



## A Network for Net Zero

Enabling an Efficient, Co-ordinated  
and Economical Whole System

The Scottish Hydro Electric  
Transmission Whole System Strategy

July 2019

## About us

**We are Scottish Hydro Electric Transmission (SHE Transmission), part of the SSE Group, responsible for the electricity transmission network in the north of Scotland.**

**We operate under the name of Scottish and Southern Electricity Networks, together with our sister companies, Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD), who operate the lower voltage distribution networks in the north of Scotland and central southern England.**

As the Transmission Owner (TO) we plan, develop and maintain the high voltage electricity transmission network in the north of Scotland.

This network takes the electricity from generators and transports it over long distances for ultimate distribution to homes and businesses in cities, towns and villages. We do this via our extensive network of overhead lines, underground cables and electricity substations, extending over a quarter of the UK's land mass and crossing some of its most challenging terrain.

As a natural monopoly, our activities are regulated by Ofgem. This includes the outputs that we need to deliver for our consumers and the associated revenues that we are allowed to collect.

This is controlled through the RIIO price control framework, where RIIO stands for Revenue made up of Incentives, Innovation and Outputs. The current transmission price control period, RIIO-T1, runs from 2013-2021.

The next electricity transmission price control period, RIIO-T2, will be five years and will run from 2021-2026.

As well as this framework and the drivers within, we have a duty to develop and maintain an efficient, co-ordinated and economical system of electricity transmission.



# Introduction

**Advances in technology are providing new and cost-effective ways of decarbonising our energy systems, creating new possibilities for the generation and use of electricity. This is opening up opportunities across the whole of the energy system for new consumer technologies, such as electric vehicles, heat pumps and smart meters, together with increasing volumes of Distributed Energy Resources (DERs) such as solar, energy storage and wind.**

Traditionally, our network has developed in response to large generation and demand users with predictable behaviours. This approach has served GB consumers well. However, the increasing level of interdependence between the many and new players in this emerging system brings with it new challenges, including more variable power flows, new failure modes and a degree of dependence on third parties for the ongoing safe, secure and economic operation of the electricity system.

We are therefore turning our attention to a more whole system approach, whereby we collaborate with other parties to consider whether actions could be taken, not only on our own transmission network to address transmission issues, but elsewhere on the electricity system, or indeed other wider network systems. For us, whole system working is where two or more parties identify a joint or multi-party approach that delivers a more economic and efficient solution for consumers compared to each of these parties pursuing their own individual solutions independently. Delivering demonstrable value for consumers is at the heart of this. During the RIIO T2 period (2021-2026), we have set the definition of whole system on developing

whole system working between the electricity transmission and distribution networks, and the stakeholders directly impacted and involved in these sectors.

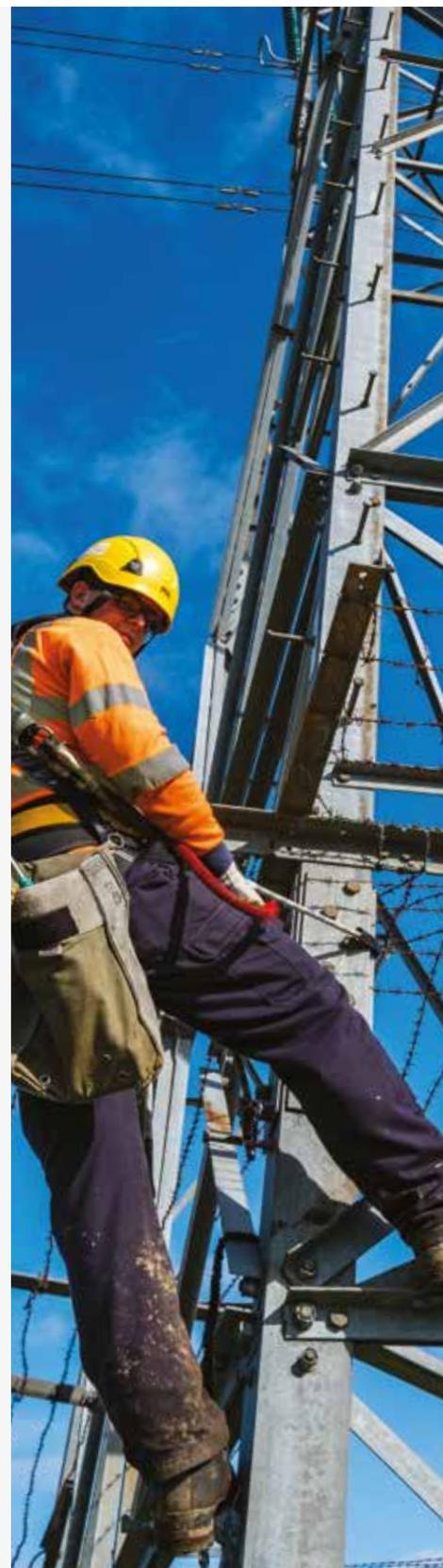
We are seeking to embed this across all our key activities, ranging from planning our network and developing it, all the way through to operating and maintaining it. We will seek to identify the activities and collaborations that are most likely to deliver the highest consumer benefit within these activities and sectors.

However, where opportunities exist for collaboration in other sectors such as gas, heat and transport, we will explore these too. As the current industry and regulatory frameworks are not designed with whole system thinking in mind, we will continue industry collaboration to develop suitable frameworks, not least through our active engagement in the Energy Networks Association's Open Network project.

The purpose of this document is to set out our whole system objective, roadmap and principles to support holistic decision-making for economic and efficient whole system outcomes.

