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Scottish & Southern Electricity Networks

TRANSMISSION

# Emerging Thinking

Your Plan, Our Future: RIIO-T2

February 2019

# Summary of our thinking

## Our Customers' Priorities

Over the past 18 months, we have been consulting with our customers and stakeholders to understand what they want and expect from the energy system over the next decade.

We have heard strong views about the need for change in how we operate, and the need for us to be closer and more responsive to our customers and stakeholders. We have not heard a single common priority from across our stakeholders, but rather a wide range of views.

The key themes from the different stakeholder groups are:

### Bill payer

Reliable, Affordable, Sustainable

### Generator

Available, Affordable, Flexible

### High impact

Vulnerable Customers, Environmental Impact, Community Impact

### Everyone

Decarbonisation, Safe from Threats, Transparent

In this paper we explain how we have carefully considered these views, along with our analysis of the future of the energy system, to reach our emerging thinking on activities and costs from 1 April 2021 to 31 March 2026 (the RIIO-T2 period).

We are continuing to develop our thinking, in collaboration with our customers and stakeholders, over the course of 2019. Please let us know what you think about anything in this paper or anything you think we have missed. Our contact details are on the back page of this document.

## The north of Scotland is essential to enabling a sustainable GB energy system

- Renewable generation located in the north of Scotland will make further significant contributions to the decarbonisation of the wider GB electricity system and to the decarbonisation of heat and transport. We identify the potential for up to 7.5 GW of new renewable connections during RIIO-T2.
- Here the electricity system has significantly decarbonised and partially decentralised, the goal is now a whole energy system approach that focuses, in the first instance, on co-ordination with the electricity distribution network and incorporates energy efficiency, heat and transport.
- New environmental policies, developed in partnership with communities and statutory bodies, should mean increases in the environmental benefit of transmission infrastructure.

## Cost-effective investments can further improve network reliability and resilience

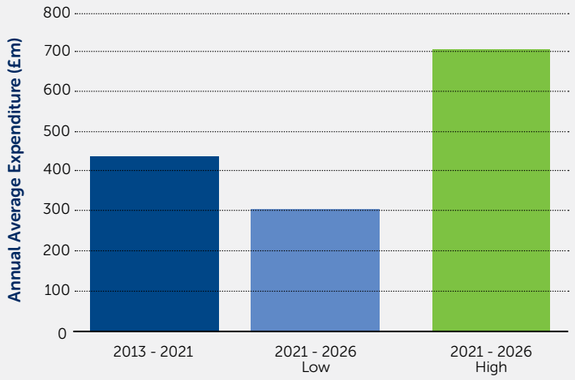
- Make cost effective interventions of around £720 million to achieve the goal of no interruptions for electricity customers due to transmission system faults.
- Adopting data and risk driven approaches to the operation and maintenance of the network, with expenditure to enable asset data gathering, analytical tools and new ways of working.
- Investment in systems to combat physical and cyber threats to network security.

## Getting connected can be more responsive to customers' changing needs

- The efficient cost of growing the network for new users - which could be up to £500 million each year - should demonstrably benefit all GB consumers being a balance of technical, social, environmental and economic impacts.
- As the sector and our network changes, all connected customers - including those connected at distribution level - should have regular design reviews to ensure their network access meets their needs.
- New technologies, such as decentralised grids, large-scale storage or marine generation, require new industry approaches that we can enable through collaborative trials and innovation.

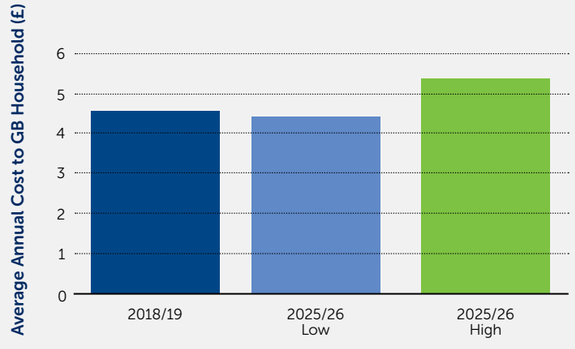
## Expenditure forecast

Customers' requirements from the north of Scotland transmission system between 2021 and 2026 are uncertain, and will depend on generation connections and future electricity demand. From our modelling, we estimate our annual total expenditure to be in the range of £300-700 million compared with £425 million pa on average between 2013 and 2021.




## Cost to GB households

The annual average annual electricity bill for a GB household is £557, of which we estimate around £4.48 is the cost of the north of Scotland transmission network. Based on our emerging thinking, we estimate that by 2025/26 this could change to between £4.28 and £5.36.




# About this paper

Scottish Hydro Electric Transmission plc (SHE Transmission)[i] is the owner of the high voltage electricity transmission network in the north of Scotland. With our sister company, Scottish Hydro Electric Power Distribution plc (SHEPD), the owner of the adjoining low voltage network, we are responsible for ensuring a safe, reliable supply of electricity to around 780,000 homes and businesses (Figure 1). We also provide grid access for over 7 GW of generation, contributing around one third of GB's renewable energy.

Electricity networks are natural monopolies - which means there is only one provider - that deliver an essential public service. Because of this, our activities are subject to strict regulation and oversight by the energy industry regulator.

Ofgem sets the rules for both how much we can charge and the standards of our service. Ofgem periodically resets these rules through a process known as the price control.

For SHE Transmission, our current price control ends on 31 March 2021 and Ofgem has started the process of setting our next control, called RIIO-T2, which will run for the following five years[ii]. As part of this process, we must submit a business plan that sets out and justifies all our proposed activities, expenditure and outcomes.

We will publish our final business plan in December 2019, and over the course of 2020 Ofgem will reach a decision on the price control settlement. This paper is intended to give an overview of our emerging thinking for our RIIO-T2 business plan.

Our emerging thinking is based on our understanding of what electricity customers, local communities and wider stakeholders in the north of Scotland and from across GB will want from the nation's energy networks in the first half of the next decade.

What we have heard, so far, is that the energy industry continues the transition towards a low carbon economy and that network companies should be working hard to make that transition happen smoothly and to the benefit of all households and businesses.

At the same time, the high levels of reliability in electricity supply should not be compromised and energy should be affordable. Our emerging thinking considers these themes, and what they might mean for the future of the north of Scotland transmission network[iii].

While we still have work to do over the coming year to develop the detail of this thinking, many stakeholders have told us that an early sight of our proposals would be helpful. We hope that this paper stimulates further discussion and insight that will inform and improve our final business plan.

## Share your views

We would welcome views on anything that is in this emerging thinking paper. In particular, we'd like to know:

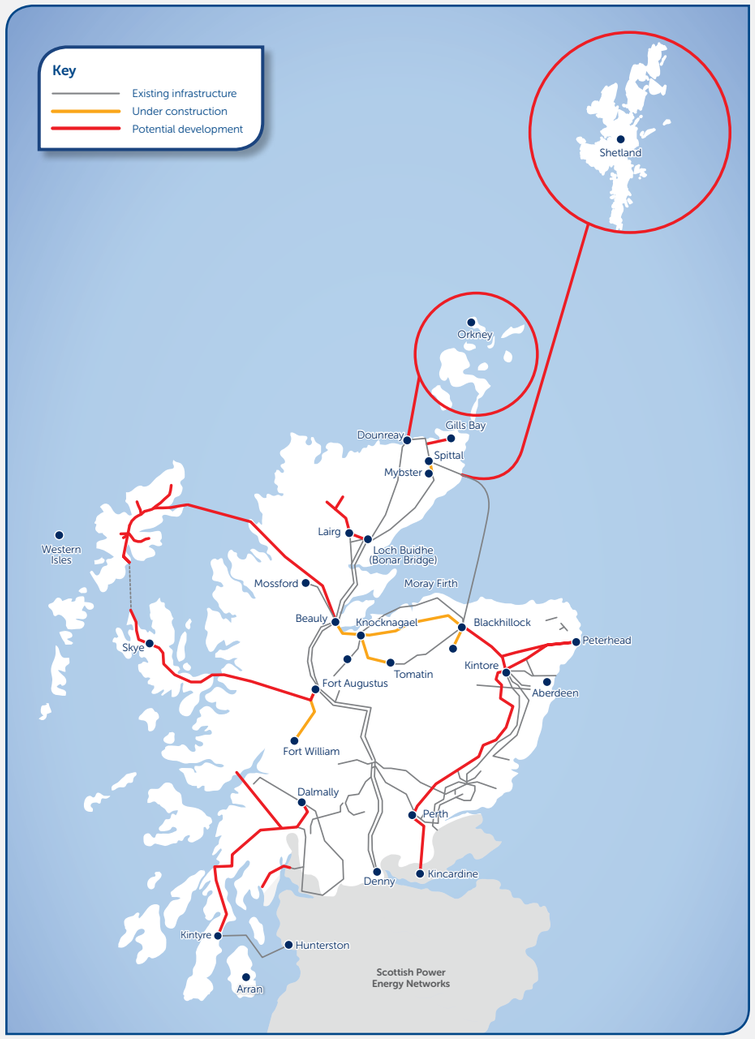
**1** Our thinking is based on what we have heard from stakeholders.
- Does this reflect your understanding of stakeholders' needs?
- Have we missed anything?
- What areas should we reconsider?

