

GLENLEE TO TONGLAND MODERNISATION	
Name of Scheme/Programme	Glenlee to Tongland Modernisation
Primary Investment Driver	Asset Health
Scheme reference/mechanism or category	SPNLT20109/Overhead (Tower) Line
Output references/type	NLRT2SP20109/132kV OHL (Tower) Conductor, NLRT2SP20109/132kV Fittings, NLRT2SP20109/132kV OHL Tower
Cost	£46.6M
Delivery Year	2026
Reporting Table	C0.7/C2.2a_AP/C2.2a_CI/C2.3/C2.4b/C2.5/C2.5a
Outputs included in RIIO T1 Business Plan	No

Issue Date	Issue No	Amendment Details
July 2019	Issue 1	First issue of document
December 2019	Issue 2	Gross cost, NPV, Monetised Risk, Long Term Risk Benefit and Delivery Year values updated.

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1. Introduction

This justification paper supports a proposal to carry out the following works:

1. Build a new L4 double circuit 132kV OHL, single POPLAR conductor, from Tongland to Glenlee substation.
2. Decommission existing R and S OHL 132kV routes.

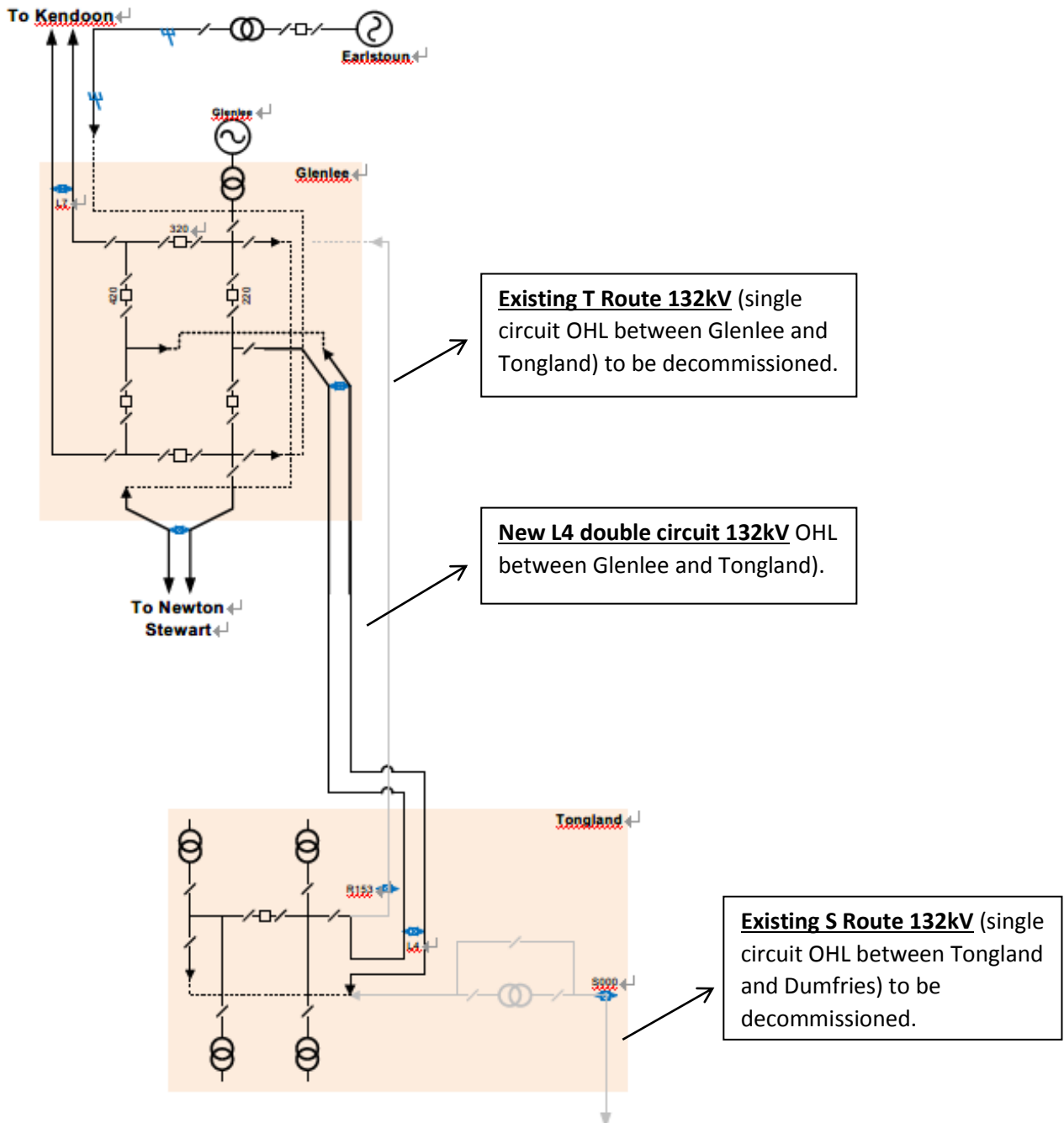


Figure 1: schematic of the proposed scheme between Glenlee and Tongland.