**We would both welcome and encourage any feedback or comments that you might have on the content of this document or, more broadly, our approach to whole system thinking and how we evolve our processes and ways of working to realise the potential consumer value that whole system offers.**

**To provide greatest influence on our plans for the next price control, it would be particularly helpful if you could provide your comments by 31 August 2019. However, comments at any time will be gratefully received and used to inform further engagement and developments in this area.**



## Our role

**As the owner of the electricity transmission system in the north of Scotland, SHE Transmission has a significant role to play in facilitating the transition to a low carbon future.**

**We must ensure that our transmission network recognises and adapts to this new way of working and we must do this in conjunction with all relevant participants and stakeholders to facilitate the energy system transition.**

As set out above, whole system thinking, i.e. looking beyond our transmission network and engaging with other parties to deliver more economic outcomes for consumers, is part of this. As such, it is a key component of our strategic objective (ref: Emerging Thinking document). Our strategic objective is to enable the transition to a low carbon economy. This objective is delivered through the four strategic themes; safe and secure network operation, sector-leading efficiency, stakeholder-led strategy and leadership in sustainability.



### Stakeholder-Led Strategy

We are taking a whole system approach to network operation and development to meet current and future customers' needs. The information required to plan, develop, operate and maintain an efficient whole system requires the understanding of our stakeholders' needs and equally, their understanding of our role within the industry, our obligations and constraints.



### Safe and Secure Network Operation

This focuses on efficient use of data to understand, predict and get the best network performance. We are enhancing data gathering capabilities on our own network as well as exploring ways of sharing data with our stakeholders to facilitate the efficient development and safe and secure operation of the whole electricity system.



### Sector Leading Efficiency

We are adopting an integrated approach to whole life development and operation of our network, using risk-based engineering to deliver value. One example of this is the review of our planning approaches with the view to introduce probabilistic methodologies as well as accommodate flexibility more fully. This ensures that we only invest in network assets that are needed and at the right time.



### Leadership in Sustainability

We are working hard to be a trusted partner of customers and communities, realising long term benefit for society, economy and the environment. We take a whole system view to our asset lifecycle and identify areas where we can contribute to sustainability, for example, by working with our suppliers to identify equipment which minimises energy losses during its operational life. We are updating our losses strategy to ensure that we effectively monitor our losses performance and that we consider losses in our network development activities going forward.

# Our Whole System Objective

Our whole system objective is to embed the consideration of whole system options and benefits in all aspects of how we plan, develop, operate and maintain our network and to make effective whole system decisions on the development of our network to deliver value for GB consumers in a sustainable way.

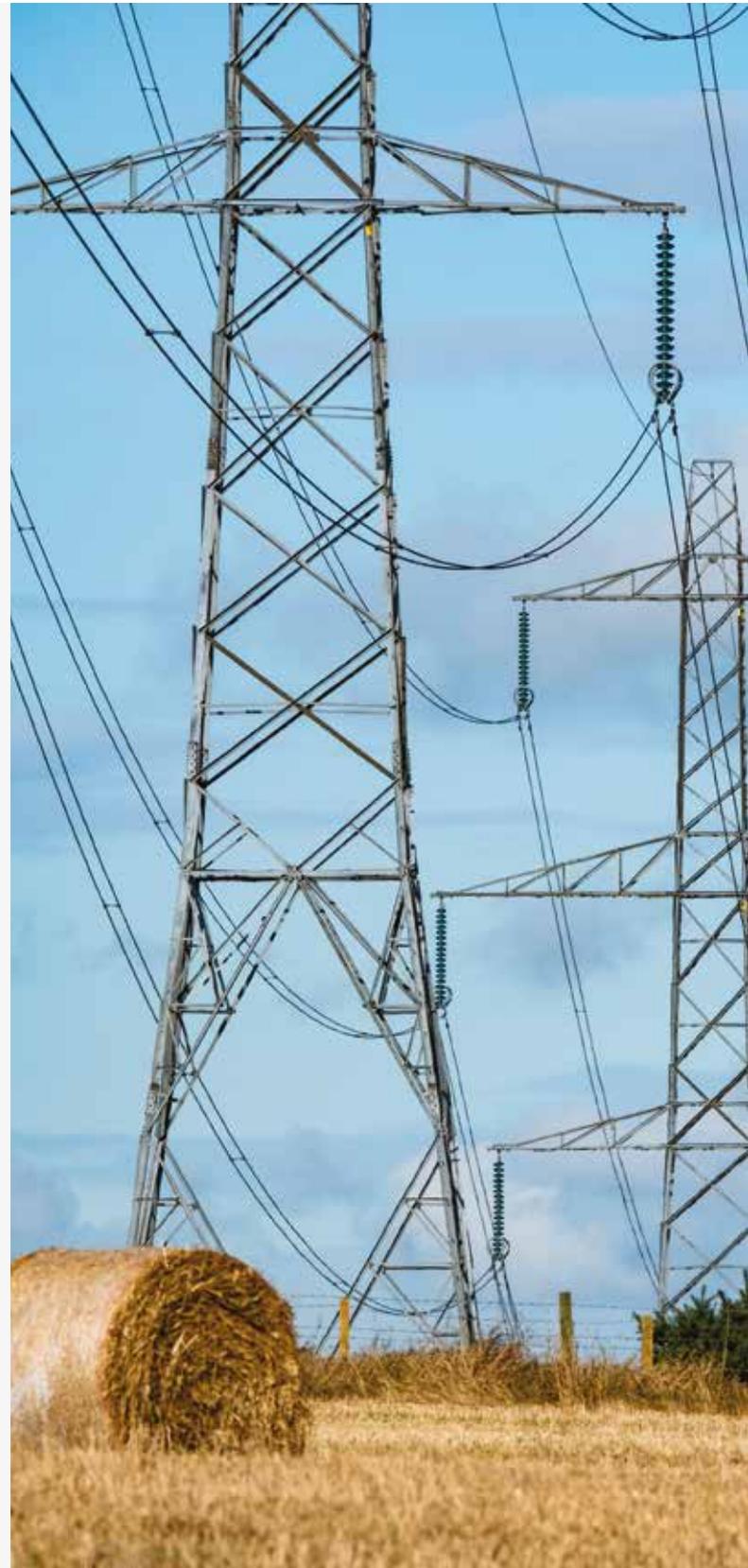
In so doing, we will develop the systems, frameworks and processes that enable us to pursue those options where it is demonstrable that they are in consumers' best interests.

