and embedding these in our processes and future projects.

Our Commitment

We will work with our suppliers and contractors to drive additional environmental improvements by accessing their expertise to identify cost effective opportunities.

Maximising Supply Chain Sustainability

<i>Incentive Type</i>	Financial Discretionary
<i>RIO-T1 Performance</i>	New Incentive
<i>Target</i>	Achieving lower carbon emissions and environmental improvements through our supply chain.

Please see **Annex 12: Output Delivery Incentives** for further detail on our Environmental Incentives.



2. Accelerating adoption of low carbon fleet

What we've learned

Our business has signed up to The Climate Group's EV100 initiative. This is a global initiative bringing together forward-looking companies committed to accelerating the transition to electric vehicles (EVs) and making electric transport the new normal by 2030. Under the agreement, we will fully electrify our vehicle fleet, a total of 72 vehicles by 2030.

For the RIIO-T2 period, we have created a defined programme for the decarbonisation of our fleet to meet our 2030 target. As this programme is implemented, we will look for opportunities to accelerate our transition to low carbon vehicles.

Our Commitments

We will strive to lead the decarbonisation of fleet vehicles, working with suppliers and other fleet operators to pilot technically viable alternatives to drive technical advancements and early adoption.

We will accelerate the delivery of a low carbon fleet, aiming to deliver by the end of RIIO-T2 ahead of our 2030 programme, thereby increasing our contribution to GB carbon footprint reduction and contributing to improved air quality.

Accelerating adoption of low carbon fleet

Incentive Type	Financial Discretionary
RIIO-T1 Performance	New Incentive
Baseline	Implementation of our programme to transition to a low carbon fleet by 2030.
Target	We will accelerate the delivery of a low carbon fleet, aiming to deliver by the end of RIIO-T2.



3. Delivering biodiversity net gain initiatives

What we've learned

Our stakeholders have emphasised the value of enhancing biodiversity at our sites where operationally appropriate to do so. Our aim in RIIO-T2 is to work with our local communities, landowners and other stakeholders to deliver 'no net loss' in biodiversity and natural capital across our new network investment activities and a net positive impact in biodiversity and natural capital across our existing sites. We will collaborate with our stakeholders and other TOs to develop and pilot a common approach and robust methodology which will measure and drive improvements in biodiversity and the value of natural capital.

We intend to focus our activity initially on measuring biodiversity at our existing sites and establishing a robust baseline.

As this methodology develops, it will enable us to deliver 'no net loss', and allow us to identify additional opportunities for biodiversity net gain in relation to our projects or sites. This incentive will drive us to deliver biodiversity improvements and achieve biodiversity net gain across our sites and RIIO-T2 projects, during the RIIO-T2 period.

Our Commitment

We will work collaboratively with our stakeholders, including the other TOs, throughout RIIO-T2 to develop and pilot a common approach and robust methodologies for delivering Biodiversity Net Gain alongside Natural Capital assessment and enhancement.

We will deliver biodiversity net gain in our network area.

Delivering Biodiversity Net Gain

Incentive Type	Financial Discretionary
RIIO-T1 Performance	New Incentive
Baseline	N/A
Target	Attain 'no net loss' of biodiversity at our sites and achieve net gain by the end of RIIO-T2.

Taken together these three initiatives constitute our second bespoke financial ODI that we will ask the User Group to assess as part of their annual review of our performance.

Their assessment will use a straightforward methodology as detailed in **Annex 12: Output Delivery Incentives**, to inform their recommendation to Ofgem as to whether our performance in that year constitutes a reward or not.

Please see **Annex 12: Output Delivery Incentives** for further detail.



It sounds obvious, but it's vital that we can actually deliver our plan for RIIO-T2.

We've used our experience and strong record of delivery to assess our plan against the constraints that can affect it, and set out how we'll manage these. We will continue to seek to **increase efficiency through constant innovation** as we deliver our plan.

Our Sustainable Workforce strategy shows our ambition to 'grow our own' talent – at the same time as making sure we have a stable and diverse workforce. We propose to achieve this at the same time as developing the new skills required to deliver many of our incentives and initiatives.

Accessing the network, *Pg 165*

To work we need to safely de-energise and disconnect plant and equipment from the network.

1

Project timescales, *Pg 166*

It is vital we assess how long each project is likely to take.

2

Internal resources, *Pg 167*

Having the appropriate numbers of staff with the necessary skills and experience.

3

A sustainable workforce, *Pg 169*

Ensuring we invest in our staff for the long-term.

4

Supply chain dependency, *Pg 171*

Complex projects rely on an extensive supply chain.

5

Embracing markets and competition, *Pg 173*

Ensuring we drive maximum value from our contracts through competition.

6

Delivering Our Plan



Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Given the scale of our RIIO-T2 plan, we need to engage with a wide range of stakeholders to make sure that we have considered all critical aspects needed to deliver our plan efficiently and on time alongside full consideration of their specific needs.

We have also engaged to check that we have fully embedded what is important to our stakeholders – such as preparing for a Net Zero future – and give them a chance to review and comment on our processes, considerations and, where necessary, compromises.

How and why we have engaged with our stakeholders

Throughout 2018 and 2019, we engaged with key industry stakeholders including Trade Unions, NGESO and our extended supply chain. We worked closely with SSE Transmission and National Grid Transmission, as well as relevant Distribution Network Operators. We have continued to work with the other Transmission Operators through established outage planning meetings. We have shared relevant parts of our plan with SP Distribution to assess network risk and necessary distribution enabling works. These interactions follow early discussions to determine lowest cost whole system solutions to network needs.

We engaged with Suppliers through targeted one-to-one discussions, Supplier Newsletters, bespoke supply chain events and in-depth supply chain questionnaires.

We've engaged with Energy & Utility Skills Group to ensure consistency between the identification of existing and future skill gaps. We also engaged with them significantly on the detail of our sustainable workforce strategy.

For the first-time, we have been able to share our plans and received feedback from the independent Transmission User Group and Ofgem's RIIO-2 Challenge Group. The Transmission User Group provide an excellent representation of our wider stakeholders, and had the expertise to assess our delivery proposals in conjunction with the wider plan.

What our stakeholders have told us is important to them

Our stakeholders want to have confidence that we can deliver what we've said we will, when we said we will – all in a safe, efficient, sustainable and future-ready manner. They want us to plan in a way that minimises risk and disruption and to deliver works that connect or facilitate new renewable generation quicker. Like us, they appreciate the dilemma between a desire to innovate and increase the sustainability of our operations against the ongoing need to deliver our plan at the lowest cost to consumers. Stakeholders also want to know that we can replace staff leaving our industry and provide our staff with the necessary learning and development support to make sure they're ready for the changing needs of the industry through RIIO-T2 and beyond.

How stakeholder feedback has shaped our plans

We have sequenced our programme of works to find a suitable balance between making significant efforts to speed up our development and delivery and making sure we have realistic and deliverable timelines. We have also assessed overall programme durations and, where appropriate, looked to reduce construction times. We have discussed contracting strategy with our supply chain and have been transparent that there will be no significant step change in our efficient contracting approach.

We introduced initiatives to better understand and work closer with our supply chain. We have also sought to develop better contractual opportunities, which increase supply chain stability and confidence so they can mirror our own innovative and sustainable ambition. We have developed a robust 'grow your own' sustainable workforce strategy, supported by EU Skill Group, to address skills gaps through the development of existing staff and recruitment of new staff to fulfill our ongoing requirements.

Why these changes are important

Through incorporating feedback from all stakeholders we have made further improvements to our plans that reduce the impact of constraint costs and the possibility of unexpected disruption events. We have also further optimised delivery programmes, meaning we can better facilitate the earliest possible connection of low carbon generation. Additionally, more efficient construction means we reduce overall system risk and minimise disruption to landowners and those who live and work in the areas we are working. Improved visibility of our plans ensures a healthier supply chain relationship where suppliers are better able to plan for the future. It also means we are better able to avoid risk of under capacity and work in a more collaborative and efficient manner. This means that suppliers can confidently invest in the staff and systems needed for more environmentally sustainable delivery of our plans. Through our work with Trade Unions and external groups our staff are able to feel confident about our future resourcing plans and continuing drive to be a more progressive employer.



Building on our experience from RIIO-T1

Connecting new generators, replacing assets and deploying innovative new equipment to increase the capability and reliability of the system: they all present different challenges that we've learned from.

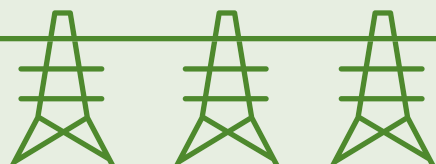
Ongoing business improvement has identified a number of areas where small changes we make will introduce an improvement in the way we plan, develop and deliver our projects. These key areas will improve the way we deliver RIIO-T2.

Reducing unknowns

We have recognised that identifying project-specific issues earlier and in more detail through more up front studies and surveys can significantly improve the way in which we deliver our projects. This may introduce some additional cost to the development stage of a project, but these costs are heavily outweighed by the benefits in considering these issues and constraints in the overall concept design and plan; mitigating their impact or avoiding their effect altogether. Previously these may only have been known at construction stage. This will reduce project delays, minimise costs due to changes in plan and ensure a safer and more environmentally sympathetic project delivery.

Improved planning

More complete understanding of our existing assets and proposed work sites informs each stage of the design process. It allows us to reduce changes in scope and to freeze the final design of projects earlier. This earlier clarity of our works throughout planning and consenting enables use of a wider suite of communication media with network users, wider stakeholders and statutory bodies. Alternative forms of media may include 3D digital modelling, stage by stage graphical storyboards and visualisation of our Environment Impact Assessments. These optimise the planning process and reduce significant changes in planning and consenting applications; delaying commencement of on-site works. We understand that any use of new media technology must not serve to exclude any of our existing stakeholders.



Embed innovation and manage risk

Innovative approaches

We have deployed a range of innovative approaches in RIIO-T1 through using new technology on the network, different techniques when we construct assets, or the way we work with our suppliers to reduce cost and risk. We have worked with our supply chain to ensure that they can support us in the deployment of new technology such as digital substations and high temperature low sag (HTLS) conductors systems – making sure their staff are acquiring the skills required alongside us.

Managing risk

All projects have risks. It is the understanding and management of these risks that determines the success of a project. Risk can take on many forms such as:

Unplanned network events such as faults
Exceptional weather events which affect the duration or sequence of our works
Environmental conditions being different from anticipated
Contractor performance
Archaeological, ecological or environmental constraints
Landowner and access difficulties
Unexpected soil or ground conditions
Planning and consenting issues
And a wide range of other risks.

Applying our approach to managing risk

Small changes and reducing unknowns will improve the way we plan, develop and deliver our projects and manage risk. When risks are not managed these can delay projects or increase costs, so they are a key focus for us. Delays not only impact on the benefit of the investment being realised but will also have a knock-on impact on other projects.

Sound project management techniques such as use of risk registers at project and portfolio levels allows us to identify and categorise risk, agree mitigation and/or management measures. Ongoing risk reduction meetings allows these risks to be monitored throughout the project lifecycle.

We deploy rigorous financial governance for the release of risk funding.

Each project is assessed and has a delivery strategy agreed which determines the correct contracting model for the project specific requirements and risks. Where risks can be more efficiently managed by our supply chain we transfer these risks transparently through our contract terms and conditions.

Through robust project review processes we identify lessons learned and feed these back into subsequent projects. As a result we have identified that by increasing the quality our upfront data gathering we can identify risks earlier, design these out where possible and manage residual risks more effectively; improving the overall delivery of our projects.

All of these factors have influenced the way we have developed our plan to make sure that it can be delivered efficiently and on time.

They also allow us to maintain globally-leading resilience and system operability, ensuring security of supplies throughout the energy transition.



Accessing the network

1

Much of our RIIO-T2 plan requires us to gain access to the live equipment on the transmission network to replace equipment, maintain it or connect new assets. To do this, we need to safely de-energise and disconnect plant and equipment from the network. When we do this, we may reduce the capability and reliability of the network and we need to plan our works in great detail to minimise any effect on the network or risk of interruptions to network customers.

In the short term, we can't alter the physical configuration of the existing network within our license area, or the current operability of the GB grid. To counteract this, we use our vast experience and expert knowledge of the system's capabilities and interactions.

This, together with established planning forums between the Electricity System Operator, other Transmission operators and relevant Distribution Network Operators, enables us to plan our works in a way which will:

be acceptable to the Electricity System Operator; and

minimise the impact of our operations on the network, consumers, network users and wider stakeholders.

Our network is built to provide a good balance between efficiency and design; incorporating optimum redundancy and duplication of assets to provide an appropriate security of supply. This balance means that when we de-energise any part of the system, there's an additional risk to consumers and generators.

Our network also supports the power flow of energy across Great Britain; balancing supply and demand, so any depletion in capacity during construction or maintenance works can introduce significant constraints in the grid's overall power flows. These restrictions can introduce significant challenges to the operability of the overall network, and adds costs to network customers as a result of 'constraining off' generation capacity or introducing the need to use alternative, less efficient generation.

During the development of our plans we have assessed the deliverability of nearly

300 initiatives

Planning high impact projects

We began by identifying all projects within our plan which would impact the overall use and operability of the **400kV** and **275kV** Main Interconnected Transmission System (MITS). Works on the MITS are the biggest challenge for overall system operability, and can trigger significant costs associated with constraining generation due to reduced system capacity.

Projects identified within this category include those which:

Severely impact the required boundary capacities required to minimise system constraints or system operability. These projects include those identified through the System Operators Network Options Analysis (NOA) process.

Non-flexible projects and those which have specific delivery dates. These projects are as a result of commitments for network customers to reinforce or increase system capacity and facilitate the connection of new generation.

Impact the MITS. These are predominantly non-load projects which are renewing equipment at key sites. Their availability is vital to the operation of the network.

Our initial high-level plan looked at ways to schedule all MITS projects, based on a full understanding of the project interactions and effect on the network. By scheduling work in the most optimised way, we can minimise risk to network customers, limit boundary and localised constraints, and reduce effects on the operability of the network. Where possible, we've looked to minimise project interdependency to introduce some flexibility, which may be required at delivery stage.

Planning nested projects

Next, we identified projects which could be delivered using outages already required on the MITS and could be delivered at the same time to reduce overall impact.

Planning flexible projects

The final group of projects are those which did not generally impact consumers or generation beyond the local network. These were predominantly on the **132kV** network or, if at higher voltages, required simple connection of new assets to the existing network. These projects have the flexibility to be programmed and delivered around other planned works. This process gave us a starting point in the formation of our plan.

Project timescales

2

Some of our projects for the RIIO-T2 period are still at an early stage of development. That said, it is vital we assess how long each project is likely to take.

Many project lead times in our plan are relatively fixed. For example, statutory periods associated with necessary planning activities and construction licenses. Another example is the long time it takes to manufacture many of our main system components; some which may have manufacturing times in excess of 12 months from award to on-site delivery.

Although there are often options to accelerate works during construction, many of the overall programme activities associated with the development and delivery of projects can't be changed.

Getting agreement on durations

To successfully complete our planned projects, we need agreement on development and delivery timescales. These timescales are indicative, but designed to be as accurate as possible.

We developed programme templates for all our major project types, using data gathered during the delivery of similar projects in RIIO-T1. These programmes identified key stage sequences and durations, and allowed us to test the viability of the initial plan shaped by available system access. The main stages of a project are shown opposite.

For the diligence of the plan, we have challenged standard project timescales for all of these activities. This is to make sure that we take consideration of:

- Earliest possible connection of generation
- Earliest benefit from network improvements
- Most efficient and sustainable construction methodology
- Risks associated with any acceleration of timescales.

Where conflicts remained between available system access and specific project programmes, we carried out more detailed analysis of the work stages and accelerated or condensed activities where possible, or deferred the works depending on risk.

Network customers have asked to be connected quicker.

Stage 1: Definition

- Understand the problem
- Gather data and information to set an overall scope definition
- Develop a range of solutions
- Analyse the best option
- Agree the overall programme

Stage 2: Development

- Gather more site information through studies or surveys to determine ground and site conditions, environmental and ecological constraints, and planning restrictions
- Identify stakeholder requirements
- Refine initial scope and gain a full understanding of risks
- Start planning and consenting work
- Concept design freeze
- Secure relevant planning and consenting approvals
- Refine programme and confirm delivery strategy

Stage 3: Delivery

- Detailed design
- Develop tender specification and documentation
- Tender and award contracts
- Site establishment and access
- Construction
- Quality management through inspection and monitoring
- Contractual management
- Stage-by-stage commissioning and decommissioning of equipment
- Staged demolition and disposal of old assets

Stage 4: Close Down

- Contract and project reviews to establish lessons learned
- Commercial reconciliation
- Commissioning and final file documentation
- Regulatory reporting

Internal resources

3

During RIIO-T1 we have grown and matured an internal team of highly skilled multi-disciplined staff, capable of developing, designing and delivering projects on time and to the highest quality. Over time, this workforce will need to evolve to meet changing workload, technology and portfolio requirements. We'll also need to make sure we have long-term plans for the inevitable movement of staff, both within the industry and through retiring at the end of their careers.

