Scottish & Southern Electricity Networks

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Planning for Net Zero

Scenarios, Certain View and Likely Outturn

October 2019

Scottish Hydro Electric Transmission plc

Net Zero Network – Scenarios

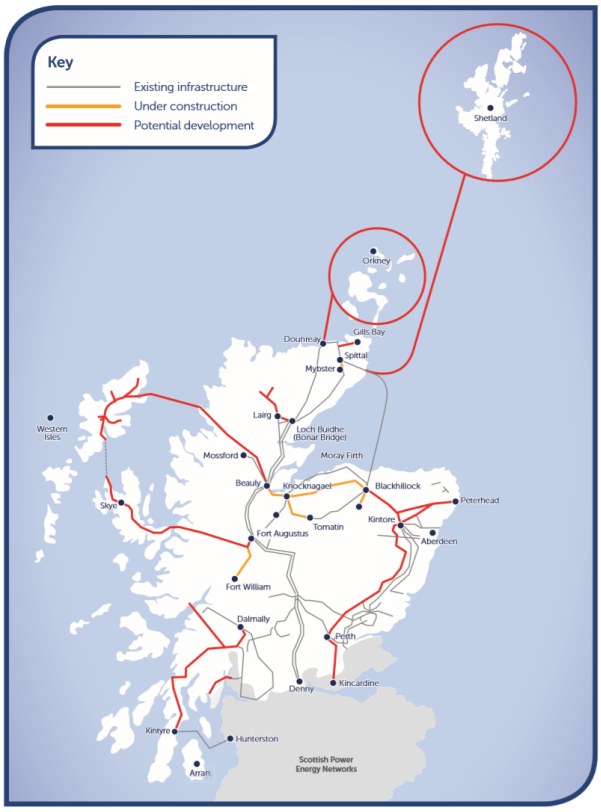
About us

Scottish Hydro Electric (SHE) Transmission is the owner of the high voltage electricity network in the north of Scotland. As the Transmission Owner (TO) we own and operate the 132kV, 275kV and 400kV electricity equipment. Our network consists of underground and subsea cables, overhead lines on wooden and composite poles and steel towers, and electricity substations, extending over a quarter of the UK's land mass and across some of its most challenging terrain.

As part of Scottish and Southern Electricity Networks (SSEN), which includes our sister company Scottish Hydro Electric Power Distribution (SHEPD) the owner of the adjoining low voltage distribution network, our electricity network is responsible for ensuring a safe, reliable supply of electricity to around 770,000 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 capacity.

We power our communities by providing a safe and reliable supply of electricity. We do so by taking the electricity from generators and transporting it at high voltages, over long distances through our transmission network for distribution to homes and businesses in villages, towns and cities.

Figure 1 The SHE Transmission network and operating area



About this paper

In June 2019 we published our draft Business Plan for the RIIO-T2 period, 1 April 2021 to 31 March 2026. This Plan used scenario analysis to assess the potential future use of the transmission system in the north of Scotland and, from this, determine capital investment requirements. In response to the draft Business Plan, stakeholders expressed support for our approach but asked for more information on the scenarios used and how these compared with our Certain View for investment. This paper provides an overview of our approach to scenario analysis, the future energy scenarios used in planning for RIIO-T2, the derivation of our Certain View and how we propose to manage uncertainty. This work is presented in the context of the UK and Scottish national policy targets of achieving net zero greenhouse gas emissions by the middle of this century.

Contents

What is Net Zero?

In December 2015, parties to the UN Framework Convention on Climate Change reached a landmark agreement to combat climate change. The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. The UK ratified the Paris Agreement in 2016.

Under the Climate Change Act 2008, the Committee on Climate Change (CCC) is an independent statutory body that advises the UK Government and Devolved Administrations on progress made in reducing greenhouse gas emissions. In May 2019, taking account of the UK's commitments as signatory of the Paris Agreement, the CCC recommended a new emissions target for the UK: net-zero greenhouse gases (GHG) by 2050 (and by 2045 in Scotland).

'Net zero' refers to achieving an overall balance between GHG emissions produced and GHG emissions taken out of the atmosphere. This encompasses the entire economy: industry, power, heat, transport, buildings, waste and land use.

www.theccc.org.uk

Summary

In June 2019 we published our draft Business Plan for the RIIO-T2 price control period from 1 April 2021 to 31 March 2026. Our Plan is what we call the Certain View where all of the activities and investments we propose have a strong, evidence-based need to be done. Under the Certain View, the renewable generation connected to the north of Scotland transmission system will reach nearly 10 GW by March 2026 and the total generation will be 11.2 GW.

This paper has been prepared in response to stakeholders' requests for further detail on the Certain View and, in particular, how the Certain View compares with future energy scenarios.

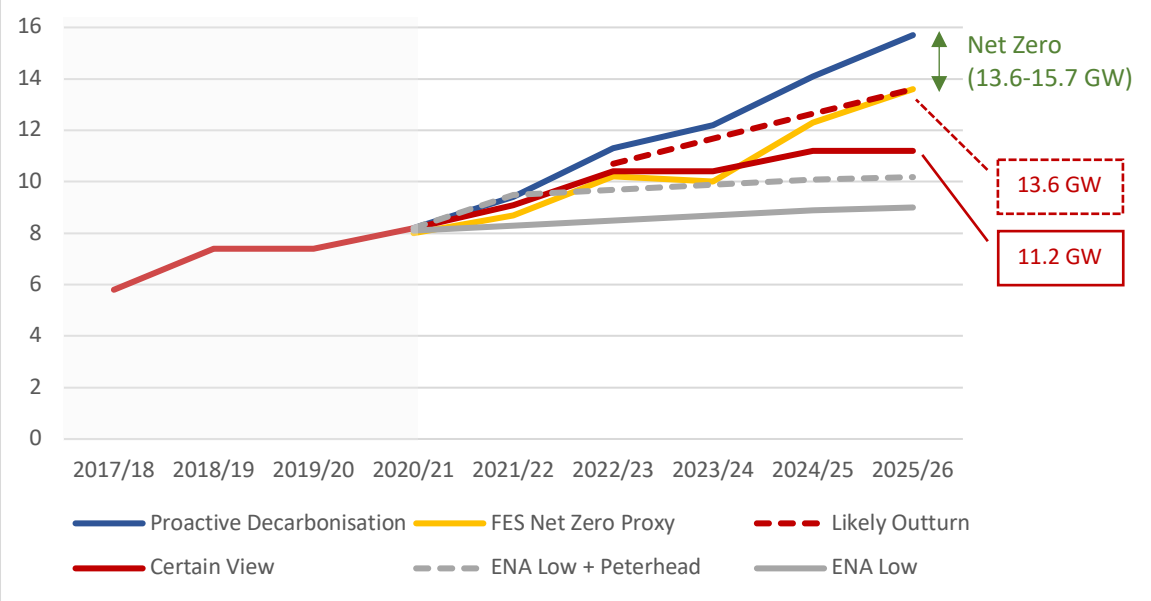
The development of our draft Business Plan used nine future energy scenarios. Each of these scenarios is a potential pathway for the energy system in the north of Scotland out to 2030 (or 2050). In general, scenarios present a 'top down' big picture of the overall generation capacity connected and electricity consumed. The variety of individual pathways is representative of the wide range of possible political, social, economic, consumer and technological directions over the duration of the scenario modelling.

The nine future energy scenarios used in the development of our draft RIIO-T2 Business Plan are described in this paper, along with a further scenario that we have subsequently developed for net zero emissions. For each scenario the connected generation forecast is shown, illustrating the wide range of outcomes against which our Plan has been developed. The range of connected generation outcomes in 2025/26 for the ten scenarios is 8.5 GW to 15.7 GW.

Figure 2 shows three of the ten future energy scenarios:

- Two scenarios – Proactive Decarbonisation and the new scenario FES Net Zero Proxy – that are pathways towards net zero greenhouse gas emissions in the north of Scotland. In these two scenarios, connected generation in 2025/26 is 15.7 GW and 13.6 GW.
- The preferred scenario of Ofgem and its Challenge Group, the ENA core scenario – low (9 GW connected generation). Figure 2 also shows this scenario with the addition of Peterhead power station (10.2 GW).

Figure 2 Total generation capacity connected to the north of Scotland transmission network*



* Includes non-renewable and large distributed generation

In contrast to the nine top down future energy scenarios, the Certain View is a detailed work programme for the RIIO-T2 period. Each of the network investments proposed has been identified through a rigorous review of the need for investment, the optimal investment option and the forecast cost of the works. This bottom up approach gives certainty through an evidence-based justification for each investment; hence the term Certain View.

In the Certain View, the total connected generation by the end of the RIIO-T2 period is 11.2 GW. This is 2.4-4.5 GW below the two future energy scenarios to achieve net zero emissions (Figure 2).

Our draft Plan was titled "A Network for Net Zero". In preparing the Plan, we were careful to ensure that the Certain View provides flexibility for the north of Scotland transmission network to accommodate greater volumes of renewable generation connections during the RIIO-T2 period. The strategic investments included in the Certain View – on the East Coast and near Tummel – are critical to ensuring that flexibility. While the need for these investments can be evidenced now, timely delivery also maintains long term net zero emissions pathways.

As with during RIIO-T1, we expect currently uncertain investments to gain certainty during the RIIO-T2 period. We have proposed flexible regulatory funding mechanisms that build on the success of RIIO-T1. These mechanisms include a volume driver for generation connections.

At the request of stakeholders, we have made a top down consideration of a credible use of uncertainty mechanisms – this is termed here the Likely Outturn Assessment. This has been considered across the entirety of the north of Scotland, including the Scottish islands, Skye, Caithness, Argyll, East and offshore waters, but without identifying specific generation connections. From this, our Likely Outturn Assessment is for generation connected to exceed the Certain View by around 2 GW, i.e. total connected in 2025/26 to be around 13.6 GW.