“

I'm very comfortable with that objective, trying to provide options we can deliver, but with the optimal solution for consumers and shareholders.

”

Energy/Utility Representative



Q1.

What do you think of our objective – is it appropriate?



Q2.

How much involvement / how much thought have you given to whole system in your role to date?



# Why Whole System Matters

A whole system approach presents a real opportunity to be smarter about how the energy system is developed and operated going forward. This is not without its challenges – not least because historically the owners and operators of these energy networks have had different drivers and regulatory frameworks, with little alignment or coordination between the different regulators and regulated parties. Additionally, third parties are increasingly offering viable solutions to meeting system needs.

We have identified a common set of drivers emerging across the energy sector that are relevant to the whole system. These are decarbonisation, decentralisation, digitisation and democratisation.



## Decarbonisation

The need to decarbonise energy systems is driving the development of low carbon technologies. We develop our understanding of these new technologies so that we can both facilitate their connection and understand the impact of their connection on our network. This informs the development of our network to allow them to operate in a way that delivers the much needed carbon benefits, whilst maintaining a reliable and secure system for all electricity consumers.



**Energy system transition is most important for me. There's no incentive in connections for having low-carbon generation. "**

Environmental Group Representative



## Decentralisation

In the past, electricity has tended to flow from large centralised power stations through the transmission system and on to the distribution network for supply to businesses and homes. Today, many of our Grid Supply Points (the points at which our transmission network physically connects to the distribution network) now export power from the distribution network onto our transmission network for significant periods of time. The growing shift from large centralised power stations to more DERs means that we must engage with developers and their suppliers to understand the behaviours of these DERs. In Scotland, much of this DER is distant from the large demand sites and, as such, it still relies on our transmission network to be transported to where the energy is needed.

With this growth in DER, there comes greater volatility in power flows on the transmission network consequently driving new system requirements for additional services to maintain efficient operation of the system. DERs can cumulatively provide valuable services to both distribution and transmission systems to help manage this volatility, such as voltage support and frequency response. They can also help to defer or avoid reinforcement of the network.

While it is National Grid Electricity System Operator's responsibility to manage system operation, the input from us as the Transmission Owner (TO), is key, not only at the operational stage but also in the short and long-term planning. In facilitating the transition to a more decentralised energy system, our network development plans need to facilitate the application of alternative whole system solutions, which may be significantly market based. Collaboration and innovation will be playing a critical role in offering an economic level of investment at the right time to ensure the efficient market operation.



**For any developer, the boundary between distribution and transmission is a false one. We should be thinking more widely across gas and electricity. "**

Infrastructure/Engineering Representative



## Digitisation

Digitisation is a significant enabler of the transition to smarter energy systems. It offers the opportunity to better understand both system and consumers' needs and to put in place systems that are able to respond and deliver this. It is critical in the coordination of DER operation to achieve reliable and secure system operation we are used to.

A key part of this is data and managing this data in a way that allows both ourselves and relevant stakeholders to make informed decisions about our whole system activities. We recognise the importance of sharing this data in a way that is meaningful and transparent, whilst at the same time, protecting the system and its users from the risk of both physical and cyber threats.

With increasing extreme weather events, system disturbances are likely increasing for example due to wild fires, storms and lightning. Digitisation plays a key role during system disturbances by allowing the coordination of DER to ride through the disturbances. In the event of disruption, digitisation will play a key role in the restoration of supplies.

The operation of the system during these periods of disturbance is bringing new challenges due to decentralisation. We are developing control automation and monitoring systems to address some of these challenges by enabling us to act swiftly when remedial action is required.

This requires innovation and collaboration with our stakeholders.



**The other barrier is assets and their flexibility. It's how much you can integrate those. Some of the digitisation stuff comes into it.**

Infrastructure/Engineering Representative



## Democratisation

Our transmission network is there to serve electricity consumers. As such, it is key that we listen to what these consumers tell us. We need to carefully balance consumers' needs against the cost and the security of our supply, making sure that our decisions, along with the transparent decision-making process and methodologies that sit behind these, are cognisant of whole system thinking.

An enhanced level of information collection, based on stakeholders' views and data, is critical in establishing proper market structures and coherent regulatory mechanisms in order to encourage whole system behaviours within the wider stakeholders.



**As a TO, there is a responsibility to your investors. However, in Scotland, communication between DNO/DSOs should be open.**

Developer/Connection Representative



## Our approach

The topology of the north of Scotland energy system means it has always been closer to a whole system than other parts of GB, in terms of the location and size of population centres, excess generation over demand, radial 132kV transmission network, off-gas population and Economy 7, as well as non-standard generation and demand connections, and we have already been engaging in whole system thinking. For example, there is a significant amount of generation looking to connect at distribution voltages in the North East of Scotland. Whilst this is not directly connected to our transmission network, its connection to the distribution network has an impact on our transmission network.