**2** Stakeholders have told us that there is no single priority for the RIIO-T2 period, but a need to consider network reliability, decarbonisation, the environment and affordability.
- Do you agree?
- Where do you think we should improve on current performance or stay the same?

Our contact details are on the back page of this document or you can respond through our website, where you can find out more about our RIIO-T2 planning. If you would prefer to meet to share your thoughts directly, then please get in touch.

We would welcome responses by 31 March. We will publish the first draft of our RIIO-T2 Business Plan for consultation in July 2019.

**Figure 1:** The north of Scotland electricity network, January 2019




### Connected Generation

| Thermal | Renewable Transmission | Renewable Distribution |
|---|---|---|
| 1.3 GW | 3.6 GW | 2.6 GW |

**Total** 7.5 GW

### Electricity Customers

**38%** Fuel poverty

**705,358** householders

**76%** Small Medium Enterprise

**74,206** businesses

### Cost

**Average annual GB household cost**

| | |
|---|---|
| SHE Transmission | £4 |
| Remaining GB Transmission | £33 |
| GB Distribution | £83 |
| Total electricity bill | £577 |

Ofgem data





[i] Scottish and Southern Electricity Networks (SSEN) Transmission, operating as Scottish Hydro Electric Transmission plc (SHE Transmission) under licence, owns and operates the transmission network across the north of Scotland including the Islands.
[ii] SHEPD's current price control runs until 31 March 2023. While this paper is primarily about SHE Transmission's RIIO-T2 business plan, SHEPD have been closely involved in the thinking.
[iii] All financial figures in this paper are in 2018/19 prices.

# The GB energy industry and the role of SHE Transmission

## Upgrading our energy system

The transition to cleaner economic growth is one of the Grand Challenges[1] of the UK Industrial Strategy[2]. In this context, being cleaner encompasses how all the nation's resources are used and the impact over the long term on our environment and economy.

Energy is used to heat, light, transport and power our homes and businesses (Figure 2); making that energy cleaner and greener is central to both the UK[3] and Scottish[4] governments' ambitions to deliver economic growth and decrease emissions.

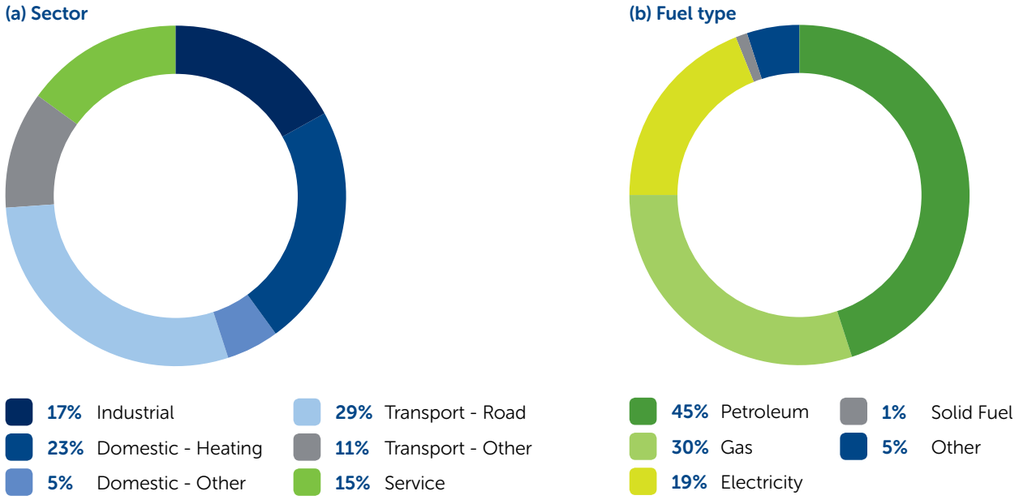
Considerable progress has been made over the past decade with the decarbonisation of the electricity generation sector. At the end of September 2018[5], the UK's renewable electricity generating capacity totalled 43.2 GW (of c.82 GW total generation) and, during that quarter, low carbon generators (including nuclear) accounted for 56% of electricity consumed.

This is a profound change from a decade earlier, when low carbon generation was only 22% of electricity used.

Looking forward to the next decade, there remains much to do to decarbonise gas (96% of use is for heating) and petroleum (86% of use is for transport). To achieve this, electrification of the heat and transport sectors is planned; see, for example, the Road to Zero Strategy[6], Switched on Scotland[7] and the Renewable Heat Incentive[8].

However, the Committee on Climate Change[9] advise that there are gaps in the policy proposals to achieve the fourth (2023-27) and fifth (2028-32) carbon budgets, including in the targets for low carbon electricity generation, and identifies viable options to strengthen existing policies.

**Figure 2:** UK use of energy in tonnes of oil equivalent (toe) by (a) Sector (b) Fuel type




**Source:** Energy consumption in the UK[10], published by BEIS in July 2018.





## The role of electricity networks

Electricity networks are the pathways that connect the sources of electricity (typically power stations) with the consumers of electricity. These networks are made up of overhead lines, underground or subsea cables, and substations that house electrical switches and transformers. Most of the GB electricity network, including the connections to homes and businesses, uses alternating current (AC) technology with high voltage direct current (HVDC) technology being increasingly used to transport power long distances through subsea cables within GB and to/from other European countries.

The transition to enable cleaner economic growth is having four significant impacts on the way that electricity networks are designed, built and operated:

### Decentralisation

Decentralisation means energy being produced, and increasingly stored, close to where it will be used. This encompasses a mix of technologies and services, such as small scale renewable technologies such as micro wind turbines and solar PV, storage devices and demand control, that are quickly expanding and developing.

Energy networks must develop to provide access to these new entrants, while continuing to support local electricity security of supply. One consequence of decentralisation in the north of Scotland is significant over production compared to local use.

### Decarbonisation

Decarbonisation means new types and sizes of low carbon generators. Renewable energy generators are commonly lower in installed capacity when compared to conventional power sources, intermittent on their output based on weather conditions and located far from population centres. These generators are high capital and low operational cost. Together these factors disrupt energy economics and network charging regimes.

Looking forward, energy efficiency and a shift to the electrification of heat and transport is altering where, when and how much electricity is used.

### Digitisation

Digitisation means the use of new communications technology and analytical tools to improve the performance - in particular, the reliability and productivity - of electricity networks. As technology is developing quickly, value appraisal is required to maintain cost-effective outcomes for bill payers, and the resilience of the network to cyber threats.

### Democratisation

Democratisation means involving customers and stakeholders from across GB in the way that networks are planned and operated. In particular, the voices of the vulnerable and fuel poor must be sought.

Decentralisation and digitisation both present opportunities for the greater involvement of customers and communities in the provision of local energy networks. It will be important to balance the roles of local and national users in the decisions about future network development.

## The part played by SHE Transmission

We are the owner of the high voltage electricity network in the north of Scotland and responsible, through legislation and our operating licence, for the economic and efficient development and operation of the transmission network.

In our day-to-day activities, we work closely with SHEPD, the owner of the contiguous low voltage distribution network, Scottish Power Energy Networks (SPEN) the owner of the electricity networks in the south of Scotland and with National Grid the System Operator of the GB transmission network[iv].

The north of Scotland is, in many ways, a challenging operating environment for energy networks. The communities that require a reliable supply of power are geographically dispersed across mountainous terrain and islands. The weather and climate mean heat and light are essential for habitation, but the associated cost of high energy consumption can place undue pressure on economically marginal households.

Electrical infrastructure can be considered intrusive or damaging to the natural environment. These challenges present opportunities too. Renewable energy is endemic, in the form of hydro, wind (Figure 3) and, potentially, marine. Community engagement in the energy transition is high, with over 1,000 community-owned renewable projects[11].

Technological innovations, such as active network management and modular composite structures, have had their first GB deployment to meet the needs of customers in the north of Scotland.

Likewise, commercial innovation, for example our Orkney Alternative Approach[12], has been driven by the needs of local generators.

We have an important and ongoing role in enabling the clean energy transition:

**1** To provide the necessary network infrastructure and policies for the cost-effective connection of renewable generation. While the power sector in Scotland has significantly decarbonised (Figure 4), the sector is expected to expand to facilitate reductions in other areas through electrification and export to the rest of GB.

**2** To participate in and support the industry changes necessary for decentralisation through locally owned and operated energy system. This will require whole system approaches with SHEPD, National Grid and other stakeholders.

**3** To engage with our north of Scotland electricity consumers, network users and wider stakeholders to ensure their needs are fully expressed and addressed in the national clean energy transition.

**Figure 3:** Map of UK wind energy resource

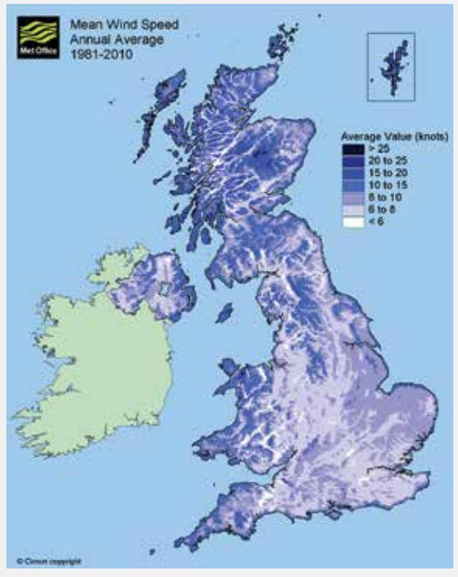



**Figure 4:** Scottish greenhouse gas emissions




**Source:** Figure 1.1 of Reducing emissions in Scotland - 2018 progress report to Parliament[13] published by the Committee on Climate Change in September 2018.