Our draft Plan set out a methodology for calculating the cost of our proposals to the average GB household. This followed the methodology used by Ofgem and applied a 2% pa. inflation assumption. For the £2.2 billion forecast expenditure for the Certain View, we calculated that the average GB household would pay around £6.59[1] for the north of Scotland transmission system in 2025/26. Applying the same methodology to the Likely Outturn Assessment, we calculate that the cost would be around an additional 71p per household in 2025/26, i.e. the average GB household would pay around £7.30.

[1] A rounded figure of around £7 is used in RIIO T2 consultation materials as this value was designed to be robust to small movements in the forecast expenditure which were expected during refinement of the Business Plan.

1 Introduction

1.1 Scottish Hydro Electric (SHE) Transmission is the owner of the high voltage transmission system in the north of Scotland. Over the past decade our network has grown around four-fold as we have connected new, predominately renewable, generation. At the end of the current RIIO-T1 price control period in March 2021, we forecast that nearly 7 GW of renewable generation capacity[2] will be connected in the north of Scotland – enough to power over 6 million GB homes and businesses and making a significant contribution to meeting national climate change targets.

1.2 In June 2019 we published our draft Business Plan[3] for the RIIO-T2 price control period from 1 April 2021 to 31 March 2026. Our Plan is what we call the Certain View where all of the activities and investments we propose have a strong, evidence-based need to be done. Under the Certain View, the total renewable generation connected to the north of Scotland transmission system will reach nearly 10 GW by March 2026.

1.3 Our draft RIIO-T2 Business Plan shows, using future energy scenarios, that there is the potential for generation connections to exceed the Certain View by 4 GW or more. We also show that this greater capacity of renewable generation is necessary to achieve a 1.5°C warming pathway (equivalent to net zero greenhouse gas emissions). The make up and timing of such generation connections over-and-above the Certain View is, at the time of preparing the draft Plan, highly uncertain. Thus, we propose flexible regulatory funding mechanisms that would allow us to respond to generation customers' needs as these become more certain and ensure that all connections are made on time.

1.4 Respondents to the consultation on our draft Business Plan have been supportive[4] of the Certain View. We have been asked to provide more information on:

- Our use of future energy scenarios in our business planning, which scenarios are pathways to net zero emissions and how these scenarios compare with the Certain View;
- The network investments that comprise the Certain View;
- An assessment of the likely outturn for connected generation and total investment at the end of RIIO-T2, and the impact on the average GB household energy bill; and
- Our proposals to manage uncertainty and how this will ensure connections are not delayed.

1.5 This paper considers each of these topics by covering the following:

1.6 Section 2 explains the **use of scenarios in business planning** and the lessons learned from scenario planning for the RIIO-T1 period.

1.7 Section 3 describes the **future energy scenarios** that have been used in the development of our RIIO-T2 Business Plan. For each of the nine future energy scenarios that we have used, the associated forecast for connected

[2] Including non-renewable generation, the total connected generation in March 2021 is forecast to be 8.1 GW
[3] www.ssen-transmission.co.uk/riio-t2-plan/
[4] For example, at five events in August 2019, over 80% of attendees responded 'yes' to the question: "For investments that are currently uncertain, we propose that funding is only released as and when it is required, protecting bill payers from unnecessary spend. Do you agree with this approach?"

generation is shown illustrating the wide range of potential futures that our Plan has been developed to accommodate.

1.8 Section 4 considers the impact on business planning of the legislated target of **net zero greenhouse gas emissions**. As this is a new policy development, there are not established scenarios that can be used. We describe our approach to ensuring our RIIO-T2 Business Plan supports the net zero emissions target, including our determination of proxy net zero scenarios.

1.9 Section 5 sets out the derivation of the **Certain View** on which our RIIO-T2 Business Plan is based and describes the driver of each network investment that is part of the Certain View. We compare the Certain View with the scenarios described in sections 3 and 4, including ENA core scenario – low and the proxy net zero scenarios. This section concludes with an update on the Fort Augustus to Skye project, the impact of the provisional outcome of the third Contracts for Difference allocation round and the Scottish islands links.

1.10 Section 6 presents a **Likely Outturn Assessment** for the RIIO-T2 period in the north of Scotland: connected generation, total expenditure and impact on the average GB household bill.

1.11 Section 7 concludes with an overview of the **flexible regulatory funding mechanisms** that we propose to allow us to efficiently manage uncertainty without any adverse impact on our customers.

1.12 Throughout this paper we focus on scenarios for connected generation. Other impacts on business and network planning, including demand and system performance have been considered in our business planning, but – as was the case during RIIO-T1 – the relative scale of generation, and potential for future growth, remains the primary driver for investment in the north of Scotland.

1.13 All expenditure in this paper is in 2018/19 prices unless stated otherwise.

1.14 We welcome any feedback or comment on this paper. You can contact us through our website www.ssen-transmission.co.uk or by email at YourPlanOurFuture@sse.com.

2 The use of scenarios in business planning

2.1 Scenarios are an important business planning tool that present alternative views of the future. Through considering a number of future scenarios, business plans can take account of uncertainty and consider options to manage that uncertainty.

2.2 For electricity networks, scenarios focus on the potential future use of the network. Specifically, the source of electricity that enters the network (typically, generation) and the consumption of electricity that exits the network (typically, consumer demand). The factors that influence these variables are wide ranging and include demographics and population distribution, the rate of growth of the economy and the pace of technological change. Scenarios must also consider the ability of the electricity network to operate safely and stably under the generation and demand assumptions.

2.3 The north of Scotland transmission network has grown significantly over the past decade in order to accommodate new, predominately renewable, generation capacity. During that period, the demand for electricity consumption has been broadly unchanged. Looking forward, prevailing national policy objectives strongly indicate a continued growth in connected generation. However, there is also the potential for material growth in demand in response to the electrification of transport and heat. The scale and timing of these changes in usage of the north of Scotland transmission network are uncertain.

2.4 One of the key challenges we face in developing our Business Plan for the RIIO-T2 period is the uncertainty in future generation and demand requirements. This is important considering:

- The significant level of infrastructure and cost associated with connecting new generation and demand onto the electricity network;
- The challenge in efficiently balancing the future anticipated need for new infrastructure while minimising the risk of stranded assets;
- Our approach to whole system planning where we consider multiple solutions at both transmission and distribution levels as well as other alternative innovative, non-network options;
- Although we can predict our future asset replacement requirements with a high degree of certainty, future generation drivers can lead to complexities where there is interface with planned refurbishment activities; and
- Future operational activities and costs that are impacted by growth and associated increased asset base.

2.5 We use scenario analysis to build an understanding of potential outcomes where uncertainty exists. This paper explains our approach to using scenarios in the development of our RIIO-T2 investment plans and how we have taken into account the inherent uncertainty and complexities associated with our network.

Lessons from RIIO-T1

2.6 Scenarios were an important part of our business planning for the RIIO-T1 period (1 April 2013 to 31 March 2021).

2.7 In 2008, the Electricity Networks Strategy Group (ENSG) – a cross-industry group jointly chaired by the UK Government and Ofgem – asked the three transmission licensees, with support from an industry working group, to develop electricity generation and demand scenarios consistent with the EU target for 15% of the UK's energy to be produced from renewable sources by 2020. Three scenarios were developed from this work: Slow Progression, Gone Green and Accelerated Growth (Figure 3a).

2.8 We used scenario analysis of these three scenarios in the development of our RIIO-T1 Business Plan focusing, in particular, on the uncertainty of future generation growth in the north of Scotland[5]. Using this approach, combined with stakeholder-led views on local development plans, we concluded:

Figure 3a ENSG generation scenarios used in our RIIO-T1 Business Plan

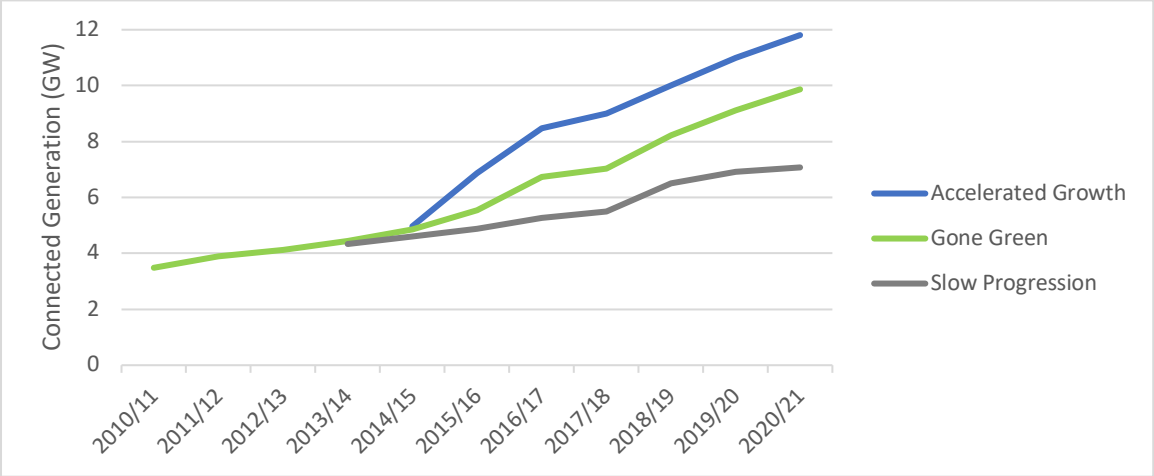
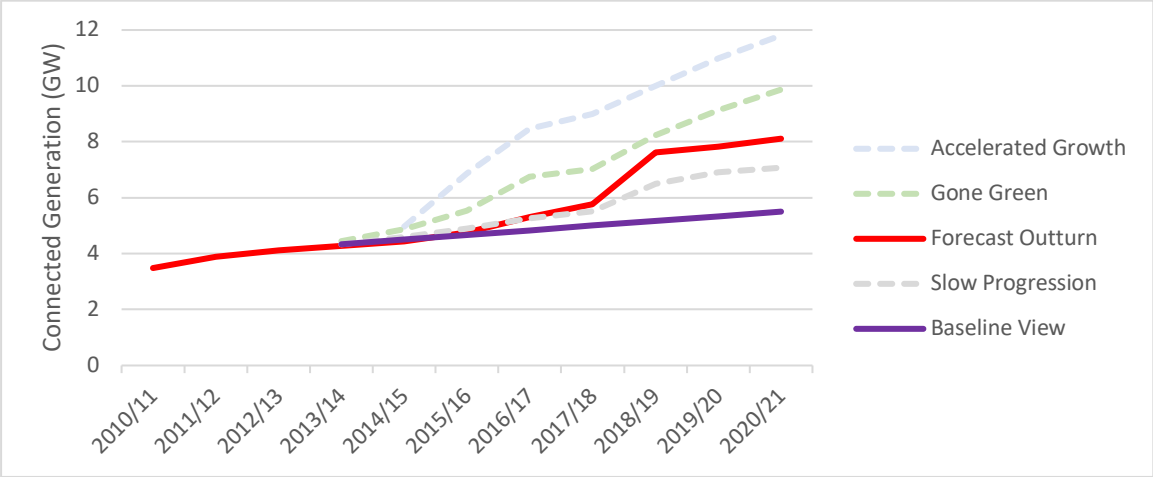


