Scottish & Southern Electricity Networks

SSEN Transmission

RIIO-T2 Business Plan – T2BP-EJP-0024

Glenshero Connection Works Engineering Justification Paper

1 Executive Summary

Our paper "Planning for Net Zero – Scenarios, Certain View and Likely Outturn[1]" sets our methodology for determining the Certain View. 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.

This paper identifies the need to carry out transmission works to accommodate the connection of Glenshero Wind Farm which has a Transmission Entry Capacity of 168MW. The primary driver for this scheme is Load.

Following optioneering and detailed analysis, as set out in this paper, the proposed scope of works is:

- Installation of a fully equipped 132kV feeder bay connected to the Melgarve 132kV GIS double busbar;
- Installation of 200m of 132kV underground cable between Melgarve substation and Glenshero substation; and,
- Installation of a 132kV circuit breaker and disconnector with metering at Glenshero substation.

This scheme will cost £4.4m and will deliver the following outputs and benefits during the RIIO-T2 period:

- Connect 168MW of renewable onshore wind to the SHE Transmission Network in line with our goal to transport the renewable electricity that, in total, powers 10 million homes.
- Provide a network connection tailored to meet our customers' requirements and in line with our goal to deliver every connection on time.

The Glenshero Connection Works project is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

[1] RIIO T2 - Planning for Net Zero – Scenarios, Certain View and Likely Outturn

Name of Scheme/Programme	Glenshero Connection Works	
Primary Investment Driver	Load	
Scheme reference/ mechanism or category	SHT20046	
Output references/type	LRT2SH2020	
Cost	£4.4m	
Delivery Year	2024	
Reporting Table	B0.7 Load Master Data	
Outputs included in RIIO T1 Business Plan	No	
Spend Apportionment	**T1**	**T2**
	£0.29m	£4.12m

2 Introduction

This Engineering Justification Paper sets out our plans to undertake the connection of Glenshero Wind Farm during the RIIO-T2 period (April 2021 to March 2026). The planned work is at Melgarve substation as shown on the map in Figure 1.

The Engineering Justification Paper is structured as follows:

Section 3: Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the need.

Section 4: Optioneering

This section presents all the options considered to address the "need" that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for Detailed Analysis in Section 5.

Section 5: Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgement contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

Section 6: Conclusion

This section provides summary detail of the selected option. It sets out the scope and outputs, costs and timing of investment and where applicable other key supporting information.

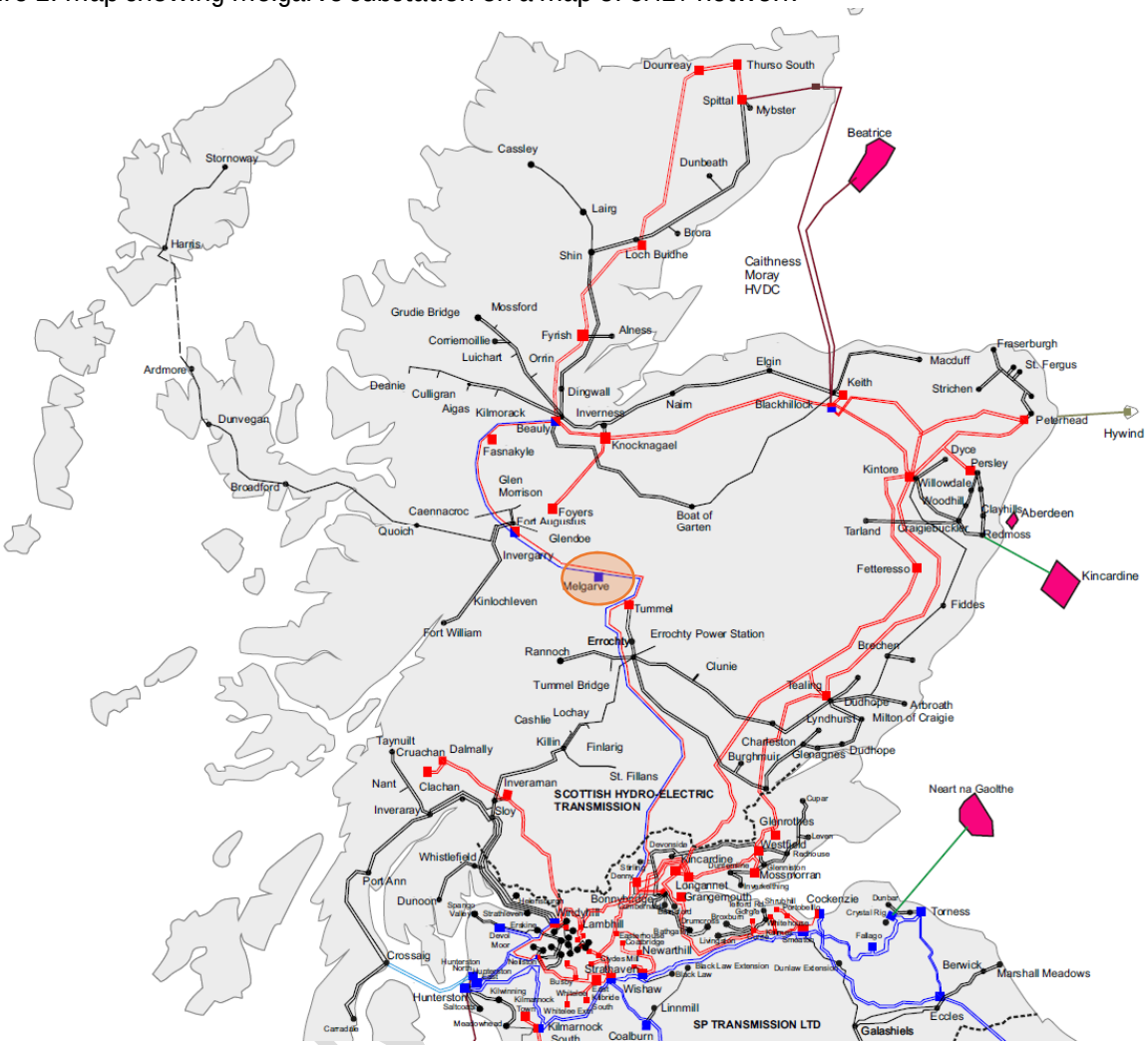
Section.7 Price Control Deliverables and Ring Fencing