## A strong track record for delivery

As the Committee on Climate Change reports: "Scotland is leading the UK on renewable electricity" contributing 33% of the GB renewable generation in 2018.

This would not have been possible without the £3 billion investment that we have made since 2010 in upgrading and growing the transmission network in the north of Scotland (Figure 5).

We have delivered this huge capital programme, including the first GB use of innovative technologies[14] and ways of working, on time and within the budget set for us by Ofgem.

This could not have been achieved without the close collaboration of the communities, generation developers and other parties affected by this transformative change.

Ofgem[15] also assesses us to have "performed well". It uses four measures, which it calls primary outputs, to measure the performance of electricity transmission network owners. These are: reliability, connections, environment and customer satisfaction.

Given the importance of providing connections for new renewable generation, Ofgem also reports on progress in providing new network capacity.

Table 1 shows our performance against these measures for the five full years of the price control period completed to date. More information about our performance can be found in our annual reports[16].





[iv] As the national electricity transmission system operator, National Grid directs the flow of electricity on our network. We are obliged by licence to make our network available to National Grid and act on its directions.

**Figure 5:** Investment in the north of Scotland transmission network and MW generation connected

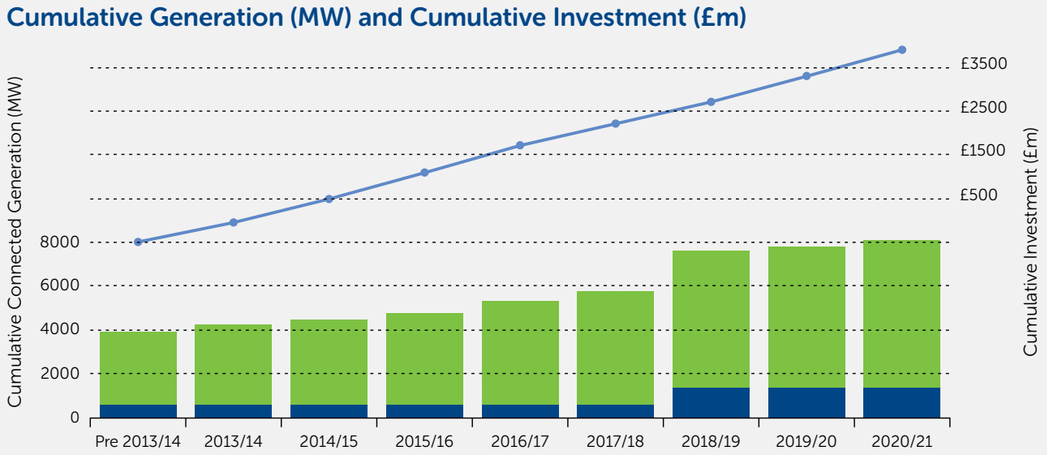



**Table 1:** SHE Transmission measures of performance for the current price control period

| Primary Output | Metric | Annual target | Outcome |
|---|---|---|---|
| Reliability | Energy Not Supplied | Less than 120 MWh | Five-year average 34 MWh |
| Connections | Timely Connection Offers | 100% on time | Achieved target in all years |
| Environment | SF6 Leakage<br>Environmental Discretionary Reward | Less than 151kg<br>Score >50% is pro-active | Five-year average 305kg<br>Five-year average 57% |
| Customer Satisfaction | Customer Satisfaction Survey<br>Key Performance Indicators<br>Stakeholder Engagement Incentive | Score of 7.4 out of 10<br>89% of weighted KPIs<br>Score of 4 out of 10 | Five-year average 7.8<br>Five-year average 80%<br>Five-year average 5.22 |
| **Connection Works** | **Metric** | **Eight year target** | **Outcome** |
| Connections Infrastructure | New MW connected | Baseline 1,168 MW | Forecast 1,572 MW |
| Shared Infrastructure | New MVA installed | Baseline 1,006 MVA | Forecast 4,096 MVA |
| Boundary Increase (or equivalent) | Named projects: Beauly Blackhillock Kintore, Beauly Mossford, Kintye Hunterston, Caithness Moray | n/a | All projects completed on time, under allowance |

Outcome for the five full years of the RIIO-T1 period: Exceeds target by more than 10% | Within +/-10% of target | More than 10% below target





# Emerging Thinking: Overview

## Reviewing our Strategic Objective

Our strategic objective since 2010, encompassing the current price control period, has been to enable the transition to the low carbon economy.

We have measured our success against this objective by the connection of new renewable generation of all scales and technologies to either the distribution or transmission network.

We believe we have been successful in achieving this objective by working closely with customers and communities and, where cost-effective, using new technologies, deploying new ways of working and instigating industry change.

During 2017, we began a review of our strategic objective. This was motivated by the ongoing changes in the energy sector and questioned whether our current objective was consistent with the requirements for the transition to cleaner economic growth for now and looking forward to 2025 and beyond.

More broadly, we wanted to understand if customers' and stakeholders expectations from the energy networks were changing and, if so, what they thought we should be focused on.

We have engaged widely across our customers and stakeholders in undertaking this review, and have welcomed the open and honest views that have been expressed. The findings from this review highlighted both the continuity and ongoing significant changes in the energy sector:

- As has been shown in many studies, local network users (generators and consumers) emphasise the importance of network access, availability and security of supply
- At the national scale, a key concern is the impact on bills - again for generators as well as consumers
- There is strong support for the decarbonisation of the whole energy sector and for the role of energy networks in enabling the transition to the clean energy economy
- However trust in the energy industry, including network operators, is low and customers worry about "big business" behaviours.

A full report on this review and its findings can be found here[17].

## New Strategic Objective

Customers' and stakeholders' views have reaffirmed our strategic objective, but we have been challenged to think about how this can be better explained to demonstrate we are aligned with the outcomes our customers and stakeholders expect.

Our strategic objective is to enable the transition to the low carbon economy. We have developed four themes that explain how we will achieve that objective. Together these four themes will drive our contribution to cleaner economic growth through decarbonisation, decentralisation, digitisation and democratisation.

Our RIIO-T2 business plan will have the purpose of meeting our strategic objective and we are currently structuring the business plan around the four themes (Figure 6).

We describe our emerging thinking for each of the four themes in the following pages.

### Stakeholder-Led Strategy

Energy networks are built and operated to meet the needs of current and future customers, and so customers' and stakeholders' needs must be the drivers of all activities.

### Safe and Secure Network Operation

Energy networks, and especially the high voltage transmission motorways, must be operated safely. They must be reliable, available and resilient to changing circumstances, be these opportunities or threats.

### Sector Leading Efficiency

Energy networks must be affordable to generators and customers, recognising the difficulties of the fuel poor and vulnerable, and be open about the trade-offs between cost and investment for local and national benefits to achieve the clean energy transition.

### Leadership in Sustainability

Energy networks must be trusted by the customers and communities they serve demonstrating long term benefit for society, the economy and the environment.

**Figure 6:** Structure of our RIIO-T2 business plan

### Stakeholder-Led Strategy

Taking a Whole System approach to network operation and development to meet current and future customers' needs

**Key topics**

- Customer and Stakeholder Engagement
- Strategic Objective
- Future Energy Scenarios
- Energy Policy
- Whole System
- DSO Transition
- Innovation
- Connections

### Safe and Secure Network Operation

Using data efficiently to understand, predict and get the best network performance.

**Key topics**

- Network Asset Risk Target
- Network Data and Monitoring
- Asset Management and Operation
- Willingness to Pay Research
- Reliability and Availability Options
- Resilience and Criticality Options
- Cyber-security
- Site security
- Productivity, Efficiency and Cost

### Sector Leading Efficiency

Integrated approach to whole life development and operation, using risk-based engineering to deliver value.

**Key topics**

- Network Performance
- Strategic Optioneering Assessment (including Cost Benefit Analysis)
- Procurement Strategy and Competition
- Engineering Policies
- Environmental Policies
- Community Engagement
- Productivity, Efficiency and Cost

### Leadership in Sustainability

Trusted partner of customers and communities, realising long term benefit for society, economy and environment.

**Key topics**

- Connections Process
- GHG Target
- Carbon Pricing
- Natural Environment and Biodiversity
- Sustainable Procurement
- Waste and Resources Targets
- Community Renewables
- Socio-economic Impacts and CBA
- Workforce Renewal
- People, Diversity and Inclusion
- Transparency in Reporting

# Stakeholder-Led Strategy

## Being stakeholder-led

When undertaking our business planning, we follow a four-step process (Figure 7). This process requires the involvement of electricity customers, local communities and wider stakeholders from the big, strategic picture - "what might the future look like?" - through to the finer local details - "what colour should this building be?".

By being open and engaged, our intention is that everyone can contribute to and understand the reasoning behind our business decisions.

While our immediate customers are electricity consumers and network users in the north of Scotland, we are part of the GB energy system and so it is important that a wide and diverse range of stakeholders are engaged in this process.