To deliver our plans efficiently, we need to make sure our internal workload and resource requirements remain relatively steady throughout RIIO-T2. Where possible, we've tried to sequence our works to avoid periods of peaks and troughs in internal resource requirements.

From our stakeholders, we've heard a clear need to look at the skills we require in the future, and how these will be different from what we have today.

Over time, our workforce will need to evolve to meet changing workload, technology and portfolio requirements.

Linking resources to programmes

To accurately forecast our future resource needs, we've developed systems which use the direct link between resource requirements and portfolio project programmes. This tool provides resource forecasts at a project level, as well as for the overall plan. It covers every resource discipline, month-by-month.

Drawing on detailed time-recording, we've gathered historic data for all RIIO-T1 projects we've completed. This data includes all hours allocated by each resource discipline against pre-determined activities or project stages. The result: we can categorise project types and link resource requirements to specific activities and stages of delivery.

Our systems allow us to flex resource requirements associated with each project's scale (CAPEX) and duration (programme) variables. We have applied this tool to our remaining RIIO-T1 programme, introduced our RIIO-T2 proposal list, and made a forecast assumption of the potential works associated with RIIO-T3.

As well as named projects, there are always ongoing levels of uncertainty for customer connection works. Based on our experiences in RIIO-T1, we've taken a pragmatic view on the work involved in progressing connections and their resource requirements through to completion.

In addition, we have assessed the staff required to operate our network and to fully deliver our RIIO-T2 maintenance plan critical for ongoing system reliability.

Finally, we have analysed the wider business support needed to pursue our SP Transmission business strategy and, through discussion and departmental analysis, looking at both existing skills and new roles needed for the future, we have determined the necessary support resources.

This structured approach has allowed us to forecast an overall workforce requirement for RIIO-T2.

To deliver RIIO-T1 we've increased our workforce by 25% due to a significant increase in the RIIO-T1 investment programme compared to the previous price review period.

25%

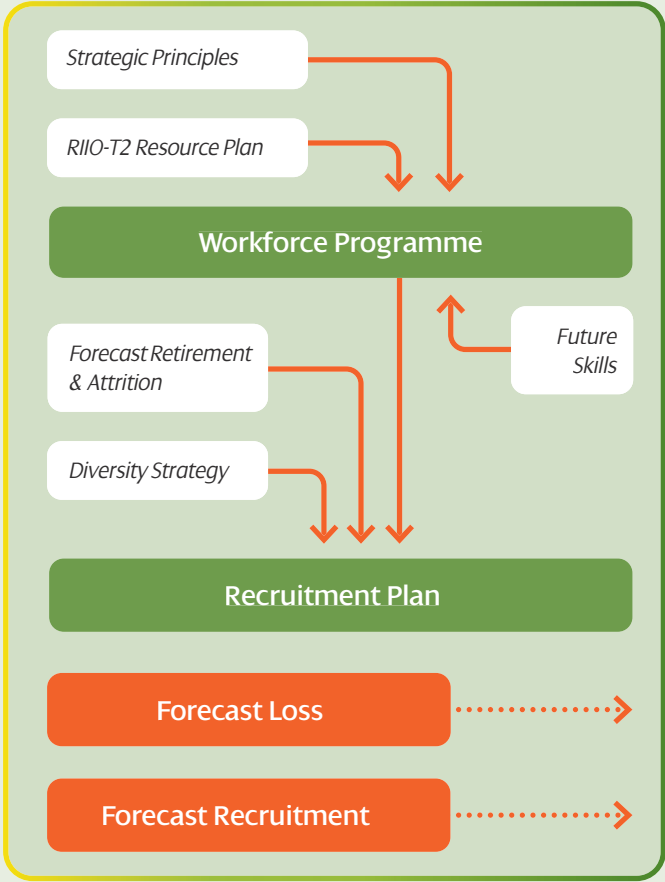
Forecasting resource gaps

To allow us to analyse our workforce resilience and develop a sustainable workforce strategy, we've used the outputs from the resource forecasting tool and managerial forecasts. We've then rationalised them to remove outlying results and modelled attrition rates. This allows a gap analysis between requirements and forecasted headcount.

This has confirmed a significant future need to bring in fresh resources, and given us clear visibility of where and when we need to invest in staff development and recruitment. We also carried out an assessment of any changes to roles or disciplines resulting in the introduction of alternative or innovative delivery methods or solutions.

Details of how we will bridge this gap and ensure a sustainable workforce are detailed in the next section and within **Annex 2: Sustainable Workforce Strategy**.

Further details are provided in **Annex 2: Sustainable Workforce Strategy**.



A sustainable workforce

4

A workforce with the right skills is essential for the safe and reliable operation of our network. Investing in our people now ensures we have the necessary staff with the correct skills to deliver our plans in the future. That's why we continue to undertake detailed reviews of our resourcing plans, and are investing to make SP Energy Networks an even better place to work.

Skill Shortages

Energy and Utilities Skills Groups and Trade Unions have acknowledged the skills shortage facing our industry. This is against a challenging background of maintaining existing skills, a new low carbon future and the requirement for new technologies.

Our diverse internal skill set means that our workforce is particularly affected by these shortages.

Our review processes have highlighted that many of our talented and experienced staff are due to retire during the next price control period.

This analysis along with the growth of our industry and the new challenges associated with the low carbon future, makes it clear that we need to recruit and train new staff. We need highly skilled, suitably authorised employees, with the specialist skills to deliver our investments. For example, new digital technology and the challenges of merging Telecoms, SCADA, Protection and Control solutions.

Alongside our business plan, we have published our Sustainable Workforce Strategy. **Annex 2: Sustainable Workforce Strategy**, detailing the technical skills we need to run our transmission business effectively and the steps we are taking to ensure resilience.

Our current workforce

Our modelling has determined that an overall steady workforce of 554 (FTE employees and contingent/agency workers) is required to successfully and efficiently deliver our ongoing customer connections commitments, deliver the RIIO-T2 load and non-load investment plan and maintain and operate our network as proposed. We have made allowances for making necessary preparations for the next RIIO-T3 regulatory period. Our staff are grouped into seven main categories:

Management – Providing leadership and vision in the delivery of our plan

Specialist Operational – Operating our plant and providing essential safety from the system for staff and contractors

Project Management – Ensuring our projects are fully delivered to a high quality, on time and within budget

Professional Engineer – Analysing our asset and system needs, determining solutions and providing designs for construction

Construction Management – Ensuring our onsite works are planned and coordinated in a safe and considerate manner

Industrial – Carrying out inspection, critical defect repairs and maintenance of our assets

Support – Provide critical support for: Regulatory, performance and commercial reporting; Production of development, design and construction drawings; Establishing and maintaining work programmes; Management of Health, Safety, Quality and Environment and Contract management

Our comprehensive resourcing review has shown that over the RIIO-T2 period we anticipate 162 of our current workforce will leave as a result of retirement and attrition and a further 109 during five-year period beyond RIIO-T2. The details of these figures are included in **Annex 2: Sustainable Workforce Strategy**.

In general we anticipate a reduction in the overall level of leavers beyond the RIIO-T2 period.

During RIIO-T1 we have identified that transferable skills are available from other industries and we have increasingly seen new recruits coming from rail, water, gas, telecoms and armed forces. Despite this, attracting and retaining skilled personnel is becoming increasingly challenging. The challenges and cost of recruiting in these areas reinforces our belief that our strategy of growing our own talent is the more cost effective and resilient strategy.

Our Commitment

We commit to growing our own talent throughout the RIIO-T2 period, providing the relevant training and support required, whilst ensuring we become a more inclusive employer.

This will be supported by our overall employee experience, which encompasses market aligned terms and conditions, a supportive approach to work life balance, and an environment which facilitates personal and professional development.

This organic growth is supplemented by selective external recruitment for highly specialised roles, or forecasted peaks, in addition to maintaining appropriate levels of experienced staff to allow for, and support the, development and training of trainees in our business.

We are continuing to invest heavily in the recruitment and training of highly skilled people to deliver our investment plans and maintain a reliable Transmission Network.

As part of this programme, between 2019 and the end of the RIIO-T2 period, we will recruit:

- 80 Graduate trainees
- 30 Engineering and craft apprentices
- 52 Skilled individuals direct from the market.

Recruitment will be advanced two years ahead to support the overall period for 'time to effectiveness' of new intakes.

We have engaged with the Trade Unions represented across our business: our future workforce plans are high on their agenda.

Partnership Arrangements

We recognise the benefits of working in partnership with other industry bodies to share best practice and ensure a pipeline of talent for the Industry.

We continue to be a member of EU Skills with representation on the Transmission and Distribution Group and the National Skills Academy for Power (NSAP).

The Scottish Apprenticeship Advisory Board provides employer leadership and contribution to the development of apprenticeships in Scotland, our CEO Frank Mitchell currently vice-chairs this board.

We continue to partner with local universities to attract talent into the industry.

Training and development of our staff

To ensure that our staff remain equipped to work to the highest standards expected, we continue to invest in in-house training and development, delivering 5,165 internal training hours during 2018; a 50% increase since 2016.

We have recently invested over £400,000 in our two training centres, extending the training catered for and improving existing facilities. They provide essential internal and external training and operational authorisations for our staff and contractors – ensuring consistent standards of core skills and safety from our system. These facilities are a key part of our delivery strategy for the future. Staff development is further supported by numerous and varied online training modules and management support media as detailed in **Annex 2: Sustainable Workforce Strategy**.

Skills needed to support the energy system transition

We must respond to unprecedented environmental issues by working to deliver sustainable growth and support urgent decarbonisation of our economies and prevent worsening climate change through achievement of agreed Net Zero targets.

The skills required by our staff are changing as a result of new technologies to meet:

The challenges of ever increasing and changeable boundary load transfer requirements

Efficient facilitation of the connection of low carbon generation

The digitalisation of networks and associated data

Cyber security

The growing need to interpret and use detailed network data associated with digitalisation.

These new skills will be required by both our existing staff and staff within new disciplines over RIIO-T2 and beyond.

Understanding our staff

Our annual employee survey 'The Loop' was responded to by 65% of our SPEN Employees this year. This allows our employees to tell us what matters most to them within their employment and how we are performing against expectations. We have seen an improvement in our employees understanding of the direction of the company, including how each of their roles contribute towards our strategic priorities and goals. Whilst we will continue to build on these key areas, we know we have more work to do in collaborating across departments and continuing to look at ways we can innovate to make improvements to the way we work.

Inclusive Employer

We're focused on attracting and inspiring the best talent – regardless of gender, age, sexual orientation, disability, ethnicity or any other factor. We remain committed to becoming a more inclusive employer, and have placed a significant focus on the following areas during RIIO-T1:

Unconscious bias training – All recruiting managers and all new line managers have unconscious bias training built into their development programmes. All of our recruitment adverts are designed to remove gender specific terminology and appeal to the broadest spectrum of potential applicants.

Supporting young people with learning disabilities – our award-winning Breaking Barriers programme, run in partnership with Enable Scotland and Strathclyde University, gives ambitious young people with learning disabilities the chance to study for a business qualification. It also provides work experience to improve their prospects of securing meaningful employment.

Addressing mental health – we've introduced mental health first aid training across the business with 13 employees now capable of identifying signs of and supporting those presenting with mental health issues.

Supporting women in sport – we've extended our rugby partnerships in Scotland and Wales to support more women in sport.

A commitment to inclusion – We work alongside EU skills, actively support the Inclusion Commitment and proactively share best practice across the sector. We continue to develop initiatives to improve education on diversity and inclusion both externally and internally through leadership training and mentoring. We continue to remove barriers to employment through inclusive policies such as flexible working.

Further details are provided in **Annex 2: Sustainable Workforce Strategy**.



Supply chain dependency

5

Complex projects rely on an extensive supply chain. This section explains the strategies we use to make sure we deliver on our commitments.

Almost 96% of our regulated transmission construction activities are delivered by the market through a wide range of suppliers, including:

Specialists used to gather defining information through site studies and surveys.

Designers using global experts on the design of transmission networks, where highly specialist knowledge is required.

Equipment manufacturers providing assets, both locally and from around the world, including transformers, cables, switchgear, protection and control systems, and all other major plant items.

We also rely on a range of specialist contractors to undertake the construction work on site:

Civil contractors to prepare the sites and the necessary infrastructure for us to access our assets. They also install the supporting foundations, construct the necessary buildings that hold and house our plant, protection and control systems.

Specialist electrical contractors who are responsible for installing and commissioning electrical plant and equipment.

Cable suppliers and installers.

Overhead line contractors who build, paint and refurbish our pylons and replace the wires that are supported by them.

Specialist demolition contractors who fully understand the works associated with the safe and environmentally responsible disposal of electrical assets.

Our supply chain provides the support and agility to respond to changes in workload over the course of a price review.

Our alternative supply chain model

Throughout RIIO-T1, one of our major successes has been our ability to deliver our project plan efficiently, to a high quality, while maintaining excellent standards associated with health and safety and environmental compliance.

To achieve this, we are delivering a significant proportion of RIIO-T1 projects under an alternative model to the historic UK industry approach.

Typically, a network operator would deliver a major scheme by contracting with a single experienced large engineering, procurement and construction (EPC) contractor. They in turn would engage sub-contractors for aspects such as the civil works, main electrical, protection and demolition works. A margin on any subcontractor's cost would be added to cover management costs, profit and other items. The terms and conditions for EPC contracts require acceptance of many of the risks associated with site conditions, detailed engineering, contractor performance and co-ordination between subcontractors. EPC contractors will include the costs of this risk, whether it materialises or not. The network operator may directly procure the significant main plant but in general, the EPC contractor would procure much of the equipment, again with associated margin.

Our model has moved us away from placing engineering, procurement and construction type contracts as standard and towards carrying out significantly more engineering and detailed design in-house and assuming roles previously adopted by a Principal Contractor. In essence, we act as our own EPC contractor.

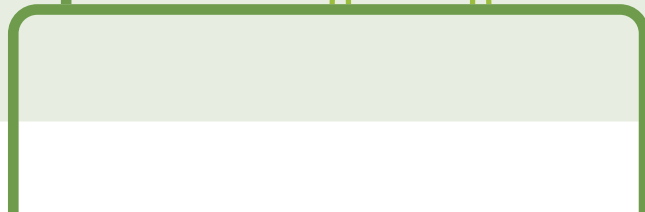
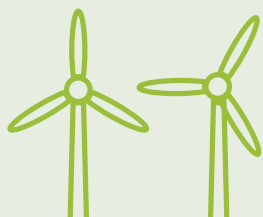
The benefits of this are:

It avoids restricting our supply chain to only those capable of all components of works associated with a project.

It allows greater ability to identify internalise and manage risk.

It allows greater flexibility in how scheduled work is designed and planned, giving greater control of development, deployment of innovation, and embedding of sustainable methodology from the onset to support achievement of Net Zero targets.

We will continue to adapt and accelerate decarbonisation, enhance digitalisation, and invest in our supply chain. Our focus is always clear: a reliable, efficient and sustainable network.



Our suppliers have asked for more visibility of our plans and opportunity to secure a longer and more stable order book.

This change has allowed us to break works into smaller supply only and discipline specific construction contracts and, as a result, has widened our supply chain from only five main contractors Pre-RIIO-T1 to significant awards to over 150 contractors during the RIIO-T1 period. This has significantly increased tender competition.

Awarding contracts to more small and medium enterprises (SMEs) has also reduced many costs of subcontracted activities and promoted use of local labour. We have also leveraged the benefits of the wider Iberdrola global group to procure main items of plant and equipment at significantly lower cost.

In summary, our move away from a single EPC contracting strategy has created efficient and cost-effective delivery of large infrastructure projects. It has also opened up the markets to a wide range of new suppliers which would not have otherwise had the opportunity. Further details on our assessment and plans for our supply chain are included in **Annex 22: Supply Chain**.

A flexible model

We recognise that we need to be flexible. Sometimes we assess that disaggregation would not deliver efficiency benefits, or that the balance of technical expertise or knowledge necessary to introduce the best innovative solutions lies outside our organisation. In these cases, we would consider tendering under an alternative approach.

Service-type activities, smaller projects and some O&M programmes are considered for longer-term framework contracts, which will be competitively market tested. This supports strong long-term working relationships with our supply chain, while reducing tendering workload and costs.

On this basis, we will continue using our existing delivery model throughout RIIO-T2, alongside ongoing assessment of the potential benefits of options such as traditional EPC models and bespoke alternative, on a project-by-project basis; supported by individual Project Delivery Strategies (PDS). This will enable us to continue to determine the most appropriate balance, and achieve the most cost-effective delivery model.