We are already engaging in whole system thinking. For example, there is a significant amount of generation looking to connect at distribution voltages in the North East of Scotland. Whilst this is not directly connected to our transmission network, its connection to the distribution network has an impact on our transmission network.

Traditionally, guided by the deterministic planning standard – the Security and Quality of Supply Standard (SQSS), we would look to reinforce our network to accommodate this where additional capacity was required. However, under a whole system approach, we broaden the options that we consider, including working with the electricity Distribution Network Operator to explore whether action taken at distribution voltages may present more efficient ways to secure this new capacity.

Given the intermittency of most DERs, there are cases where we have deferred investments in transmission, instead investing in active network management systems to manage generation output in real time to ensure our assets are operated within their rated capabilities. This allows a transparently calculated trade-off between generation curtailment and investment in often expensive network reinforcements.

We work closely with the National Grid Electricity System Operator, who undertakes a cost benefit analysis on our behalf to inform us of economic developments on our network. In some cases, we may still reinforce the transmission system as the most economical solution.

However, this process allows us to demonstrate transparently that we are taking whole system decisions in our network development and operation.

“

**It's the regulator's problem and the Government's problem at the end of the day.** ”

Infrastructure/Engineering Representative

“

**In the Emerging Thinking document, there's variability between new generation in different areas and different demand in different areas. If you have large energy demands [and] you're unsure whether they'll shift to electricity, how do you model and update those numbers during RIIO-T2?**

Developer/Connection Representative

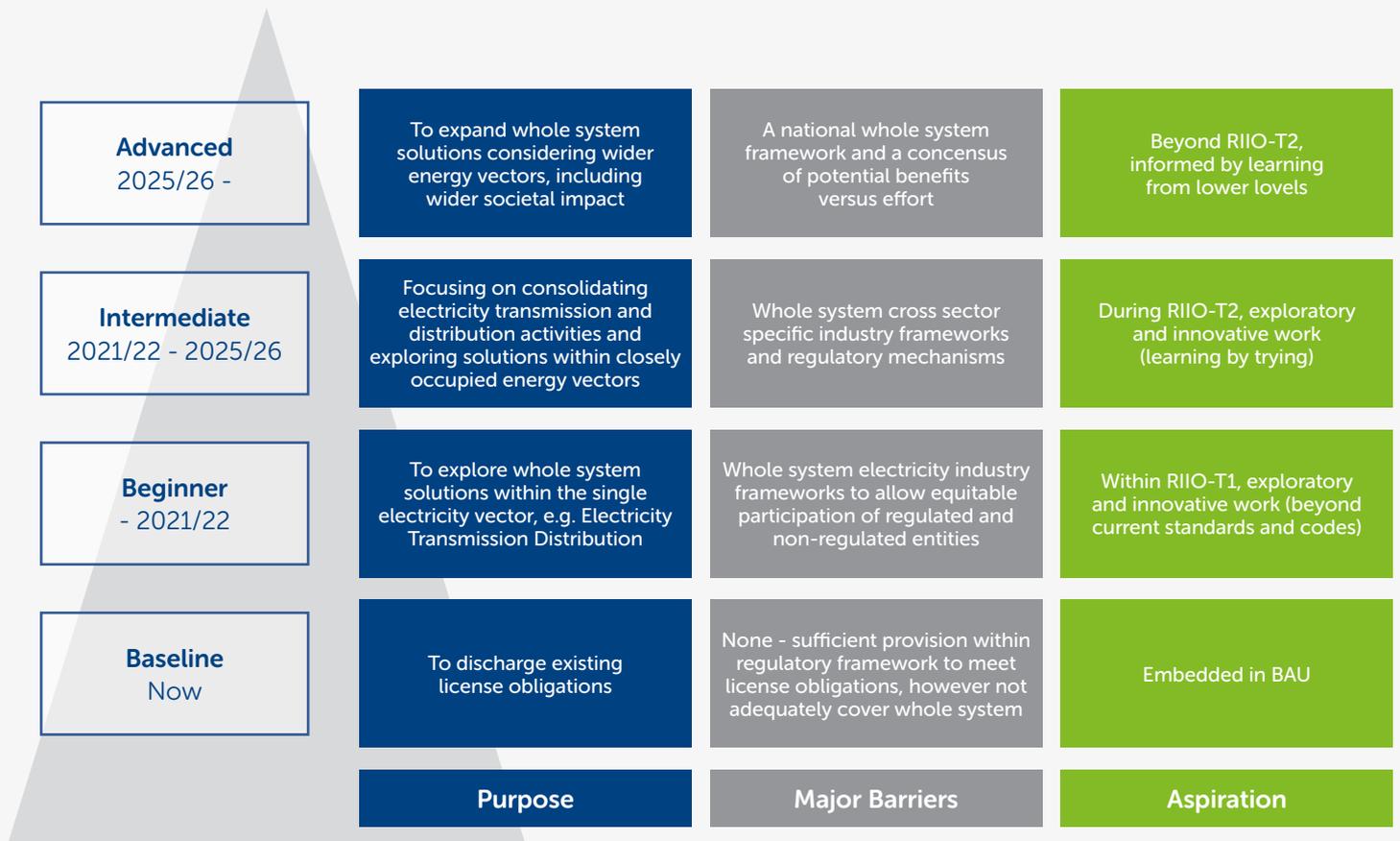
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The framework for this engagement between parties and how any whole system solution might be identified and delivered is still in its infancy. There are many considerations to be taken into account, not least how we make this work for all parties involved, given that there are many non-regulated parties that may potentially be able to provide whole system solutions. There exist limitations in the current industry and regulatory frameworks that still present barriers to whole system even among regulated parties, for example, there are no clear funding routes to allow one party to develop a solution to meet the need of another party's network if it was the most economic whole system solution. We are actively participating in the Energy Networks Association's Open Networks industry project to explore and develop whole system investment and operation frameworks.

