

Network Rail Currie Feeder			
Name of Scheme/Programme	<i>Network Rail Currie Feeder</i>		
Primary Investment Driver	<i>Load – Thermal Capacity</i>		
Scheme reference/ mechanism or category	<i>SPT200195 SPT200196</i>		
Output references/type	<i>LRT2SP2036</i>		
Cost	<ul style="list-style-type: none"> • £8.329m – total project costs <ul style="list-style-type: none"> ○ Network Rail funded – £8.329 		
Delivery Year	<i>RIIO T2 – 2024</i>		
Reporting Table	<i>B0.7 Load Master Data B4.2a Scheme Summary B4.5 Scheme Asset Data B4.5a Scheme Asset Data B4.6 Scheme Output Profile</i>		
Outputs included in RIIO T1 Business Plan	<i>No</i>		
Spend apportionment (£m)	T1	T2	T3
	0.625	7.705	0.0

Issue Date	Issue No	Amendment Details
July 2020	Issue 1	First issue of document – Draft Determination Update

Table of Contents

1. Introduction	3
2. Background Information	3
3. Optioneering	4
4. Detailed Analysis	5
5. Conclusion.....	6
6. Future Pathways – Net Zero	7
Primary Economic Driver	7
Payback Periods	7
Pathways and End Points.....	7
Asset Stranding Risks	7
Sensitivity to Carbon Prices.....	7
Future Asset Utilisation.....	7
Whole Systems Benefits	7

1. Introduction

An application has been received from Network Rail, to provide supply to a new rail traction substation located near Currie in Midlothian. The subsequent offer was accepted. A TO Construction Agreement (SPT-TOCO-366) is in place for these works. The proposed new supply will comprise of two points of connection each capable of 26.5MVA, as requested by the customer. The connection shall be provided based on SQSS compliance as per Network Rail's request.

The primary driver for investment at Currie 275kV substation is the provision of a new demand supply point to Network Rail in response to connection application received. In developing the proposed solution at the substation, we have worked collaboratively with Network Rail to ensure the best whole electricity system is considered and an economic, co-ordinated and efficient solution is selected.

2. Background Information

This paper supports the proposal for a new demand connection to Network Rail at the Currie 275kV site located in the Midlothian area. Network Rail currently do not have connection infrastructure at the substation site.

Network Rail are seeking a demand connection of 19MVA (30 min peak) and 31.9MVA (1 min peak).

This engineering justification paper outlines the works proposed to facilitate the new demand rail traction supply that has been included in baseline funding as part of our RIIO-T2 business plan. Network Rail are presently already contracted to connect for the associated with the works progressing through the project development phase.