We are reviewing our approach to involving stakeholders and will be consulting on our revised Customer and Stakeholder Engagement Methodology in April 2019. Find out more about how to contribute here[18].

## Stakeholder-led for RIIO-T2

We have applied the four-step process to the development of our business plan[19] for the RIIO-T2 period.

In this section we consider how this has shaped our emerging thinking on current and future customers' needs, and in the remainder of this paper we explore some of the options to meet those needs.

**Figure 7:** Our business planning process

**Legal obligations**

We operate under rules set out in legislation and our licence that are overseen by regulatory bodies. We must follow these rules.

**Current and future customers' needs**

Energy networks are long life, and we make decisions today that will affect customers many years into the future.

**Identify options**

Once we have identified the need to act, then we must identify all of the different options to achieve that outcome.

**Preferred option**

The decision on the preferred option will consider a wide-range of factors including legal obligations, cost to the customer, technical solution and environmental impacts over the whole life of the asset.





## Emerging thinking on current and future customers' needs

The RIIO-T2 period ends on 31 March 2026. To prepare a business plan that extends just over seven years from today means making a forecast of what customers might want from the energy sector and our transmission network during that time. To make this forecast we have asked three questions of customers and stakeholders:

### 1 What do you need from the transmission network in the north of Scotland?

This was the question at the core of our review of our strategic objective discussed on page 13. The answers highlight the breadth of expectations on energy networks and how these can change through time.

In 2010 when we were preparing our current business plan[20] there was near unanimity on the need to focus on decarbonisation. Now, stakeholders have told us we need a broader approach that encompasses reliability, access, resilience to threats, decentralisation and whole system approaches, sustainability and affordability, as well as continued decarbonisation as part of the clean energy transition.

You can find out more about how stakeholders' views have shaped the four themes of our strategic objective here[21].

### 2 How do you think energy will be generated and used in the future?

Energy networks transport power and so the need for networks depends on how much power needs to be moved and when. Research that we undertook during 2017 identified that electricity generation and use in the north of Scotland is different from other parts of GB. Since then we have been running a wide-ranging programme of consultation on the detailed factors, in some cases highly localised, that affect the energy system in the north of Scotland and might impact upon the future development of the transmission network.

In summer 2018 we published the three north of Scotland future energy that had been developed through this engagement (Figure 8). These scenarios form the basis of our RIIO-T2 business planning and reflect stakeholders' views that we should plan for extreme, but realistic, outcomes.

You can read more about how our scenarios were developed and contribute to ongoing work here[22].

**Figure 8:** North of Scotland Future Energy Scenarios

**Proactive Decarbonisation**

Scottish consumers are supportive of decarbonisation, increasing their use of renewables and engage in the benefits of decarbonisation and decentralisation at local levels.

The focus is on capital investment in large scale projects and policy is in place to stimulate the development of less established, low carbon energy technologies.

**Local Optimisation**

Scottish consumers and businesses are driven by cost reduction as well as decarbonisation, investing in decentralised, domestic micro-generation to reduce their spend on energy.

The focus is on delivering decentralisation and decarbonisation through democratisation of energy supply to deliver improved affordability for consumers and businesses.

**Cost Limitation**

Scottish consumers are less inclined to invest in micro-generation and renewable heating technologies, but energy efficiency continues to be a focus of national and local Government.

The focus is on delivering cost reduction in energy bills. Decarbonisation is a secondary consideration, as a result there is low uptake in domestic micro-generation and little focus on decentralisation.

# Safe and Secure Network Operation

## 3 How might the energy policy framework change?

Changes in the energy policy framework can come from Government, regulatory bodies or the industry (for example through Code changes). The UK Government describes a pathway of ongoing change towards a future where low carbon is synonymous with low cost economic growth. Some of the proposed elements are: reform of the capacity and low carbon auctions, supporting investment in non-traditional technologies and flexibility, reviewing the distinction between supplier and distributor, the Energy Standards Review, a review of industry codes and governance, and the future of network charging project.

All of these changes, and others over the coming seven years, will impact the operation of energy networks. The intent of these changes will be to affect the GB energy system, but effective implementation requires understanding of the local factors (as we have shown, for example, with the energy scenarios in Figure 8).

Our role provides a bridge between north of Scotland stakeholders and the national energy transition. Necessary changes to our ways of working and technological innovation should be of benefit to local and national stakeholders. We are publishing working papers on Whole System and the Distribution System Operator Transition[23] to share our emerging thinking and seek stakeholders' views on how we can ensure their needs are met by the future energy policy framework

### What next?

**Open consultations**

- Working Paper DSO Transition

**Upcoming consultations and events**

- Innovation, Connections and Whole System workshop (Glasgow, February 2019)
- Innovation Strategy (March 2019)
- Customer and Stakeholder Engagement Methodology (April 2019)
- Approach to Whole System Planning (May 2019)
- North of Scotland Future Energy Scenarios: (i) Industrial and Commercial Demand, (ii) Electricity Storage and Hydrogen, (iii) Electric and Low Carbon Heating (spring/summer 2019)

## Stakeholder-led outcomes

Stakeholders have told us that network reliability is essential. There is a high economic and social cost for households and businesses if their supply of electricity is interrupted. A study[24] of the rolling blackouts in California in 2000-01 estimated that GDP was depressed by 0.7-1.5% as a consequence. Unsurprisingly both household and business electricity users report that they would pay significant sums to avoid power cuts. A recent European study[25] reported the value of 1 kWh of energy, equivalent to boiling a kettle ten times, to be €4.62-15.90 (approximately £4-14) depending on the customer group and duration of the power cut.

Investment over the past decade means that the reliability of the GB transmission system is now greater than 99.99%[26]. However, energy sector changes - such as decarbonisation and decentralisation - along with emerging global risks - including climate change, cyber security and physical security - mean that the prevailing security of supply cannot be taken for granted.

Responding to what stakeholders' have told us, our emerging thinking in this area for the north of Scotland transmission network considers: reliability for end consumers, availability for generators and market participants, and resilience to threat. You can read more in our working paper on The Future Operation of our Network[27].

## 100% reliability for end consumers

The reliability of the GB transmission system is measured by the number of loss of supply incidents and the volume of energy that does not reach household and business customers during those events[v].

Over the first five years of the current price control period, we have had ten loss of supply incidents that resulted in 170 MWh of electricity not being supplied to end consumers (Figure 9). We are the only GB transmission company to offer a compensation scheme for homes and businesses affected by a power cut on our network.

Near 100% network reliability is achieved through rigour in the day-to-day operation and maintenance of the network assets, and making investments in the right thing at the right time. Our analysis shows that new information technologies create an opportunity to use data and analytics to improve efficiency in the management and operation of the network and so reduce cost to customers in the long term. Our thinking is that by 2025, undertaking cost-effective incremental investment during RIIO-T2, households and businesses should never experience an interruption in electricity supply due to a fault on the transmission network[vi].





[v] Households and businesses are not connected directly to our network, but indirectly connected via SHEPD's network. In some instances, SHEPD is responsible for maintaining security of supply when we are undertaking maintenance or construction work on our network. Loss of supply in those circumstances is not attributed to transmission reliability.

[vi] This excludes interruptions due to third party actions or force majeure events.

## 100% reliability for end consumers

Our stakeholder-led ambition of no interruptions for households and businesses is subject to rigorous analysis to demonstrate that the necessary investment is cost effective. There are three parts to our plans for RIIO-T2:

### Part 1

Using remote monitoring to direct and support inspection programmes. Historically inspection of asset condition and performance has been done by schedule, for example every six months or every year depending on the type of equipment.

We plan to increase our use of remote monitoring equipment, such as drones, robots and sensors, that can collect information which we can analyse and identify whether further inspection or intervention is needed. These approaches deliver particularly high value in the remote north of Scotland and islands. We have assessed the business case to invest £5 million in these remote monitoring approaches during the RIIO-T2 period.

Remote monitoring should enable us to improve network performance and the productivity of network operations. This is important as our operating costs have grown with the scale of our network. We forecast total operating costs to be around £300 million during RIIO-T2.

### Part 2

Using risk-based modelling to assess the need for asset replacement. Currently, this uses information collected from the main assets that make up the network to undertake an assessment of the impact of failure of individual assets. Equipment with a high risk of failure can be identified for pre-emptive action. As we explain in the next section, once we have identified the potential need for investment, we develop the preferred option following the principles set out our Strategic Optioneering Methodology.

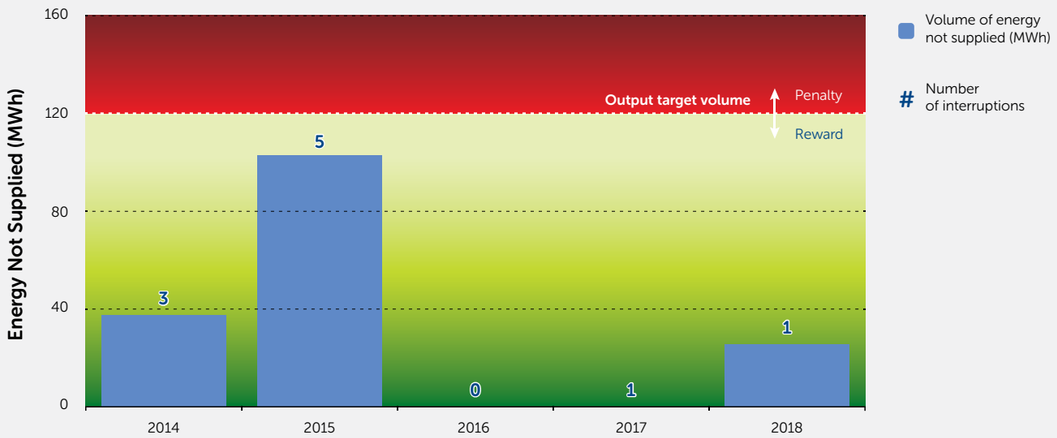
Our analysis to date has identified around 250 fixed assets and 1,200 km of linear assets that are likely to require intervention during RIIO-T2 at an estimated cost of £660 million.