For us, consolidating our current whole system activities and establishing the future framework by exploring and testing whole system ways of working in order to scale up this activity is the logical objective for the next price control period (RIIO-T2). We believe this should focus on the opportunities that exist between electricity transmission and distribution in the first instance, but not to the exclusion of wider whole system opportunities, i.e. between electricity networks and other vectors, e.g. gas, transport and heat networks should they materialise.

As this learning is embedded in our business and the frameworks become more robust and understood, we believe the opportunity to extend into other vectors can be built in on a more enduring basis.

The following diagram serves to illustrate how we 'categorise' this ambition and the timeframes over which we see this being delivered.



Our whole system ambition - targeting the intermediate level during RIIO T2 period (2021 to 2016)

“ SHE Transmission is uniquely positioned to work towards a whole system approach for distribution and transmission. The big question is how to bridge the gap between electricity and gas. There are competing forces and unique dimensions here. ”

Infrastructure/Engineering Representative

**Q3.**  Have we got the right level of ambition with regards to whole system?

**Q4.**  How satisfied are you with our approach to whole system?

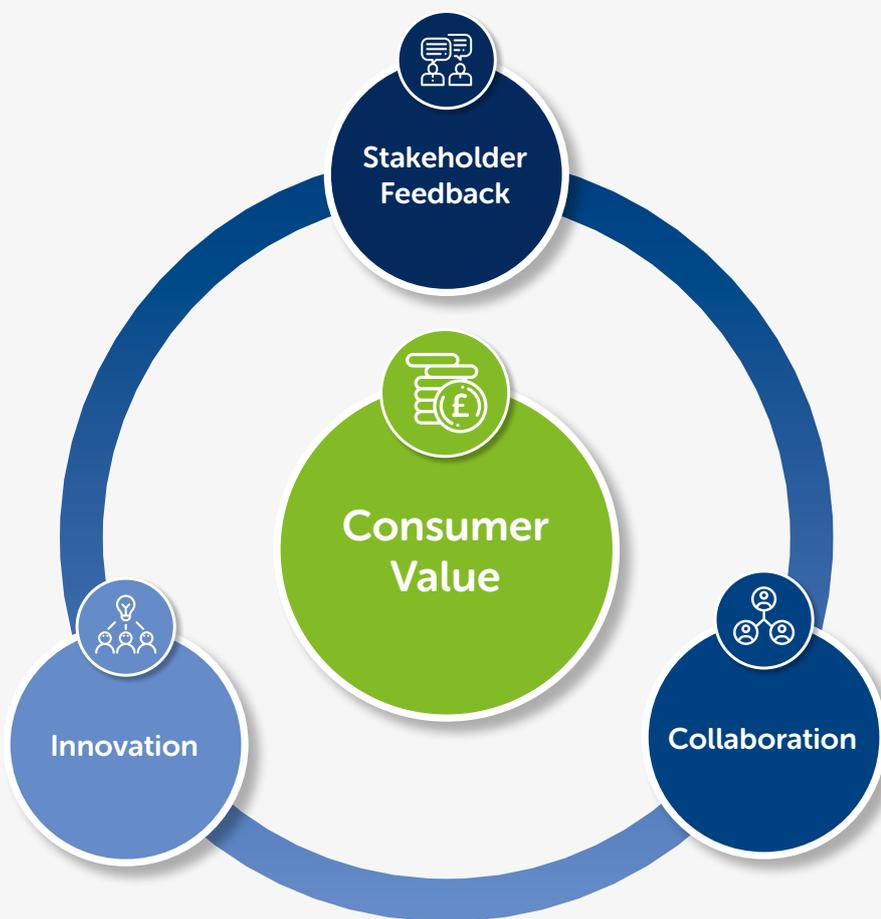
# Our Whole System Principles

In order to embed this approach in our business, we are guided by four core principles, with delivering value for consumers being at the heart of these.

These principles are based on our four strategic themes, set out earlier in this document, and focus on the need to:

- Engage stakeholders;
- Demonstrate collaboration; and
- Continue to innovate.

The importance of each of these in our approach is set out below.



## Consumer Value

**At the heart of our whole system policy is delivering value for consumers. If there is not demonstrable value for consumers in taking a whole system approach, there is no point in doing this.**

However, if done properly, we believe our transparent, balanced and stakeholder informed whole system solutions can and should deliver value because of the way that they bring together networks to ensure that single or smarter solutions are delivered for both current and future consumers with potential competing interests.

To do this, it is important that we understand where and how our network is linked to activities in other sectors so that we can assess the impact of our activities on others and focus on those impacts that drive the highest benefits for consumers.

In order to assess whole system options, we are developing a Whole System Cost and Benefits Analysis (WSCBA) tool. This will give transparency to our assessment and decision-making processes.

It will also allow us to rank our whole system activities to allow objective prioritisation of those activities that deliver the highest consumer benefits.

“

**Could the whole system approach offer a much greater value to the customer?** ”

Environmental Group Representative



## Stakeholder Feedback

**The key to delivering value for consumers is delivering sustainable solutions that are well informed by our stakeholders. This will be based on a good understanding of our stakeholder's expectations.**

While it is important that we understand how our stakeholders' activities impact us, we equally need to understand how our activities impact them. It is important to establish an effective two-way communication, tailored for different customers and stakeholders at all levels.