Figure 3b Forecast outturn generation connections during RIIO-T1



[5] ww.ssen-transmission.co.uk/media/1316/doc5.pdf

- From a starting point of 4 GW of connected generation, there was significant uncertainty around the scale, timing and location of generation connections during RIIO-T1. Based on connection applications alone the potential for up to 10 GW of new generation capacity was identified. The range of outcomes under the three generation scenarios was 3-8 GW, with the central Gone Green scenario forecasting 5.7 GW (Figure 3a).
- Combining the scenario analysis with stakeholders' views and the status of known generation developments, we assessed a Baseline View of a credible minimum volume of onshore generation connections during RIIO-T1. This Baseline View was 1.1 GW, significantly below the forecast for all three scenarios. The upfront capital investment programme set out in our RIIO-T1 Business Plan was based on connecting the Baseline View.
- Recognising that the three scenarios, along with other evidence, strongly argued that a higher volume of generation than the Baseline View was likely to connect during the RIIO-T1 period, we developed flexible regulatory funding mechanisms to allow additional capital investment to enable these connections based on need. These mechanisms included the sole-use and shared-use volume drivers, pre-construction output substitution and the Strategic Wider Works (SWW) reopener.

2.9 Our forecast outturn position for generation connected at the end of RIIO-T1 (+4 GW) is shown in Figure 3b, along with the Baseline View (+1.1 GW) and the three ENSG scenarios.

2.10 This approach has been very successful. As anticipated, the Baseline View of generation connections has been exceeded. The regulatory funding mechanisms have released additional capital investment as and when generation above the Baseline View has come forward for connection.

2.11 Scenarios have continued to play an important role in the assessment of network investments during the RIIO-T1 period, for example:

- Prior to 2015, future energy scenarios described within the Electricity Ten Year Statement (ETYS) were used to assess the Main Interconnected Transmission System (MITS) network boundary capability requirement based on the required power transfers determined using the industry standard deterministic methodology;
- Major SWW reinforcements developed and delivered within RIIO-T1 have used generation and demand scenarios to underpin value for money aspects through Cost Benefit Analysis (CBA) methodology. This has involved detailed studies undertaken by both us (and our external consultants) and the Electricity System Operator (ESO). These assessments used least worst regret in order to identify the optimum solution; and
- The Network Options Assessment (NOA) process introduced in 2015 incorporated this scenario and CBA based approach to make recommendations for wider network reinforcements. NOA takes total GB constraints into account when assessing the consumer value delivered by reinforcement options under alternative future energy scenarios.

2.12 In addition to national scenarios of generation and demand, we have used local scenario analysis to model our north of Scotland network. This has allowed us to develop an understanding of specific local and regional energy network users' needs. For example, the withdrawal of the Renewable Obligation subsidy to onshore wind generation from May 2016 led to some schemes terminating or deferring their connection dates. As a result we increased our emphasis on assessing the 'what if' consequences to shared use reinforcements to

assess the potential impact of a changing generation background. This has been done by determining local scenarios for generation development.

2.13 Throughout (and prior to) RIIO-T1, future energy scenarios have been an important part of our approach to network development in the north of Scotland. Major system reinforcements have been subject to thorough assessment to determine the most cost effective investment for a number of different futures, accounting for both known and unknown growth drivers. This is evident in, for example, the Beauly Denny overhead line being constructed at 400kV, but currently operated on one side at 275kV facilitating future incremental upgrade to unlock more capacity. In Kintyre and Argyll, in considering options for intervention on high risk assets, we have taken a strategic view that includes for future generation growth.

2.14 To support this approach to business planning, we have worked closely with local and national stakeholders as well as other network operators and the ESO. We consider the views of customers and communities critical in network development. Accordingly, we have expanded the scope of our cost benefit analysis to incorporate environmental and social factors that complement conventional economic elements.

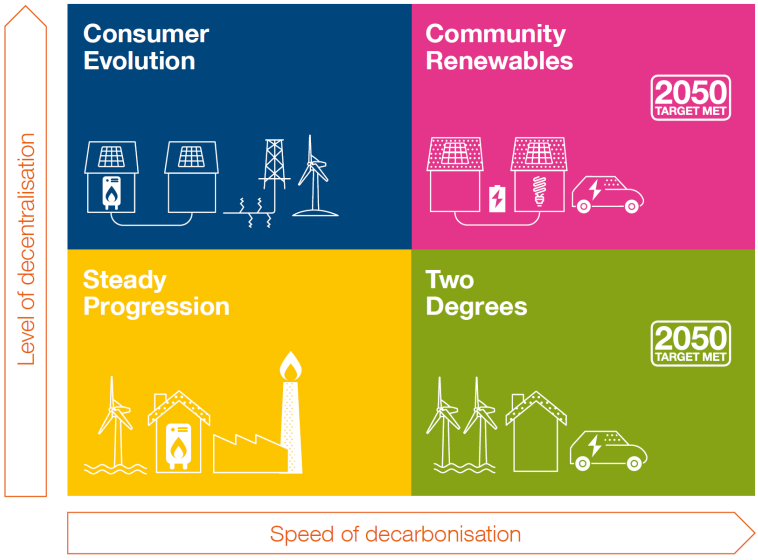
3 Scenarios used in our RIIO-T2 Business Plan

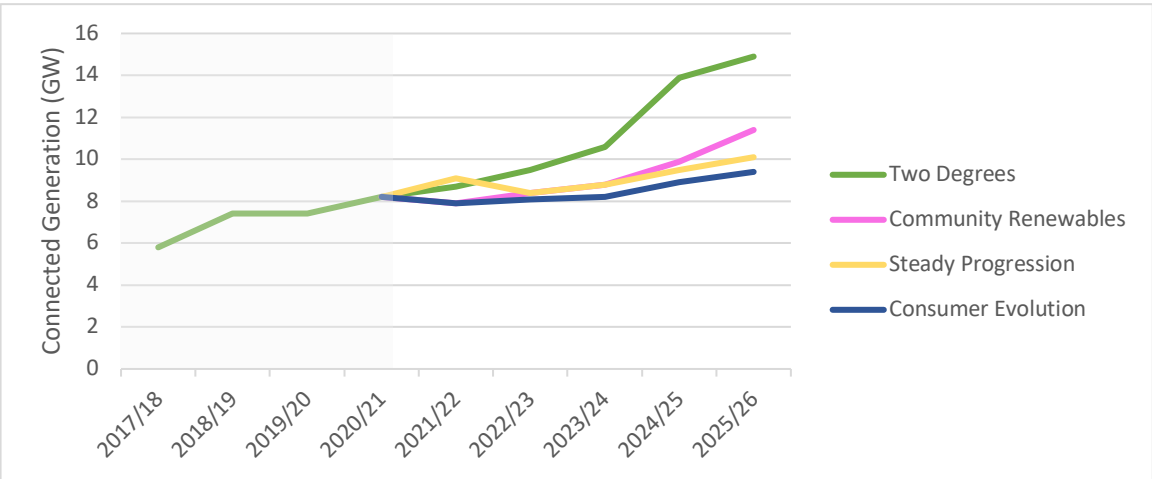
ESO Future Energy Scenarios

3.1 National Grid, in its role as the GB ESO, develops Future Energy Scenarios (FES) for the GB energy industry looking out by 30 years and beyond. These scenarios present credible pathways for energy demand and supply on a whole system basis, incorporating gas and electricity across the transmission and distribution networks. The ESO undertakes extensive stakeholder consultation and detailed network analysis with input from all three transmission licensees to refresh its FES annually.

3.2 The current version of the ESO FES was published in July 2019[6]. This combines two drivers – speed of decarbonisation and level of decentralisation – to produce four scenarios: Consumer Evolution, Steady Progression, Community Renewables and Two Degrees (Figure 4). The ESO FES is used to inform investment for large strategic upgrades to the GB transmission network, in particular in the annual NOA[7] process.

Figure 4 2019 ESO FES: overview of scenarios and connected generation assumptions for the north of Scotland





[6] www.fes.nationalgrid.com

[7] www.nationalgrideso.com/insights/network-options-assessment-noa

North of Scotland Future Energy Scenarios

3.3 Building upon the national political, economic, social and technological possibilities explored by the ESO FES, during 2017 and 2018 we undertook a detailed examination of the many unique factors and drivers that have the potential to influence future development requirements on our network. This resulted in our North of Scotland Future Energy Scenarios (NoS FES).