### Part 3

Individually reviewing, on an ongoing basis, the critical points on the network. We define critical on an asset-by-asset basis, being a function of customer and wider network impacts of failure.

Our work to date has identified up to £55 million of investment in cost-effective interventions that will reduce the number of critical points, for example by removing some single points of failure. For other critical points where investment is not possible or cost-effective, monitoring and inspection can be increased and contingency plans reviewed.

**Figure 9:** Reliability of our transmission network 2013/14-2017/18




## Flexible solutions for cost effective network availability

Participants in the GB energy market, such as generators, storage providers or demand-side solutions, pay for access and use of the transmission system. We have a strong track record of working with our connections customers to provide the network access that they need, at the right time, and this is reflected in >95% reported customer satisfaction.

Customers can influence the level of their network charges by making choices about the security, or likely availability, of the network. For example, a customer can choose a single circuit connection with no availability during maintenance or fault conditions, or could pay more for a double circuit connection with higher availability.

The energy market is increasingly diverse, which provides greater opportunity for these customers to share network access. Higher utilisation avoids reinforcement, so saving customers money, but can restrict availability during periods of high usage.

Using the principles of Whole System Planning, this approach requires close collaboration with the customer, the System Operator and SHEPD.

Customer engagement, including our recent consultation on the connections process, has shown that there is a desire for flexible solutions, but these must be suitable for each user and the potential restrictions made clear upfront.

You can read the consultation and our response here[28].

In summary, current and future customers that provide market services are looking for a level of network availability that suits their needs. This might include:

- Consideration of flexible, including non-network, solutions as a standard element of the connection offer process.
- Providing timely, quantitative information to customers about future network availability. In particular, to highlight where network conditions have (or are planned to) change and work with customers to ensure they optimise network availability. This might result in changes to the connection arrangements of already connected customers.
- Developing measures that allow reporting on network availability, for example actual network availability as % of planned availability or customer satisfaction with network availability.

The transmission network in the north of Scotland has been at the vanguard of the use of whole system, flexible approaches to efficient network operation.

Currently one quarter of our generation customers have flexible access arrangements using an intertrip or active network management scheme. This has been achieved through targeted innovation and bespoke solutions to address individual customers' needs.

We expect this field of innovation to continue to develop during RIIO-T2. Our sustainability ambition "Connecting for Society" sets a target to meet customers' requests for accelerated connections and to report on our ability to do so.

# Sector Leading Efficiency

## Remaining resilient in a changing world

Electricity is an essential public service, underpinned by safe and secure energy networks. The Government defines critical national infrastructure, such as energy networks, as assets and associated systems which if lost could result in major detrimental impact on essential services or national security. Planning to manage the risks we face, including business continuity following an incident, is an essential part of what we do. In general, the major threats to energy networks fall into two categories:

### Physical threats

Physical threats that might come from damage to the network. These threats might be malicious, like terrorism or other criminal acts, or consequential, like extreme weather or the consequences of climate change. We assess these threats on an ongoing basis, following the advice of experts and authorities, and conduct our operations and investments to minimise the potential for physical threats.

### Cyber threats

Cyber threats can take many forms from stealing data to taking over the remote operation of the network. Under the Network and Information Systems Regulations 2018 we are an Operator of Essential Services and have responsibilities to manage cyber security and cyber resilience in such a way as to minimise the threat. The potential risks associated with these threats may increase as we deploy remote monitoring across the network.

While these major threats are not new, the nature of the threat regularly changes and, hence, so must our readiness. Our planning for the RIIO-T2 period encompasses a review of our strategic asset spares and emergency response procedures, as well as the roll-out of investments to upgrade system restoration capabilities during a 'black start' scenario.

We are continuing our consultation with stakeholders to explore other high impact risks. Our RIIO-T2 business plan will set out our risk management procedures and the outcome of 'stress testing' of our proposals.


### What next?

**Open consultations**
- Working Paper The Future Operation of our Network

**Upcoming consultations and events**
- The Future of Our Network, (Edinburgh, 5 March 2019)
- Approach to Whole System Planning consultation (May 2019)

## Stakeholder-led outcomes

Customers and stakeholders are concerned about the cost of energy. Electricity transmission network costs contribute[29] £37 (3%) of the typical dual-fuel energy customer bill of £1,221. For some customers, this bill is hard to afford. The most recent statistics show that around 13% of households in GB are in fuel poverty[(vii)].

The commonly cited causes[30] of fuel poverty are low incomes, high energy prices and energy inefficient housing. In Scotland[31], all three of these factors are higher than the national average resulting in fuel poverty rates of around 25% with the highest rates in Highland (52%) and the Islands (50-59%).

Keeping costs down matters. We define efficiency as the optimal use of resources (time, materials, people and money) to achieve a necessary outcome. Our customers and stakeholders set out the outcomes that they desire. We then use whole life Cost Benefit Analysis (CBA) to assess the technical options to achieve the outcome, and identify the option with the greatest benefits for the lowest cost.

We use whole life Cost Benefit Analysis (CBA) as the means to determine whether an outcome is necessary: that is, if the benefits are greater than the costs.

In some instances, where permitted by law and our licence, this can consider a 'do nothing' option. Where action is justified, we then use open market competition to reveal the lowest resource cost to deliver the outcome.

Driven by our stakeholders' expectations for the lowest possible cost outcomes, we explain our emerging thinking on efficient investment on the following pages.





[(vii)] Fuel poverty in England is measured using the Low Income High Costs indicator, which considers a household to be fuel poor if they have required fuel costs that are above average (the national median level) and, were they to spend that amount, they would be left with a residual income below the official poverty line. Governments in the devolved nations, including Scotland, define fuel poverty as households that need to spend more than 10% of their income on fuel.

## The need for investment

Interventions on energy networks cannot be avoided. We identify four main categories for investment on our network:

1. To grow the network to connect new renewable generators and to accommodate changing patterns of energy use such as to connect new generation or accommodate shifting demand.
2. To maintain, refurbish or replace existing assets that are worn, damaged or at the end of life.
3. To ensure the performance of the system, for example high levels of intermittent generation can impact power quality.
4. To establish and maintain the communications equipment necessary for real time operations and, where cost effective, asset monitoring.

The latter of these two categories are relatively new, and increasingly important, as the way the transmission network is used and operated changes with decarbonisation, decentralisation and digitisation. We must work closely with National Grid, the system operator, to understand its operational needs including making operational investments, collecting operational data and developing options for future network growth.

Before making any investment, we must be certain that investment is necessary and the preferred option is the one that realises the most overall benefit for the GB energy consumer and local communities.

This appraisal can be complicated by the long life and high cost of transmission infrastructure. In some cases, the preferred option can be to do nothing; in others the preferred option can be to build larger rather than return later to make a second upgrade. Sometimes, for example where an innovation is being trialled, the overall benefits might be uncertain.

A summary of the decision tree for our Strategic Optioneering Methodology is shown in Figure 10. This can be a lengthy process taking several years from identification of the potential need for investment to the first spade going in the ground.

The main reason for this is to be rigorous and thorough in the assessment of technical options, incorporating the views of the local community, statutory bodies, landowners and other affected parties, along with properly understanding the environmental and social impact of the new infrastructure.

We consulted in autumn 2018 on our approach to project development, and the lessons we have learned over the past decade.