We have also made consideration within our programme of works to avoid short-term peaks and troughs of contractor requirements, specifically in individual disciplines. This reduces any risk of supplier over and under-capacity. We also believe that it's critical to promote a healthy supply chain relationship by endeavouring to maintain a relatively steady order book for suppliers throughout the full regulatory period.

Developing our supply chain

Our disaggregation of contracts has resulted in a wider supply chain base, and the introduction of numerous smaller suppliers working with us. Despite some initial turnover of contractors entering and withdrawing from the market, we have now reached a level of maturity within our supply chain. This supports collaborative working.

The quantity of works proposed for RIIO-T2 are representative of those within RIIO-T1. However, to make sure our enduring supply chain is capable, available and equipped for delivery of RIIO-T2, we are carrying out an in-depth analysis of them while keeping them informed of RIIO-T2 developments through:

Supplier events – we have created forums for existing and new suppliers to engage with teams from across SP Transmission, including procurement, to understand how we can involve them in our plans.

Newsletters – reaching a wider audience, these have provided suppliers with visibility of upcoming tenders, what we have achieved together, and our longer term plans.

Bilateral meetings – to allow for more detailed discussions on opportunities, to take feedback, and to consider how we can work together in more innovative and sustainable ways.

We've been keen to share the associated challenges and opportunities that we and our supply chain will face within the RIIO-T2 environment. We have discussed opportunities to work closer together to support alternative tendering and award approaches, provide opportunities to extend order books, support investment in local resources and reduce use of agency staff where possible.

Overall, we believe our approach is consistent with the need to build innovation, efficiency and sustainability into the way we deliver our RIIO-T2 plan. We have issued a wide ranging questionnaire to our suppliers to give us a greater understanding of them and make joint plans for ongoing development. As a result of early feedback we are already discussing ways in which we can make it easier for our supply chain to mirror our own ambitions for innovative working and environmental sustainability. Further details of the survey and associated analysis are contained within **Annex 22: Supply Chain**.



Further details of our supply chain analysis are available in **Annex 22: Supply Chain**.

Embracing markets and competition

6

In this section, we're going to look at competition. We have a responsibility to develop and maintain an economic, efficient and coordinated transmission network. We extensively use market driven competition to do this for the benefit of consumers. In recent years, we've taken a series of steps in developing our processes to further extend our use of competition and will continue to do so during RIIO-T2. We summarise our ambitions below, but full details can be found in our Competition Plan, accompanying this Business Plan.



Almost 96% of our regulated transmission construction activities are delivered by the market

96%

Native competition

We support competition in transmission – with almost 96% of our regulated transmission construction activities delivered by the market. The remaining 4%, covering some operational and maintenance activities, is deliberately delivered in-house due to the specialist nature of the work.

We will continue to drive efficiencies through the use of a flexible delivery strategy based around a disaggregated contracts model which has significantly increased tender competition. Before the start of RIIO-T1, we only used five contractors. We are currently contracting with over fifty suppliers and have used in excess of 150 different suppliers throughout RIIO-T1.

Accredited with our ISO 9001 Procurement Policy and Procedures status since 2013, we are confident that ScottishPower's existing procurement and monitoring practices reflect Ofgem's Best Practice Principles. Further details of our extensive procurement procedures can be found in our Competition Plan.

What are we intending to do for RIIO-T2?

We will continue to drive efficiencies through the use of our flexible delivery strategy based around our disaggregated contracts model, which has significantly increased tender competition in RIIO-T1. We have full confidence in the effectiveness of our procurement model, and we plan to increase transparency with Ofgem in highlighting the scale of competition this model is driving.

For this reason, during the RIIO-T2 period, we propose to share the following procurement data with Ofgem, on an annual basis:

Number of tenders placed for SP Transmission under competitive processes.

Average number of bidders per competitive tender placed.

Total value of contracts awarded under competitive tender processes.

We would propose that the Regulatory Reporting Pack (RRP) process is used to provide this data annually. However, to ensure consistency in data provision across the TOs, we would expect Ofgem to engage with the TOs in the development of appropriate Regulatory Instructions and Guidance (RIGs) for the transparent sharing of such data.

Full details can be found in
Annex 18: Competition Plan.



Early Competition

We see strong similarities between Ofgem's objectives for early competition models, particularly in relation to the identification of alternative solutions to network reinforcement, and whole system planning, which SP Transmission has been actively pursuing throughout RIIO-T1. We also engage closely with the ESO in the NOA process which has a major bearing on determining cost effective network solutions.

We note Ofgem's new criteria for early competition of £50m+ and contestable. We have several projects which we intend to deliver during the RIIO-T2 period which meet the £50m threshold. As requested in the Business Plan Guidance, we have listed each of these projects in our Competition Plan, highlighting the other delivery solutions SP Transmission has explored.

Only one of these projects included in our baseline, meets the early competition criteria – the installation of hybrid synchronous compensation at Eccles.

Given the demand for the connection of further renewable generation and system strength previously provided by synchronous generation, there is a strong need for synchronous compensation across our network. In response to our changing network, the ESO is developing a Stability Pathfinder project, intended to create and manage a market for inertia and system stability services to be assessed against TO network solutions. This Pathfinder project is part of the ESO's plans to facilitate early competition in transmission.

We have identified a further three sites at Hunterston, Strathaven and Kincardine, where the installation of synchronous compensation is required. These projects are being considered within the scope of the ESO Stability Pathfinder project which is assessing a wide range of build and non-build solutions provided by network operators and third parties.

What are we intending to do for RIIO-T2?

Expand on our whole system planning work engaging with TOs, DNOs/DSOs, the ESO, market players and key stakeholders to identify network needs at the earliest stage, and determine the most cost effective solutions, which benefit consumers.

Continue to engage with the ESO to determine an appropriate role for the TOs in current and future Pathfinder projects, reflective of our licence obligations to develop and maintain an SQSS compliant transmission network.

Late competition

We agree with Ofgem's decision to retain the well understood late competition criteria of new, separable and high value (£100m+). In line with Ofgem's Business Plan guidance, we have provided details in our Competition Plan of all projects over £100m which SP Transmission expects to deliver during RIIO-T2.

Of those projects, the only project which meets the late competition criteria is the 2GW Eastern HVDC Subsea Link from Torness to Hawthorn Pit (current anticipated landing point). This Link is a cross boundary project affecting all TOs. As a Strategic Wider Works (SWW) project, it falls outside the scope of this Business Plan. Our assessment is consistent with the conclusions of the ESO in the Networks Options Assessment 2018/19¹, which states this project meets the competition criteria. Further details can be found in our Competition Plan.

Ofgem's Late Competition models

We support, and already use, competition in onshore transmission where it delivers better outcomes for consumers, provided that it is established in an effective and legally robust way. We consider it fundamental that Ofgem acts within the statutory framework in delivering its 'extending competition in electricity transmission' framework. We are therefore strongly of the view that Ofgem should be waiting until the UK Parliament has the relevant legislation in place before pressing ahead with any proposals in this area, i.e. amending the Electricity Act to allow for the Competitively Appointed Transmission Owner (CATO) model.

Of the late competition delivery models proposed by Ofgem, SP Transmission continues to hold the view that the 'early' CATO model is the only model proposed by Ofgem which could potentially deliver actual competition. We consider it the approach most likely to potentially deliver material consumer benefits from innovative solutions and efficiencies in the design, construction and delivery of transmission assets. However, as none of Ofgem's proposed late competition models have yet been established, we question whether Ofgem can have these regimes fully in place in time for RIIO-T2.

What are we intending to do for RIIO-T2?

Progress with the development and delivery of the 2GW Eastern HVDC subsea link in close collaboration with the other TOs and the ESO.

Continue to work closely with the ESO in the NOA process to identify forthcoming projects which meet the late competition criteria.



¹ ESO, Networks Options Assessment 2018/19, P93, www.nationalgrideso.com/document/137321/download

This section considers the overall financing arrangements within our plan, an overview of our revenue and then an insight into how we have approached our financing plan. Much of our evidence is highly technical. The following pages provides an accessible summary of this detail. We have performed a full review of all financial information requested in Ofgem guidance and Consumer Challenge Group correspondence. All requested analysis is provided in this section and **Annex 25: Finance**.

This section also addresses questions on appropriate cash flow levels, and appropriate shareholder remuneration.

We also explain our plan assumptions on capitalisation and regulatory depreciation, and how we adopted Ofgem's financial policies on the treatment of taxation and pension costs.

In this section, we'll outline each of the following areas in more detail to show how we reached our financing conclusions.

Our Revenues, *Pg 177*

In our plan we have adopted Ofgem's working assumption for the Cost of Equity. We set out our alternative proposal within *Annex 25: Finance* and *Annex 34: Our Supplementary Business Plan*.

Cost of Capital, *Pg 178*

In our plan we have adopted Ofgem's working assumption for the Cost of Equity and Cost of Debt. We set out our alternative proposal within *Annex 25: Finance* and *Annex 34: Our Supplementary Business Plan*.

Notional gearing, *Pg 179*

We introduce cash flow risk. We also test that our proposal delivers acceptable upside and downside potential from the price control package, using Return on Regulatory Equity (RoRE) analysis.

Financeability, *Pg 182*

We carry out 'static' (or, in other words, non-probabilistic) testing. This ensures an expectation of an investment grade credit rating – but no higher.

Efficiency and financeability, *Pg 187*

We further test our plan by conducting a comprehensive probabilistic risk analysis, using a framework developed in conjunction with our economic advisers NERA. This is designed to test our plan against external shocks.

We present detailed analysis of our Finance in *Annex 25: Finance* and *Annex 34: Our Supplementary Business Plan*.



Financing our Plan Efficiently



Co-creating our RIIO-T2 plans

Purpose of stakeholder engagement for this chapter

Stakeholder engagement for financing our plan must account for the views of consumers, networks and wider stakeholders – to ensure all our funding decisions are efficient and always consider the potential impact on consumer bills. It is the network owner's responsibility to demonstrate that their financing plan is 'efficient', requiring no greater cash flow than is necessary to be 'financeable'.

We have regulatory and licence requirements to ensure our network is adequately funded so that it remains safe, secure and reliable. Equally we must ensure longer-term network investment funded through shareholder investment is sustainable. By this we mean making sure investors' rate of return on their investment in our network is set at a level that takes account of the inherent risk associated with investing in the GB electricity sector at present. To achieve this we use our dedicated investor engagement team to understand the rate of return investors require, and better understand the concerns of investors at a global scale including: the impacts of issues such as Brexit; and changes to funding proposed by the regulator.

How and why we have engaged with our stakeholders

Using workshops and consumer research surveys we engaged with consumers and consumer representatives about our investment plans for RIIO-T2 in respect to their priorities. This allows those stakeholders who are less familiar with how we are financed to better understand when and why we invest, and to have their say in these decisions.

Engaging with consumers and consumer representatives, we worked independently and in collaboration with SSE Transmission and National Grid to explain the key attributes of the transmission network. We used various qualitative and quantitative workshops, interviews and online tools to establish the 'willingness-to-pay' of GB bill payers for delivering in these areas. Finally, we conducted a GB-wide consumer and business acceptability survey to outline each aspect of our plan and the associated bill impact.

We also engaged with investors and the regulator via meetings and conferences and have taken into account relevant guidance and publications from financial market experts. We have also been able to infer investor feedback by analysing financial market reaction to relevant events.

We were also able to share the methodology and high-level calculations behind the financing of our plan with the Transmission User Group.

What our stakeholders have told us is important to them

Consumers have told us that they find the way network companies are funded complicated and not something they value having detailed information on. What they do care about, however is the bill impact of our investment decisions and ensuring our investments represent value for money for them. Consumer representatives expressed that our overall bill impact is low given the amount of activities, investment and additional consumer benefit it will enable us to deliver in RIIO-T2.

A number of global utility investors have expressed concerns that Ofgem's proposed cost of capital does not accurately reflect the true risks which investors continue to take when financing electricity network operators in GB. Ofgem's working assumption of the cost of equity for RIIO-T2 is 4.8% (CPIH). Our investors also informed us that they continuously review areas of investment opportunity and challenge, taking into account a number of different considerations. For example, the stability of the geographical area within which they invest remains a key factor, especially when those investments are recovered over a long period, such as 45 years, for transmission networks.

The Transmission User group were particularly keen to understand how our financial methodology/breakdown compares to the other transmission operators and how lower rates of return for investors would impact our plan.

How stakeholder feedback has shaped our plans

Based on the feedback we have gathered from stakeholders and expert evidence, we offer an evidenced alternative recommendation to Ofgem's draft cost of equity. This reflects a fair return for our investors founded on economic evidence, the external environment and regulatory precedent.

Why these changes are important

The transition to Net Zero carbon will require significant, sustainable investment in electricity infrastructure over the next five to ten years. Part of this funding relies on the long-term investment made possible by shareholders. Through our extensive engagement programme, our assessment is that Ofgem's assumed cost of equity may disrupt the efficient financing of networks businesses. It puts at risk network companies' ability to raise new finance, which is essential to fund the necessary investment to deliver the outputs that consumers, network users and customers require and to facilitate the transition to a low carbon economy.

£1.20 **Consumer Bill Impact**
(per average household/year)

Annual cost to consumer bill in RIIO-T2 for financing, both equity and debt portions, of RIIO-T2 RAV additions and past elements of RAV (average RIIO-T2 RAV £2.8bn).

Please see our Finance Stakeholder Engagement in **Annex 34: Our Supplementary Business Plan**.



Our revenues

We have two strands of base revenue that finance our plan. Here, we provide some context on revenues before detailing our financial plans in full.

Our average revenues explained

We have two strands of revenue. On the one hand, we have revenue directly associated with past capital investment. This is referred to as regulated asset value (RAV) revenue, and includes depreciation and return.

On the other, we have revenue related to the day-to-day running of the network (not RAV-associated). This revenue pays for a wide range of items, including network upkeep and maintenance, taxes (such as corporation tax), and business rates.

Our average annual increase in base revenue for the RIIO-T2 period mainly reflects the increase in our RAV-related revenues. These revenues are shaped by the scale of past investment and during RIIO-T1 we made a substantial investment across our licence area.

We forecast that RAV-related revenues relating to the opening RAV of £2.6bn will be greater than 85% of revenue associated with the RAV.

Set by Ofgem, recovered through National Grid

Our revenues are set by Ofgem. They are based on proposed investments and commitments we agree with Ofgem through the business plan process.

We recover our revenues through charges to the system operator National Grid. National Grid, in turn, levies charges to generators, networks and end consumers. The charges are collected by energy retailers through electricity bills.

The financial inputs

Parameters	Ofgem's SSMD Assumptions
Cost of equity	4.8%*
Cost of debt	iBoxx 11-15 year Trombone
Notional gearing	60%
Financeability adjustment	None
Capitalisation rate	85%
Dividend yield	3.0%
Credit rating	Baa1
Other policies	Per Ofgem

*Cost of equity adjusted to 4.3% for Base Revenue with 0.5% earned through assumed out-performance as per SSMD May 2019.

Based on our current assumptions, we will not need to implement any further financeability adjustments. However, this could change if our input assumptions have to be altered during the business plan process.

Our revenues are a combination of elements which are:

Fixed – based on us delivering agreed outputs in the future

Variable – due to uncertainty about the future, such as the amount of connected generation

Incentives and adjustments from previous years – and price controls.

Our forecast revenues for RIIO-T2 and in comparison with RIIO-T1 (7.0% RPI basis)

Regulatory, £m (2018/19 Prices)

	21/22	22/23	23/24	24/25	25/26	Total	Averages		Variance
							RIIO-T2	RIIO-T1	
Depreciation	166.4	178.3	181.8	178.8	157.3	862.6	173	140	33
Return	73.8	78.9	80.5	81.2	81.6	396.0	79	89	-10
Revenue associated with RAV	240.2	257.2	262.3	260.0	238.9	1,258.6	252	229	23
Fast Pot	47.8	49.9	42.7	34.2	31.6	206.2	41	29	12
Non-Controllable Opex (Rates)	34.2	34.9	34.7	34.5	37.0	175.3	35	32	3
Equity Issuance Costs	0.0	0.0	0.0	0.0	0.0	0.0	0	1	-1
Additional Income	0.0	0.0	0.0	0.0	0.0	0.0	0	11	-11
Tax allowance	14.7	15.3	14.1	11.9	7.1	63.1	13	14	-1
Other	-6.2	-7.0	-7.4	-8.9	-10.6	-40.1	-8	-2	-6
Revenue not associated with RAV	90.5	93.1	84.1	71.7	65.1	404.5	81	85	-4
Allowed Baseline Revenues	330.7	350.3	346.4	331.7	304.0	1,663.1	333	313	19

*the figures above are calculated using the working assumptions (Inflation etc.), published by Ofgem in the Sector Specific Methodology Decision document – May 2019.

