

PD Installation for GIS and GIB Programme - OFGEM justification paper	
Name of Scheme/Programme	PD Installation for GIS and GIB Programme
Primary Investment Driver	Asset Health
Scheme reference/mechanism or category	SPNLT2060 Non-Lead Asset – Protection, Control, Telecoms and Metering
Output references/type	NLRT2SP2060 / Non-Lead
Cost	£ 2.8m
Delivery Year	RIIO-T2
Reporting Table	C0.7 Non-load Master / C2.2a Scheme Summary
Outputs included in RIIO T1 Business Plan	No

Issue Date	Issue No	Amendment Details
October 2019	Issue 1	First issue of document
December 2019	Issue 2	Cost updated

Table of contents

1	Introduction	3
2	Background Information	3
3	Optioneering	3
4	Detailed analysis	4
4.1	Selected option	4
4.2	Innovation	5
5	Conclusion.....	5
6	Future Pathways – Net Zero	5
7	Outputs included in RIIO T1 Plans.....	5

1 Introduction

The introduction of GIS at Transmission voltages has been a notable development during the RIIO-T1 period as SPT had only one such site before then. While the technology has been available for a number of years, the more significant population in the RIIO-T1 period has been influenced mainly by climatic and space considerations.

Due to its construction, GIS (Gas Insulated Switchgear) and GIB (Gas Insulated Busbar) are inherently difficult to inspect, monitor and maintain. This programme proposes the installation of partial discharge (PD) monitoring at these sites to mitigate the risk of failures.

2 Background Information

Over the RIIO-T1 period these have been installed at 8 locations (one in construction). These locations and voltages are:

	Location	Extended Name	Operating Voltage
1	HUCS	Hunterston Converter Station	400kV
2	HUNE	Hunterston East	400kV
3	WISH400	Wishaw	400kV
4	KILS400	Kilmarnock South	400kV
5	KILS275	Kilmarnock South	275kV
6	WIYH132	Windyhill	132kV
7	CURR132	Currie	132kV
9	CHAP	Chapelcross (in construction)	132kV

As the introduction of GIS and GIB in such volumes has been a recent addition and the current generation of equipment is significantly different from the original site, there is limited experience of its long term performance, failure modes and deterioration mechanisms. To allow SPT to develop condition assessment and effective asset management of this fleet of assets, SPT proposes to install PD monitoring at these sites.

3 Optioneering

The following is a summary of the options considered for this project.

	Option	Status	Reason for rejection
1	Do nothing: Use current inspection methods and monitoring of new GIS / GIB equipment	Rejected	Rejected on the basis that the existing regime currently used for gathering condition assessment data on AIS equipment does not provide the information required to allow any process or review of equipment condition on GIS and GIB equipment
2	Installation of PD Equipment: Install Industrial standard equipment to undertake continuous PD monitoring of GIS and GIB	Proposed	-

4 Detailed analysis

4.1 Selected option

Effective Asset Management relies on the robust processes in place for inspection and maintenance, ensuring accurate and effective condition information is available.

The relatively recent introduction of this GIS and GIB technology means there is limited experience of it's to performance.

Due to the construction of GIS and GIB, other than the recording of gas pressures and visual external inspections, the ability to assess the condition of the equipment is limited. To resolve this, the current industry practice is to install online Partial Discharge (PD) monitoring equipment. This equipment is placed at multiple points on the switchgear and GIB and it monitors discharge activity within the assets.

These discharges come from two sources, firstly defects in construction that are inherent from the installation, and secondly from failure of components internally that ultimately will result in a disruptive failure.

The installation of the PD monitoring will allow detailed analysis of the condition of the population to establish background PD performance in the initial phase. As time progresses the management and interrogation of this equipment will allow the detection of early onset of failure and allow intervention to be undertake prior to and to prevent disruptive failure.

The benefit of PD detection has been demonstrated previously at the Torness 400kV.

The Torness 400kV is a GIS substation from the 1980s. This site was one of the first 400kV GIS substations and over time had a PD scheme developed and installed to understand its performance.



Other inspection techniques would not have found this issue.

The installation of GIS and GIB comes with a lifetime management responsibility for TOs to ensure the maximum economic life and hence consumer benefit. To do this PD is essential to ensure an adequate system monitoring tool is in place to support the equipment.

The installed GIS/GIB assets have been assessed on a criticality with regard to the SPT network. Using this approach, there are two approaches adopted.

For the 132kV Network, the GIS and GIB are installed with internal PD antenna that are capable of being interrogated. These sites will have their PD levels routinely recorded to ensure that performance is clearly monitored. All future 132kV installations will also have this equipment installed as standard and the routine PD level measurement will be part of the SPT Asset Inspection Process as BAU.

For the 275kV and 400kV network, as the assets present a higher criticality within the Transmission network, SPT will install online PD monitoring to allow the constant monitoring of these assets. The

online installation allows expert systems within SPT to highlight trends and step changes in PD levels at these locations and allow early interventions.

This project aims to install PD monitoring retrospectively at the sites below:

	Location	Extended Name	Operating Voltage
1	HUCS	Hunterston Converter Station	400kV
2	HUNE	Hunterston East	400kV
3	WISH400	Wishaw	400kV
4	KILS400	Kilmarnock South	400kV
5	KILS275	Kilmarnock South	275kV

The installation of online PD monitoring will become standard practice for any future 275 and 400kV GIS and GIB installations.

4.2 Innovation

Innovation is a key component to deliver value in all SPT projects. While the PD technology used in the project is becoming standard, the understanding of the lifetime of the latest generation of GIS and GIB is not. With the introduction of the PD monitoring, the ability to manage and maximise the life of this equipment becomes possible. Through the use of the PD monitoring, innovative ways of targeted interventions can be developed.

5 Conclusion

The volume of quantity of GIS equipment has increased significantly during RIIO-T1. As the equipment is a new generation compared with pre-existing installations, there is a requirement for TOs to develop their understanding of the management and performance of this population for maintenance and ongoing lifetime support of equipment. Due to the construction of GIS and GIB, traditional methods of inspection and monitoring are ineffective. The deployment of PD monitoring on this equipment allows enhanced management of the equipment to become possible and improves the likelihood of interventions before failure.

The proposed solutions will deliver a system that allows the monitoring of condition and performance of the GIS and GIB equipment to ensure the longest possible life and the best long term solution for consumers. The programme targets only the most critical GIS and GIB assets within the SPT network.

- Costs: £ 2.8 m
- Timing of investment: RIIO-T2 period
- Declared outputs: N/A

6 Future Pathways – Net Zero

We have reviewed this project against the criteria set out within the business plan guidance and have assessed that it does not prevent achievement of our Net Zero plans or lead to stranded assets.

7 Outputs included in RIIO T1 Plans

There are no relevant RIIO-T1 plans or outputs.