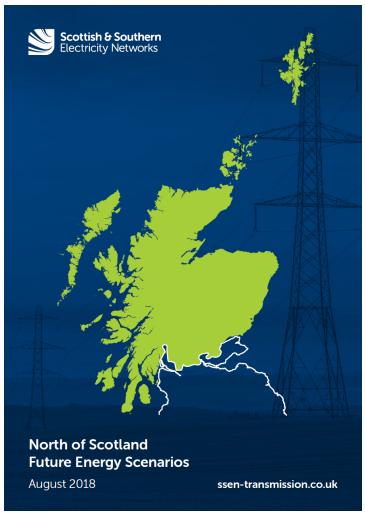
3.4 The NoS FES have been informed by extensive stakeholder engagement to determine the range of potential energy outcomes that are specific to the north of Scotland (Figure 5). These scenarios have been used as a key tool in developing our RIIO-T2 business plan proposals by providing:

- A comprehensive range of generation scenarios to test and model our RIIO-T2 Business Plan proposals for both generation and demand;
- Insight into the local drivers impacting future development across all regions within our network area; and
- A platform to consider other areas of the energy system (distribution, heat, transport) as we move towards a whole system planning approach.

North of Scotland and Net Zero

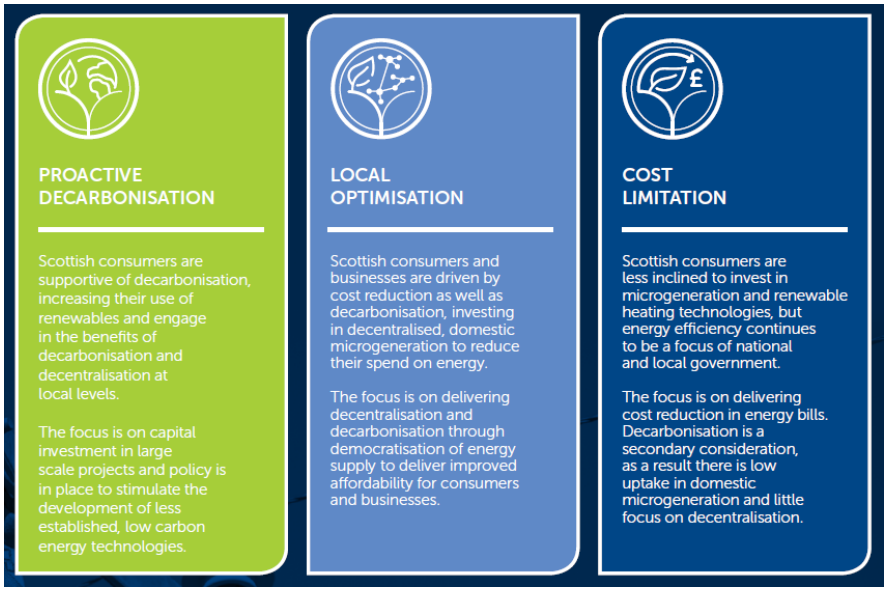
Given the GB path to net zero requires Scotland being able to achieve net zero by 2045, five years ahead of England and ten years ahead of Wales, our network needs to be ready to deliver the flexibility to enable an accelerated net zero pathway. Our stakeholders support this – over the past two years as we have engaged on our RIIO-T2 Business Plan, there has been a consistent message about the success of Scotland's decarbonisation to date and the need for this to continue.

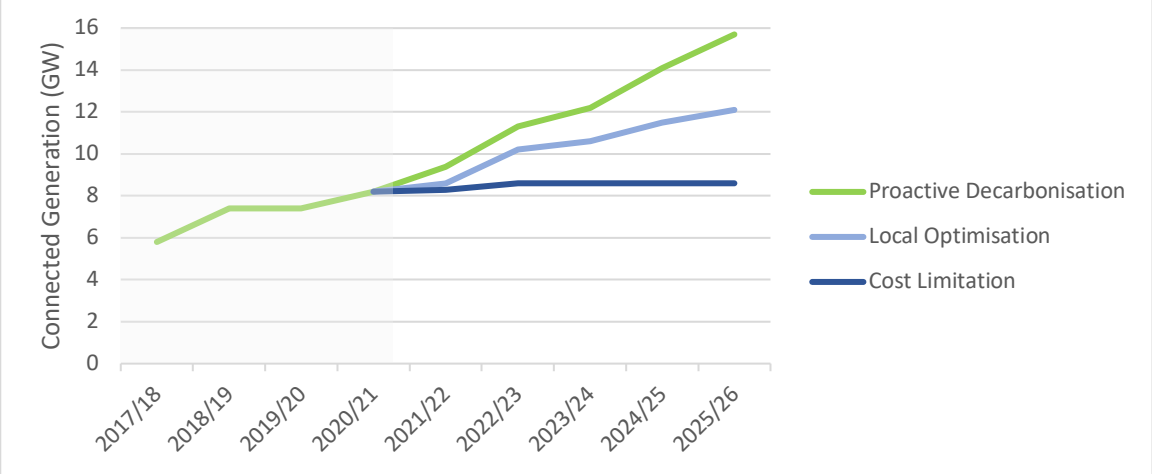
A key area of engagement which has directly influenced what network activities are proposed in our plan relates to our North of Scotland Future Energy Scenarios. In recognition of differing policy positions at a GB and Scottish level, establishing a regional view of our network based on engagement with local authorities, community and local energy groups, developers and future customers, was considered a key input into network planning for the RIIO-T2 period and beyond. We engaged with stakeholders via targeted interviews and consultations and undertook extensive trend analysis to determine our North of Scotland Future Energy Scenarios, which were published in August 2018.



www.ssen-transmission.co.uk/media/3411/north-of-scotland-future-energy-scenarios-full-report.pdf

Figure 5 NoS FES overview of scenarios and connected generation assumptions for the north of Scotland





Energy Networks Association core scenario

3.5 In late 2018, as part of the RIIO-2 regulatory process, Ofgem and its RIIO-2 Challenge Group asked the GB energy networks, gas and electricity, to work together to establish a common 'core' future energy scenario[8]. This work has been co-ordinated through the Energy Networks Association (ENA). It has been undertaken using existing industry datasets and analysis and has not involved new stakeholder consultation.

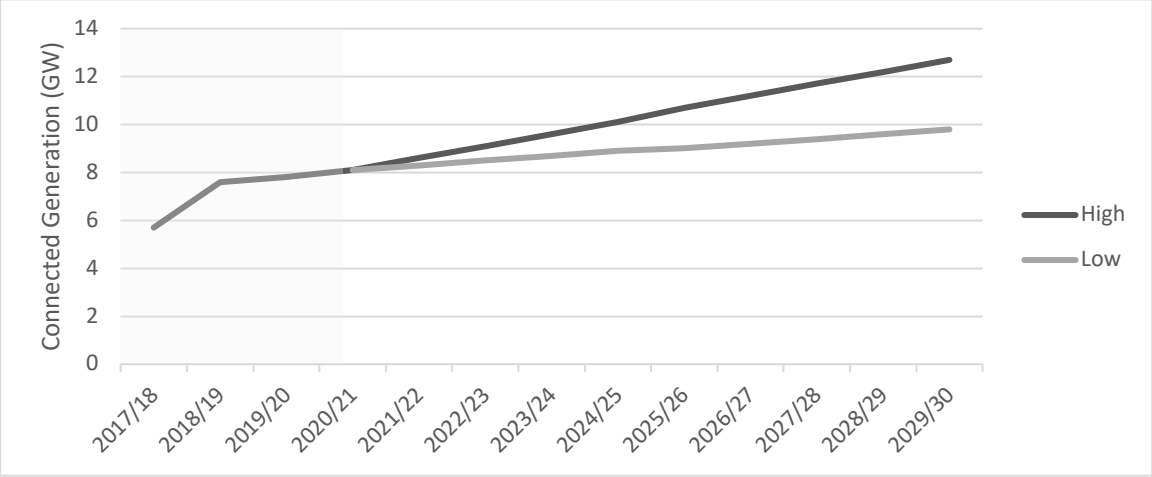
3.6 The approach adopted to establishing this core scenario was to identify the key drivers of energy networks for the RIIO-2 period using the 2018 ESO FES assumptions as shown in Table 1. For each driver, the ENA group made an assessment of the 2030 outturn (low/medium/high); Table 1 also notes the consensus (or otherwise) in this assessment. This subjective assessment has then been interpolated to derive scenarios for connected generation in the north of Scotland (Figure 6).

[8] www.energynetworks.org/assets/files/ENA%20Common%20RIIO2%20Scenario%20report%20-%20March%202019%20FINAL.pdf

Table 1 Drivers of ENA core scenario for GB energy networks

DRIVER	Sub-element	2017 GB actual	FES 2030 Low (GB)	FES 2030 High (GB)	2030 GB view
Offshore wind (GW)	Transmission connected	5.3	16.1	29.1	Mid-point, consensus
Onshore wind (GW)	Transmission connected	6.1	9.3	12.4	Mid-point, consensus
Nuclear (GW)	Large	9.2	2.9	9.0	Low, consensus
Distributed (GW)	Solar, waste, biomass, hydro	35.8	43.1	68.6	Mid-point, consensus
Other (GW)	Hydro, CCGT, marine, CCS, coal	47.9	28.4	40.9	Low, wide range of views
Interconnectors (GW)		4.0	9.8	19.8	Mid-point, consensus
Storage (GW)	Hydro, battery, other	2.7	4.0	4.8	Mid-point, consensus
Low carbon vehicles (m)	PEVs, PHEVs	0.1	2.7	10.6	High, consensus
Low carbon vehicles (GW)	Demand	0.1	2.6	8.1	High, consensus
Heat (000 properties)	Heat pumps, district heating	488	1,050	5,440	Low, consensus
Peak demand (GW)		59.4	60.8	62.9	High, consensus

Figure 6 Interpolation of ENA core scenario: connected generation assumptions for the north of Scotland



Variance between scenarios

3.7 Taken together, the three suites of future energy scenarios described above represent nine different potential future pathways for energy in GB and the north of Scotland. For connected generation, the range of potential outcomes in 2025/26 varies between 8.6 GW and 15.7 GW.