*Cost of equity adjusted to 4.3% for Base Revenue with 0.5% earned through assumed out-performance as per SSMD May 2019.

Cost of Capital

As required by Ofgem's Business Plan Guidance, we have submitted a Business Plan which incorporates Ofgem's working assumptions for the Cost of Capital and addresses financeability on the basis of Ofgem's key assumptions.

However, we disagree with a number of aspects of Ofgem's approach to the assessment of the Cost of Capital for RIIO-T2 which we do not believe has been based on all the available evidence and has been set at a level which may disrupt the efficient financing of the UK's network businesses. We explain, in detail, why we disagree with Ofgem's assumptions and present our alternative proposal for the Cost of Capital allowance in **Annex 34: Our Supplementary Business Plan** and elaborate further in **Annex 25: Finance**.

Cost of Equity

Cost of Equity (CoE) represents the return shareholders require for providing their capital to a company, proportionate to the risk faced by the company. It is the minimum return we need to attract and retain equity financing in our business, so that we're able to fund our investments. It is more important now than ever before to attract the sufficient investment to support GB's transition to Net Zero.

In contrast to the cost of debt, the cost of equity cannot be directly observed. Regulators routinely set a forward-looking allowance for the cost of equity using asset pricing models. Ofgem have relied primarily on the application of the Capital Asset Pricing Model (CAPM) framework for setting the Cost of Equity for the RIIO-2 price control, with forward-looking sources of evidence, such as DGM and infrastructure discount rates, used as a cross-check to the CAPM implied range. The Cost of Equity cannot be assessed based on a company's financeability. This is a cross check to ensure the fair return delivers a financeable plan.

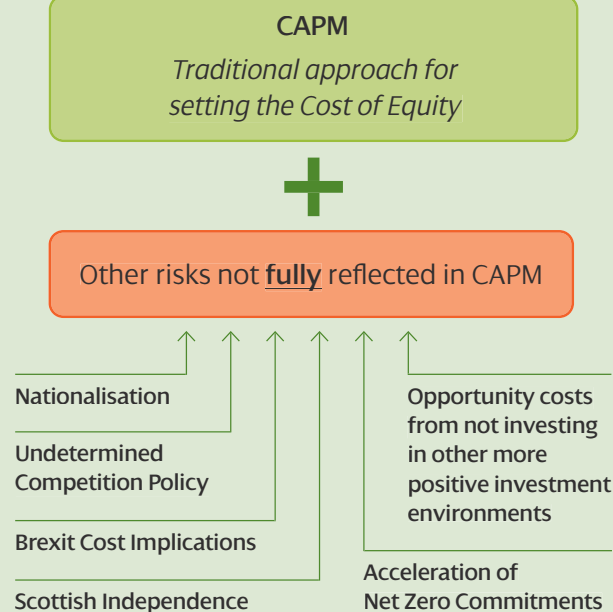
Under the CAPM framework, the return required by equity investors consists of the return on a risk-free investment (i.e. the risk-free rate (RFR)) and a risk premium that reflects the risk involved in a particular equity investment. This is estimated as the product of the risk premium on the equity market as a whole (i.e. equity risk premium (ERP)) and the equity beta, a measure of the riskiness of a particular equity investment relative to the equity market. By construction, the ERP is calculated as the residual between the total market return (TMR), which is the expected return on the market portfolio, and the RFR. However, the CAPM does not fully capture all of the risks priced in by investors in their required returns (as seen in the infographic opposite). Formally, the CAPM equation for the CoE can be defined as:

$$\text{Cost of Equity} = \text{risk-free rate} + \text{beta} \times \text{equity risk premium}$$

In their SSMD publication, Ofgem laid out their decision on the methodology for estimating the forward-looking real CoE for the RIIO-2 price controls, which produced a range of 4.00-5.60% (real, CPIH) for a notional gearing of 60% set under market conditions at that time. Ofgem use the mid-point of this range to arrive at their underlying Cost of Equity estimate of 4.8% (real, CPIH).

Unprecedented by any other regulator or price control, Ofgem apply a downwards 50bps adjustment to the underlying CoE estimate in reaching their CoE working assumption of 4.3% (real, CPIH). This Allowed vs Expected Return adjustment or 'outperformance wedge' is based on Ofgem's view that investors expect network companies to outperform the cost and output targets set at the price control, so this outperformance should be removed from companies' CoE starting points. It is ours and other stakeholders' view that Ofgem's proposed deduction is arbitrary and based on a flawed conceptual and evidential basis. It will distort investor's confidence in the sector and weaken incentives, ultimately leading to poor consumer outcomes. Please see **Annex 25: Finance** for further detail.

Establishing the Required Return for Investors



Establishing Cost of Debt

Network companies need revenue to service their long-term debt, and this needs to reflect the actual costs of financing this efficiently incurred debt.

In RIIO-1 Ofgem adopted an indexation approach for determining the allowed cost of debt, whereby the allowance was benchmarked annually against a predefined index. The chosen index was a 10 year trailing average of the outturn yields of the iBoxx A and BBB rated sterling non-financial bond indices with a maturity of more than ten years.

In their May 2019 Sector Specific Methodology Decision (SSMD) publication, Ofgem base their working assumption on an 11-15 year Trombone of the A/BBB iBoxx index, less the expectation of CPIH inflation. This results in an average Cost of Debt for RIIO-2 of 1.93% (real, CPIH).

We support the recalibration of the debt allowance mechanism for RIIO-2 as under Ofgem's existing RIIO-1 mechanism the transmission sector would be expected to underperform the debt allowance (that is, be 'out of pocket').

For our Alternative Cost of Capital Proposals, please see **Annex 9: Cost of Capital NERA report**, **Annex 25: Finance**, and **Annex 34: Our Supplementary Business Plan**.



Notional gearing and return on regulatory equity (RoRE)

Over the following pages we assess notional gearing in the context of the financial benefits and penalties available to the network companies in RIIO-T2 from outperforming or underperforming the price control assumptions.

Notional gearing represents the assumed percentage of net debt to RAV for the notional company. This in turn impacts the percentages of RAV that attract debt and equity allowances.

Setting notional gearing is complex, bringing together many issues and interactions. The diagram below illustrates the key inputs involved and their relationship.

SP Transmission

RIIO-T1 and RIIO-T2 comparison

	RIIO-T2	RIIO-T1
Notional Gearing	60%	55%

1. Cash flow volatility

Cash flow volatility is affected by:

- Scale of investment
- Capitalisation rate
- Profile of expenditure
- Totex incentive rate (Sharing Factor)
- Other incentive mechanisms and rates
- Uncertainty mechanisms

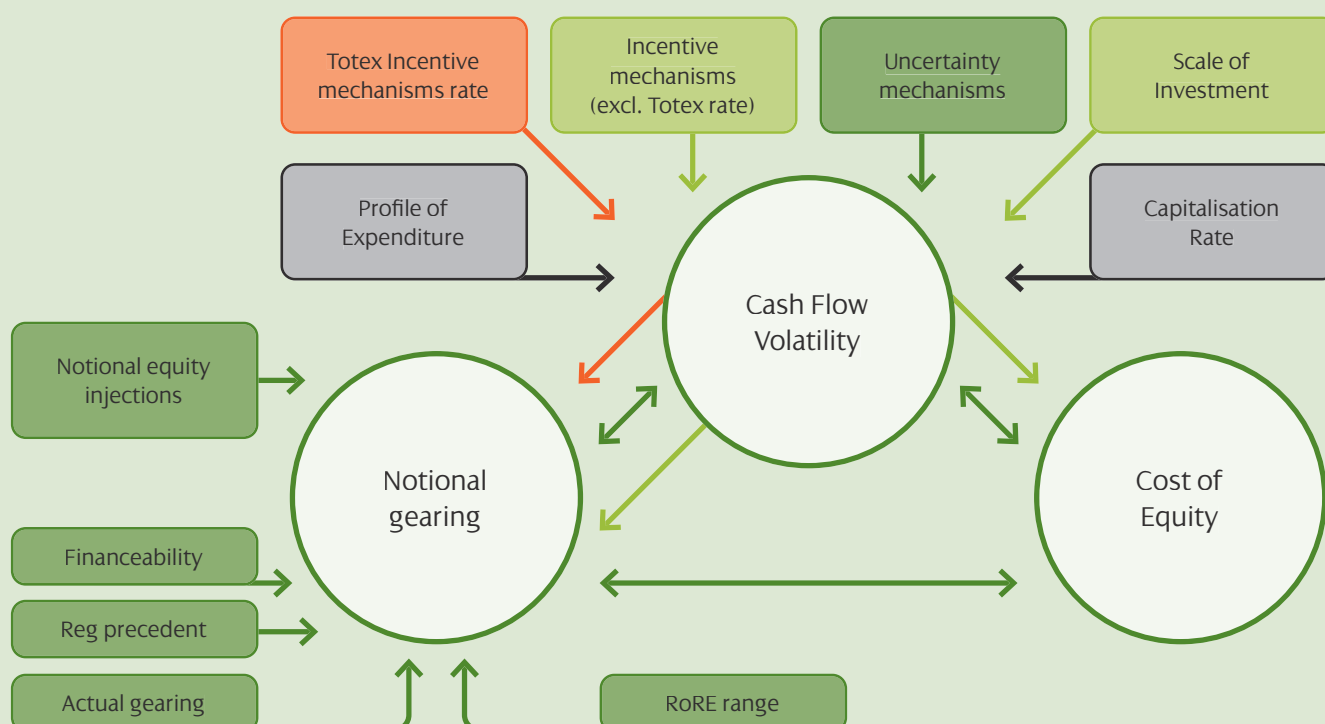
Scale and profile of expenditure is largely determined externally by the requirement to meet present and anticipated outputs – in order to deliver a secure and efficient network.

The RIIO-T2 uncertainty mechanisms and incentive characteristics are yet to be finalised. However, in general, we have not departed from the overall framework set out by Ofgem and have not sought to adjust cash flow risk.

We have however proposed a decrease from the current RIIO-T1 capitalisation rate of 90% to a rate of 85% for RIIO-T2. This capitalisation rate more closely aligns with the mix of capital and operational expenditure that will be delivered in the RIIO-T2 period – it also aligns with the working assumptions provided as part of the Ofgem RIIO-T2 sector specific methodology decision (SSMD).

Capitalisation rate can provide a short-term lever to adjust financeability. In the longer term, a notional capitalisation rate which differs from the actual capitalisation policy can lead to an accounting mis-match. As a result, we prefer not to use the capitalisation rate as a financeability lever. You can read more about asset lives and depreciation in our Evolution of the Regulatory Asset Value (RAV) section.

Setting notional gearing



2. Cost of equity

The extent to which the cost of equity can be flexed is externally limited by the minimum expected return required by the market to secure investment.

This cost of equity is dependent on the systematic (non-diversifiable) risk as reflected (under CAPM) in the asset beta. Further detail is available in the **CoE section on page 178**.

3. Notional gearing

In this section we introduce a central base scenario for gearing of 60%, as set out in Ofgem's sector specific methodology decision along with two alternatives of $\pm 5\%$ (i.e. 55% and 65% gearing).

It therefore remains to ensure that given the above externally determined factors, the idiosyncratic risk for a notional average network business at a given level of gearing will, when exposed to the full range of RIIO-T2 incentives and external risk, lead neither to excessive returns for shareholders nor to financial distress.

The current proposal of 60% gearing for all RIIO-2 sectors would represent an increase for Electricity Transmission. However, it would represent a decrease for Gas Distribution and Transmission, as notional gearing of 55% was accepted by both Scottish transmission operators at RIIO-T1. While 65% was the level accepted by gas distribution and transmission companies, the current proposals would represent an increase of 5% for SP Transmission. This, as well as Ofgem's working assumption of a lower cost of equity of 4.8%, would reduce cash flows and adversely impact credit metrics when compared with RIIO-T1.

Ofgem has suggested adopting sector-specific notional gearing if it would enable the maintenance of appropriate credit metrics under a wide range of market conditions. We explore this further in our financeability and risk assessments. Given the scale of investment during RIIO-T2 will not materially differ to that at RIIO-T1, greater emphasis should be placed on this proposal.

Taking these factors into account, 60% gearing with a $\pm 5\%$ variation is the base scenario we have used to carry out our detailed overall financeability testing.

Having identified a starting range for our gearing assessment, we then introduce a range of plausible outperformance or under-performance outcomes arising from the most material of the package of RIIO-T2 incentives.

This allows us to stress-test our proposed level of notional gearing by examining the overall range of returns to which SP Transmission will be exposed. In line with the SSMD on regulatory adjustment mechanisms (RAM's), we aim to calibrate the RoRE within the 300bps range as a maximum, with returns around the level of the Cost of Debt index at the minimum.

We later further validate our conclusion on notional gearing by simulating the external risks to cash flows and the resulting impact on business financeability (by Monte Carlo, using Moody's credit rating methodology). This further credit rating testing is described fully in the **Financeability assessment section on page 182**.

Further details can be found in the **Financeability assessment section on page 182**.



4. Return on Regulatory Equity (RoRE)

At this stage we conduct RoRE analysis. This estimates the financial benefits and penalties available to the notional network company in RIIO-T2 from outperforming or under-performing the price control assumptions.

In accordance with Ofgem's Sector Specific Methodology Decision for RIIO-T2 and the RIIO principle, the overall financial package should ensure a fair return to shareholders (as measured by the return on the notional proportion of the RAV that is financed by equity), with a minimum return around the cost of debt.

The RoRE calculation is forward-looking. We use RIIO-T2 average RAV values and average allowed revenue determined by Ofgem's Business Plan Financial Model (BPFM) in our calculation.

We recognise the draft nature of the incentive assumptions due to the ongoing price control refinements. We expect that these inputs will be revised as we approach the draft and final determinations in 2020.

The assumptions underlying our RoRE analysis are summarised below:

RoRE analysis

Assumptions made for RIIO-T2

Input	SP Transmission	Source
Base Revenue (Annual Average)	£333m	Calculated by BPFM (18/19 Prices)
Equity RAV (Annual Average)	£1,102m	Calculated by BPFM (18/19 Prices)
Gearing	60.00%	Per Ofgem SSMD (May 19)
Sharing Factor	67.5%	Per Ofgem SSMD (May 19)
Totex (Annual Average)	£275m	BP Totex (18/19 Prices)
BP Incentive	$\pm 2\%$ of Totex	Per Ofgem SSMD (May 19)
Totex Uncertainty	$\pm 10\%$	Per Ofgem SSMD (May 19)
Energy Not Supplied Incentive	+£2.0m / -£6.4m p.a.	SPT Proposal
Customer Satisfaction	$\pm 1.0\%$ of Base Revenue	SPT Proposal
SF ₆ Emissions*	$\pm £1.1\text{m p.a.}$	SPT Proposal
Environmental Impact	$\pm £1.7\text{m p.a.}$	SPT Proposal
Performance re offers of timely connection	-0.5% of Base Revenue	SPT Proposal
Network Reliability and Resilience	£4.8m p.a.	SPT Proposal
Consumer and Network Users	$\pm £1.7\text{m p.a.}$	SPT Proposal

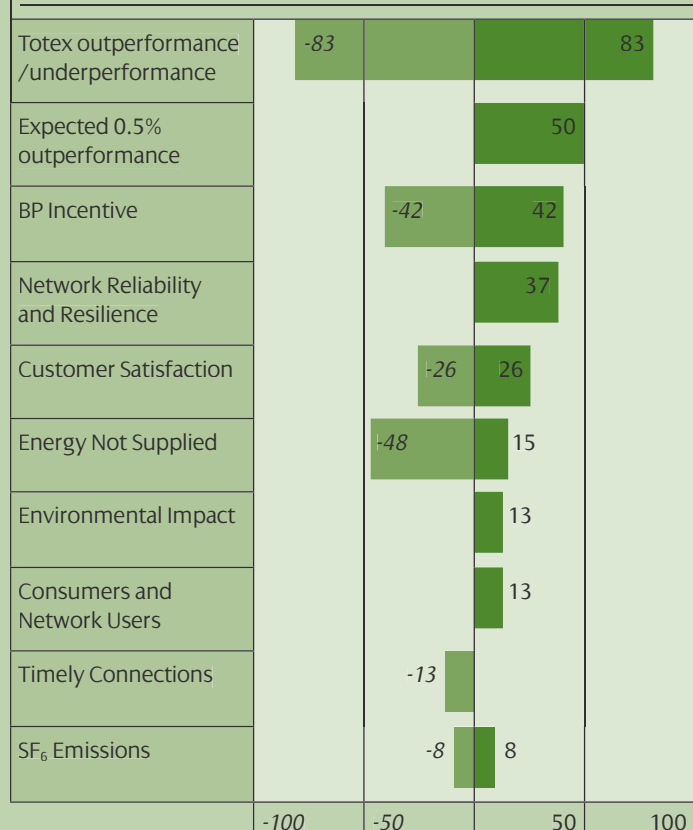
*Estimate as Ofgem will finalise the methodology for SF₆ baselines and targets in the Draft and Final Determination

In line with the Sector Specific Methodology Decision document, the BP incentive value is removed from the calculation of the RoRE. If included this would have increased/decreased RoRE by circa 42bps.