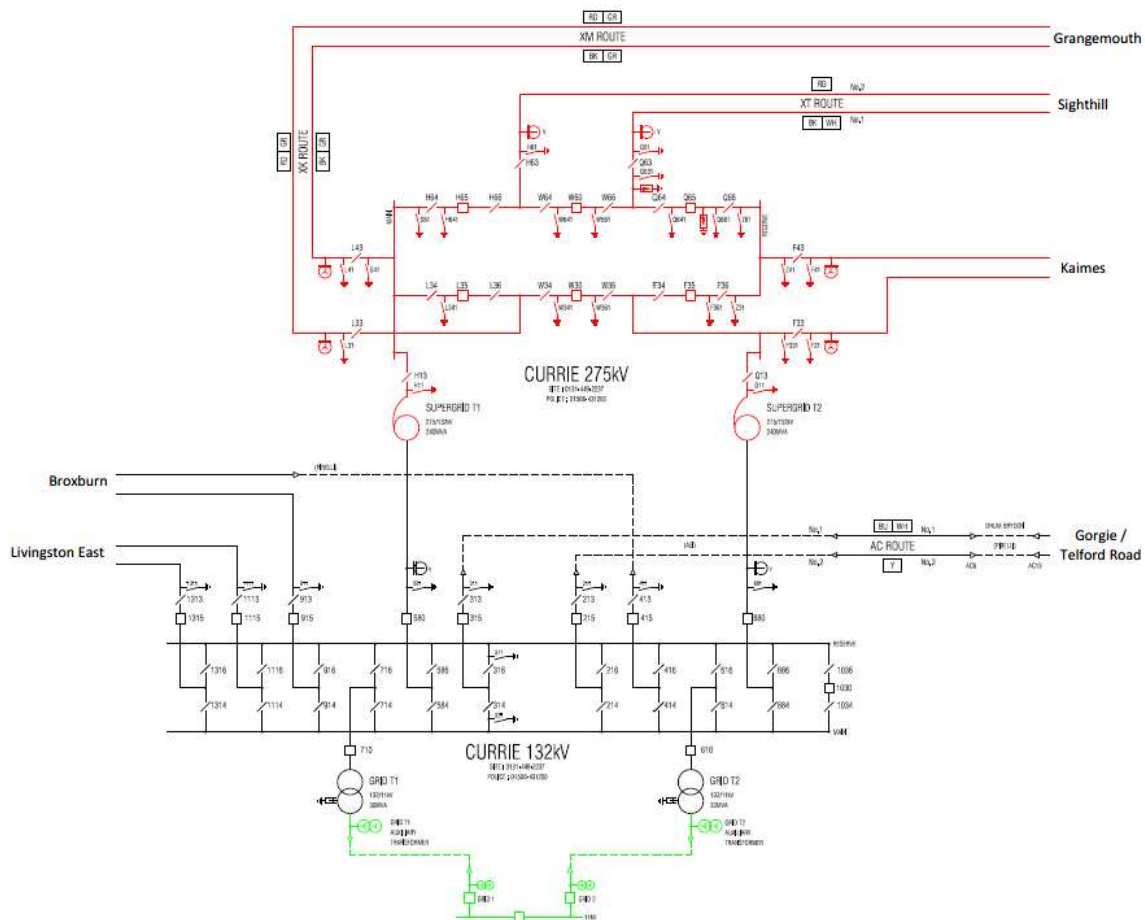


Figure 1. Existing network at Currie 275kV and 132kV

3. Optioneering

The table below presents a summary of the options considered for this project.

	Option	Status	Reason for rejection
(a)	No Intervention	Rejected	Not compliant with SQSS.
(b)	New Network Rail supplies connected at Currie 132kV	Rejected	Non-compliance with voltage unbalance limits under outage conditions. High risk of causing a disturbance to other network Users.
(c)	New Network Rail supplies connected at Currie 275kV	Proposed	-

4. Detailed Analysis

To accommodate the required SQSS compliant Network Rail traction supply at Currie 275kV substation, it is proposed that two new disconnectors will be installed connecting into the HV side of the existing SGT1 and SGT2 275/132kV transformers. Two new single-phase transformers (one per circuit) shall be installed each with a minimum thermal rating of 26.5MVA with associated 25kV line disconnectors and circuit breakers.

The proposed Currie feeder substation that Network Rail require is located approximately 0.5km to the north of the existing Currie 275kV substation and as such it will be required to install 450m of 25kV cable per circuit between the existing Currie 275kV substation and the new Network Rail traction supply. At the feeder station two disconnectors, metering class instrument transformers and metering circuit breakers will be installed, serving as the point of connection for Network Rail. A schematic of the proposed works is given in Figure 2.

