

Glenniston 132kV switchgear replacement project - OFGEM justification paper	
Name of Scheme/Programme	Glenniston 132kV switchgear replacement project
Primary Investment Driver	Asset Health (Non-lead assets)
Scheme reference/mechanism or category	SPNLT 2040 / (Switchgear Other replacement)
Output references/type	NLRT2SP2040
Cost	£ 2.84m
Delivery Year	2023
Reporting Table	C0.7 / C2.2a_CI / C2.2a_AP / 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, delivery year and future pathways – Net zero text updated.

Table of contents

1	Introduction	3
2	Background Information	4
3	Optioneering	6
4	Detailed analysis	7
4.1	Scope of work.....	7
4.2	Selected option	7
4.3	Environment & Sustainability	7
5	Conclusion.....	7

1 Introduction

Glenniston 132/33kV substation is an outdoor 6 bay, single busbar substation located near Cowdenbeath, Glenniston in Fife.

With supplies from Mosmorran and Westfield it is an important transmission substation supporting the local distribution network in Fife.

Please find the existing bays at Glenniston 132/33kV substation:

1. Mosmorran 1 (referred to as MOSM 1 henceforth)
2. Mosmorran 2 (referred to as MOSM 2 henceforth)
3. Westfield (referred to as WFIE henceforth)
4. Redhouse (referred to as REDH henceforth)
5. GT1
6. GT2
7. Bus section CB

Glenniston 132kV substation feeds into Glenniston 33kV outdoor substation located within the same perimeter through GT1 and GT2.

The condition of the non-lead assets – disconnectors, earthing switches, busbars, instrument transformers, insulators and structures – have also been assessed and in all cases, intervention is required. The site survey assessment report is available for review.

In line with above, limited intervention on the non-lead assets is being proposed under this project within RIIO T2 period.

Note that the existing bus section circuit-breaker 120 is an OW410 unit with a EoL modifier score of 10.54 (at end of RIIO-T2 period without any intervention). This circuit-breaker along with associated bus section disconnectors 124 & 128 are already being replaced under project UC-NA7420 ‘Glenniston 132kV substation reinforcement and associated works’ in the RIIO-T1 period. The works included in this RIIO T2 project relates to the remaining 132kV bays.

2 Background Information

Condition assessments carried out on the 132kV disconnectors at Glenniston 132kV substation have shown that the mechanical components of some disconnectors are at a level of deterioration where intervention is required and the electrical components are at the end of their serviceable life. A significant level of corrosion has also been observed on the operating mechanism and operating rods for these disconnectors.

The recommendation for these 132kV disconnectors is that it would be possible to refurbish them and make them operational for the expected design life of refurbished bays (40 years). However for refurbishing and reusing existing disconnectors, a substantial amount of work is required to be carried out by a specialist contractor. This involves rebuilding main contacts, sand blasting arcing rings, painting, replacing earth cables, rewiring and painting mechanism boxes, replacing contactors, relays, fuses, heaters and mechanism boxes to be tested in workshops. There is an element of added cost and time for refurbishment that needs to be reflected in the overall project timescales and costs. The costs and timescales to refurbish the disconnectors / mechanism / concrete structure when compared with the costs and timescales to replace them indicate that replacement is the most economic option.

The concrete structures would also require significant refurbishment repeated rounds (every 15 years) for continual operational life.

Accordingly the RCP Disconnectors 403, 603, 113 & 213, associate earth switches and concrete structures have been considered for replacement in this project. Condition assessment of the remaining disconnectors has shown no requirement of intervention within the RIIO T2 period.



Figure 2: Existing AEI 132kV RCP Disconnector at Glenniston 132kV substation

Based on the condition assessment carried out on the existing P&C installation, these have also been considered for full replacement in this project.