We show the relative impact of the most material RIIO-T2 risks as basis points of RoRE in the Tornado chart below:

Revenue Risk Factors

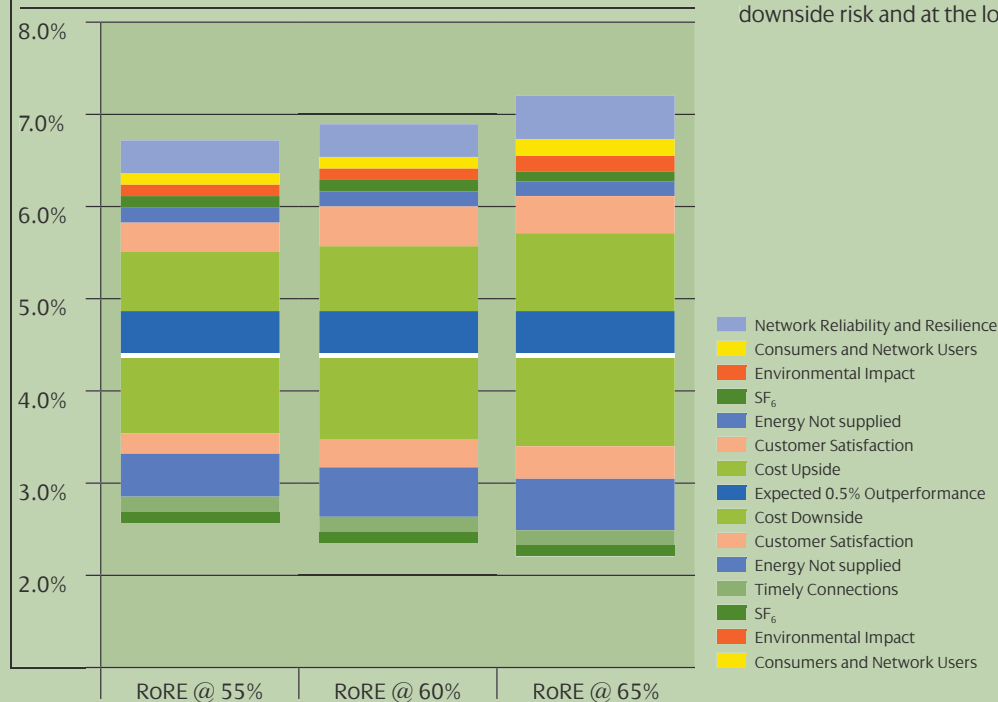
As basis points of RoRE



Combined, these individual risks determine the overall range of feasible RoRE performance in RIIO-T2. We present this as a 'layer cake' below, showing a range of gearing.

RIIO-T2 RoRE

Change with Gearing



Our view

Our key conclusion: current outperformance will peak at 195bps, whereas underperformance could reach a reduction of 178bps.

The range of feasible RoRE at 60% gearing extends from a maximum of 6.8%, down to a minimum of 2.5%. This compares with a Cost of Debt which starts at 2.03% in RIIO-T2. These values exclude the Business Plan incentive as per Ofgem's working assumptions.

Overall, our RoRE analysis indicates that Ofgem's working assumption for Cost of Equity and Gearing (4.8% and 60%) are consistent with the level of revenue risk factors currently embedded within our RIIO-T2 Business Plan.

However, our analysis also indicates that the draft price control RoRE range is below the 300bps set via the RAM's methodology which would allow a return of 7.3% before adjustment. This represents a substantial decrease in the total RoRE achievable when compared with the RIIO-T1 period, with a top-end RoRE of around 11%.

We've carried out analysis to find out if the draft gearing assumptions are set at an optimal level, alongside the effect of varying the gearing up or down in 5% increments. The impact of these changes in gearing is shown in the table below.

Our conclusion

RoRE range comparison

Gearing	Outperformance RoRE	Downside Cover
55%	6.53%	2.71%
60%	6.75%	2.52%
65%	7.02%	2.28%

60% represents the optimal level of gearing based on our draft assumptions, and is consistent with a financeable Business Plan.

Future analysis is required after the incentive package is agreed which should allow the possibility of reasonable returns without excessive downside risk and at the lowest overall cost to consumers.

Financeability – key assumptions and headline proposals

We conclude that we require a CoE that enables us to attract and retain sufficient equity finance to provide the necessary investment to maintain network reliability, and absorb the forecast expenditure volatility as we facilitate the transition to a low-carbon economy.

In our financial modelling, we assume that the cost of debt is 1.93% which is the value of the iBoxx 11 to 15 year trombone, as per the SSMD. However, the allowed Cost of Debt (CoD) is set in real terms and our debt is primarily nominal (that is the coupon includes an inflation component). Our financeability analysis indicates that this mis-match contributes to declining financial ratios.

To support the process of assessing financeability, we have engaged economic consultants including NERA, First Economics, and OXERA.

Within this section we present our financial plan based on the Ofgem's assumptions, shown in the financial inputs table below.

Our plan results in an investment-grade credit rating on Moody's rating scale which is consistent with the range that underpins Ofgem's CoD index. The current assumptions provide a credit rating that is weaker by one notch when compared with RIIO-T1. In addition we consider the resilience of the company to all contracted connections proceeding including those funded through uncertainty mechanisms. This yields a base rating one notch lower. We then considered further external risks which, if they were to materialise, would also result in a lower rating and represent material downside risk. In having regard to the impact of its decisions on existing and future consumers, as well as financeability, Ofgem will have to consider a range of evidence and perform cross checks, for example, by looking at proxies of rating agencies' assessments.

Financial Parameters

Inputs	Ofgem's SSMD Assumptions
Cost of equity	4.80%
Cost of debt	1.93%
Gearing	60.00%
Vanilla WACC	3.08%
Asset lives	Held at 45
Capitalisation rate	85%
Additional income (BP incentive)	N/A
Equity injection threshold	5.0%
Dividend % of notional equity	3.0%

Target credit rating

We have assessed the credit ratings for SP Transmission on both a notional and actual basis against our target overall rating of A3 to Baa1 before risk.

This makes sure our financeability criteria are fully consistent with credit quality underpinning the allowed cost of debt index, which equally weights A and BBB (S&P) rated non-financial sterling bonds. This is also consistent with our licence obligation to maintain an investment-grade credit rating.

Failure to ensure alignment with the index would lead to greater costs to the consumer; if the notional company was only to achieve a Baa rating then the index should be changed to ensure the CoD matches the rating for each company. This would increase the CoD assumed for the notional company and increase the annual revenues that each company would collect to ensure that the higher cost of debt is recovered. There are also further issues with allowing the rating to slip into the Baa range, with higher costs to the businesses in relation to weakening credit ratios. This again would make it more expensive for all TOs to raise debt to finance required investment which is not in the consumers interest. Finally a lower rating for the notional company on a base case would lead to less headroom to deal with external shocks that are outwith the companies control (for example Macro Economic changes). These changes could lead to a significant weakening of the financial health of the network operator and lead to greater risk of problems in delivery of the proposed RIIO-T2 outputs that are of great benefit to the general consumer. These scenarios are examined later in the chapter.

As explained in our Financeability assessment section, we have taken into account the full range of credit rating factors, not just credit metrics. This means that the scores for individual sub factors may be outside A3 or Baa1, and could fall outside the wider investment grade range of A1 to Baa3 (A to BBB range in S&P ratings).

To clarify, this means that we are not currently targeting an A3/Baa1 rating for all Credit ratios, but we are targeting ratios that will allow us to score an overall rating of A3/Baa1. This is explained in more detail in the Financeability assessment section.

Ofgem's economic model assesses an individual standalone company, and Ofgem has a statutory duty to have regard to the need to ensure that licensees can finance their licensed activities – meaning they are allowed sufficient cash flows to pay interest and dividends to the providers of finance. Financeable also means that a company needs to be able to raise the required financing in the financial markets in order to deliver its licence commitments and expected expenditure resulting from the RIIO-2 price control settlement.

SP Transmission is competing in the financial markets with other electricity and gas network companies. To compete on equal terms, it is important that our implied credit ratings as part of the final proposals are no worse than the implied credit ratings afforded to other networks in the previous RIIO price control settlements, which were set using a similar cost of debt index.

Based on Moody's rating methodology¹ for regulated electric and gas networks, the RIIO-T1 price control resulted in an implied rating of A3 – this is explained in the RIIO Regulatory precedent section. Therefore, the RIIO-2 final proposals for electricity transmission need to achieve an implied credit rating of at least a A3/Baa1.

1. Rating Methodology – Regulated Electric and Gas Networks – March 2017.

One of the main impacts within the move to the RII0-T2 methodology was Ofgem's decision to transition the measure of inflation from the Retail Price Index (RPI) to the Consumer Price Index including owner occupiers' housing costs (CPIH). This move has been deemed appropriate due to RPI no longer representing the official measure of inflation in the UK.

In theory, any change in the inflation index used for price setting purposes should be revenue-neutral, as long as the same inflation index is used to calculate the real cost of capital and to index the RAV over time, the choice of inflation index has no impact on the present value of revenues charged to consumers.

However, the inflation index determines the balance between the amounts recovered within period versus those deferred into the future. As a result, it affects the profile of bills over time – referred to as intergenerational fairness.

This impact will be of significant interest to a wide variety of stakeholders, and it is of vital importance that they understand the full impact of the move to CPIH and are fully briefed on its NPV neutral nature.

We are not currently targeting an A3/Baa1 rating for all credit ratios, but we are targeting ratios that will allow us to score an overall rating of A3/Baa1.

Our overriding objective has been to deliver an efficiently financeable plan that will offer an adequate return to investors at the lowest possible cost to consumers.

Ensuring efficient financing costs

– Price Control Financial Model ('static') analysis

In this section we present our financing plan based on the draft assumptions and primary analysis; we refer to this as our 'static' analysis. This is in contrast to our 'probabilistic' risk assessment, presented later in this section, which applies the Monte Carlo model to analyse the likely impact of external risks to our financeability ratios. In this section we also generate and test our regulatory credit ratios.

'Static' refers to the fact that we introduce a number of financing components and assumptions, then test the outcomes to ensure that an efficient, financeable plan can be demonstrated using Ofgem's Business Plan Financial Model (BPFM). We will submit the BPFM alongside our Business Plan submission in line with Ofgem's guidelines.

We have explained our allowed return financing components in this section. You can find further explanation of our other assumptions and policies in our **Financeability assessment** section on **page 188**.

Our overriding objective has been to deliver an efficiently financeable plan that will offer an adequate return to investors at the lowest possible cost to consumers. This results in the following credit rating based on Moody's 2017 rating methodology for regulated electric and gas networks.

Credit rating	
	Notional
Moody's notional Credit Rating	Baa1

The key ratios forming these results are detailed under our Key credit ratios section in the comparison of credit ratios to RII0-T1.

For the 'static' analysis that informed the credit rating above we have assumed Business Plan Incentive additional income of zero.

It's possible that Ofgem's view of the efficiency of our Totex proposals may result in a penalty with a resultant risk to our financeability. This would be in addition to the penalty applying under the Totex incentive mechanism if we have to spend in excess of the allowance in order to deliver our outputs and, importantly, make sure we meet our licence obligations around continuity of supply.

Capitalisation rate

The capitalisation rate of 85% in our business plan is in line with expected statutory capex over the RII0-T2 period. You can find more in our **Total expenditure and capitalisation** section on **page 190**.

Asset lives and depreciation

We can deliver an efficient financing plan and maintain an investment grade credit rating, without employing additional financial levers.

This assumption may need to be reviewed in the event of a change to revenue assumptions. You can read more about asset lives and depreciation in our **Evolution of the Regulatory Asset Value (RAV)** section on **page 190**.

Further details can be found in the **Evolution of the Regulatory Asset Value (RAV)** section, Pg 190.



RIIO Regulatory precedent

As mentioned in our analysis of the target credit rating, the RIIO price control proposals for regulated electricity and gas network companies result in an implied rating of Baa1/A3 based on Moody's rating methodology.

In the next section, we set out how we have followed Moody's rating methodology for SP Transmission, and have mainly assumed that the qualitative factors applied in recent RIIO-1 price control proposals are the same.

Implied credit ratings for RIIO price control proposals

Company	Cost of equity	Gearing	Credit rating score	Implied credit rating
SPT	7.0%	55%	6.85	A3
SHTL	7.0%	55%	7.32	A3
NGET	7.0%	60%	7.41	A3
NGGT	6.8%	63%	6.61	A3

The tables show that Electricity and Gas Transmission companies have an implied credit rating of A3. This supports our conclusion that the RIIO-T2 final proposals for SP Transmission need to achieve an implied credit rating of at least a A3/Baa1.

In our assessment of the implied credit ratings, we have mainly assumed that the qualitative factors are the same as those that we applied in RIIO-T1. These qualitative factors have a weighting of 60%, and contribute broadly the same score for all companies to the overall credit rating score.

The remaining factors that influence the final rating score are the four key credit metrics used in Moody's methodology. Together these have a weighting of 40%, and could have a significant impact on the overall score.

Credit Ratios account for 40% of overall credit rating assessment, and so have a significant impact on the overall credit rating.

A breakdown of Factors 1–3 is contained within the Financeability section of our Finance annex, **Annex 25: Finance**.



Financeability assessment

In the main we have followed Moody's rating methodology for regulated electric and gas networks.

This approach considers credit metrics and qualitative factors, for example business risk and regulatory environment. Moody's stated objective is for users of this methodology to be able to estimate a company's rating within two alpha-numeric notches.

Moody's analysis focuses on four key rating factors. These are:

- Regulatory environment and asset ownership model
- Efficiency and execution risk
- Stability of business model and financial structure
- Key credit metrics.

A fifth factor focuses on structural considerations of debt. This is assessed on features that contribute to the likelihood of default such as complexity and creditor influence. Together, these qualitative features act as an overlay against any score that may be derived from the first four factors. We do not expect this factor would have a material impact on the overall credit score derived from our analysis.

Each factor is made up of a number of sub-factors, to each of which Moody's assigns a weighting.

First, we set out our assessment of sub-factors as shown in the table below. Our assessment of the key credit metrics is set out later in this section, following on from our financial modelling.

In arriving at our Moody's notional credit rating score we have maintained the non-credit metric ratio factors at the same level as our RIIO-T1 assumptions. This is in line with the updated methodology published in 2017. Recent events may influence a reduction in the future assessment of these qualitative factors to the detriment of the stated scores below. We will continue to monitor the credit rating agencies' guidance and will update our analysis if required.

The tables below summarise our assessment:

Rating factors for SP Transmission

Factor 1: Regulatory Environment & Asset Ownership Model (40%)	Aaa	Aa	A	Baa	Ba	B
a) Stability and Predictability of Regulatory Regime	X					
b) Asset Ownership Model		X				
c) Cost and Investment Recovery			X			
d) Revenue Risk		X				
Factor 2: Scale & Complexity (10%)						
a) Scale and Complexity of Capital Programme			X			
z Financial Policy (10%)						
a) Financial Policy & Behaviours			X			

N.B. The values for the key credit metrics that comprise Factor 4 are calculated as part of the financeability assessment later in this section.

Key credit ratios – Factor 4

Credit metric ratios account for 40% of rating agencies' rating assessment, and so have a significant impact on the overall rating. It is worth noting that Moody's rating methodology takes the average of the worst three consecutive years in assessing an overall rating for a particular ratio.

We ran two metric tests, one notional one actual, when developing our plan and here is what we found.

Notional company with Ofgem's draft assumptions (CoE at 4.8%) Key Credit Metrics

	Weighting	RIIO-T2		RIIO-T1		
Adjusted Interest Cover	10.0%	1.47x	Baa	1.69x	Baa	
Net Debt / RAV	12.5%	61.4%	Baa	57.1%	A	
FFO / Net Debt	12.5%	10.8%	Ba	14.3%	Baa	
RCF / Net Debt	5.0%	8.9%	Baa	10.4%	Baa	
Rating Including Rating from Grid Factors 1-4		7.75	Baa1	7.25	A3	
RIIO-T2 Period	21/22	22/23	23/24	24/25	25/26	Avg
Adjusted Interest Cover Ratio	1.58x	1.47x	1.47x	1.48x	1.49x	1.47x
Net Debt to Closing RAV	60.58%	61.43%	61.60%	61.12%	60.74%	61.38%
FFO / Net Debt	12.08%	11.37%	11.32%	11.21%	10.02%	10.85%
RCF / Net Debt	10.10%	9.42%	9.37%	9.24%	8.04%	8.88%

The Notional company with Ofgem's draft assumptions results in a overall rating of Baa1 for the notional company. This overall grade is one notch lower than notional company at RIIO-T1 with all individual ratings weaker than those in RIIO-T1.