3.8 The variety across the scenarios is intentional and welcome as it allows for comprehensive assessment of the capability of our RIIO-T2 Business Plan to accommodate the widest range of credible energy futures. This was a key stakeholder observation during the development of the NoS FES – that the scenarios should focus on defining the end member outcomes and, hence, stakeholders could have confidence that our Plan is capable of delivering in consumers' interests regardless of what the future holds.

3.9 We explain in the following sections of this paper how these future energy scenarios have been used in the derivation of our Certain View, to assess the uncertainty during the RIIO-T2 period and have informed the design of regulatory mechanisms to manage this uncertainty.

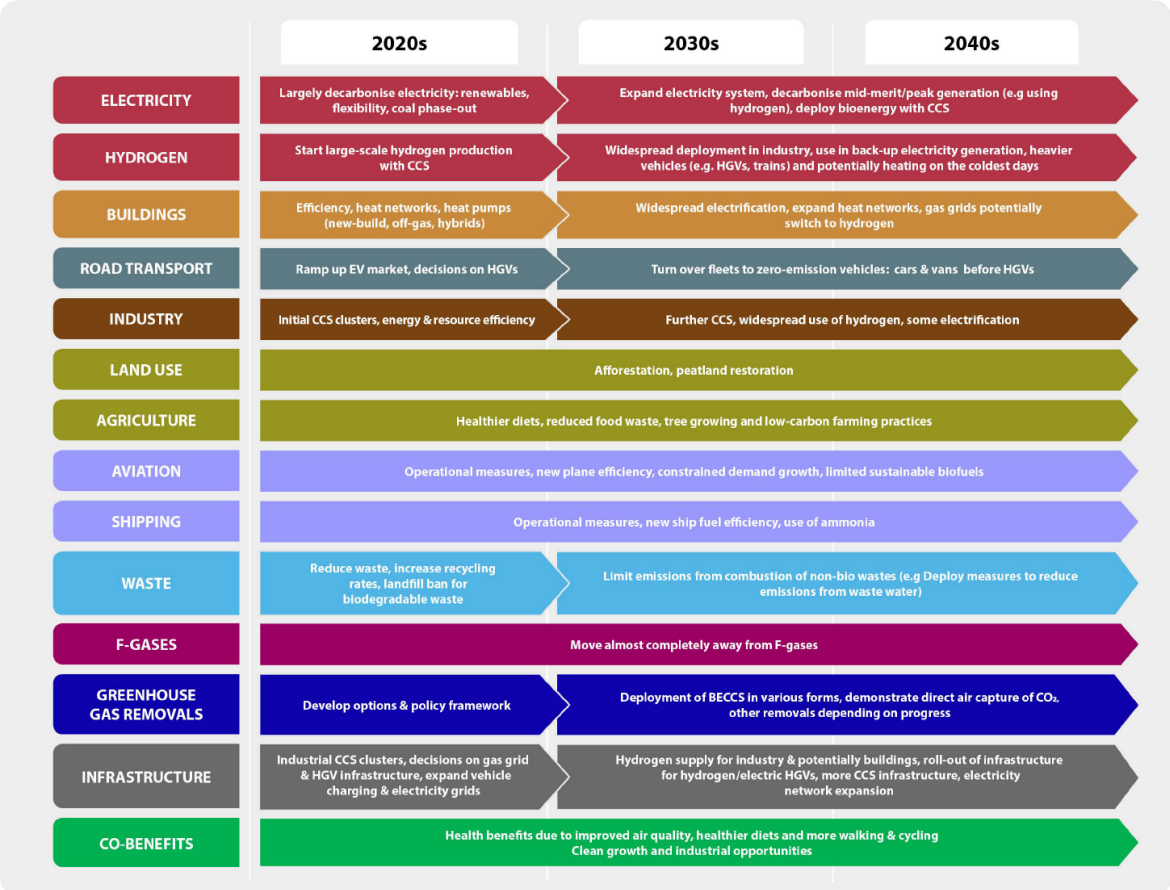
4 Planning for net zero

4.1 In May 2019, the Committee on Climate Change[9] recommended a new emissions target for the UK: net zero greenhouse gases by 2050. In Scotland, the Committee recommended a net zero date of 2045, reflecting Scotland's greater relative capacity to remove emissions than the UK as a whole. The Committee's recommendation was accepted and put into legislation by both the UK and Scottish Governments.

4.2 The net zero target requires all power, heating, transport, domestic, and industry and commercial sectors to be decarbonised along with public engagement and contribution (Figure 7). In the Committee's Net Zero Technical Report, it is emphasized that the uncertainty on the pathways to achieve net zero is large and timescales are long. The Committee presents core measures, further ambitions and speculative scenarios which demonstrate that achieving net zero can be done in more than a single way, however highlight that it is unlikely that all the options will become available in the appropriate timeframe. Due to this, it is important that all options to reduce emissions are developed and pursued in the short-term and delivery is progressed with urgency.

4.3 The implications of a net zero future for the electricity transmission system are profound. In addition to the decarbonisation of the generation of electricity, the decarbonisation of buildings, transport and industry are all likely to increase demand for electricity. With increasing reliance on electricity, security of supply and resilience of the system must increase.

Figure 7 The transition implied by the Committee on Climate Change to achieve net zero emissions



[9] www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

4.4 The future energy scenarios described in section 3 were developed prior to the recommendation and adoption of the net zero target and so do not explicitly consider pathways to achieve the target:

- None of the scenarios in the 2019 ESO FES achieve net zero by 2050. The 'greenest' scenarios – Two Degrees and Community Renewables – are predicated on the 2°C warming pathway. These scenarios estimate 491 TWh/year annual electricity demand and peak demand of 115 GW in 2050, almost twice as much as today's peak.
- The Proactive Decarbonisation scenario in the NoS FES sets out the credible maximum decarbonisation of the energy system in the north of Scotland. This scenario is predicated on the 1.5°C warming pathway consistent with net zero, however the NoS FES does not look beyond 2030.
- Net zero was not identified as a driver or consideration for the ENA core scenario.

4.5 Following the Committee on Climate Change's report, further work is required to reset future energy scenarios to achieve net zero emissions on a whole system basis.

Net zero and RIIO-T2

4.6 On 8 August 2019 Ofgem[10] wrote to network licensees setting out its expectation that RIIO-T2 Business Plans should be able to flex to support the achievement of the net zero target.

4.7 We welcome Ofgem's clear direction on this, which is consistent with the strongly held views of our stakeholders about the importance of decarbonisation and sustainability. These stakeholder views were central to our June draft Business Plan: "A Network for Net Zero".

4.8 Our established approach to network planning (described in section 2) means that Ofgem's expectations are not new to us. The Proactive Decarbonisation scenario, a valid net zero emissions pathway which was developed to satisfy the 1.5°C target, allowed us to test the ability of our June draft RIIO-T2 Business Plan to flex – through the use of regulatory mechanisms that we have proposed – to achieve the net zero target.

4.9 However noting the absence of well developed GB-wide scenarios out to 2050, we have carefully considered how our Business Plan can flex to accommodate achieving the net zero target. We have identified the following factors as key to our consideration:

- The view presented by the Committee on Climate Change of extensive electrification, particularly of transport and heating, supported by a major expansion of renewable and other low carbon power generation. Electricity grid infrastructure will need to grow to accommodate this and the Committee argue for timely upgrades and future-proof network investment decisions.
- The potential growth of credible and cost effective decarbonisation options in the north of Scotland including: onshore and offshore wind, hydro, gas carbon capture and storage, and interconnection. There are local constraints on demand growth including: electric vehicle infrastructure, penetration of electric heating, quality of the housing stock, and local economic conditions. There are also credible opportunities to develop local hydrogen systems.

[10] www.ofgem.gov.uk/system/files/docs/2019/08/letter_to_networks_on_achieving_net_zero.pdf

- The current configuration and condition of the north of Scotland transmission system, in particular where intervention will be required to ensure the continued safe and secure operation of the network. For example, we consider upgrades can be done to cables, conductors and network elements that are towards the end of their lifespans, providing better efficiency and potentially more capacity to achieve net zero emissions.

4.10 The essential need to match supply and demand will not change. Historically this requirement has been accommodated largely by the use of generating plant whose output could be controlled or dispatched as necessary. However, with increasing volumes of variable output renewables connecting to the network this balancing of the system becomes harder. Increased level of interconnection to other countries, such as provided by the interconnector with Norway, can improve security of supply and allow sharing of back up capacity. It also allows advantage to be taken of different weather conditions and variations in the demand profiles for electricity over a larger area. Demand is also becoming more flexible and controllable, thus playing a more active role in the overall demand supply balancing.

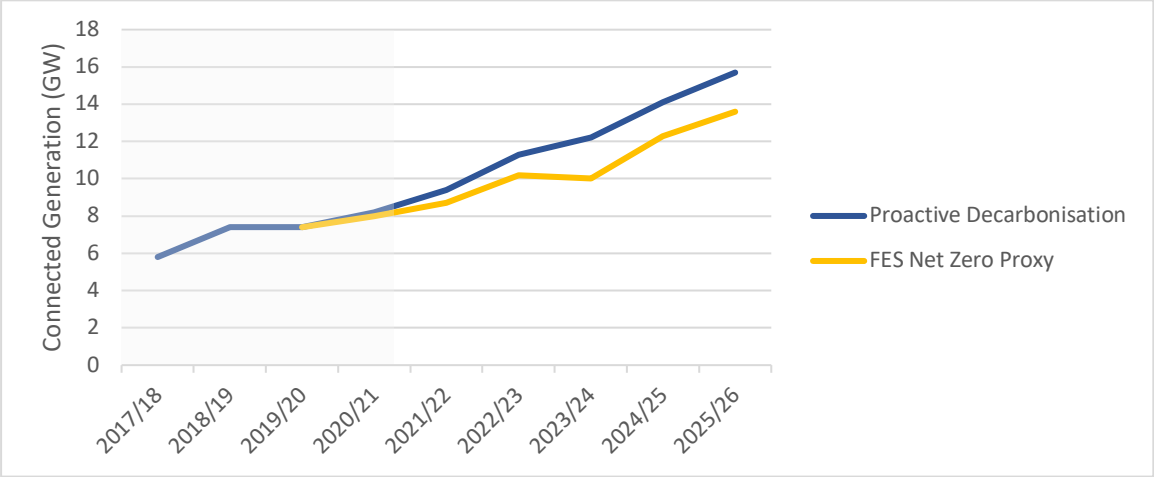
4.11 In our business planning for the net zero target, we assume that balancing requirements to maintain grid system frequency are increasingly likely to require specific measures rather than relying on the inherent energy reserve contained in the conventional large scale generation units. Increased levels of storage such as batteries or pumped storage hydro schemes are expected to come forward in response to this need. The future energy scenarios all reflect these expected increases in these technologies.

