

System monitoring modernisation project - OFGEM justification paper	
Name of Scheme/Programme	System monitoring modernisation
Primary Investment Driver	Asset Health
Scheme reference/mechanism or category	SPNLT2051 Non-Lead Asset – Protection, Control, Telecoms and Metering
Output references/type	NLRT2SP2051 / Non-Lead
Cost	£ 3.8m
Delivery Year	2026
Reporting Table	C0.7, C2.2a
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	Cost updated

Table of contents

1	Introduction	3
2	Background Information	3
2.1	Fault locators	3
2.2	Fault recorders	3
2.3	Power quality sensors	4
3	Optioneering	4
4	Detailed analysis	4
4.1	Fault locators	4
4.2	Fault recorders	4
4.3	Power quality sensors	5
4.4	Selected option	5
5	Conclusion	5
6	Future Pathways – Net Zero	5
7	Outputs included in RIIO T1 Plans	5

1 Introduction

Maintaining a healthy system monitoring asset base allows for comprehensive post-fault analysis, and increased ability to diagnose ongoing network issues. This is particularly relevant given the ongoing energy transition, of which the effects on the system are still not clear.

The principal driver for the proposal is the replacement of system monitoring devices that are obsolete with minimal spares provision, and are prone to failure. The following devices have been identified as requiring intervention:

- TWS fault locators
- DAU fault recorders
- Power quality sensors

The secondary driver is the improvement in technology in recent years, the installation of which would allow better visibility of the increasingly complex network conditions that are being experienced.

It is considered that investment is required during this price control period as maintenance of these devices is becoming onerous, and spare parts can only be obtained from decommissioned units. Without intervention, it will not be possible to maintain the existing population over the period.

The project is characterised by the delivery of high volumes of individual device replacements or modifications, and so would run for the length of the price control period.

2 Background Information

2.1 Fault locators

The hardware utilised in the TWS fault locators presently installed on the SP Transmission network is of a 20 year old design and is now obsolete, and so some parts can no longer be purchased. Intensive ongoing maintenance is required to deal with issues like fan, CPU and disk drive failures. Over half of the installed fault locator population are of this older type.

Modern devices offer improved fault location accuracy and, consequently, faster overhead line repair times and reduced operating costs.

2.2 Fault recorders

There are nearly 500 older model fault recorders installed on the SP Transmission network which are now obsolete and no longer supported by the manufacturer. The oldest of these units will be more than 25 years old at the end of T2, and the units only have a 15 year design life. Repairs are increasingly required (e.g. analogue and CPU card failures, communications issues) and spares can only be made available through decommissioned units. The oldest fault recorders on the network were installed to allow SPT to manage the risk created by Geo-magnetically Induced Currents and oscillatory stability concerns and are therefore critical assets.

Modern fault recorders include a full suite of facilities including power quality measurements and phasor measurements. This data can be used to manage the more complex network conditions that are increasingly being experienced, such as power quality problems and reduced inertia associated with the transition from large conventional power stations to low carbon non-synchronous generation, and so help to reduce the effects on end users.

2.3 Power quality sensors

The first generation of power quality sensors in operation on the network frequently suffer failures due to age and electromagnetic interference. This affects less than a quarter of installations.

3 Optioneering

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

	Option	Status	Reason for rejection
1	Minimal intervention: Replace failed units only.	Rejected	Rejected on the basis that there is sufficient history of component failure to merit a more pro-active approach. Due to energy transition, requirement for reliable measurements has increased.
2	Balanced intervention: Begin upgrade programme for fault recorders in line with failure rates, and replace TWS fault locators and undependable PQ sensors.	Proposed	-
3	Full intervention: Replace TWS fault locators and older-model fault recorders. Replace undependable PQ sensors with standard V output type.	Rejected	Rejected on the basis that the increased scope of work would be unjustified, and would require significant resource and outage requirements.
4	Integration with protection and control relays: Use of fault recording functionality within the protection and control relays as opposed to using stand-alone units.	Rejected	P&C-based fault recording does not provide the storage or the slow-scan capability that is offered by dedicated system monitors. There is a significant challenge to develop an interoperable system to bring together all fault records from different P&C manufacturers, leading to increased costs. To have remote access to P&C-based fault recording would require new intra-substation infrastructure and cybersecurity measures, resulting in increased costs..

4 Detailed analysis

Where possible, the required system monitoring modernisations have been incorporated into the major switchgear or transformer replacement works, and so the analysis below applies only to devices expected to be unaffected by the projects proposed elsewhere in the overall RIIO-T2 plan.

4.1 Fault locators

Due to the maintenance requirement being experienced in RIIO-T1, a full replacement programme has been proposed. As it is a requirement to maintain compatible equipment at both ends of a circuit, it is planned to replace the TWS fault locators with their modern equivalent. This will allow works to be carried out efficiently without having to work in multiple substations simultaneously.

4.2 Fault recorders

Existing IDM fault recorders are proposed to be upgraded rather than replaced, keeping CT and VT connections in place while replacing aged electronics. The upgrade kit has been developed with the manufacturer and trialled during RIIO-T1, bringing the devices to equivalent capability of the most

modern version. This approach offers several advantages. Since no wiring is required, works can be completed without outages and with minimal resources, and unit costs reduced.

It is proposed that 10% of the installed population is upgraded per year to maintain acceptable coverage with current failure rates, and it is proposed to prioritise the oldest units which have exhibited the greatest levels of unreliability. Parts found to be in good condition will be used as spares for the rest of the population. It is expected that the continuation of fault recorder upgrades will form part of the system monitoring modernisation plan for the next price control period.

There is a remaining population (less than 1%) of fault recorders on the network which are upgraded versions of an even older unit, and so require to be replaced rather than upgraded.

4.3 Power quality sensors

It is proposed to replace the signal conditioning electronics only, which have been identified as the source of failures, leaving the rest of the installation in place.

4.4 Selected option

The proposed option minimises disruption by reducing outage requirements and replacing devices of a type with a history of failure, dealing with components beyond the end-of-life where support is not possible.

5 Conclusion

System monitoring performs an increasingly important function for network and fault analysis. The existing population of devices includes a number of older models which are now obsolete. The proposal outlines a programme of work that optimises availability and system coverage while minimising system disruption. The volumes of relays and schemes involved means that investment will be required throughout the RIIO-T2 period, coordinating with other major works where possible.

- Predicted costs: £3.8m
- 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

N/A.