The only area that registers an improvement is the rating for 'scale and complexity of capital programme'. This is due to the fact that although the investment programme for both periods is similar, the RAV is larger in RIIO-T2 as a result of the investment undertaken in RIIO-T1. This improves this sub factor from Ba in RIIO-T1 to Baa in RIIO-T2 uplifting the rating for the RIIO-T2 period.

The AICR and RCF/net debt both weaken but remain above the investment grade rating floor of 1.4x and 7% respectively on average however FFO/Net Debt weakens to below investment grade. The impact of the strength of these metrics in relation to external shocks will be examined as part of our risk assessment analysis in Efficiency and financeability.

It should be noted that the values in the table above assume that 25% of debt is index linked (ILD). This has the effect of strengthening the AICR ratio and the overall rating. If the assumption in line with SP Transmission's actual debt portfolio was that none of the notional companies debt was index linked, the AICR would drop to 1.29x and would also drop outside of investment grade. This weakens the overall rating to a score of 8.30 which is just above the Baa1/Baa2 divide. This is explored further in our analysis within the finance annex, **Annex 25: Finance**.

A further consideration is required in regards to the long term financeability of SP Transmission based on the draft assumptions provided by Ofgem. The move to CPIH for example may provide a boost to short term metrics but will weaken any long term outlook based on the reduction in the growth of the RAV in future periods. Ofgem have stated the long-term outlook should be addressed at a future price control.

The main difference between the results below and those of the notional company are due to the assumption around the transition of gearing between the RIIO-T1 and RIIO-T2 periods.

Actual company with Ofgem's draft assumptions (CoE at 4.8%) Key Credit Metrics

	Weighting	RIIO-T2		RIIO-T1		
Adjusted Interest Cover	10.0%	1.74x	Baa	1.69x	Baa	
Net Debt / RAV	12.5%	57.8%	A	57.1%	A	
FFO / Net Debt	12.5%	12.1%	Baa	14.3%	Baa	
RCF / Net Debt	5.0%	8.8%	Baa	10.4%	Baa	
Rating Including Rating from Grid Factors 1-4		6.55	A3	7.25	A3	
RIIO-T2 Period	21/22	22/23	23/24	24/25	25/26	Avg
Adjusted Interest Cover Ratio	2.17x	2.07x	1.99x	1.64x	1.60x	1.74x
Net Debt to Closing RAV	56.25%	57.61%	58.01%	57.78%	57.63%	57.81%
FFO / Net Debt	14.16%	13.42%	13.13%	12.31%	10.82%	12.09%
RCF / Net Debt	10.37%	9.97%	9.80%	9.02%	7.54%	8.79%

Once the parameters have been updated to reflect the actual capital structure of SP Transmission the rating improves further. It should be noted that the 'actual company' view above has been provided consistent with Ofgem's prescribed inputs including forecast cost of debt costs. The gradual increase in gearing from the RIIO-T1 position of 55% to the working assumption of 60% allows for lower interest payments over the RIIO-T2 period, which improves the suite of ratios and leads to an improved overall rating of A3 when compared to the notional company at Ofgem's draft assumptions.

Further to this the inclusion of other items such as incentives & RIIO-T1 Legacy adjustments also positively impact the overall rating when compared to the notional company.

Ratio Analysis

To complete our "Static" analysis we have listed out the individual ratios along with the agencies investment grade threshold for each ratio. We have listed the resulting ratios based on the parameters listed in the chapter so far.

The table below details the scoring framework pertaining to the financial ratios for each of the major credit rating agencies.

Ratios						
<i>Debt Metrics</i>						
	Fitch		Moody's		Standard & Poor's	
	A	BBB	A	BAA	A	BBB
Capex to RAV (%)			<4%	>12%		
FFO Interest Cover [Incl accretions] (x)	4.50x	3.50x	5.5-4.0x	4.0-2.8x	>3.5	3.5-2.5x
FFO Interest Cover [excl accretions] (x)	4.50x	3.50x	5.5-4.0x	4.0-2.8x	>3.5	3.5-2.5x
Adjusted Interest Cover Ratio (x)	1.75x	1.50x	3.5-2.0x	2.0-1.4x		
Net Debt to Closing RAV (%)	60%	70	45-60%	60-75%	<70%	<70%
FFO/Net Debt (%)			26-18%	18-11%	>12%	12-8%
RCF/Net Debt (%)			21-14%	14-7%		

Ratios			
<i>Key Credit Metrics</i>			
	RIIO-T2 (Notional)	RIIO-T2 (Actual)	RIIO-T1 (Notional)
Capex to RAV (%)	10.1%	10.1%	18.2%
FFO Interest Cover [Incl accretions] (x)	3.86x	6.03x	3.98x
FFO Interest Cover [excl accretions] (x)	4.42x	6.03x	3.98x
Adjusted Interest Cover Ratio (x)	1.47x	1.74x	1.69x
Net Debt to Closing RAV (%)	61.4%	57.8%	57.1%
FFO/Net Debt (%)	10.8%	12.1%	14.3%
RCF/Net Debt (%)	8.9%	8.8%	10.4%

The previous table contains the average RIIO-T2 period ratios based on the parameters of the following views:

- Ofgem's assumptions (4.8% CoE) on a notional basis
- Ofgem's assumptions (4.8% CoE) on an actual basis
- SPT's RIIO-T1 ratio's for comparison.

We are not targeting any individual credit ratio to be higher than a Baa1 with several close to the Baa3/Ba1 threshold. Companies achieve an investment grade rating over a multitude of factors and are not necessarily deemed to be non-investment grade if all factors do not achieve the guideline criteria. Although weaker scoring ratios will apply more strain to the overall score due to their weighting.

It can be seen in the opposite table that the individual ratios are weaker when compared to the overall RIIO-T1 position due to the significantly lower cost of capital assumptions for the RIIO-T2 period. The only "outlier" to the opposite is the Capex-to-RAV ratio, due to the comparative size of the RAV between the RIIO-T1 and RIIO-T2 periods. In particular for the scenarios using Ofgem's proposed CoE there are ratios which are not consistent with an investment grade credit rating.

A ratio of particular concern is the adjusted interest cover ratio which measures how easily a company can repay interest on their debt. This crucial ratio for investors substantially weakens across the RIIO-T2 period particularly when compared to RIIO-T1. Using Ofgem's assumptions this ratio is currently on the investment grade threshold. Although not evident from the table above but shown earlier in the section, the reduction is also gradual for all four metrics across the period as a whole. This has been partially mitigated by the NPV neutral move to CPIH inflation which increases cash flow in early years at the expense of future RAV growth. Therefore this will have a more pronounced impact in future price controls. Detailed individual ratio analysis by year is presented in our finance annex, **Annex 25: Finance**.

Finally it should be stated that if the CPIH switch had not occurred, the resulting ratios would have been significantly weaker, as explained in the previous section. Under this scenario the overall rating with Ofgem's cost of capital would shift to a Ba1 due to significantly weaker AICR and FFO/Net Debt ratios.

Impact of Connection Uncertainty Mechanism

We have further tested the financeability based on the impact of the requirements to deliver all currently contracted connections using Ofgem's SSMD assumptions. Our modeling of this scenario shows our credit rating will drop to Baa2 with no ratios achieving investment grade metrics before other risks are considered. Further details are contained within the **Deterministic Analysis** section of our Finance annex, **Annex 25: Finance**.

Notional gearing

Similar to our approach to RoRE analysis, we modelled the static analysis on a notional basis, using a gearing level of $\pm 5\%$. Our conclusion: the movements in financeability are quite significant at 55% and 65%.

Gearing for SP Transmission

	@ 60 %	@ 55 %	@ 65 %
Moody's notional credit rating	Baa1	A3	Baa1

Further deterioration in the AICR and increased gearing leads to a weaker overall rating at 65% gearing – the opposite is true for gearing of 55%. We believe that a notional gearing of 65% is not appropriate. Compared to a lower lever of gearing, our probabilistic analysis shows that the weak credit rating would lead to greater risk to the implied investment credit rating.

However, the working assumption of 60% or 55% gearing would provide a stable investment grade credit rating, and align with regulatory precedent. **Further details are contained within Annex 25: Finance**.

Efficiency and financeability

We have worked with NERA to develop a financeability risk model. The model is based on Ofgem's Price Control Financial Model, and helps support our assertion that our proposed financing package is not just efficient, but robust.

We have extended the base model to incorporate the calculation of credit metrics and overall score, using the Moody's Methodology (previously described). We attach a paper describing NERA's modelling methodology contained within **Annex 16: NERA – Risk Modelling for RIIO-T2**.

We have used the model to demonstrate that the suggested financeability scenario delivers an efficient, robust financeability plan. To do this, our model uses the Monte Carlo method to simulate the individual and aggregate credit metrics over the full range of plausible outcomes. The model does this for every individual risk we have identified.

The model considers the risk to cash flows from external risks only – where possible, we have identified the plausible distribution of outcomes for an average network business. In conjunction with our RoRE analysis, this should make sure the business is sufficiently and securely funded, so that the normal operation of RIIO-2 incentives is unlikely to lead to financial distress when coupled with adverse shocks from external risks.

For us, a robust plan is one that makes sure the expected overall credit rating for a notional average transmission business will be solidly within the A to Baa (Moody's) range of credit rating. ('Overall' means we include non-financial ratio components.)

Under any realistic combination of adverse external outcomes, there should only be a small probability that this rating might drop to a level inconsistent with the allowed Cost of Debt. More specifically, we target an overall credit rating of A3 or Baa1. This is also consistent with SPT's license obligation to maintain an investment grade credit rating.

Ofgem has a statutory duty to have regard to the need of to ensure that licensees can finance their licensed activities, meaning they are allowed sufficient cashflow to pay interest and dividends to providers of finance.

Initial assumptions

Before conducting our financeability testing, we have considered each of the components of the allowed return. This provides us with the opening parameters for our risk and financeability testing that we established earlier.

Risk assessment	
Notional	
	Inputs
Cost of equity	4.8%
Cost of debt	1.93%
Gearing	60.00%
Dividend yield	3.0%
Asset lives	Held at 45
Capitalisation rate	85%

We have followed Ofgem's guidance for RIIO-2 regarding SSMD when we calculated the notional inputs above.

Each unique combination of these inputs constitutes a single scenario. For each scenario, a network business will be exposed to a range of financial risks. Some of these risks will be external to the business, and some will arise from regulatory mechanisms specific to the price control. For example, incentives, output mechanisms and residual risk may be only partly mitigated by uncertainty mechanisms.

More information on the financeability risk model can be found in **Annex 16: NERA – Risk Modelling for RIIO-T2**.

More information about the efficiency and financeability of our plan can be found in **Annex 25: Finance**.



Our financeability assessment

We test the robustness of our financial plan only against external risks not directly within our control. The external risks we consider are:

Risk	Modelling approach
Totex Uncertainty	$\pm 10\%$ of base assumption for 10-90th percentile applying a triangular distribution.
Non-controllable Opex Uncertainty	$\pm 10\%$ of base assumption for 10-90th percentile assuming a triangular distribution.
CPIH Uncertainty	Simulated based on OBR forecast uncertainty ranges.
Taxation	Actual and allowed tax modelled bottom-up.
Cost of Debt Indexation	Based on modelled uncertainty in the real RFR given historical variation and relationship between RFR and debt spread. We use Ofgem's trombone approach.
Cost of Equity Indexation	Based on modelled uncertainty in the real RFR given historical variation and Ofgem base Cost of Equity parameters.
Sharing Factor (Consumer Share)	67.5%
Dividend Yield	3.0%
Equity Issuance Threshold	5.0%
Base Cost of Equity	4.8%
Incentive Uncertainty	$\pm 1\%$ (max/min) of RoRE based on triangular distribution (calibrated such that RoRE max/min is ± 300 bps together with Totex uncertainty assuming a triangular distribution).
Totex Capitalisation Rate	85%
Proportion of inflation-linked debt	25%

We simulate a set of outcomes using Monte Carlo. For each iteration of the Monte Carlo Model we calculate the credit metrics and use these to derive an overall credit rating using Moody's methodology (as described in the Financeability assessment section).

Moody's methodology applies significantly greater weights to components of the overall calculation. These are closer to the low rating end than to components at A or above, so the distribution of rating outcomes is strongly asymmetric.

Risk Assessment Results – notional basis

The distribution of credit rating outcomes generated by simulation is shown as a fan chart below:

SPT credit rating including external risk



The central path (the median) is shown as a dark line. Using Moody's methodology, the path commences at an A3 rating and retains this level for the period despite decreasing in the years of peak investment. At the median position we are therefore forecasting we will maintain an investment grade-credit rating consistent with the allowed cost of debt.

However as indicated in the graph above, our modeling predicts that there is a prospect that the overall rating will decline across the period to a rating of 9.00 (Baa2) for the final years. This indicates that the current parameters may lead to an outcome, at a low probability, which would see the rating for SPT that is inconsistent with the CoD index as explained in the sections above. We have also undertaken this analysis using a CoE of 4.3% with the results showing a higher probability of a non compliant investment grade of Baa2 throughout the period and even the possibility of a non investment grade rating of Ba1. Further analysis is contained within the Financeability section of our Finance annex, **Annex 25: Finance**.

Conclusion

In summary, we have demonstrated by this risk assessment that our plan, and in particular a notional gearing of 60% should ensure a business sufficiently securely funded that the normal operation of RIIO-T2 incentives is unlikely to lead to financial distress when coupled with adverse shocks from external risks.

A breakdown of Factors 1–3 is contained within the Financeability section of our Finance annex, **Annex 25: Finance**.



Ofgem Deterministic analysis

We have also undertaken the prescribed deterministic analysis of financeability for the notional company to demonstrate the movement in our credit ratios and the overall credit rating per Moody's methodology set out earlier. The seven scenarios used are listed in the table below:

Notional company with Ofgem's draft assumptions

Key Credit Metrics	Capex to RAV (%)	AICR (x)	Net Debt to Closing RAV (%)	FFO/ Net Debt (%)	RCF/ Net Debt (%)	Overall Rating
Static Values	10.06	1.47	61.38	10.85	8.88	Baa1
Interest Rate +1%	10.06	1.49	61.10	11.09	9.12	A3
Interest Rate -1%	10.06	1.45	61.67	10.61	8.66	Baa1
CPIH +1%	10.06	1.51	60.35	11.04	9.02	A3
CPIH -1%	10.06	1.44	62.98	10.67	8.76	Baa1
RPI-CPIH wedge +.5%	10.06	1.46	62.06	10.75	8.82	Baa1
RPI-CPIH wedge -.5%	10.06	1.49	60.77	10.94	8.95	Baa1
Totex +10%	11.00	1.41	63.37	10.15	8.25	Baa1
Totex -10%	9.11	1.54	59.92	11.64	9.60	A3
RoRE (through incentives) +2%	10.06	1.92	59.67	12.97	10.90	A3
RoRE (through incentives) -2%	10.06	1.05	64.31	8.94	7.07	Baa2
Proportion of inflation linked debt +5%	10.06	1.52	61.38	10.85	8.88	Baa1
Proportion of inflation linked debt -5%	10.06	1.43	61.38	10.85	8.88	Baa1
No RoRE Out-performance	10.06	1.37	61.97	10.35	8.41	Baa1

Our analysis indicates that after testing against these potential scenarios, the overall rating for SP Transmission remains consistent with the base case static view of Baa1 in most cases. However that does not mean that these scenarios do not impact the individual ratios and the strength of the overall rating. As explained in the previous section, none of the individual ratios above achieve a rating of A3 or above in our base scenario.

Taking each scenario at a time we compare the results to the main credit agencies guidance:

Interest Rate scenario: the impact on revenues (especially return & tax) and movements in Net debt (Interest payments due) as a result of interest rate movements. A move of 1% downward would result in slight weakening of all ratios however all still remain above the Ba (Investment grade) with the exception of the FFO/Net Debt as in the base case. The converse is true for the 1% reduction therefore it can be shown that the current plan is relatively resistant to the risk of small interest rate movements.

CPIH scenario: measures the impact to a company's net debt and cash flows based on movements in the inflation rate (Primarily the Interest & tax payments), The scenario results in slight movements in all ratios but the +1% view results in a higher overall rating due to the improvement in the FFO/Net debt.

RPI-CPIH Wedge: tests the impact of a divergence in the RPI-CPIH inflation rates by flexing the CPIH rate against a constant RPI rate. Therefore an increase in the wedge of 0.5% would be the same as decreasing the CPIH rate by 0.5%. Therefore this has a similar impact to the CPIH scenarios above.