4.12 In order to test the ability of our Business Plan to accommodate the net zero target, we have examined all of the available evidence to determine a credible generation and demand outcome for the end of the RIIO-T2 period consistent with net zero emissions by 2045. We have concluded:

- For energy demand, while it is credible to plan for some growth due to electrification (particularly of transport), the impacts on the electricity transmission system are likely to be negligible during the RIIO-T2 period. These are captured in the Proactive Decarbonisation NoS FES. However, more significant impacts are likely beyond 2026 and, hence, planning and development works are critical during RIIO-T2. These activities are a key part of our RIIO-T2 Business Plan outputs.

- For electricity generation, the Proactive Decarbonisation NoS FES is a net zero emissions pathway. To provide an alternative pathway, we have combined elements of the 2019 ESO FES Two Degrees and Community Renewables to create a FES Net Zero Proxy scenario. This suggests that connected generation outturn between 13.6 GW and 15.7 GW in 2025/26 would be required (Figure 8).

Figure 8 Connected generation in the north of Scotland in net zero scenarios



4.13 We describe in the following section 5 how these factors have been taken into account in the capital investment proposals in our RIIO-T2 Business Plan.

5 The Certain View

5.1 Scenarios are a useful planning tool to assess the range of potential outcomes over a future time period. However scenarios are, by design intent, based on broad assumptions. This can be termed a 'top down' approach. For example, an assumption that energy demand will increase by a specified percentage per year across a region. Within that broad assumption there can be significant local variability and/or regional uncertainty and, accordingly, scenarios have limitations when determining the detailed scope of specific investments or activities that constitute a Business Plan. At that point they become instead an important component in a mechanism which brings a wider range of considerations into play to identify detailed investment proposals.

5.2 Every investment or activity in our RIIO-T2 Business Plan has been identified from a detailed examination of the underlying need and the options available to meet that need. This includes both future energy scenarios (top down) and all of the local factors (bottom up) that contribute to need. By combining all known relevant information, we can have confidence that our conclusion is the most cost effective output.

5.3 All of investments and activities identified through this comprehensive approach are combined to give an overall view of the Business Plan – we have called this the Certain View. It is made up of investments and activities where there is strong evidence of need and where the best option can be identified.

5.4 Given the timescale of the Business Plan, being prepared in 2019 to cover the period out to 31 March 2026, there will be other investments and activities that are currently uncertain but will become certain during the lifetime of the Plan. Top down scenarios, such as the ESO FES and NoS FES, can be directly compared with the Certain View to provide an invaluable insight into the likely extent of uncertainty in the Plan.

Methodology to determine the Certain View

5.5 The Certain View is every activity and investment that we propose to undertake during the RIIO-T2 period where there is compelling evidence of need. This encompasses capital investment to grow the network and accommodate new renewable generators, the activities to operate the network safely and securely every day, the service we provide to customers and communities, and how we run our business sustainably in the interests of the environment and future energy users.

5.6 This paper, however, is concerned with the network investment element of the Certain View and, in particular, ensuring timely and efficient capital investment to grow the system to meet the net zero target. The methodology to determine this element of the Certain View is described below. We include both growth-driven and asset risk-driven investments in this description. While asset risk-driven investments might not be intended for the immediate connection of new generation, we consider both the impact of these investments on the net zero target (e.g. the potential benefits of future proofing) and the efficient integrated delivery of construction works (e.g. with nearby growth-driven investments). Other forecast expenditure, such as IT and cyber security, operations and resilience, has been determined on the basis of the capital investment described here.

5.7 There are five parts to the network investment element of the Certain View (Table 2):

1) Investments that commenced during RIIO-T1 and will be completed in RIIO-T2. Each of the six projects are required to increase the capacity on the transmission system to accommodate growth in renewable generation.

2) Strategic investments that have been given a consistent sustained 'proceed' signal by the NOA. The two projects to reinforce the East Coast transmission system were assessed as critical in the January 2019 NOA[11], driven by the need to increase boundary transfer capability between the SHE Transmission and Scottish Power Transmission regions. For both projects, the optimum delivery year is the same across all four ESO FES scenarios. While these investments are primarily growth-driven, the work is on existing assets so also improves condition and reduces risk of failure.

3) Investments required to replace or refurbish existing assets. This is equipment that our risk based assessment has determined will reach an unacceptable risk associated with failure during RIIO-T2. Detailed local optioneering is used to identify the optimal intervention and the optimal timing for that intervention. Twenty nine such interventions are proposed during RIIO-T2.

4) Other investments with strong evidence of certainty now. The four investments included in this element have different drivers. The North East 400 project combines risk based asset replacement requirements with increases to network capacity to accommodate new generation connections and the NorthConnect interconnector. The Kinardochy Reactive Power investment has both generation connection and system (NOA) drivers. Glenshero and Moray Offshore are generation connections.

5) Activities required to ensure timely investment. Prior to starting construction, detailed design and development work is required for each investment we undertake. Our strategic optioneering assessment can take many years and cost up to 5% of the final expenditure in the investment. It is this work that ensures the right option is delivered at the right time.

5.8 The generation capacity that is forecast to connect in the Certain View is 3.1 GW. This comprises 2.7 GW of offshore wind in the Moray Firth and near the Firth of Forth, along with 0.4 GW of onshore wind developments across the north of Scotland. Added to the forecast 8.1 GW that will be connected to the north of Scotland transmission system by March 2021, this takes the total connected generation under the Certain View to 11.2 GW by the end of the RIIO-T2 period.

5.9 The schemes in the Certain View are described in Table 2 with reference to the primary driver for investment: growth-driven or asset risk-driven. However, a number of these schemes will realise multiple benefits to the transmission system. For example, the North East 400 is a complex package of network investments that delivers asset risk, growth capacity and system operation benefits. We use cost benefit analysis (least worst regrets) to optimise the programme of such investments so as to minimise the overall cost to consumers.

[11] www.nationalgrideso.com/document/137321/download

Table 2 Network investment elements of the Certain View*

Scheme name	Driver for investment
(1) Investments that commenced during RIIO-T1 and will be completed in RIIO-T2	
6 schemes	*Forecast RIIO-T2 investment, £82 million*
Carradale GSP	Increased capacity at Grid Supply Point for the connection of new distributed generation
Creag Riabhach	New overhead line and substation for windfarm connection
Limekilns	New overhead line and substation for windfarm connection
Lairg - Loch Buidhe	New overhead line and substation to increase the local transmission system capacity to accommodate new generation connections
Tealing 275kV busbar	Substation works to connect new offshore windfarm
Millenium South	New overhead line and substation for windfarm connection
(2) Strategic investments that have been given a consistent sustained 'proceed' signal by the NOA	
2 schemes	*Forecast RIIO-T2 investment, £433 million*
East Coast 275 (ECU2)	To increase boundary transfer capability. Works include a new substation at Alyth, substation works at Tealing and reprofiling of existing 275kV circuits
East Coast 400 (ECUP)	To increase boundary transfer capability. Works include reconductoring of existing overhead line and substation works at Alyth, Kintore, Fetteresso and Blackhillock
(3) Investments required to replace or refurbish existing assets	
29 schemes	*Forecast RIIO-T2 investment, £690 million*
Aigas PS	Risk based replacement of transformers at generation connection substation
Beauly 132	Risk based replacement of transformers and switchgear at substation
Beauly to Deanie	Risk based refurbishment of overhead line
Broadford GSP	Risk based replacement of transformers at Grid Supply Point
Charleston to Glenagnes	Risk based replacement of underground cable
Culligran PS	Risk based replacement of transformer at generation connection substation
Deanie PS	Risk based replacement of transformer at generation connection substation
Dudhope GSP	Risk based replacement of transformers at Grid Supply Point
Foyers PS	Risk based replacement of transformer and switchgear at generation connection substation
Glenmoriston	Risk based replacement of transformer and switchgear at substation
Harris to Stornoway 132	Risk based replacement of existing overhead line
Invergarry T 132	Risk based replacement of conductor on overhead line and tower painting
Keith	Risk based replacement of substation switchgear
Kilmorack PS	Risk based replacement of transformer at generation connection substation
Kintore	Risk based replacement of transformers and switchgear at substation
Peterhead	Risk based replacement of transformers at substation
Peterhead to Inverugie	Risk based replacement of fittings on 132kV overhead line
Port Ann to Crossaig	Risk based replacement of existing overhead line
Quoich T	Risk based replacement of disconnectors and earth switch