This section provides a view of whether the proposed scheme should be ring-fenced or subject to other funding mechanism.

Section 8: Outputs included in RIIO-T1 Business Plan

This section identifies if some or all the outputs were included in the RIIO-T1 Business Plan and provides explanation and justification as to why such outputs are planned to be undertaken in the RIIO-T2 period.

Figure 1: Map showing Melgarve substation on a map of SHET network



3 Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the need.

3.1 Growth Need

We are required at all times plan and develop our transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS), and the System Operator Transmission Owner Code (STC). Furthermore, we are obliged to ensure that we can provide adequate transmission capacity to facilitate connections to customers in the north of Scotland who wish to connect to, and use, the transmission system in order to participate in the national wholesale electricity market.

A Transmission Owner Construction Agreement (TOCA) has been concluded with NGESO in respect of a connection application submitted by [redacted] for their proposed 168MW Glenshero Wind Farm development near Melgarve substation, located 18km south east of Fort Augustus substation.

Power system studies undertaken on the connection of Glenshero have shown that the wind farm can be accommodated on the Melgarve 132kV busbar without requiring additional works at Melgarve substation, when assessed against the criteria of Section 2 of the NETS SQSS. Works are required in order to connect Glenshero to the Melgarve busbar.

[redacted]

In line with the Connect and Manage Guidance 2013[2] generators can connect ahead of the completion of Wider Works. Connect and Manage derogations from the planning criteria of NETS SQSS are required to allow these generators to connect ahead of the completion of the Wider Works. We submitted a derogation report as part of the associated Glenshero offer, this was accepted by NGESO.

[2] National Grid ESO - Connect and Manage Guidance, March 2013.

4 Optioneering

This section presents all the options considered to address the need that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for Detailed Analysis in Section 5.

'Do nothing' option

We are obliged to ensure that we can provide adequate transmission capacity to facilitate connections to customers in the north of Scotland who wish to connect to and use the transmission system in order to participate in the national wholesale electricity market therefore there is the 'do nothing' option has been discounted.

Option 1

This option considers:

- Installation of a fully equipped 132kV feeder bay connected to the Melgarve 132kV GIS double busbar.
- Installation of 200m of 132kV underground cable between Melgarve substation and Glenshero substation.
- Installation of a 132kV circuit breaker and disconnector with metering at Glenshero substation.

Glenshero substation (owned by the User) is located only 200m from our Melgarve substation. As a result, connection to this substation has been identified as the only feasible option. It is the shortest distance for connection of Glenshero wind farm to our transmission network.

Due to the distance between the User (Glenshero) and the nearest SHE Transmission substation (Melgarve) being only 200m, overhead line has not been considered suitable for the connection circuit. Therefore, an underground cable has been proposed.

PROGRESSED TO DETAILED ANALYSIS

5 Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgement contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

5.1 Cost Benefit Analysis

A Cost Benefit Analysis has not been carried out since there is only one option identified for the delivery of this connection.