Totex scenario: the impact is more stark as all ratios will be impacted by movements in expenditure. For 10% underperformance, all ratios weaken against the base view due to the fact not all additional expenditure will be funded through the sharing factor mechanism. The FFO ratio, for example, moves further below the Ba threshold (Investment grade) with both the AICR and RCF ratio's moving closer to this threshold. For a 10% outperformance, all ratio's improve versus the base case as expected, due to the additional revenue provided via the sharing factor mechanism. Overall our plan would remain financeable under these scenarios.

RoRE scenario: we can see the greatest movement in ratios from our base position. All ratios improve under the 2% outperformance scenario with most pushing towards the A3 threshold, for example the AICR due to additional earned revenues. However for the 2% underperformance inverse is true as the reduction in revenues results in AICR and RCF moving towards the Ba threshold and the FFO ratio actually no longer being investment grade. This pushes the overall company rating into Baa2 which is one notch lower than in the base case.

ILD Scenario: Finally, the inflation-linked debt scenario measures the impact of a movement of $\pm 5\%$ on the base assumption of 25% of company debt of which the interest related payment is linked to inflation. The only real impact of this is observed via the AICR which weakens with any decrease in the proportion of inflation linked debt. We do not believe this scenario is very relevant for SP Transmission as we currently do not have any inflation linked debt and are not forecasting for this to change.

Finally the no RoRE outperformance in scenario shows overall weaker ratio's due to the lower CoE (4.3%). This results in both the AICR & FFO/ Net Debt representing non investment grade (Ba).

After reviewing the impact of these scenarios our conclusion is in line with those from our own scenario modelling above, in that our overall plan is sufficiently securely funded that it can absorb potential external shocks and at a notional gearing of 60% with exception of the scenario detailed on [page 186 "Impact of Connection Uncertainty Mechanism"](#). The proposed RIIO-T2 incentives mechanisms are unlikely to lead to financial distress.

Further details can be found in the Financeability section of our Finance annex **Annex 25: Finance**.



Evolution of the Regulatory Asset Value (RAV)

Below we set out our business plan assumptions which inform the evolution of the RAV. In all cases our assumptions are consistent with RIIO principles, and fully adhere to Ofgem's strategy decisions.

The forecast RAV table below reflects the impact of the forecast total expenditure, regulatory capitalisation assumption, and regulatory asset lives amortisation assumption which are explained below.

Growth in the RAV through RIIO-T1 is evident, increasing from £1.6bn to £2.6bn – an increase of 61% compared to the forecast increase over RIIO-T2 of 11% to £2.9bn.

RIIO-T1 forecast RAV and forecast RIIO-T2 RAV
£m (2018/19 Prices)

	RIIO-T1		RIIO-T2				
	Yr1*	Yr8	Yr1	Yr2	Yr3	Yr4	Yr5
Closing RAV	1,625	2,619	2,716	2,820	2,880	2,895	2,918
RAV Growth	61%		11%				

*Yr1 represents the opening RAV for RIIO-T1

Total expenditure and capitalisation

Our total expenditure (Totex) included the categories prescribed by Ofgem. These are mainly direct expenditure, non-system capex and indirect costs. Totex does not include business rates or pension deficit funding. Within our business plan a fixed 85% of totex is allocated to the RAV for SP Transmission which is consistent with Ofgem's guidance and reflects our forecast annual statutory capitalisation.

We calculated totex with reference to the expenditure projections over the RIIO-T2 period and applying an asset life threshold to distinguish between 'slow' and 'fast money'. This compares with 90% in the RIIO-1 period which saw unprecedented levels of capital investment in our network.

Asset lives and depreciation

Consistent with Ofgem guidance, our base assumption is to model regulatory depreciation using average economic asset lives of 45 years for new assets with straight line depreciation.

Assets existing at 31 March 2013 continue to be depreciated over 20 years, consistent with Ofgem's decision as set out in the March 2011 RIIO-T1 Strategy. During the RIIO-1 period, asset lives increase linearly from 20 years in 2012/13 to 45 in 2020/21.

Our plan does not seek to adjust asset lives as a source of financeability adjustments. This preserves the intended equitable inter-generational amortisation of the RAV.

In the longer term, a notional capitalisation rate which differs from the actual capitalisation policy can lead to an accounting mis-match. As a result, we prefer not to use the capitalisation rate as a financeability lever.

Shareholder remuneration

We aim to enhance shareholder remuneration by leading the sustainable creation of social, economic and environmental value for consumers, network users and wider stakeholders, including our shareholders and communities, in the area we do business and for Britain as a whole.

We aim to equitably compensate all groups that contribute to the success of our work. To this end, we consider our contribution to social return, employment and wealth for society when we're making investment decisions.

Our dividend policy is based on the principle all parties must share in success. This means consumers benefiting from lower bills and better services, while investors earn a reasonable return.

We are of the view that a dividend yield of 4.0% on the equity proportion of the RAV is more appropriate. This is lower than our assumption at TPCR4 and RIIO-T1, which was 5%.

Comparative dividend yield

Company	Dividend yield
National Grid	5.8%
SSE	8.8%
Penon	5.5%
Severn Trent	4.7%
United Utilities	5.0%
Average	6.0%

Observed dividend yields for UK networks companies are higher than our assumption. Adjusting for the current high yield of SSE, the average is 5.25%.

We believe our dividend assumption of 4% is sustainable, and compatible with the maintenance of our financial strength. We propose that it's also prudent when compared to companies with a similar business profile.

In determining SP Transmission's dividend policy we have taken into consideration Ofgem's proposal of 3.0% for a notional company, that is the basis of the modelling in this section. However, we consider this to be materially below the level investors expect from the sector.

Through our parent companies we maintain the flexibility to adjust the level of dividend we pay, and the amount of new equity required to support our long-term investment strategy.

RIIO-T1 is notable for the unprecedented level of investment in the transmission infrastructure – we were able to achieve this thanks to an equity injection of £185m by our parent company to support this period of investment.

Financial Policies

Pensions

Our business plans fully reflect Ofgem's pensions methodology as set out in various documents and consultations since 2009.

Our pension costs are calculated on the basis of the decisions set out in section 7 of the RIIO-2 Sector Specific Methodology Decision, Finance Annex (24 May 2019).

Established deficit

For the ScottishPower Pension Scheme (SPPS) a roll-forward valuation to 31 March 2016 has been produced from the previous formal triennial valuation dated 31 March 2015 reflecting the requirements set out in the Decision on Ofgem's policy for funding Pension Scheme Established Deficits (7 April 2017).

We have used the method set out in the Pension Deficit Allocation Methodology (PDAM) to determine the split of liabilities and assets between pre (Established) and post (Incremental) cut-off date of 31 March 2012.

The funding allowance of the regulatory portion of the established deficit reflects a 0.2% discount rate spread evenly over 8.6 years from 1 April 2016. The pension principles are subject to ongoing review by Ofgem to make sure they continue to meet the interests of current and future consumers.

Established Deficit Annual allowance	SPPS
Regulatory fraction	4.8%
SP Transmission annual allowance 8.6 years from 1 April 2016 at discount rate of 0.2% (18/19 prices)	£3.3m p.a.

Incremental deficit

The incremental deficit is included in totex, and benchmarked as part of total totex. Consistent with the calculation of the established deficit, this has been calculated based on a roll forward of the 31 March 2015 triennial valuation to 31 March 2016.

Incremental Deficit Annual Payment	SPT
Incremental deficit payments for 18/19	£0.5m p.a.

Pension scheme administration costs and Pension Protection Fund (PPF) levy costs

These costs are reflected in our plan, but are relatively small in value. Details will be provided in **Annex 25: Finance**.

Ongoing future service costs – Defined benefit and contribution schemes

Our defined benefit pension schemes closed to new members in 2006. The contribution rates for future service accrual for 2019/20 (based on the 31 March 2018 triennial valuation) are shown below:

Ongoing defined benefit scheme Excluding expenses (%)		
	SPPS	Manweb scheme
Pension and death benefits	56%	53.4%
Employee	5.0%	5.5%
Employer	51.0%	47.9%

Defined benefit schemes employer contribution rates Excluding expenses (%)

	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
SPPS	48%	51%	51%	51%	55%	55%	55%	60%
Manweb	45%	48%	48%	48%	51%	51%	51%	56%

Defined contribution scheme employer contribution rates Excluding expenses (%)

	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Average	9.9%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%

Tax transparency and beyond

The Ofgem policy decisions effecting taxation are in the main modelled automatically in the Price Control Financial Model. Our business plans fully reflect all policies that are well established and understood. **Further detail on taxation payments is provided in Annex 25: Finance.**

We feel very strongly that it's important for us to not simply respect the letter of the UK's tax laws, but to be completely transparent in how we are taxed.

The two main tenets of our tax policy are:

Respect legislation – we stay strictly within the boundaries of law

No artificial structures – we take a conservative and prudent approach to planning.

Our ultimate parent company, Iberdrola S.A., has published a full report on tax transparency and the company's commitment to society.

CSR Europe, the leading European business network for Corporate Sustainability and Responsibility, released a Blueprint on Responsible and Transparent Tax behaviour and recently featured Iberdrola, endorsing its approach.

The CSR Report can be found online here:
<https://bit.ly/2KGoXjF>

The Iberdrola Report can be found online here:
<https://bit.ly/2Ngktmd>

As the energy transition evolves at pace, maintaining our strong track record of trust and transparency with our consumers, network users and wider stakeholders is vital. Retaining this level of trust and transparency, coupled with our continued dedication to **keeping network users and consumers at the heart of our decisions**, have been key factors behind our ambitious Business Plan.

We have challenged ourselves and truly stretched our efficiency targets, to ensure that we achieve the best outcome for all.

To achieve this, we placed a comprehensive assurance and governance framework at the centre of our business plan development process – with full support of our board throughout, and continued engagement with consumers, network users and wider stakeholders.

Through utilising an engineering strategy we have retained our blueprint of ‘*doing the right thing*’, which follows on from our current RIIO-T1 philosophy. Building our projects “bottom up” and layering these to incorporate the recommendations of industry experts, stakeholder input and lessons learned from our RIIO-T1 experiences, have been key in the delivery of our business plan.

The thinking behind the framework

In this section, we explain how our robust assurance and governance framework provides confidence in our business plan by:

Building on an established framework

Responding to extensive challenge from a team of internal and external experts, with continued engagement from our board

Underpinning everything with robust and accurate evidence.

Professor Dame Lesley Anne Glover
Independent Non-Executive Member, SPENH Board

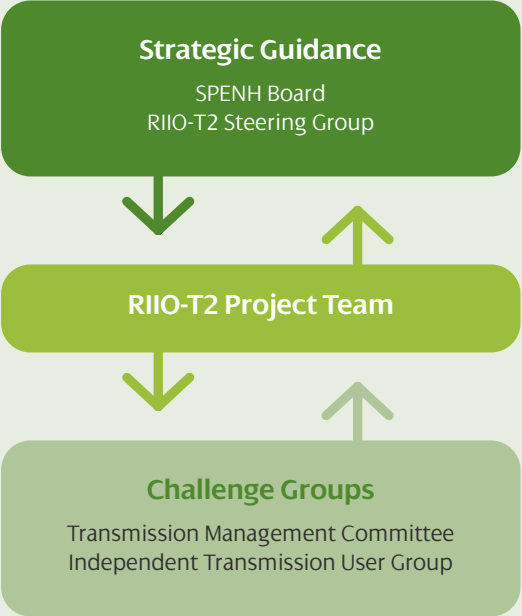
“As a board, the guiding principle in all of our reviews has been to make sure our RIIO-T2 Business Plan puts consumers first and delivers value for money, ensuring that we maintain a resilient network that prepares for the transition to Net Zero. The ongoing engagement we have had with the project team throughout the business plan development process gives me the confidence that our business plan achieves all of this and importantly, will allow us to take a leading role in the delivery of a Net Zero future.”

Governance and Assurance



Governance

An overview of our governance framework:



Ms Wendy Barnes
Independent Non-Executive Member, SPENH Board

"It is critical, as Sufficiently Independent Directors and as a Board, that we are guided by our stakeholders to ensure that we deliver a truly meaningful plan. It is heartening to see our stakeholders directly influencing the shape of the business plan. This level of transparency and unprecedented access to information provides me with confidence that our plan will meet their requirements."

For further information on the involvement of the SPENH Board, please refer to our **Board Assurance Statement**.



Strategic Guidance

Board of Directors of SP Energy Networks Holdings Limited (SPENH board)
The SPENH board has overall responsibility for the long-term strategy and direction of our RIIO-T2 business plan. The board seeks to ensure the company continues to operate responsibly and ethically, while delivering success for consumers, stakeholders and shareholders.

The SPENH Board is comprised of eight directors, three of which are independent.

Sr Armando Martínez	Chairman	Non-Executive
Sr Antonio Espinosa de los Monteros	Member	Non-Executive
Sr José Izaguirre Nazar	Member	Non-Executive
Mr Frank Mitchell	CEO	Executive
Mr Scott Mathieson	Member	Executive
Ms Wendy Barnes	Member	Independent, Non-Executive
Ms Alison McGregor	Member	Independent, Non-Executive
Professor Dame Lesley Anne Glover	Member	Independent, Non-Executive

Our business plan has been developed using a “bottom-up” approach, shaped by our extensive stakeholder engagement. The SPENH board, including our Sufficiently Independent Directors (SIDs), has been fully engaged throughout this development process. Updates on RIIO-T2 are provided at our regular SPENH board sessions and four dedicated workshops have been held in 2019 to focus on RIIO-T2. The board has also reviewed and provided feedback on each draft of our plan. The dedicated workshops have been effective in providing the SPENH board members the opportunity to challenge our RIIO-T2 project work stream leads on all areas of our business plan. In quarter 2 of 2019, strong challenge was received from the SPENH board on the Totex element of our business plan. This led to a detailed exercise being carried out by the project team which justified to the board, including our SIDs, our ambitious and efficient business plan. This strong level of engagement with the SPENH board has continued throughout the development process and has provided them with the reassurance that our business plan is underpinned by a comprehensive assurance framework and can be fully justified.

RIIO-T2 Steering Group
Chaired by Frank Mitchell, the CEO of SP Energy Networks, the project steering group, set up specifically for RIIO-T2, comprised a representation of the executive team from across our business including Iberdrola and Corporate and met on a bi-monthly basis.

The purpose of the steering group was to provide direction and governance at a senior executive level to the work being undertaken by the project team. This helped to shape our business plan outputs and create a business plan consistent with our purpose. As part of our commitment to full governance, all of our steering groups are run to a set agenda, with minutes of meetings captured and action logs in place.

Our RIIO-T2 project team

Our dedicated, highly experienced team is led by **Programme Director, Jim Sutherland**.

Jim oversees a team of work stream leads, each with considerable experience in their areas of expertise, aligned to the price review process. Each lead has their own team of highly skilled professionals.

This layered approach allows us to cover each area in detail, to ultimately create a robust business plan.

Internal Governance

Our Programme Plan

Once the team was established, our first step was to create a programme plan. Through continued engagement with our consumers and stakeholders to understand their needs, as well as taking guidance from the relevant RIIO-2 methodology and guidelines, we made sure we had the right deliverables identified to deliver an ambitious business plan in line with all internal and external requirements.

Programme Management

The programme plan is a live document and undergoes multiple iterations; this is managed by our Programme Management Office (PMO).

The PMO is also the hub for overseeing our Internal Governance Process, taking charge of rigid reporting timescales and standards. Through this robust planning and reporting process, we established key timelines and communicated them to our stakeholders, including the Independent Transmission User Group. This gave them sight of when key milestones were due, and any necessary input required or outputs they should expect.

We hold monthly meetings with the RIIO-T2 programme director and work stream leads to monitor progress and risk registers. These sessions ensure transparency and collaboration to resolve project-wide issues. Our RIIO-T2 risk register also feeds into SP Energy Network's overall Enterprise Risk Reporting framework.

For further information on the RIIO-T2 project team members please refer to **Annex 17: RIIO-T2 Project Team**.

You can find further details in **Annex 5: Co-Creating the plan with our Stakeholders**.



Challenging the business plan

The right level of challenge makes sure we are aligned with our corporate values and our commitment to delivering what our stakeholders want.

As we've prepared this plan, our internal assurance activities were supported by challenge through two key groups: the Transmission Management Committee (TMC) and the Independent Transmission User Group:

Transmission Management Committee

This group includes our key internal stakeholders, senior leaders and experts involved in running and supporting the Transmission Business and people at the heart of preparing the business for RIIO-T2.

The Committee is an established "Business As Usual" internal forum and, for the purpose of RIIO-T2, is used for collaboratively supporting and challenging the development of our business plan. The key objective: make sure all decisions are fully considered and robust.