Redmoss	Risk based replacement of transformers and switchgear at substation
Redmoss to Clayhills	Risk based replacement of underground cable
Sloy to Windyhill East	Risk based replacement of earthwire on overhead line and tower painting
Sloy to Windyhill West	Risk based replacement of fittings on overhead line, foundation repairs and tower painting
Sloy PS	Risk based replacement of transformers at generation connection substation
St Fillans PS	Risk based replacement of transformer at generation connection substation
Tealing	Risk based replacement of transformer and reactor at substation
Tummel Bridge	Risk based replacement of transformers and switchgear at substation
Dunoon 132kV	Risk based replacement of existing overhead line
Willowdale	Risk based replacement of transformers and switchgear at substation
(4) Other investments with strong evidence of certainty now	
5 schemes	*Forecast RIIO-T2 investment, £255 million*
North East 400	Combined asset- and growth-driven investments with delivery programme optimised to minimise outage costs. Works include conductor replacement on existing overhead line, and substation works at Kintore, New Deer, Peterhead and Rothienorman
Kinardochy Reactive Power	System driven investment to accommodate new generation capacity and increase boundary capability
Glenshero	New overhead line and substation for windfarm connection
Moray Offshore WDA	Substation works to connect new offshore windfarm
(5) Activities required to ensure timely investment	
	Forecast RIIO-T2 investment, £128 million
Variety	Preconstruction activity to develop future investments to ensure these works are ready to proceed to construction when the need is confirmed. Includes generation connections, risk based interventions and NOA options

* More information on these schemes including location maps can be found in section 4 of our draft Business Plan and in the project section of our website

5.10 Cost benefit analysis is also used in the options assessment to determine the optimal investment. This includes consideration of 'over sized' options, sometimes called future proofing or anticipatory investment. Anticipatory investment can be the most cost effective option where, for example, the incremental cost associated with over sizing is small. Two schemes in the Certain View include an element of anticipatory investment:

- Port Ann to Crossaig overhead line replacement, which is primarily required due to the condition and performance of the existing 132kV asset. Our analysis demonstrates that it is cost effective to rebuild this line at 275kV capability given the small incremental cost and high potential for future generation growth in the area.
- Kinardochy Reactive Power investment, which is primarily required for capacity and system performance reasons. Our analysis demonstrates that it is cost effective to construct this substation at 400kV capability to allow for the future uprating of the Beauly Denny overhead line.

Certain View, scenarios and net zero

5.11 The investments included in the Certain View have largely been identified through detailed examination of the evidence that drives specific need and options (e.g. generation connection or risk based asset intervention), rather than through the output of top down scenario modelling.

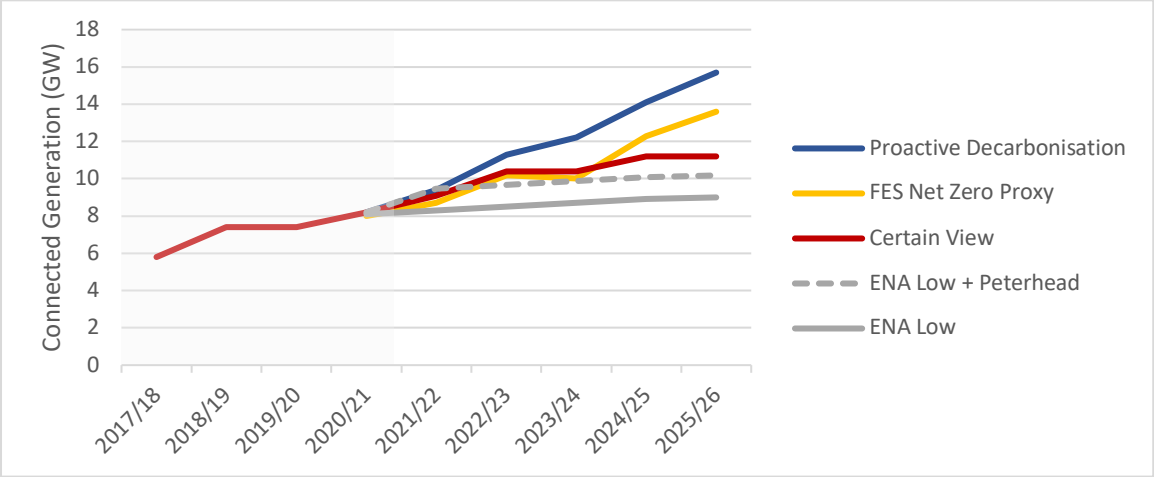
5.12 The exceptions to this are the strategic investments that have been given a sustained 'proceed' signal by the NOA: East Coast 275 (ECU2) and East Coast 400 (ECUP). The NOA takes a whole GB view of the economic development of the transmission system and specifically the strategic system boundaries. As such the options considered in the NOA are not contingent on single drivers, but rather the supply and demand across a region. The range of scenarios modelled results in a confidence of the need for that option, e.g. if the option is needed for all four scenarios then the confidence is high, or if the option is only needed in one or two scenarios then the confidence is low. For both ECU2 and ECUP the need for investment is strong in all four ESO FES scenarios.

5.13 Ofgem and its RIIO-2 Challenge Group have requested us to illustrate our RIIO-2 Business Plan against the ENA core scenario – low. Should our Business Plan propose to deliver outputs above this scenario then we are required to provide justification for our proposals.

5.14 As described in section 3, the ENA core scenario – low is a top down approach that uses the 2018 ESO FES assumptions to forecast that 9 GW of generation will be connected in the north of Scotland by 2025/26. The Certain View results in 11.2 GW of connected generation from the schemes listed in Table 2. We note the following in respect of the difference between the two:

- The ENA core scenario – low has been determined using proportional allocation of a GB outcome, i.e. it is not based on named generation connections. The Certain View is, however, based on named generation connections and so provides a strong basis for our Business Plan.
- A key difference between the Certain View and the 2018 ESO FES is the treatment of Peterhead power station (1,180 MW), which is in the Certain View but not the 2018 ESO FES. We do not believe there is any basis for the exclusion of Peterhead, it is of critical system importance and is currently contracted to increase its connected capacity. The inclusion of Peterhead in the ENA core scenario – low would largely close the gap with the Certain View (Figure 9).

Figure 9 Connected generation assumptions for the north of Scotland: Certain View, scenarios and net zero



5.15 While Figure 9 illustrates a significant gap between the Certain View and the net zero pathways (Proactive Decarbonisation and FES Net Zero Proxy), the investments in the Certain View do provide an ability to flex to accommodate pathways to the net zero emissions target.

5.16 The proposed sequential reinforcement of the East Coast transmission system – through North East 400, East Coast 275, East Coast 400 and pre-construction of a future offshore East Coast HVDC link – are critical, cost effective steps in the net zero journey. The comprehensive 'no regret' approach exhibits efficiencies in network access and asset and growth driver interactions. The 400kV system will reduce the rise in transmission losses and support options for further network future reinforcement.

5.17 The 400kV network expansion will further provide additional system strength, helping combat emerging issues around 'weakening grids' as more conventional thermal generation is closed or not connected continuously. Due to its proximity to the oil and gas infrastructure of the North Sea basin the north east is also a candidate for some of the Carbon Capture Use and Storage (CCUS) highlighted as playing an important part in the net zero scenario. The reinforcement of the network in this region will allow initial deployment of the technology around existing power generation and petrochemical processing facilities. Similarly the cities of Aberdeen and Dundee are potential hubs for future hydrogen deployment envisaged in national strategies for net zero.

5.18 The Kinardochy Reactive Power project is also a critical investment to provide improved network performance flexibility in the light of increased levels of intermittent renewable generation.

Update on Skye, CfD auctions and Scottish islands links

Fort Augustus to Skye investment

5.19 In our June draft RIIO-T2 Business Plan we noted that recent generation connection requests in the Skye region had led to a review of our network development plans for the Fort Augustus to Skye overhead line. This review considered future generation requirements along with the need to ensure security of supply and the risk associated with the condition of the existing equipment.

5.20 Our provisional findings from this review are:

- Comprehensive analysis of efficient pathways for long term network development demonstrates that there is a strong case for the replacement of the existing wood pole overhead line between Broadford and Ardmore. Our initial view is that this replacement would be an overhead line along a similar route with works completed during RIIO-T2. The current asset would then be dismantled. The key benefits of this investment are improved security of supply to Skye and the Western Isles, along with some additional capacity for generation connection.

- Risk based assessment of the condition and performance of the existing steel tower overhead line between Quoich and Broadford demonstrates that intervention will be required by around 2030. There are strong drivers for an upgrade to the capacity of this line (and between Fort Augustus and Quoich) to accommodate new generation connections and increase security of supply on Skye. Our next step will be to conclude on the preferred investment option and timing, and submit an application for planning permission during 2020.

5.21 We will be discussing the findings of our review with stakeholders over the coming weeks before putting forward an updated position in our final RIIO-T2 Business Plan. At this time these investments remain outwith the Certain View.

CfD auctions

5.22 On 20 September 2019, the UK Government announced the provisional results of the third CfD allocation round[12]. In the context of the north of Scotland transmission system, three allocations are important:

- Remote island wind on Orkney (two generators, total 36.72 MW)
- Remote island wind on Western Isles (two generators, total 238.5 MW)
- Offshore wind on the East Coast (one generator, 454 MW)

5.23 Also important is the generators that were not successful in the allocation round including remote wind on the Scottish islands and offshore wind in the Moray Firth.

5.24 We will engage with the relevant parties on this provisional position over the coming weeks and modify our network investment plans (if required) in our final RIIO-T2 Business Plan.

Scottish islands links

5.25 The Certain View in our June draft RIIO-T2 Business Plan did not include network investments between the Scottish mainland and the island groups of Orkney, Shetland and the Western Isles. We explained that these investments were uncertain until the final determination of ongoing regulatory assessment processes under the RIIO-T1 Strategic Wider Works mechanism.

5.26 For Orkney, on 16 September 2019 Ofgem published its conditional decision on the need for investment[13]. For Ofgem to approve the proposed 220 MW Orkney transmission project, Ofgem must be satisfied, by no later than December 2021, that new generation projects totalling at least 135 MW of generation on Orkney have either been awarded a CfD or are likely to go ahead despite not being awarded a CfD. In light of the 2019 CfD allocation

12 www.assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/832924/Contracts_for_Difference_CfD_Allocation_Round_3_Results.pdf

13 www.ofgem.gov.uk/publications-and-updates/orkney-transmission-project-conditional-decision-final-needs-case

being 36.72 MW, this condition has not yet been met. We now intend to consult with Orkney developers and other stakeholders to help establish the optimal 'whole system' solution to unlock Orkney's renewable potential.