Similar to the assessment of primary plant, a visual inspection has been carried out on the existing civil assets viz. busbar concrete gantries and plant equipment structures / foundations. To complement the data gathered through visual inspection, SP Energy Networks commissioned a specialist concrete surveyor to assess the condition of a gantry of similar age and type at Devol Moor 132kV substation. Based on the results extrapolated for the gantries, and the associated financial analysis carried out for extending the operational life of the gantry structure by 40 years, it was confirmed that the four off extreme end gantries can be reused subject to a certain level of intervention. The gantries would be subject to regular maintenance every 15 years and so would require two more round of refurbishment after RIIO T2 for a service life of 40 years.

4 off busbar gantries along with 1 off WFIE circuit gantry is now been considered for refurbishment and reuse as part of this project. Note this is subject to technical feasibility check via detailed loading calculations for the current short circuit levels to be carried out before the project delivery.



Figure 2: Existing concrete gantries proposed to be reused at Glenniston 132kV substation

The existing busbar conductor was noted to be aluminium flexible substation conductor in some of the spans, while in the remaining spans original Holtom conductor is still installed.

Replacement of the Holtom conductor and insulator strings has been included within this project, while no intervention is proposed on the aluminium flexible conductor or associated insulator strings.

Existing control building is proposed to be reused with minor refurbishment works. Building service upgrade works considered within the control building.

3 Optioneering

The following is a summary of the options considered for this project. The respective associated drawings for each of these options are available for review if required.

	Option	Status	Reason for rejection
	Baseline option: Do nothing in RIIO-T2 period with investment deferred to RIIO-T3 period. Scope of works similar to option 1.	Proposed	-
1	In situ online replacement of existing RCP Disconnectors / refurbishment of concrete assets / complete P&C replacement	Proposed	-
2	Offline replacement of existing RCP Disconnectors / refurbishment of concrete assets	Rejected	As we are only replacing the disconnectors, with respective circuit-breakers in the same bay not being relocated, any new offline location for disconnectors is not viable from an electrical layout perspective.

Based on engineering design studies to determine the costs of the options identified as addressing the asset condition issues, the following option has been considered:

- Baseline option: Do nothing in RIIO T2
- Option 1: In situ online replacement of existing RCP Disconnectors / refurbishment of concrete assets

4 Detailed analysis

4.1 Scope of work

The scope of work is summarised below:

- With individual circuits on outage, carry out in situ replacement of existing 132kV RCP disconnectors listed in previous section.
- Under outage of one half of busbar, carry out refurbishment on the gantry structures.
- Replace OHL catenary conductor on the busbar as required.
- Replace P&C scheme as required.

4.2 Selected option

Please find below a cost and construction timescale summary of all the options reviewed:

	Baseline option: Do nothing in RIIO T2 with investment deferred to RIIO T3. Scope of works similar to option 1.	Option 1: In situ online replacement of existing RCP Disconnectors / refurbishment of concrete assets
Cost	£ 2.84m	£ 2.84m
Construction timescales	5 months	5 months

Note that the costs have been built up from individual costs for each element and included in a bill of quantities. The bill of quantities has been engineered from the design layouts developed for each option. The basis of individual unit costs has been the SP Transmission MoSC (Manual of Standard Costs) tool which makes reference to costs incurred during previous similar projects. Site contractor costs have been derived from contract costs from previously executed similar projects by SP Transmission in the RIIO T1 period.

4.3 Environment & Sustainability

In line with company's objective of minimising its environmental impact, the selected option considers reuse of existing civil concrete gantries and foundations at site. This avoids approximately 375m³ of concrete being classified as waste and is a sustainable initiative in line with SP Transmission RIIO-T2 sustainability policy.

5 Conclusion

The only issue with baseline option (Works deferred to RIIO T3) is the condition of the existing RCP Disconnectors / Civil assets / P&C system which requires intervention within the RIIO T2 period. Without intervention, the ongoing operational issues associated with these existing assets would see an increased level of maintenance requirements eventually leading to a risk of failure.

Accordingly, intervention within RIIO T2 period is preferred over deferring the investment to RIIO T3 period. Option1 is the selected option.