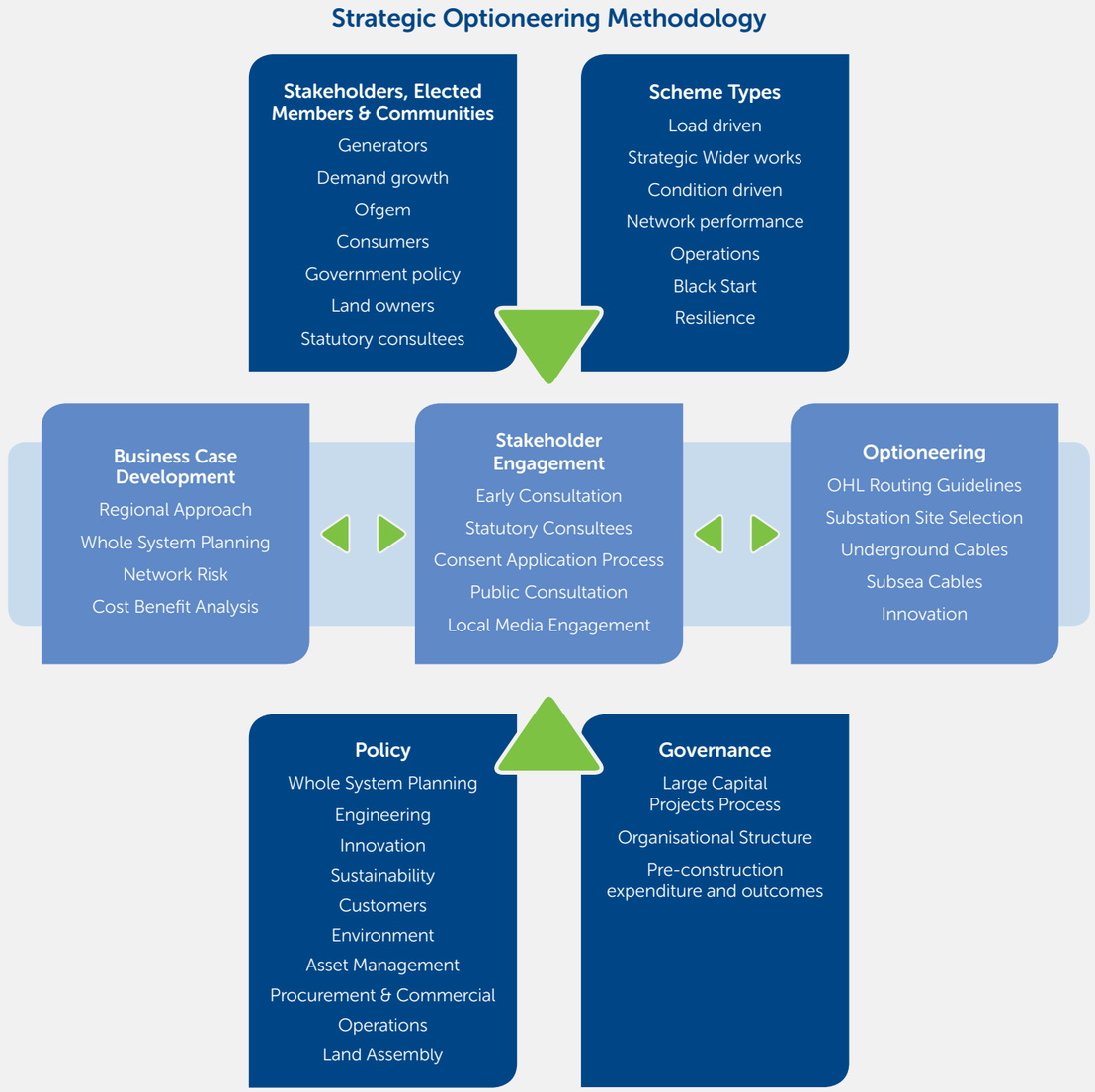
You can read this consultation and our response here[32]. In general, people are supportive of the approach we take to planning transmission investment and, in particular, to community engagement and consultation.

However, three opportunities for improvement were highlighted: more information on the regional network development plans, earlier engagement in the optioneering stage and more explanation of our decision-making through the process.

We are applying these learnings to update our Strategic Optioneering Methodology, which will be published in June 2019.



**Figure 10:** Strategic Optioneering Methodology for transmission investment



## Potential investments during RIIO-T2

Our North of Scotland Future Energy Scenarios (page 15), developed in collaboration with stakeholders, are the basis for our emerging thinking on the future evolution of the network. Using the scenarios, we have undertaken an early stage assessment of the potential investments that might be required on our network during 2021-26. These are shown on the infographic overleaf.

For many of these potential investments, the detail of the preferred option and the decision to proceed to construction is not yet made.

Our Strategic Optioneering Methodology will be applied in each case, allowing for the views of customers, communities and stakeholders to be heard throughout the project development phase. For potential investments already under development, you can access the project information on our website[33].

There is a range of potential investment outcomes during RIIO-T2 reflecting the different future energy scenarios (Figure 8):

- At the low end, our Cost Limitation scenario, there is little change in either generation or demand in the north of Scotland. As a consequence, we will be investing largely to maintain or replace existing assets only, as we described in the previous section. We estimate that this would cost around £250 million on average each year.
- At the high end, our Proactive Decarbonisation scenario, both generation and demand would increase significantly in the north of Scotland. Thus, in addition to investing in existing assets, we would need to invest to expand the network and ensure ongoing system performance. We estimate that this could cost up to £650 million on average each year.

Based on our experience from the current price control period, the most likely outcome is somewhere between these two extremes. Some of this investment is near certain, such as replacing essential assets at the end of their life, other investments are dependent upon external factors, not least future generation growth.

Thus, it is important that the price control is designed flexibly so that customers only pay for that investment which our rigorous analysis demonstrates is required and is of the greatest overall benefit to consumers.

## Ensuring efficient outcomes during delivery

While the greatest contribution to efficient outcomes is in the choice of investment option and the timing of the investment (including not investing at all), resource minimisation can also be achieved during construction.

Measuring the efficiency of outcomes in electricity transmission is difficult as each project has a bespoke design to reflect local conditions and needs, meaning that comparisons or trends cannot be used as evidence of relative efficiency without detailed 'normalisation' of costs.

We believe that open market competition is the best way to reveal the most efficient delivery for a specified outcome.

Over the past decade, we estimate that around 80% of our incurred expenditure has been competitively procured.

## The role of innovation

Our emerging thinking demonstrates that there is significant uncertainty, and hence investment requirements, in future network users' needs. We recognise that committing now to invest in the network to accommodate the Proactive Decarbonisation scenario might not be the most economic and efficient use of consumers money.

Innovation plays in important role in addressing this uncertainty this by enabling new ways of network development to be identified and trialled to meet customers' requirements and, potentially, delaying or avoiding reinforcement. One example of this is flexible connections where additional capacity can be gained from the existing network without full reinforcement in exchange for generator potential constraint.

We don't just see innovation as only applicable in a technical way, instead we see innovations as anything that allows us to 'Identify and prove new ways of working for the long-term benefit of our Customers and Stakeholders, and Ourselves.' This is a wide definition and it is important to that we are transparent and rigorous in its application through:

- identifying problems, or potential new ways of working from across industry and further afield, where innovation can help improve our business operation for our customers, stakeholders and ourselves;
- identifying what relevant work has been undertaken elsewhere and learning the lessons from that;
- testing those new ways of working to determine if they will efficiently deliver what is required;
- rolling innovations out to become normal business activity and ensure maximum value is attained; and
- regularly reviewing the effectiveness of our approach.

Achieving this consistently requires a strategy that has buy in from all relevant parties otherwise it will not be effective. Our draft Innovation Strategy will be published in March.

### What next?

**Upcoming consultations and events**

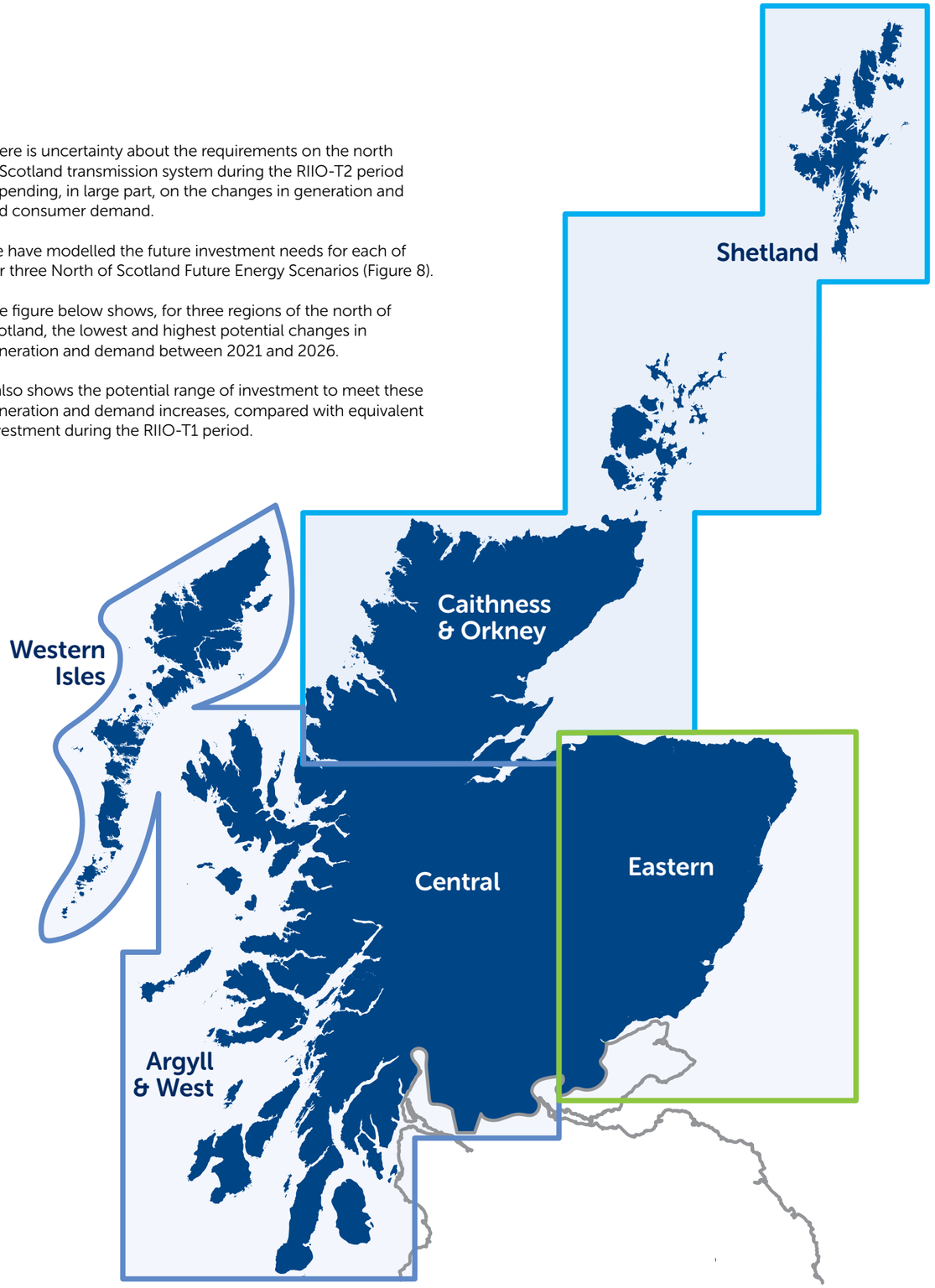
- Innovation, Connections and Whole System workshop (Glasgow, February 2019)
- Willingness to Pay Joint TO study report (April 2019)
- Strategic Optioneering Methodology (June 2019)
- Regional Infrastructure Development Roadshows (June 2019 and December 2019)