5.27 For Shetland, on 19 March 2019 Ofgem published a consultation on its minded-to position to approve the 600 MW Shetland transmission project on the condition that the Viking Energy Wind Farm is awarded a CfD in the 2019 allocation round[14]. While Viking Energy were not successful in the CfD allocation, we note its statement that it remains committed to delivering the project[15].

5.28 For Western Isles, also on 19 March 2019 Ofgem published a consultation on its minded-to position to reject funding for the Western Isles transmission project, due to uncertainty regarding whether sufficient generation will come forward to justify the large size (and subsequent additional cost) of the proposed 600 MW link[16]. Ofgem noted its willingness to consider alternative proposals that more appropriately protect consumers from the risk of funding an oversized transmission link. Discussions continue with Ofgem and stakeholders on options for the Western Isles link, taking account of the successful CfD allocation to 238.50 MW of generation.

5.29 All three Scottish islands links remain outside our Certain View; however, we continue to work to develop these investments and will provide a further update in our December final RIIO-T2 Business Plan.

[14] www.ofgem.gov.uk/system/files/docs/2019/04/shetland_consultation_updated_30042019.pdf
[15] www.sse.com/newsandviews/allarticles/2019/09/sse-renewables-secures-2-2gw-of-new-offshore-cfd-contracts/
[16] www.ofgem.gov.uk/system/files/docs/2019/04/western_isles_consultation_updated_30042019.pdf

6 Likely Outturn Assessment

6.1 Our June draft RIIO-T2 Business Plan presented the Certain View outcomes and expenditure. In the Certain View, the total connected generation by the end of the RIIO-T2 period is 11.2 GW and the total forecast expenditure is £2.2 billion.

6.2 During the consultation on the draft Plan, stakeholders have strongly supported[17] our Certain View approach and the detail we have provided on the outcomes it will deliver. However, stakeholders have asked us to share our best assessment of what the likely outturn will be.

6.3 We have confidence in the Certain View because the need for investment is known and, in consultation with stakeholders, we have given detailed consideration to the preferred option (including whole system and 'do nothing' options) and its cost. This is evidently not the case where the need is uncertain. We present in this section an assessment of the potential for currently uncertain investment – we term this the Likely Outturn Assessment. We emphasise that this is only provided for illustration[18].

6.4 In deriving the Likely Outturn Assessment, we have considered:

- The status of known generation developments, contracted and in scoping, and the potential timeline for connection;
- The cost of offshore wind generation and associated technology developments;
- The potential for continued growth of distributed generation; and
- The availability of transmission capacity for new generation connections and growth that could be delivered and utilised within the RIIO-T2 period.

6.5 This has been considered across the entirety of the north of Scotland, including the Scottish islands, Skye, Caithness, Argyll, East and offshore waters. From this, our Likely Outturn Assessment is for generation connected to exceed the Certain View by around 2.4 GW (Figure 10), i.e. total connected in 2025/26 to be around 13.6 GW.

6.6 To forecast the expenditure associated with our Likely Outturn Assessment, we have considered:

- An average unit cost for the connection of new generation, incorporating sole use, shared use, strategic and other infrastructure requirements[19]; and
- The incremental operating cost of a larger transmission network.

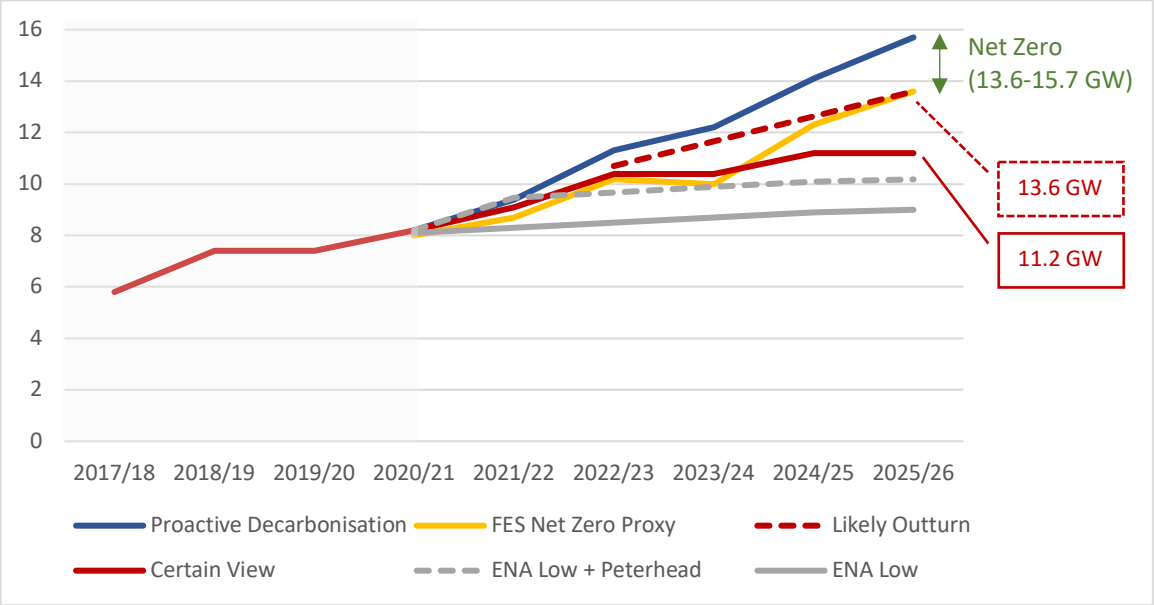
6.7 From this, we estimate the total expenditure for Likely Outturn Assessment to be between £3-3.5 billion.

[17] www.ssen-transmission.co.uk/riio-t2-plan/

[18] Also that we have not undertaken financial modelling or financeability assessment for the Likely Outturn Assessment.

[19] We have not, however, assessed other uncertain costs; for example the VISTA scheme and investments that might be required by the ESO.

Figure 10 Total connected generation in the north of Scotland



6.8 Our draft Plan set out a methodology for calculating the cost of our proposals to the average GB household. This followed the methodology used by Ofgem and applied a 2% pa. inflation assumption. For the £2.2 billion forecast expenditure for the Certain View, we calculated that the average GB household would pay around £6.59[20] for the north of Scotland transmission system in 2025/26. Applying the same methodology to the Likely Outturn Assessment, we calculate that the cost would be around an additional 71p per household in 2025/26, i.e. the average GB household would pay around £7.30.

[20] A rounded figure of around £7 is used in RIIO T2 consultation materials as this value was designed to be robust to small movements in the forecast expenditure which were expected during refinement of the Business Plan.

7 Efficiently dealing with uncertainty

7.1 Citizens Advice has set out five principles that it thinks need to be met in order for the next price control to really deliver for consumers. We fully support Citizens Advice's principles and our draft Business Plan was developed to implement them. The second of these principles is:

"The value of any unspent funding for infrastructure projects is returned to consumers promptly and in full. Through their bills, consumers are paying for significant infrastructure investment. However, if energy network companies defer these projects or decide not to undertake them, they are sometimes able to keep a portion of that funding. This can drive up costs for consumers."

7.2 Our Certain View and proposed flexible regulatory mechanisms go beyond the requirements of Citizens Advice's principle 2. We believe that funding for infrastructure investments should not be released until the need has been demonstrated. This protects consumers from uncertain costs and avoids the complicated clawback of funding that has not been used.

7.3 However the risk associated with this approach is that funding is not released on time and potentially infrastructure investment is delayed. To mitigate this risk, there are two key elements in our draft Plan:

7.4 First, a clear commitment to undertaking pre-construction works to ensure that investments are ready for construction when the need is certain. This includes the design and consent of connections for new generation developments.

7.5 To realise cost efficiency in delivering our capital programme requires substantial focus in the project development phase. This phase is critical in delivering early value by ensuring we develop the most efficient solutions and carry out preliminary design activities to minimise unnecessary cost exposure during the delivery phase. It is this phase that unlocks the potential for efficiency savings, driving considerable consumer benefit. It also ensures that works are energised on time.

7.6 The network investments that have been included in our Certain View already include a provision for the development phase. Our proposal for uncertain projects in RIIO-T2 is as follows:

- For new generation schemes covered by the generation connection volume driver (see below), to include the pre-construction costs as part of the overall unit cost used to design the uncertainty mechanism.
- For the development of other uncertain network investments, the Certain View includes forecast expenditure required for pre-construction works. This is flexible and would be used for all activities, rather than being scheme specific. Such activities might include identification of non-network options delivered by others. Given the uncertainty associated with predicting the actual levels of required pre-construction expenditure, and mindful of Citizens Advice's principle 2, our proposal is to reconcile efficiently incurred costs at the end of the price control period with an adjusting mechanism to hand back unused allowances. This will be what is known as a "use it or lose it pot".

7.7 We anticipate there will be a requirement for us to incur pre-construction expenditure on projects that will be constructed in RIIO-T3. This spend relates to both asset and generation driven investment. Again, the Certain View includes forecast expenditure required for pre-construction works during the RIIO-T2 period.

7.8 Second, a suite of flexible regulatory mechanisms that release funding for investment when it is required. These mechanisms take three broad forms:

1) Automatic funding release associated with output delivery. Specifically the generation connections volume driver that releases an agreed funding allowance per unit of output (e.g. MW connected or MVA capacity).

2) Within period determination, or reopener, for strategic investments such as boundary enhancements and Scottish islands investments. Under a pre-agreed process, we would apply to Ofgem to confirm the need and efficient funding for investment.

3) An operating cost escalator that would automatically increase our operating cost allowances as the network grows.

7.9 All three of these mechanisms have been successfully used during RIIO-T1, and our proposals build upon our learning[21].

[21] Regulatory Framework – October 2019

Scottish & Southern Electricity Networks

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