In line with above, the proposed 132kV outputs to be delivered in this project are:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/set/each)
132kV OHL (Tower Line) Conductor	Replacement	76.7 cct. Km	66 cct. Km
132kV OHL Fittings	Replacement	287 sets	266 sets
132kV Tower	Replacement	287 each	133 each

2. Background Information

The RIIO T1 submission included a proposal for the reinforcement of the Dumfries and Galloway 132kV network by building a supergrid between Harker and Auchencrosh. The three objectives of the project were:

- Replacement of ageing assets.
- Provision of additional network capacity to enable the connection of renewable generation.
- Providing the Moyle interconnector capacity in accordance with its design capability.

Due to the uncertainties at the time and high value of the scheme the proposal was submitted as a Strategic Wider Works (SWW) project. Within the SWW process a Cost Benefit Analysis (CBA) was carried out by the System Operator (NG ESO) to assess various options of reinforcements and against various generation scenarios. The CBA conclusions were that no reinforcements over and above a reduced scheme were deemed economic and efficient. The reduced scheme resolves the needs of the system in terms of asset modernisation and provides a degree of reinforcement that enhances the capability of the system in Dumfries and Galloway by providing uplift in capacity to connect renewable generation. The reduced scheme is split into four distinct projects:

1. Kendoon to Glenlee 132kV reinforcements (UC-NA13815 – TORI 221).
2. **Glenlee to Tongland 132kV modernisation (this engineering justification paper).**
3. Newton Stewart to Glenlee 132kV re-conductoring (TORI 223).
4. New Cumnock SGT2B (UC-NA12188).

The Glenlee to Tongland 132kV modernisation works enable the removal of the R route, the S route and the Tongland quad booster.

Most of the construction of the Glenlee to Tongland 132kV modernisation project will take place in the RIIO-T2.

2.1 Data Analysis and Interpretation

A design study was carried out to provide details on the suitability of the R and S 132kV overhead line routes to satisfy the network development proposals in respect of upgrading and or modification, taking into consideration their condition and design.

The main conclusions arising from the study were:

- The condition of the existing supports and certain key components of the conductor system is such that their residual service life is limited and correspondingly there is an immediate and high risk that reliability levels will have been compromised and hence system security.
- The existing PL1 single circuit tower support designs are 1920s vintage and as such any intended design modifications would require compliance with current standards, particularly in respect of upgrading i.e. strengthening and or reconfiguring to accommodate a second circuit. This would apply equally even if the existing routes were to be only re-conducted on either a like for like basis or with larger conductors.
- The effect of any redesign of the existing supports (including foundations) in relation to the strengthening and or modification would generally result in impractical and uneconomic solutions when compared with the option of full support replacement using currently available designs.

2.2 CBRM Summary

CBRM extract is shown below indicating End of Life (EoL) for each of the identified asset for replacement:

R Route:

Asset Description	Year of Installation	EoL*	Monetised Risk (R£m)*
Phase Conductor R Route 132kV	1974	7.05	685,531.80
Phase Fittings R Route 132kV	1974	14.31	78,439,213.31
Steel Tower R Route 132kV	1932	11.88	932,737.00

*Values at the end of the RIIO-T2 period with no intervention as per NOMs methodology.

S Route:

Asset Description	Year of Installation	EoL*	Monetised Risk (R£m)*
Phase Conductor S Route 132kV	1975	7.09	1,884,634.39
Phase Fittings S Route 132kV	1975	14.75	267,660,608.41
Steel Tower S Route 132kV	1932	11.94	5,657,196.31

*Values at the end of the RIIO-T2 period with no intervention as per NOMs methodology.

3. Optioneering

Three options have been considered based on the requirements identified within the condition assessments produced for the existing for the reinforcement of the Dumfries and Galloway 132kV network and the need to replace existing R and S Routes, where Option 2 has been recognised as the only viable option which meets the project objectives.