There is uncertainty about the requirements on the north of Scotland transmission system during the RIIO-T2 period depending, in large part, on the changes in generation and end consumer demand.

We have modelled the future investment needs for each of our three North of Scotland Future Energy Scenarios (Figure 8).

The figure below shows, for three regions of the north of Scotland, the lowest and highest potential changes in generation and demand between 2021 and 2026.

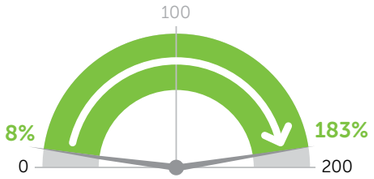
It also shows the potential range of investment to meet these generation and demand increases, compared with equivalent investment during the RIIO-T1 period.



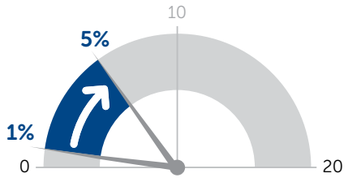



# Caithness, Orkney and Shetland

## Generation

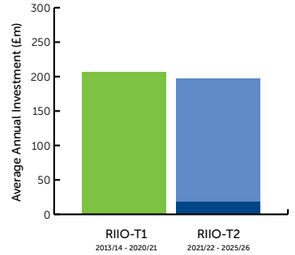



## Demand




Potential range (low to high) of increase in generation and demand during RIIO-T2

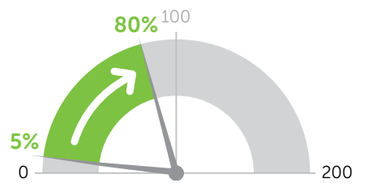
## Investment



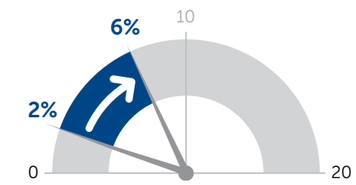

Level of investment dependent on generation and demand scenario

# Central, Argyll and Western Isles

## Generation

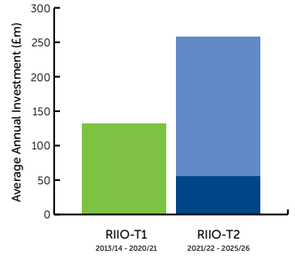



## Demand




Potential range (low to high) of increase in generation and demand during RIIO-T2

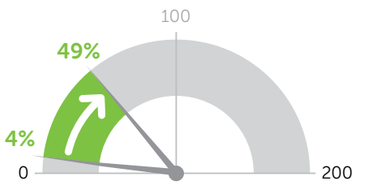
## Investment



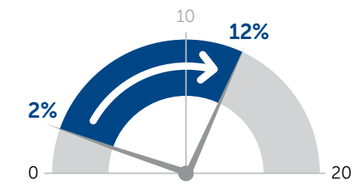

Level of investment dependent on generation and demand scenario

# Eastern

## Generation

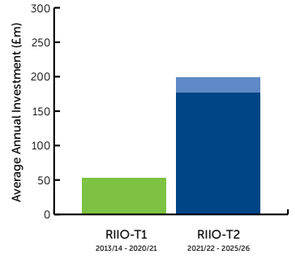



## Demand




Potential range (low to high) of increase in generation and demand during RIIO-T2

## Investment




Level of investment dependent on generation and demand scenario

# Leadership in Sustainability

## Stakeholder-led outcomes

Sustainability, or sustainable development, seeks to balance environmental, social and economic objectives to deliver long-term equitable growth.

International surveys[34] show increasing awareness of, and universal strong support for, sustainability objectives. In the UK, there is generally low, albeit increasing, awareness[35] of sustainability per se, but support for the associated policy ambitions including for environmental management and climate change action.

To understand the expectations of our customers, communities and stakeholders for sustainability in our business, we undertook a programme of engagement and consultation during late 2017 and early 2018. Our approach sought to understand the key issues for our different stakeholders, recognising that not all parties have an equal interest in all aspects of sustainability. However, it was the strong view of most consultees that our targets should be short, measurable and ambitious.

You can read about our consultation and its outcome, including our Sustainability Delivery Plan, here[36].

Our Sustainability Strategy[37] was published in May 2018.

This sets out six focus areas for our activity over the coming years (Figure 11), with targets against which progress can be measured.

We are committed to reviewing our Strategy and reporting on our performance each year.

### Definition

Following international best practice, we use the Brundtland definition of sustainable development from the 1987 UN Report Our Common Future[38]:

**"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."**

**Figure 11:** Our sustainability ambitions


Supporting the UN sustainability goals:

## Our six sustainability ambitions

### Connecting for society

As we develop our network for the decarbonised and decentralised economy, our customers and stakeholders have highlighted the wider societal expectations that accompany this investment, including affordability for electricity consumers and generators.

Our main action is to ensure major investment decisions are assessed against a Cost Benefit Analysis (CBA) framework which includes technical, social, environmental and economic aspects, with sufficient engagement to inform decisions on trade-offs between different factors[viii]. This approach should enable a wider range of connection options to be explored, and give customers confidence that the most cost effective solution is identified. In addition, we will act to deliver low carbon energy connections as quickly as possible so that they can contribute to meeting renewable energy and decarbonisation targets. Our ambition is to meet customers' requests for accelerated connections, using Whole System and flexible solutions, where it does not impose additional cost on other customers.

### Mitigating climate change

We will tackle our direct and indirect carbon emissions. This means assessing the full life cycle carbon costs of our assets when making investment decisions, considering their impacts during construction, in operation and when replaced. Our commitment is, by summer 2020, to have set a Science Based Target with the Science Based Targets Initiative[39]. As such, our ambition is to achieve the level of decarbonisation in line with best practice in climate science. We intend to present a provisional target as part of our RIIO-T2 Business Plan. Prior to our target being in place, we will report each year on our scope 1, scope 2 and scope 3 emissions[ix].

### Promoting natural environment

Promoting our natural environment encompasses many areas including (but not limited to) biodiversity, natural processes, landscape change and visual amenity. There are strong views in the north of Scotland and across GB that our actions be environmentally sensitive.

While we work to ensure our operating policies follow best environmental practice (for example, for noise, oil leakage, woodland and forestry, species management), our stakeholders tell us we can, and should, go further. Our main objective is to positively contribute to the UN[40] and Scottish Government[41] Biodiversity strategies by achieving an overall 'No Net Loss' on new infrastructure projects gaining consent in 2020 onwards and achieving 'Net Gain' on projects gaining consent in 2025 onwards.

Our projects also have a visual impact on the natural environment. To address this, we are developing new policies that learn from our experience and evolving best practice to ensure that the visual impact of new infrastructure is integrated in our projects from conception and is reduced as far as practical using our social, environmental and economic CBA. These policies will be applied to all projects undertaken during RIIO-T2.

### Optimising resources

Increasing material scarcity, the environmental impact of manufacturing these resources and inconsistency in local end-of-life material solutions, for example recycling facilities, mean that we need to work harder to ensure we are making best use of these resources.

Our ambition has three parts: minimise waste, optimise resources and use sustainable materials. In line with circular economy principles we will seek to keep resources in use for as long as practicable, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.

We will work with our contractors to ensure that they follow the principles of waste minimisation and resource re-use on our projects, making requirements on waste and resource use a feature of our contracts. Optimising resources requires us to rethink how we use, manage and dispose of materials to ensure we use resources in a responsible and sustainable way.

Where appropriate, we will seek to use resources which are as sustainable as possible, adopting new products, to reduce our reliance on non-renewable and limited resources.

Each year we will report on our waste sent to landfill, resource re-use and recycling. Much of our waste and resource use is associated with our construction and field-based activities. We are currently engaging with our supply chain and contractors to gather the data to establish a baseline position for our performance. We intend to develop indicative targets for resource management for our RIIO-T2 Business Plan.