Here are just two examples of how the committee's work has changed our business plan:

Deliverability; the TMC challenged that the risk of deliverability against the system constraints was higher than acceptable regarding lead and development time frames. Our response: re-sequence our portfolio of projects, reducing the risk and smoothing the investment profile.

Supply Chain; the TMC challenged the sustainability of the supply chain. As a result, expert analysis was carried out to develop and evidence our supply chain strategy.

The committee meets monthly and, as part of our commitment to full governance, has Terms of Reference in place, with meeting minutes and actions captured.

Independent Transmission User Group

This group of experts represents the increasingly broad needs and requirements of our multiple network users, consumers and stakeholders and has therefore been paramount to informing our RIIO-T2 investment decisions.

Our SIDs have been in contact with Charles Hendry, the chair of the User Group and have access to the group if needed. We have provided the User Group with an 'access-all-areas' pass to our Transmission business, both in terms of our staff and physical network infrastructure.

The User Group met every month to review the phased development of our plans with the senior managers and teams responsible for producing each chapter. Having the User Group at every step of the process has been invaluable to the co-creation of our plan. We have made incremental changes based on their input and challenge throughout the process. As an example, the User Group asked us to carry out additional analysis on the calculations of the boundary requirements between ourselves and SHETL and ourselves and NGET by 2030, based on all four future scenarios. The analysis clearly demonstrated to the User Group the need for large reinforcements to facilitate the power flows through our network area, as described in the Load Related Expenditure section of our business plan.

We recorded any questions or challenges raised by the User Group on a Challenge Log which can be reviewed in **Annex 5: Co-creating the plan with our Stakeholders** alongside our responses. The User Group also made direct comments on our draft business plan documents. All challenges and feedback have been responded to by the relevant senior manager of the RIIO-T2 team – along with related comments, actions and amendments.

Assurance

It's important our business plan is free from mistakes and inaccuracies, earning the trust of our consumers, network users and wider stakeholders. To ensure it is, we have worked hard to build on our already robust internal assurance framework.

Integrated Management System

We have an Integrated Management System (IMS) which consists of four international standards. These are Asset Management ISO55001, Quality Management ISO9001, Environmental Management ISO14001 and Health and Safety OHSAS 18001. The IMS is the way in which we organise and manage our business in order to achieve our business goal and objectives while ensuring we care for the environment, our people, our customers and network integrity. These standards define the guidelines that we must follow to enable us to be compliant to meet these requirements. We are independently audited against the requirements every three years and were awarded accreditation again in 2018. In 2019, the external auditors commented that we were seen to be in the "upper tier" compared to other organisations from a system control and structure perspective.

Ofgem's Data Assurance Guidance

Our existing assurance framework has been developed over the years to ensure strict adherence to Ofgem's Data Assurance Guidance (DAG) – we regularly receive positive feedback from Ofgem on how we've applied the guidance.*

DAG sets out the following steps in relation to every submission made to Ofgem:

A risk assessment for each submission, following a defined risk assessment methodology, and the preparation of a method statement explaining how the submission is prepared.

Second person checks and senior manager reviews of every submission prior to being sent to Ofgem.

The determination and completion of any additional assurance activities for those submissions assessed as high or critical risk, prior to submission, from a pre-defined list.

An annual report on the results of the risk assessment and assurance activities, providing confidence in the accuracy of content.

An alternative way to assess risk

In order to enhance this framework further we developed a holistic approach to assessing risk with our Assurance team, adding a strategic view of business impact by using our Enterprise Risk Reporting methodology.

Combining this with Ofgem's existing DAG methodology lets us consider risks from a range of perspectives¹.

It was important for us that this assessment was carried out independently, giving us confidence that the right level of assurance was defined for each aspect, and the right provider engaged to deliver the assurance. Therefore, we worked with independent external experts, Complete Strategy, to support us. They have extensive experience in regulated industries and proven success in the production of high standard submissions with large companies in the utility sector.

To carry out the appropriate risk assessment, our business plan was broken down into several key components, referred to as "building blocks".

Each building block was risk assessed using both methodologies. The assurance activities were deployed based on risk score: the higher the score the more extensive the assurance. Where there was a disparity between the DAG and Enterprise Risk Reporting methodology score, the level of assurance applied was based on the highest score, providing the greatest amount of coverage across the plan.

Ms Alison McGregor

Independent Non-Executive Member, SPENH Board

"I am confident that we have achieved a robust and deliverable plan, which is underpinned by a comprehensive assurance and governance framework. The ongoing engagement we have had with the project team via the Board has provided reassurance that this framework has been adhered to and the plan has been subject to extensive challenge and review from a number of independent specialists."

* Feedback received verbally from Ofgem and can be evidenced in our feedback letter on our Network Data Assurance Report May 2019.

¹ The DAG methodology considers risks of providing inaccurate or incomplete data submissions and how this impacts on customers; competition; financial; and comparative efficiency.

The Enterprise Risk Reporting methodology considers risks to SPEN associated with the investment options and how this impacts on profitability; health and safety; operational performance including impact on customers; environment; and stakeholder reputation.



Three Lines of Defence Assurance Model

We use a ‘Three Lines of Defence’ model for deploying our assurance activities.

First line of defence

This represents the minimum DAG activities: risk assessments and method statements are in place followed by second person and senior manager review.

This is applied to all sections of the business plan regardless of risk score, across both our data tables and narrative, with method statements in place for both.

This consists of:

- Risk assessment** – *Applied to full content*
- Method statement** – *Applied to full content*
- Second person** – *Applied to full content*
- Senior manager** – *Applied to full content*

Second line of defence

For those aspects of the plan attaining a risk score of High or Critical we applied additional assurance activities;

- Challenge from independent internal and/or external experts** – *Applied based on risk*
- Challenge from our internal Assurance Team** – *Applied based on risk*
- Challenge and sign-off by our directorate, CEO and Sufficiently Independent Directors via our Board** – *Applied to full content*

Internal / External Experts

We made use of internal experts in various teams throughout our organisation, including colleagues in our Engineering Design and Standards teams and our Control Room. These teams, who are independent from the RIIO-T2 project team, provided challenge on a number of aspects ranging from validation of the needs case and detailed engineering designs to ensuring that our proposals were “deliverable” from a systems access, resource and supply chain perspective.

All of our investment proposals were challenged via our System Review Group. The System Review Group, which is independent from the RIIO-T2 project team, is a long established internal forum, comprising engineering experts. The group meet on a monthly basis to review the content of investment proposals, from a technical and engineering perspective, in order to approve the concept and technical design. All of our investment proposals are submitted to this forum for scrutiny and refinement as required.

We wanted to make sure that the independent external parties we used to challenge the plan were recognised as experts in their field, ensuring both quality and credibility of the assurance provided. The detailed level of scrutiny provided by our independent external experts gives us confidence that we have fully considered all options and that our submission is based on factual evidence. All recommendations and challenges made as a result of these assurance activities were fully explored by the project team and are tracked centrally to ensure all are addressed. Our submission has been amended as appropriate, improving its overall reliability.

Our SIDs were presented with the option to meet with our external assurance providers if needed and they were given access to all final reports. As an example, details of five of our key independent external parties who have carried out assurance activities, the purpose of engagement and a summary of the key outputs can be viewed in the Table overleaf. Details of the remaining external parties used, along with their final reports produced, can be viewed in **Annex 23: Our Assurance Framework**.

Using our SharePoint site, we have an assurance library in place for collating our assurance activities. By creating and updating this library, we now have quick access to crucial information for the above detailed assurance and audit purposes.

Internal Assurance Team

We also work with our internal Assurance team, who have been involved from the outset providing guidance on our approach and to provide independent assurance on our data tables, on a sample basis.

The first data audit was completed in Quarter 2 of 2018 on the first draft of our data tables. This looked at Load and Non-load expenditure tables and several other cost tables. At this stage, improvement opportunities over the control of the data tables were identified. Further iterations of the population of the tables have since been completed and a further data audit carried out in quarter 1 of 2019 on the same tables showed that the required controls were in place to ensure an accurate submission.

The adequacy of the second and senior manager challenges on the data tables, and the method statement content, were also reviewed to ensure that these were to the required standard.

Further data audits have been carried out by our internal Assurance team, using a risk based approach. Tables from the Data Tables and NARM notebooks were sample tested, as was the approach to cost benefit analyses. All findings have been addressed for this final submission and more detail is reported in our irregular submission report in line with DAG requirements.


Review and Sign-off

We are applying various additional layers of sign off, aligned to those in the DAG to ensure a rigorous review process for our submission. We are engaging the relevant directors, CEO and the full Board including our SIDs, to review, challenge, and sign-off all sections of the plan using formal certificates to be clear on accountability.

You can find further details on how we review our investment proposals in **Annex 13: Investment Process**.



Refer to **Annex 23: Our Assurance Framework** for further information on all external assurance activities undertaken.



Independent External Party	Purpose of our engagement	Output
Arcadis <i>Arcadis is a leading global design and consultancy firm for natural and built assets – with an established international track record of delivering technical and costing support to energy network companies for regulatory submissions.</i>	To critically review the scope and costs for our RII0-T2 plan.	<p>Arcadis carried out a review which covered over 50% of the plan's capex and tested our assumptions applied to the wider engineering plan. The review carried out took the form of a "deep dive" into the projects, in order to examine the complexity and wide range of cost drivers that are characteristic of transmission projects. The project specific engineering design that was undertaken for each project was tested by Arcadis in order to understand the scope of work in detail; this ensured a like-for-like comparison with their benchmark data.</p> <p>Feedback from Arcadis was that costs for core activities in our plan are efficient relative to benchmarks in most areas but they identified a small number of areas that we needed to review. We undertook a review of the schemes and extrapolated the findings to all relevant projects in our plan, resulting in cost reductions of £11m, 1% reduction in our planned load and non-load capital expenditure.</p>
Complete Strategy <i>Complete Strategy have extensive experience advising companies during price control processes in regulated industries.</i>	Advise on the regulatory and political context for our plan and make sure our submission meets the needs of the regulator. Support development of our assurance framework.	<p>Developed a list of Ofgem's requirements for our plan – then validated and provided feedback on our draft submission. Updates were made on the back of this, and we are confident that our plan is fully compliant with Ofgem guidelines.</p> <p>Conducted an independent risk assessment of our business plan building blocks using DAG and Enterprise Risk Reporting methodology. The output of this assessment became the framework for identifying the level of assurance activities required.</p>
Elias Ghannoum <i>World renowned expert with over 48 years' experience in every aspect of Overhead Transmission Lines.</i>	Elias reviewed the robustness of the engineering methodology we used to produce the input required by the CBRM Tool for overhead lines.	<p>Elias validated our methodology – with a small number of recommendations made. Changes made as a result include:</p> <p>Information on historical defects have been collected and incorporated into the plan as part of the evidence to support intervention.</p> <p>Updated our innovation plan with a new approach for site specific ratings of current environmental areas and development of a wind and corrosion map to help predict elements of fatigue and corrosion rates on OHL components across the OHL SPT Region.</p>
Ramboll <i>A leading multi-disciplinary engineering company experienced in the delivery of major projects providing specific technical advisory, engineering design and regulatory services.</i>	Engaged as an external technical consultant to provide independent technical review of proposals for 19 projects – and confirm we have provided sufficient evidence within the proposal documentation that we adequately considered alternative options and adequately justified the technical requirements for the selected option.	<p>The major schemes reviewed by Ramboll withstood technical challenge, with no significant issues identified. A number of minor recommendations were taken on board. Changes made include:</p> <p>Detailed site surveys for non-lead assets now available which are referenced in the Engineering justification papers submitted to Ofgem.</p> <p>Introduction of an executive summary into the SP Energy Networks internal approvals process documents – summarising the needs case, solution and options considered. This has also been introduced to the engineering justification papers requested by Ofgem.</p>
Sia Partners <i>A consultancy that works closely with Ofgem on designing new incentives. Sia designed the BMCS Incentive and the Social Obligations Incentive.</i>	To review the stakeholder engagement sections of our draft business plan against Ofgem's guidance and a model of best practice.	A number of recommendations were made by Sia Partners on the stakeholder engagement sections. All of these recommendations were addressed during a full update of the relevant sections of the plan.



Refer to **Annex 23: Our Assurance Framework** for further information on all external assurance activities undertaken.

Third line of defence

ScottishPower has a well-established Internal Audit team which is independent from SPEN. The annual audit plan for SPEN focuses on the main risks of the business including regulation and is approved by the SP Energy Networks Holding Limited Audit and Compliance Committee. Internal Audit has carried out audits related to (a) governance of the internal RIIO-T2 project programme and (b) RIIO-T2 business plan assurance.

Example of critical risk:

Overhead Lines – cases, optioneering, methodology

Overhead lines are a significant part of our investment plan, around £219.7m in spend.

Our plan is based on condition data interpretation which is complex and requires a high degree of engineering knowledge. It is critical that our strategy is robust.

DAG – high

The value of totex covered brings DAG impact score to high.

The required approach has changed since RIIO-T1, and the need to draw information from multiple sources, means the DAG probability score is also high.

Enterprise Risk Evaluation Methodology – critical

The amount of totex covered by this element is enough to make it a critical risk.

Adjustments to our allowance by Ofgem would also impact our operational performance, if we are unable to deliver the most efficient set of work, although this is not expected to reach the point where safety is compromised.

Assurance

Second person and senior manager reviews. Challenge and sign-off by our directorate, CEO and Sufficiently Independent Directors via our Board.

External assurance applied via Elias Ghanoum, a 'world-renowned' expert with over 48 years experience in Overhead Transmission Lines (Engineering, Design, Specifications, Construction, and Failure analyses).

SP internal audit of external assurance process.

Example Assurance feedback

Fatigue at spacer locations should be considered for failure ahead of conductor tension.

Recommended that focus should not be only on CBRM and should review network at higher level to profile works.

Actions taken

Increased minor works programme aiming at spacer replacement reducing the replacement of conductor.

Long-term RIIO-T2 / RIIO-T3 plan has been produced.

Assurance of our plan as a whole

We wanted to make sure the plan is assured as a whole as well as by individual component. As part of this ambition, we reviewed our full draft business plan with public organisations Citizens Advice Scotland and Community Energy Scotland to challenge whether we were meeting the needs of those they represented. This assurance activity also extended to Scottish Government to review and challenge whether our proposals will enable them to follow through on their policy commitments.

Another key motivator for assurance of the plan as a whole was to ensure that we were providing the information our regulator has requested. Working with Complete Strategy, we developed a list of the requirements and expectations set out by Ofgem through their various consultations and business plan guidance document. The content of our business plan was developed to ensure that each of these requirements and expectations were addressed. This was an iterative process, with Complete Strategy carrying out further assurance work to review our draft business plan against this defined list. All feedback points received from the multiple sources of review of our plan are recorded and tracked. Our SIDs have reviewed this Tracker and are comfortable that all comments have been addressed.

We are proud of the assurance framework we have implemented and are confident that it exceeds the expectations of our consumers, network users and wider stakeholders – giving them trust in our plan.

Sr Armando Martinez

Non-Executive Chairman, SPENH Board

"As chairman of the board, it is essential to me that we have provided a robust challenge to ensure that the plan is line with strategic direction, whilst delivering for our stakeholders and shareholders. I have been very impressed with the responses provided by the RIIO-T2 project team to the challenges and questions raised by the board."

Further information on the assurance provided by Elias Ghanoum can be viewed in **Annex 23: Our Assurance Framework**.



900MW

We will connect at least 900MW of renewable energy generation playing our part in facilitating the Scottish Government Net Zero target of 2045.

99.99998%

We will adapt our world-class, resilient network maintaining our outstanding track record of energy supplied for our customers.



1,600MVA

Our plan will deliver an additional 1,600MVA of boundary capacity, ensuring power can be moved around the country to meet the demand of our consumers and network users.

Equivalent to powering 1.5m homes and a reduction of 1.6Mt per annum of CO₂.



Saving consumers in constraint costs

£152m p.a.

9,700kg

Our Plan will avoid at least 9,700kg of SF₆ being added to our network during RIIO-T2.



158,000

We will meet the needs of our consumers and network users by ensuring sufficient network capacity for 158,000 electric vehicles that we expect to be operational in our network area by 2026.

The average annual cost to the domestic customer's bill to deliver our RIIO-T2 plan.

£0.92

Our efficient and ambitious plan minimises the impact on our customers' bills.



Increased monetised asset risk benefit by

£1.6bn

9.5%

Our RIIO-T2 plan is more efficient than RIIO-T1.

£1.375bn

Our investment to maintain our outstanding network reliability, delivering what our customers want and to facilitate Net Zero.

1.86Mt CO₂e p.a.

Our plan will deliver an overall CO₂e saving as we facilitate Net Zero.

Summary of our plan



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**SP ENERGY
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