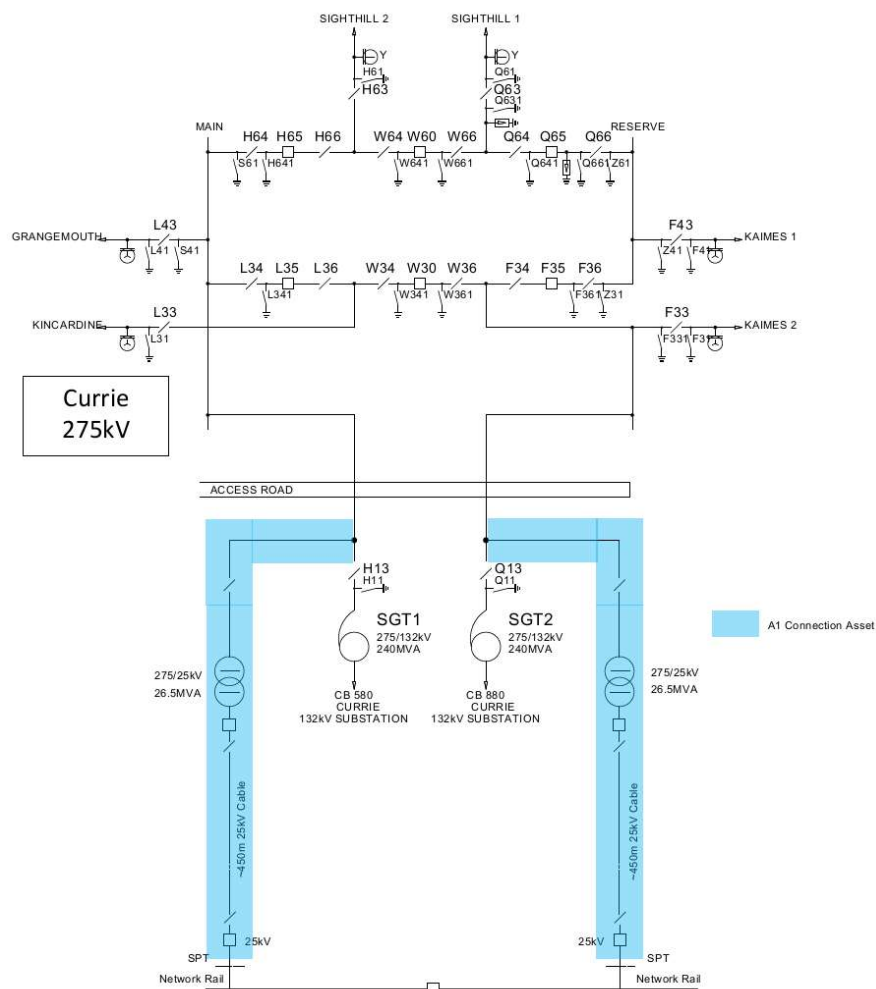


Figure 2. Proposed network configuration

The maximum load requested by Network Rail of a 1-minute peak of 31.9MVA is the highest expected load and is within the traction transformers' long time (x1.5) and short time (x1.8) emergency loading capabilities.

When connecting unbalanced loads, careful attention has to be paid to the voltage unbalance that this will cause and the potential impact on the network and other Users. Voltage unbalance, or the Negative Phase Sequence (NPS) voltage, may not exceed the limits in Grid Code CC.6.1.5 (b) and CC.6.1.6. From a cost point of view, a connection to Currie 132kV would be preferred. However, network studies have shown that under outage conditions, there is a very high risk that NPS voltage limits will be exceeded. Relative to the unbalanced load, Currie 275kV has a higher fault level, leading to reduced levels of voltage unbalance. Therefore, a connection at Currie 275kV rather than 132kV has been offered. The two connections shall be connected to a different phase pair, i.e., R-Y and Y-B, or R-Y and B-R, or Y-B and B-R.

5. Conclusion

SP Transmission has a statutory obligation, that on notification from the Electricity System Operator (National Grid ESO) of a receipt of an application for connection or modification of an existing connection: to offer to enter into an agreement with the system operator to connect the third party.

The proposed solution has been developed in co-ordination with Network Rail. To comply with Negative Phase Sequence voltage limits it is proposed that a connection is made to the 275kV network at Currie substation.

Project Summary:

- Forecast Costs – £8.329m
 - Network Rail funded – £8.329m
- Timing of Investment – 2020/2024
- Outputs:
 - Addition – 2 x 275/25kV 26.5MVA Single Phase Traction Transformers
 - Addition – 4 x 25kV AIS CB OD
 - Addition – 0.9km 25kV UG XLPE Cable

Outputs included in RIIO T1 Plans

Not Applicable.

6. Future Pathways – Net Zero

Primary Economic Driver

The primary driver for investment for the proposed works is the provision of an increase in Network Rail traction supply capacity at Currie substation in response to a request from Network Rail.

Payback Periods

A CBA has not been undertaken for the proposed scheme installation.

Pathways and End Points

The proposed solution has suitable capacity to accommodate the currently proposed demand at the site.

Asset Stranding Risks

There is minimal risk of asset stranding associated with the installation of the proposed works as the proposed substation is to feed the electrification plans associated with Network Rail. Should the developers terminate the proposed works will be revised and the scope amended as appropriate.

Sensitivity to Carbon Prices

The proposed scheme is not sensitive to carbon price.

Future Asset Utilisation

The utilisation of the proposed assets would be increased by increased traffic on the Network Rail system.

Whole Systems Benefits

The works proposed are to facilitate increasing electrification of the rail network; as such there is some Whole System interaction with Transport networks.