5.2 Project Sensitivity

As outlined in our core RIIO-T2 business plan document, "A Network for Net Zero[3]", we believe we have a critical role to play in delivering Net Zero ambitions in both the UK and Scotland. Therefore, our plan has been carefully designed with the flexibility to deliver pathways to Net Zero. Our policy paper "Planning for Net Zero – Scenarios, Certain View and Likely Outturn" demonstrates that the investments which we are making are consistent with the UK Governments' net zero emissions by 2050 target. In preparing our RIIO-T2 Business Plan, we ensured that our 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. Our approach to using a 'Certain View' means that there is strong evidence-based need and justification that the load related works are necessary for connections of renewable generation. These works are necessary to meet our legal and regulatory obligations to provide a connection to any customer who requests it.

Table 1. Sensitivity Analysis table

Sensitivity	Test and impact observed – switching inputs
Asset Performance / deterioration rates	N/A
Ongoing efficiency assumptions	Switching efficiency assumption: increased or decreased. Test would have no impact on (feasible) option selection, as only one option was taken forward to detailed analysis and therefore there is no impact on the preferred solution.
Demand variations	No significant demand forecast.

[3] A Network For Net Zero

Energy scenarios	Sensitivity considered in Section 3 (Need) already. As we have adopted a "Certain View" approach, as outlined in our "Planning for Net Zero – Scenarios, Certain View and Likely Outturn" policy paper, means that there is strong evidence-based need and justification that the load related works are necessary for connections of renewable generation. These works are necessary to meet our legal and regulatory obligations to provide a connection to any customer who requests it. Please see Section 3 of the EJP and our "Planning for Net Zero – Scenarios, Certain View and Likely Outturn" policy paper for further details.
Asset utilisation	As outlined in the energy scenarios section, we are anticipating increasingly more generation connecting to our Transmission network. As outlined in our "Planning for Net Zero – Scenarios, Certain View and Likely Outturn" policy paper our business plan has been carefully designed with the flexibility to deliver pathways to Net Zero. There is strong evidence-based need and justification that the load related works are necessary for connections of renewable generation. These works are necessary to meet our legal and regulatory obligations to provide a connection to any customer who requests it. We are unable to consider the known unknowns.
Timing / delivery	We have considered timing of investments as part of our CBAs.
Consenting / stakeholders	Where applicable we have considered consenting and stakeholder engagement as part of section 5 (Detailed Analysis) and the impact which this has had on the selection of the preferred solution.
Public policy / Government legislation	We have considered the impact of public policy, government legislation and regulations as part of the need (section 3), optioneering (section 4) and detailed analysis (section 5) and the impacts this has on the selection of the preferred solution. For example, the projects have considered the impact of the UK Governments' Net Zero emission by 2050 target, SQSS and ESQCR.

5.3 Proposed Solution

As explained within Section 4 Optioneering of this paper, only one option has been considered for the connection of Glenshero windfarm to our transmission network. Therefore, no CBA was required for this project.

A Single Line Diagram (SLD) of the proposed connection at Melgarve substation is shown in Appendix A.

The proposed scope of works is:

- Installation of a fully equipped 132kV feeder bay connected to the Melgarve 132kV GIS double busbar.
- Installation of 200m of 132kV underground cable between Melgarve substation and Glenshero substation.
- Installation of a 132kV circuit breaker and disconnector with metering at Glenshero substation.

The Shared Use Enabling works for the connection of Glenshero is the Tummel Reactive Compensation project.

5.4 Competition

The Glenshero Connection Works project is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

5.5 Carbon Modelling

We are committed to managing resources over the whole asset lifecycle – i.e. including the manufacturing of assets, construction, operations and decommissioning activities – to reduce our greenhouse gas emissions in line with climate science and become a climate resilient business. It is our aspiration that the carbon lifecycle cost of investment options plays a key role within our project development and is considered in the selection of a preferred solution. We have therefore developed an internal carbon pricing model that estimates a carbon cost for each option considered in our CBA through deriving values for:

1. Embodied carbon, which relates to the carbon emissions associated with the manufacturing and production of the materials use in production of the lead assets (transformer, reactors, underground cables and Overhead lines. Overhead line is made up of tower/wood pole/composite pole, conductor and fittings) procured and installed as part of the project.

2. The carbon emissions associated with the main stages of the project lifecycle (construction, operations and decommissioning).

It is our vision to embed carbon considerations within our strategic optioneering and project development processes, which will require us to determine a way of flagging high carbon options within our CBA outputs. We will continue to develop our thinking in this space, which will involve our model being validated by a third party, so the results included in this EJP are indicative and subject to change.

Table 2. Carbon Footprint Modelling for the Glenshero Connection Works.