To gather useful feedback from our stakeholders, we recognise the importance of tailoring our engagement and effectively communicating what we do and why we do it; describing our position within the electricity industry and the constraints within which we operate; our relationships with our stakeholders; how our activities impact our stakeholders and consumers; and how stakeholder input is taken into consideration in shaping our strategies.

In so doing, we believe our stakeholders can be sufficiently informed so that they are better able to understand where they are able to influence our approach to whole system working.

When engaging with stakeholders on whole system working, we will be certain to keep our focus on how this delivers value for consumers. By clearly laying out our whole system approach in this way, this not only allows stakeholders to understand our thinking, but to contribute to its development and identify what information they require so that they ensure that their activities are complementary to our efforts.

We will continue to host stakeholder-led, effective, two-way communication events to ensure that our whole system strategy is founded on our customers' needs, meets the expectation of our stakeholders and is properly communicated and understood.

“

**In terms of the agencies responsible for the economic development in particular areas, there must be some advance notice of what they're planning.**

”

Environmental Group Representative



# Our Whole System Principles



## Collaboration

Despite the multiple parties involved, the electricity network in GB operates as one coordinated system, which is connected to European markets through interconnectors. The secure and efficient operation of the electricity system is contingent upon effective coordination and collaboration between the different parties in a broad church, which is particularly important for the north of Scotland's features – we have a high renewable potential, but also a high fuel poverty and high environmental value.

As a TO, we play a significant part in facilitating this collaboration through several interfaces as specified in industry frameworks and codes. One of the challenges going forward is ensuring that these frameworks and codes facilitate the changes that are needed in our energy system to deliver the needs of consumers.

We believe this is best achieved by looking at where we need to get to and then working back to understand the changes needed to industry frameworks and codes to deliver this.

Collaboration				
	TO-NGESO	TO-DSO/TO	TO-Customer	TO - Wider Stakeholders
Consumer Value	Faster access to low marginal cost/ sustainable generation  Lower constraint costs from outages	Optimum overall cost solutions for network issues (capacity, operability, etc.)	Optimum overall cost solutions for green power and network capacity with flexible connections  Improved power quality (harmonics, voltage flicker, etc.)	Stakeholder input/ feedback  Cross-vectors collaboration such as Gas, Transport and Heat to meet consumer demand and decarbonising in a timely fashion
Enhancing existing codes and standards for whole system				New frameworks



## Innovation

**In order to make the most of smart technologies, the ability to test and trial these new innovations on our network is key to delivering and supporting the energy system transition. In embedding whole system working, we will continue to seek and prove new ways of working for the long-term benefit of our customers, stakeholders and SHE Transmission.**

We have identified a number of innovation projects which are likely to deliver high value for consumers include more optimised connection solutions, system automation and active network management, dynamic asset rating and monitoring, development of probabilistic analysis tools, development and use of whole system future energy scenarios as well as development of a transparent whole system cost benefit analysis.

Taken as an example, the optimised connection solutions will focus on the use of technology to publicly make available data about our current network, future network developments and capacity availability for different DER categories. This not only allows stakeholders to provide useful feedback on how we could improve our development activities, but also helps them develop a good understanding of where opportunities may exist on our network and when they might materialise. Stakeholders have told us this information is very useful to them and will potentially help them in working with us to identify economic and timely connections to meet their needs while advancing the decarbonisation of our energy. More details on this and other innovations are provided in our [Innovation Strategy](#)<sup>1</sup>.

The strategic decision will be made by quantifying the effort, benefits and risk, set out in SHE Transmission's RIIO-T2 [Innovation Strategy](#)<sup>1</sup>.

**“  
Innovation is brilliant, but it has to have a positive effect on the end numbers. If it doesn't return on investment, I'm not sure how many people will accept it. ”**

Developer/Connection Representative

**Q5.**

Do you agree with the principles we have identified – is there anything missing?



# Whole System Implementation

**We aim to maximise consumer benefits by through whole system thinking in all our activities – both internally within SHE Transmission and externally with the system operator, neighbouring transmission and distribution network operators and wider stakeholders.**

As well as SHE Transmission, the SSE Group also owns and operates the distribution network in the north of Scotland, Scottish Hydro Electric Power Distribution (SHEPD). This means that, as a group, we are well-placed to test and develop a coordinated approach to whole system working across both electricity transmission and distribution networks in the north of Scotland.

A recent example of our whole system approach is the Carradale Grid Supply Point (GSP) reinforcement. A number of developers were seeking to connect their windfarms to the Carradale GSP.