Option	Status	Reason for rejection
Baseline - Do Minimum <ul style="list-style-type: none"> Do nothing. 	Rejected	Intervention is essential as part of reinforcements and modernisations to the system.
Option 1 – Replacement of R and S Routes with a new OHL double circuit to Dumfries	Rejected	Rejected on environmental and cost basis.
Option 2 – Replacement of R and S Routes with a new OHL double circuit to Glenlee	Proposed	Accepted as the most economic and efficient scheme

4. Detailed analysis

Option 2 achieves the main objective of replacing R and S Routes while providing provision of additional network capacity to enable the connection of renewable generation.

4.1 Option 2: Replacement of R and S Routes with a new OHL double circuit to Dumfries

The following interventions are proposed to be replaced in a staged manner in this option:

- Build a new L4 OHL with double circuit, single POPLAR/SYCAMORE conductor, from Tongland to Glenlee substation.
- Decommission existing R, S and remainder of N routes.
- Decommission the quad booster at Tongland.
- Update all OHL records to reflect the works carried out.
- Carry out condition assessments on sections of removed conductor/insulators and towers.
- Provide report to the Asset manager to include condition of all redundant conductors, steelwork and foundations along with associated tests logs for existing/new concrete.

Specific factors attributable to this option which results in additional costs are listed below:

- Allowances for the undergrounding/diversion of distribution lines within the new proposed corridor.
- Ground condition along the proposed route corridor.
- Wayleave and environmental restrictions along the proposed route corridor.

The following specific risks have been identified for this option:

- Overhead crossings to be mitigated through scaffolding and traffic management systems or deployment of a catenary support system.

- Utilities within working areas and tower positions to be addressed through procurement of records for duration of the project.
- Access routes to be addressed through early engagement with landowners, employing low bearing pressure ground vehicles and trackway where possible to minimise extents of stone tracks.
- Foundation designs to meet ground condition.
- Network operability/wayleave/environmental restrictions which impact on the progression of works as planned.

5. Conclusion

The 3 options proposed have been reviewed in terms of scope feasibility, cost, timescales and construction risks with Option 2 demonstrating the primary objective of lead assets replacement whilst affording greatest reduction in risk to the network.

In line with the costs prepared, the proposed scope of works and CBA analysis, option 2 (replacement of R and S Routes with a new OHL double circuit to Dumfries) is the selected option:

- Scheme Total Cost: £46.6M
- Timing of investment: 2017 – 2026
- Declared outputs:

Asset	Type of Activity	Disposal (cct. Km/sets/each)	Addition/Activity (cct. Km/set/each)
132kV OHL (Tower Line) Conductor	Replacement	76.7 cct. Km	66 cct. Km
132kV OHL Fittings	Replacement	287 sets	266 sets
132kV Tower	Replacement	287 each	133 each

- Long term risk benefit (LR£m):

R Route:

Asset Description	Long Term Risk Benefit (LR£m)
132kV OHL (Tower Line) Conductor	59.88
132kV OHL Fittings	538.60
132kV Tower	38.99

S Route:

Asset Description	Long Term Risk Benefit (LR£m)
132kV OHL (Tower Line) Conductor	206.32
132kV OHL Fittings	1,856.42
132kV Tower	247.10

- Price control period of outputs: 2026

6. FUTURE PATHWAYS – NET ZERO

6.1 Primary Economic Driver

The primary driver for this investment is asset condition and risk. The investment does not have a strong reliance on environmental benefits.

6.2 Payback Periods

The CBA conducted was part of a wider analysis which included the reinforcement aspects of the project. Consumers benefit from reduced network risk immediately on completion of the project.

6.3 Pathways and End Points

The network capacity and capability that result from the proposed option has been tested against and has been found to be consistent with the network requirements determined from the ETYS and NOA processes. Additionally, the proposed option is consistent with the route-specific capacity requirements from SPT's Energy Scenarios.

6.4 Asset Stranding Risks

Electricity generation, demand and system transfers are forecast to increase under all scenarios. The stranding risk is therefore considered to be very low.

6.5 Sensitivity to Carbon Prices

The CBA inputs for this element of the wider project were not sensitive to carbon prices.

6.6 Future Asset Utilisation

It has been assessed that the preferred option is consistent with the future generation and demand scenarios and that the risk of stranding is very low.

6.7 Whole Systems Benefits

Whole system benefits have been considered as part of this proposal. The capacity and capability of the preferred option is consistent with the provision of whole system solutions.

7. OUTPUTS INCLUDED IN RIIO T1 PLANS

N/A