	Project Information	Option 1
Project Info	Project Name/number	
	Construction Start Year	2022
	Construction End Year	2024
Cost estimate £GBP	Embodied carbon	£ 1,319,287
	Construction	£ 691,781
	Operations	£ 71,913
	Decommissioning	£ 330,489
	Total Project Carbon Cost Estimate	**£ 2,413,470**
Carbon footprint tCO2e	Embodied carbon	18,752
	Construction	9,677
	Operations	351
	Decommissioning	968
	Total Project Carbon (tCO2e)	**29,748**
Project Carbon Footprint by Emission Category	Total Scope 1 (tCO2e)	262
	Total Scope 2 (tCO2e)	90
	Total Scope 3 (tCO2e)	29,397
SF_6 Emissions	Total SF_6 Emissions 3 (tCO2e)	253

In line with our sustainability strategy commitments, the carbon impact of the preferred option along with the regional gross value add (GVA) have been assessed for this scheme.

Table 3. Carbon impact and Regional Gross Value Add table showing CBA value impact.

Benefit category	Details	CBA value impact
Carbon impact – embedded carbon	Embedded carbon relates to carbon emissions associated with the manufacturing and production of the materials procured and installed as part of the project.	The discounted value of embedded carbon is estimated at around £0.3m over the lifetime of the assets.
Carbon impact – carbon displacement	Carbon displacement is determined through allocating a value to the displacement of fossil fuels from connecting new renewable generation.	The estimated annual discounted carbon abatement associated with the Transmission Entry Capacity of 168MW is the region of £13m, according to the Scottish Governments Renewable Electricity Output Calculator[4].
Regional Gross Value Add (GVA)	GVA is a measure of the value generated in an economy by any unit engaged in the production of goods and services. SHE Transmission has developed a tool to quantify the estimated regional GVA on the Scottish economy resulting from expenditure associated with the new generation connections enabled, and the work associated with SHE Transmission investments. Total GVA is calculated by measurements at three levels: 1. Direct GVA: value generated from direct project expenditure 2. Indirect GVA: value generated from employment of sub-contractors and demand for goods and services from suppliers down the supply-chain 3. Induced GVA: value generated from greater demand and spending on goods and services such as accommodation, food, fuel and retail by employees who are employed as a result of the direct and indirect impact.	The total direct regional GVA to the Scottish economy associated with the contracted generation projects enabled is estimated at £37m (discounted over estimated asset life). Indirect and induced GVA totals £41m (discounted). The direct GVA associated with the SHE Transmission expenditure is estimated at £0.6m (discounted), indirect and direct GVA totals £0.7m.

[4] https://www2.gov.scot/Topics/Statistics/Browse/Business/Energy/onlinetools/ElecCalc

5.6 Cost Estimate

The cost of the proposed option for works on Glenshero Connection works has been developed using rates from existing framework contracts and benchmark delivered RIIO-T1 projects. The total cost for delivering the scope of works for the preferred solution is £4.4m. The works are classified as Transmission Connection Assets (TCA) and will therefore be paid for directly by the User.

6 Conclusion

This Engineering Justification Paper confirms the need for undertaking construction works on the transmission network at Melgarve substation to accommodate the 168MW connection of Glenshero Wind Farm.

The primary driver for this reinforcement is the load related driver of renewable generator connections in the local area.

The proposed scope of works is:

- Installation of a fully equipped 132kV feeder bay connected to the Melgarve 132kV GIS double busbar.
- Installation of 200m of 132kV underground cable between Melgarve substation and Glenshero substation.
- Installation of a 132kV circuit breaker and disconnector with metering at Glenshero substation.

This scheme will cost £4.4m and will deliver the following outputs and benefits during the RIIO-T2 period:

- Connect 168MW of renewable onshore wind to the SHE Transmission Network in line with our goal to transport the renewable electricity that, in total, powers 10 million homes.
- Provide a network connection tailored to meet our customers' requirements and in line with our goal to deliver every connection on time.

The Glenshero Connection Works project is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

7 Price Control Deliverables and Ring Fencing

As set out in our Regulatory Framework paper (section 1.12 and Appendix 3) we support a key principle from Citizens Advice – one that guarantees delivery of outcomes equivalent to the funding received - to ensure that RIIO-T2 really deliver for consumers. At the project level this means that if we don't deliver the output, or a materially equivalent outputs, we commit to returning the ex-ante allowance for the output not delivered.

This means that if the funding for Glenshero Wind Farm should be ring-fenced and if it does not go ahead, we will return the allowances £4.41m in full (minus any justified preconstruction expenditure).

It also means that we commit to delivering the connection of 168MW of renewable generation for the costs of £4.41m. If we do not deliver that connection of 168MW of renewable generation, or a materially equivalent output, we commit to returning a proportion of the ex ante allowance. The detailed methodology should be decided at when developing the Close Out methodologies but should apply the same principles of uncertainty mechanisms - that any under delivery should be material.

8 Outputs included in RIIO T1 Business Plan

There are no outputs associated with this scheme included in our RIIO T1 plans.

Appendices

Appendix A – Glenshero Single Line Diagram

CONTENT DELETED