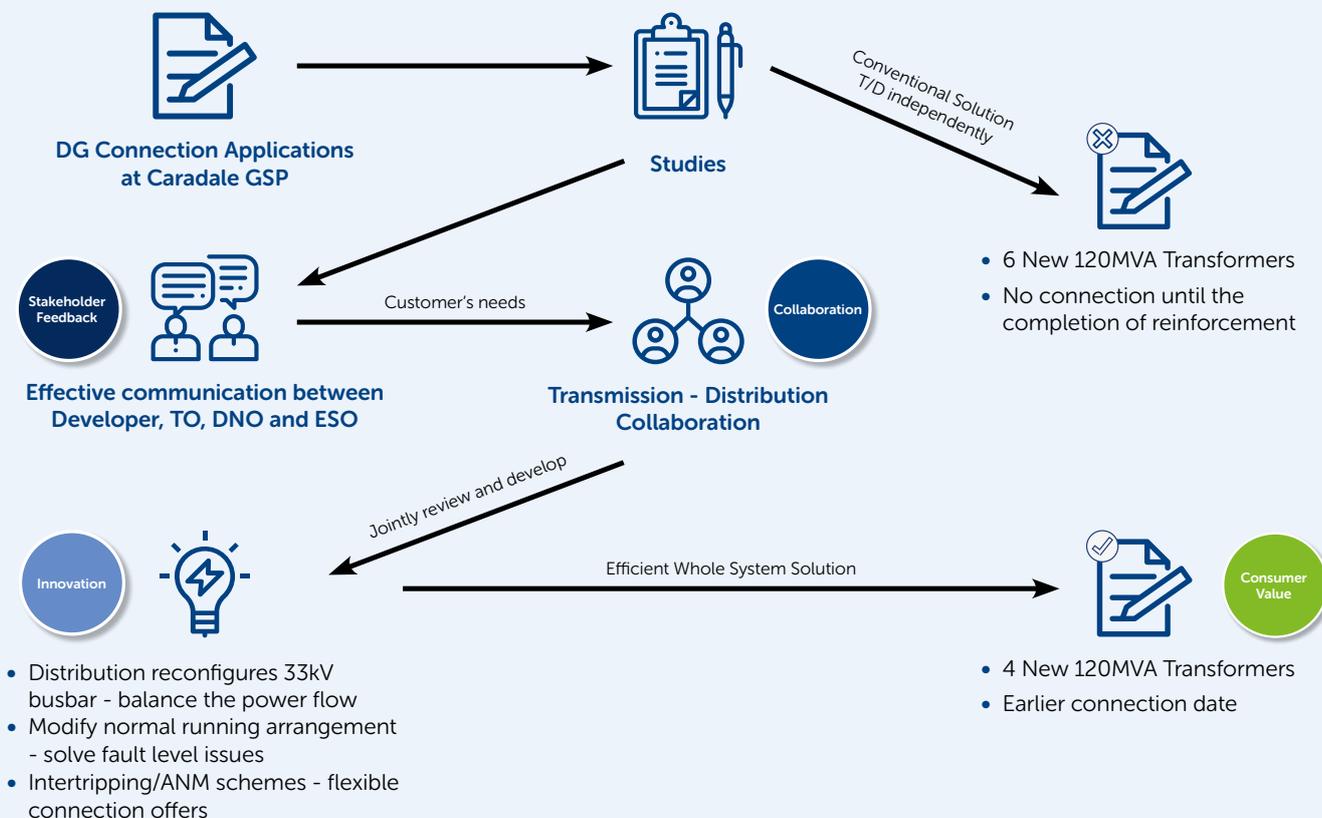
Our network studies revealed we need to replace the existing 4 transformers with 6 new 120MVA transformers, and connection of these projects would not be possible until the completion of

this reinforcement. In order to explore the alternative effective options, we held several meetings with SHEPD, NGE SO and developers to explain the situation and understand their prioritised needs as well as the needs of our developers.

With this effective communication, SHE Transmission and SHEPD collaborated to jointly review and develop an innovative solution – to reconfigure the 33kV busbar, modify normal running arrangements and through offering a flexible connection with intertripping and active network management.

This new whole system solution reduced the reinforcement requirements to 4 new transformers together with an earlier connection date for developers. This still leaves open the possibility of future expansion should the need arise.

## Implementation of the Carradale GSP whole system solution



The benefits from this whole system exploration include deferring the high-cost transmission works; maximising the utilisation of assets; reducing construction works, as well as facilitating the connection of renewable generation.

This collaborative approach also presented challenges, such as inevitably increased workload for both Transmission and Distribution within the same guaranteed standard period to make connection offers. This was necessary to facilitate the collaboration and joint studies while ensuring that we comply with our obligations regarding the treatment of confidential data and the funding provisions within our individual regulatory settlements.

We are taking an active role, working with the industry via the ENA Open Networks project to develop a whole system investment framework capable of dealing with these and other issues.

In RIIO T2, we believe it will be important to advance this relationship to explore, develop and test whole system working. As such, we will be cognisant of this as we review our existing processes and develop new ones; we will seek to align system analysis assumptions; and we will look at how we can manage information exchange across transmission and distribution to ensure that relevant data is accessible to stakeholders without compromising data security, and that investment and operational decisions are optimised on a whole system basis.

**“  
How do you expect funding and allowances to be moved around if alternative whole system solutions are found to be ‘better’ options to deliver a TO output?  
”**

Webinar Participant

The following pages set out our vision for how this could work.



# Whole System Implementation



## Stronger Collaboration within the Electricity Vector

**To be effective, collaboration will be key in achieving efficient whole system solutions within the planning, development and operation of the system.**

There are opportunities for standardising our whole system approach across GB in the long term. Working with the industry, and notably through the ENA, we will contribute our experience and learn from others in the development of whole system frameworks.

An example of stronger collaboration is the regional development approach, which will consider regional system needs on both the transmission and distribution systems in a coordinated manner.

A number of steps are necessary to achieve a whole system position on system needs and solutions:

### **a) Information sharing:**

Information sharing has been identified as one of the areas needing improvement, firstly between network companies and secondly with the wider stakeholders. To facilitate the development of whole system solutions, it is important that the system needs are determined from a coherent set of DER on the transmission and distribution systems within a region.

We are leading a project on the ENA Open Networks project to develop a whole system future energy scenario (WSFES) framework to facilitate this. We are already trailing the development of FES, working with SHEPD, which will allow us to determine future whole system needs on a whole system basis. We expect that the production of WSFES within our area will be business as usual during RIIO T2.

### **b) Assessment of system needs:**

With details of the WSFES available, we will work with SHEPD and the ESO to develop a consistent set of assumptions on how the DER might operate. This in turn informs network requirements to support that operation. Given the uncertainty in how the DER will operate on a daily, weekly, seasonal and annual basis, we are exploring ways of improving or modelling capability to capture their characteristics.