### Supporting thriving communities

Without the continued support of the communities in which our assets are located, we wouldn't be the business we are today or become the business we want to be in the future. We want to ensure that these communities realise social and economic benefit from our investments. Our immediate focus in on enabling local renewable energy, giving back to communities and using local supply chains.

We are developing targets against we can measure and report on our progress, perhaps including the local socio-economic impact of each £ we spend; the locally-sourced content ratio of our major project investments; the delivery of community and locally owned renewable energy connections; the award of funds through our Resilient Communities Fund; and, the number of volunteering days used in local communities. Responding to the RIIO principles set out by Citizen's Advice[42], we have recently consulted[43] on our ideas for meaningful performance reporting by energy networks.

### Growing careers

Our ambition is to attract, develop and retain a sustainable pipeline of highly engaged employees, and in doing so, help to address the lack of diversity and skills shortage in our industry.

We believe the skills gap is an opportunity to become a more inclusive employer and grow sustainable careers, maximising social value by recruiting from local areas. We believe broadening the potential talent pool and skills base will result in a higher quality of decision-making and improved company performance and productivity. We also ask our contractors to at least meet our minimum standards, paying employees working on our projects the Living Wage and meeting Modern Slavery Act legislation. By doing this, it's not just SHE Transmission that benefits – society and the individuals and their families do too.

### What next?

**Open consultations**

- Sustainability Action Plan
- Reform in RIIO: Transparency[44]

**Upcoming consultations and events**

- Environment Workshop (Perth, March 2019)
- Sustainability Strategy: Update (May 2019)
- Annual Sustainability Report (August 2019)
- Sustainability Workshop (August 2019)





[viii] Our CBA framework is part of our Strategic Optioneering Methodology, which will be published in June 2019.

[ix] Scope 1: direct greenhouse gas emissions occurring from sources owned or controlled by the company e.g. our vehicles and on-site boilers. Scope 2: indirect greenhouse gas emissions from the generation of purchased electricity consumed by the company. Scope 3: all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions e.g. business travel, grid losses, production of purchased materials and contractor emissions.

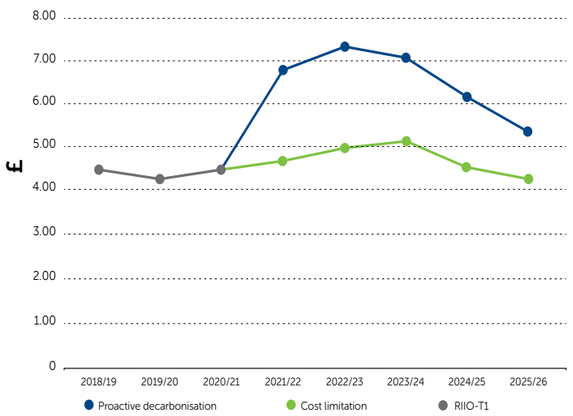
# How much will households pay for our RIIO-T2 plans?

## This is a difficult question to answer at this time.

In order to estimate the impact of our RIIO-T2 emerging thinking on the average household bill we need to make assumptions about the decision Ofgem will take on the price control settlement. These assumptions allow us to estimate our allowed revenue, to which we can apply further assumptions to estimate how much an average GB household will pay. We explain the assumptions we have made for this paper below.

Using these assumptions, we estimate that in 2018/19 our costs for the north of Scotland transmission network are around £4.48 for the average GB household. Looking forward, based on our emerging thinking for the RIIO-T2 period, we estimate that this could change to between £4.28 (-5%) and £5.36 (+20%) by 2025/26 (Figure 12).

**Figure 12:** Estimated cost of our transmission network to the average GB Household (£)








## Assumptions: The price control settlement

Ofgem published a consultation[45] on the methodology for the RIIO-T2 price control on 18 December 2018.

It intends to publish its decision on the methodology by the end of May 2019. We have made assumptions about three aspects of Ofgem's decision to allow us to make an estimate of our allowed revenue:

### Expenditure allowances

We have assumed that the costs associated with our emerging thinking are allowed in full, with no change to the current form of cost allowances. Our expenditure forecast is shown on page 3.

### Financial parameters

We have based the key financial parameters on Ofgem's working assumptions. This includes a working assumption of 4% for the baseline cost of equity, a RIIO-T2 average of 1.74% for the cost of debt based on a 10 year trailing average, an inflation measure of CPIH and a notional gearing level of 60%.

### Other financial adjustments

We have not assumed any other financial adjustments, for example due to performance incentive mechanisms. We intend to set out our thinking on incentive-based regulation in a working paper to be published in March.

Using these assumptions, we have estimated that our allowed revenue will be between £1.9 billion (under the cost limitation scenario) and £2.6 billion (under the proactive decarbonisation scenario) during RIIO-T2.

Note that the capitalisation rate assumption has been kept consistent across the scenarios to keep the revenue impact comparable. Under the proactive decarbonisation scenario, a higher capitalisation rate would be justifiable due to the higher investment profile, which would result in a lower total revenue for the period and hence a lower cost per customer for that scenario than currently presented.

While we have adopted these assumptions for this Emerging Thinking paper, we have some significant concerns about Ofgem's proposals for the methodology for the RIIO-T2 price control. We will publish our response, and ideas about how the methodology might be improved, in March 2019.

## Assumptions: Cost to household customers

The revenue that we are allowed to recover under the price control is paid by all GB electricity network customers (households, businesses and generators).

The process for doing this is complicated and means that there is not a standard charge in your electricity bill. For the purposes of this paper, we have used a simple top-down approach that is intended to follow the methodology described by Ofgem[46] with five steps:

1. Start with our allowed revenue that is charged to customers through the 2018/19 Transmission Use of System (TNUoS) tariffs.

2. Calculate the proportion of this allowed revenue that is paid by Demand customers:
   - **a.** by multiplying Item 1 by 84% (which is the percentage of the TNUoS charge paid for by demand customers[47]); and then
   - **b.** by multiplying Item 2a by 62% (which is our best estimate of the demand proportion paid by households).

3. In order to calculate the unit cost (£/kWh), divide the result from Item 2b by 142.3 TWh (which is the total electricity used by households[48]).

4. Households also pay for electrical losses on the transmission network, so increase the unit cost figure by 9% (which is the GB proportion of losses).

5. Finally, to calculate the cost of our network to the average GB household, multiply the unit cost by 3,100 kWh (which is the average domestic consumption value used by Ofgem).

This approach is based on the charging methodology and inputs from 2018/19, so our forward looking estimates do not include for future changes to these variables. For the year 2018/19, Ofgem estimates that the cost of the GB transmission network to the average GB domestic consumer is £37[49]. Of the total £2.6 billion revenue[50] collected, our element is £362 million.

Using the methodology described above, we calculate that the share of this £37 cost to the average household that is due to SHE Transmission is around £4.48.

# Appendix

## Website Links


1. www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges
2. www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future
3. www.gov.uk/government/publications/clean-growth-strategy
4. www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/
5. www.gov.uk/government/collections/energy-trends#2018
6. www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy
7. www.gov.scot/policies/renewable-and-low-carbon-energy/low-carbon-transport/
8. www.gov.uk/domestic-renewable-heat-incentive
9. www.theccc.org.uk/publication/independent-assessment-uks-clean-growth-strategy-ambition-action/
10. www.gov.uk/government/statistics/energy-consumption-in-the-uk
11. www.energysavingtrust.org.uk/scotland/communities/community-renewables/community-energy-reports
12. www.ssen-transmission.co.uk/projects/orkney/
13. www.theccc.org.uk/publication/reducing-emissions-in-scotland-2018-progress-report-to-parliament/
14. https://www.ssen-transmission.co.uk/information-centre/industry-and-regulation/riio-t2/emerging-thinking-documentation/
15. www.ofgem.gov.uk/publications-and-updates/riio-electricity-transmission-annual-report-2016-17
16. www.ssen-transmission.co.uk/information-centre/industry-and-regulation/transmission-price-control-review/
17. https://www.ssen-transmission.co.uk/information-centre/industry-and-regulation/riio-t2/emerging-thinking-documentation/
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22. www.ssen-transmission.co.uk/information-centre/industry-and-regulation/future-energy-scenarios/
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26. www.nationalgrideso.com/insights/transmission-performance-reports
27. https://www.ssen-transmission.co.uk/information-centre/industry-and-regulation/riio-t2/emerging-thinking-documentation/
28. www.ssen-transmission.co.uk/news-views/articles/2018/11/transmission-connection-process-consultation-document/
29. www.ofgem.gov.uk/data-portal/overview
30. www.nea.org.uk/about-nea/fuel-poverty-statistics/
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32. www.ssen-transmission.co.uk/news-views/articles/2018/9/have-your-say-on-transmission-asset-development/
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47. www.nationalgrideso.com/charging/transmission-network-use-system-tnuos-charges
48. www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2018-main-report
49. www.ofgem.gov.uk/data-portal/overview
50. www.nationalgrideso.com/charging/transmission-network-use-system-tnuos-charges

Scottish & Southern Electricity Networks

TRANSMISSION

## Contact us

**We welcome your views on any of the emerging thinking in this paper, or any other topic relevant to the future of the GB energy sector.**

Please get in touch:
**yourplanourfuture@sse.com**

We plan to publish more details on our RIIO-T2 business plan in early July 2019.

**SSEN Community** **@ssencommunity**

**ssen-transmission.co.uk**

We are a Living Wage Employer

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