

Digital Substation Offline Test Facility Project - Ofgem justification paper	
Name of Scheme/Programme	Digital Substation Offline Test Facility
Primary Investment Driver	Asset Health
Scheme reference/mechanism or category	SPNLT2059 Non-Lead Asset – Protection, Control, Telecoms and Metering
Output references/type	NLRT2SP2059 / Non-Lead
Cost	£ 0.4m
Delivery Year	2026
Reporting Table	C0.7, C2.2a
Outputs included in RIIO T1 Business Plan	No

Issue Date	Issue No	Amendment Details
October 2019	Issue 1	First issue of document
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1 Introduction

This justification paper supports a proposal for an offline test facility for digital substations. This is required to facilitate the adoption and interoperability testing of new devices and manufacturers for digital substation projects.

The offsite test facility is in line with our objectives for innovation cluster C4 (digitalisation of power networks), theme 4 (standardisation). Standardisation of digital solutions based on utility specifications is important to ensure that the future supply chain for digital solutions meets our requirements.

2 Background Information

During RIIO-T1, a number of protection and control devices were successfully used in the NIC project FITNESS trial of multi-vendor digital substations. This, and subsequent work, demonstrated that interoperability of devices and their associated tools is possible, but highlighted that existing approval processes (internally or internationally) do not provide sufficient checks to ensure this.

New devices will be required as we extend our applications and manufacturer base for the rollout of digital substations at a number of different sites over the course of RIIO-T2. As manufacturers continue to develop their IEC 61850 process and station bus compatible devices, there is an expectation that each new digital substation may see the proposal of alternative devices by tenderers or designers. Configuration and testing tools and software are also constantly being updated. It is important for cost and design optimisation that we test all new devices in an offsite environment to fully realise the benefits of digital substations.

An offline test facility is required to confirm interoperability / interchangeability of new devices proposed for use in digital substations, and for initial design and testing, and (if required) vendor training associated with the new products. Additionally, as device technologies and international standards develop, new features may become available, and backwards compatibility may have to be verified. This extends not only to protection and control devices, but also to other associated equipment such as Ethernet switches and network clocks.

3 Optioneering

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

	Option	Status	Reason for rejection
1	Funded through projects	Rejected	Rejected on the basis that the timescales of a project may limit opportunities to work with new devices/manufacturers to make them suitable for use or to trial new features.
2	Funding for small-scale trials	Proposed	-
3	Full funding	Rejected	Rejected on the basis that the majority of testing will be business-as-usual and project-specific.

4 Detailed analysis

Offline testing is an important requirement for successful roll-out of digital substations, as it is through this that significant CAPEX savings can be made by reducing time on site. As part of the standard delivery process for a project, offline testing facilities will be established to verify the design and complete 85% of full protection, control and automation system tests prior to the equipment to be delivered to site. Similarly, the offsite test facility also allows for test of replacement IEDs and substation updates and extensions prior to application on site, thus resulting in significant OPEX savings through minimal effect on the operational system on site.

Successful digital substation implementation relies on the correct implementation of IEC 61850 by device manufacturers, although they have significant flexibility as to how they achieve this. Without pre-qualification of devices, the risk of complicating the design and commissioning process significantly increases.

Since we do not want to limit our manufacturer or device pool, an offline test facility allows the pre-qualification of devices based on their interoperability / interchangeability and their configuration tools. This is on top of our normal device approval process, and provides an environment where we can work with manufacturers to help them meet our specification and understand which new features and functions we can adopt. It also allows for the trial of equipment that is less well established in national or international approvals, such as Ethernet switches and clocks. Note that currently there is no international approval process to certify multi-vendor digital solution interoperability at functional and application level. This is deemed as a necessity for the utilities to test and qualify for themselves depending on the nature of deployment on their individual networks.

5 Conclusion

Allowing for a digital substation offline test facility that is not tied to a specific project allows longer term development of the manufacturer base, and the trial of new or improved features to fully utilise the potential benefits of digital substations.

- Costs: £0.4m
- 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.