We intend on developing probabilistic approaches to address this issue, which is a departure from the current deterministic planning standard and therefore we will be following our innovation strategy to keep it focused on delivering consumer value. We are engaging with the ESO and other TOs to determine the scope of the review of the SQSS to ensure that it accommodates flexibility in the provision of network capacity while maintaining security of supply.

### **c) Identifying a wide range of solution options:**

This is a critical step in whole system in that there are increasing ways of meeting network needs and the number of parties able to offer viable solutions is increasing.

Open and transparent communication of these needs is essential to ensure that not only traditional network solutions are considered in addressing these needs. We will work closely with the ESO and the DSO on the information to be published and how to ensure potential solutions are presented on a consistent basis to allow a fair comparison.

Publishing this information and stakeholder engagement allow stakeholders to have a say in how the networks are developed and also open up opportunities for innovation.

### **d) Determining the optimum solution:**

One of the innovations we plan to undertake is in the area of whole system cost benefit analysis which is essential in determining of optimum whole system solutions.

Technically viable options will be assessed, not only in terms of their capital costs, but also their wider impacts, for example, the potential customer interruption costs, environmental impacts – losses and carbon footprint, lifecycle operational costs and impact on stakeholders. This will allow us to transparently determine the whole system solutions to be implemented.

### **e) Solution funding and execution:**

Where a whole system solution sits with one regulated party, the funding routes to take this forward are covered within the current regulatory frameworks and are well understood.

However, where whole system solutions sit across different regulated parties or a combination of regulated and non-regulated parties, more work is needed to incentivise collaboration and to clearly set out how the funding arrangements will work.

Work is currently ongoing in this area and we would undertake some exploratory work where we identify significant benefit for consumers where suitable frameworks have not yet been developed.



## Stakeholder Engagement

During the development of our whole system strategy, SHE Transmission has held many stakeholder engagement sessions, both internally and externally, including two special engagement events with round-table discussions and webinars.

The internal stakeholder engagement sessions have helped to broaden internal perspectives and awareness of the scope and the opportunities that exist under a whole system approach. Externally, we have managed to successfully engage more than 30 organisations, including the industry's Regulator, utilities, parties with interests in transport, generation and construction, consultancy firms and academia.

This has given us the opportunity to not only present our whole system ambition, but also to listen carefully to their views and feedback on our proposals.

- ABB Ltd
- ABO Wind
- Aquatera
- Balfour Beatty
- BayWa r.e.
- Corrie Construction
- DP Energy
- EMEC
- Energy Saving Trust
- Energyline
- General Electric
- Glasgow Caledonian University
- Green Cat Renewables
- Local Energy Scotland
- LSTC Ltd
- Morgan Sindall
- National Grid
- Nortech Management Ltd
- Ofgem
- Open Grid
- Power and Renewables
- Powerline Technologies
- RES
- Russet Engineering
- Scottish Power
- SHEPD
- SSE Renewables
- Siemens
- The Cyberhawk
- TNEI
- Transport Scotland
- Xero Energy

These events have really helped shape our whole system thinking based on the feedback we received from our stakeholders. In February 2019, it was clear that stakeholders attending the event had little understanding of what whole system meant. Acting on their feedback and developing realistic examples to specifically illustrate the benefits of whole system, we reviewed our approach. Stakeholders attending the next event, three months later, responded more confidently when asked how well the concept of whole system had been explained and whether they agreed with our approach to whole system.

Going forward, we will continue to host stakeholder-led, effective, two-way communication events to ensure that our whole system strategy is founded on our customers' needs, meets the expectation of our stakeholders and is properly communicated and understood.



## Whole System Development Forum

We have established an internal forum to co-ordinate the development of whole system working across SSE's transmission and distribution networks, with particular focus on the interface between transmission and distribution. We will keep broadening the membership to involve more stakeholders to work together for a better whole system.

The objectives of this forum are to:

- Develop a better understanding of electricity system operation across both transmission and distribution;
- Establish what data sharing is necessary to facilitate whole system working and identify where changes are needed to the regulatory framework and codes to remove any undue barriers;
- Ensure consistency in engineering and commercial assumptions;
- Develop governance on common activities with supporting processes and work instructions for transmission and distribution engagement on whole system Planning within the transmission and distribution businesses;
- Adopt whole system learning and best practice from elsewhere within the electricity industry and engage in/influence external debates; and
- Identify opportunities for innovation in investment planning and operation of the transmission and distribution systems in the whole system context.



### Q6.

Overall, do you understand what we mean when we say 'whole system'? Do you think that we are explaining it clearly enough, or can our definition be improved?

### Q7.

Do you have any other comments on our whole system strategy?

# We want to hear from you

## We welcome any comments and feedback on this whole system strategy

Summary of questions in this document:

- Q1.** What do you think of our objective – is it appropriate?
- Q2.** How much involvement/how much thought have you given to whole system in your role to date?
- Q3.** Have we got the right level of ambition with regards to whole system?
- Q4.** How satisfied are you with our approach to whole system?
- Q5.** Do you agree with the principles we have identified – is there anything missing?
- Q6.** Overall, do you understand what we mean when we say 'whole system'?  
Do you think that we are explaining it clearly enough, or can our definition be improved?
- Q7.** Do you have any other comments on our whole system strategy?

This document and future revisions will be hosted on  
[www.ssen-transmission.co.uk](http://www.ssen-transmission.co.uk)

To find out more about our RIIO-T2 plans visit:  
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If you would like to get in touch with the team to ask questions,  
and provide feedback and comments then please email us at  
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