Cockenzie 275kV CT Replacement – OFGEM Justification Paper	
Name of Scheme/Programme	Cockenzie 275kV CT Replacement
Primary Investment Driver	Asset Health
Scheme reference/ mechanism or category	SPNLT2097 / Current Transformer
Output references/type	NLRT2SP2097 / Non Lead
Cost	£0.92m
Delivery Year	2024 - 2025
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	Number of CTs to be replaced reduced as these will now be carried out under another project. Costs reduced accordingly.

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1 Introduction

Following the summary of assessments carried out at Cockenzie 275kV substation, options have been considered for intervention on 275kV current transformers (CTs).

Cockenzie 275kV substation was commissioned in 1965 and remains a key part of the main interconnected transmission system. There has been one major refurbishment since then, in 2004 when all air blast circuit-breakers were replaced. Works have also been carried on one bay with the commissioning of an MSCDN and its associated switchgear in 2016. This report highlights the needs case for intervention following conditions assessment of the CTs and based on this, options to manage their condition.

There are 17, 3phase sets of oil filled CTs at Cockenzie. Of these, 48 are original and 3 are new assets installed as part of the MSCDN Installation. Multiple assessments including an external condition assessment and oil analysis have been carried out, indicating the need for intervention in the original assets. 3 CTs are not connected to the system and 6 will be replaced by another project. It is proposed that 39 CTs will be replaced during outage period 2024-2025.

- 275kV CT disposed: 39 units
- 275kV CT additions: 39 units

2 Background Information

There are two main types of Instrument Transformers installed on the SPT network, these being sealed for life or oil insulated units. Sealed for life units require no maintenance and are left to perform without intervention for their service life with routine inspection only. These are replaced in line with the instrument transformer replacement policy or in accordance with other guidance from operating experience. Oil insulated units on the other hand are maintained and checked for oil levels periodically to ensure optimal performance. These transformers are replaced based on condition assessments and oil analysis.

During oil analysis or DGA inspection it was observed that all Reyrolle oil filled CTs at Cockenzie showed evidence of thermal faults. This has revealed that very high internal temperatures are being reached. These temperatures are much higher than would be caused by loading conditions and can cause a breakdown of the oil, observed through the presence of ethane and methane gas. Due to the age of the plant and thermal performance, this could escalate and could disruptive failures. These thermal faults were detected in all original Reyrolle CTs.

The site surveys performed an external inspection covering corrosion and oil leakage. One bay originally named M40 now R40 was replaced in 2016, these 3 new CTs have no signs of thermal faulting.

Figure 1 - REYROLLE CTs 1965

Figure 2 - R40 CTs 2016

Following test data and inspection results, 16 of the original bays 17 are considered for intervention.

3 Optioneering

A summary of the options considered for interventions for the Reyrolle CTs were as follows:

	Option	Status	Reason for rejection
1	No Intervention	Rejected	Does not manage the network risks.
2	Refurbishment in RIIO-T2	Rejected	There is no feasible refurbishment option.
3	Replacement in RIIO-T2	Proposed	-
4	Refurbishment in RIIO-T3	Rejected	There is no feasible refurbishment option
5	Replacement in RIIO-T3	Rejected	The condition assessment has determined that the degree of deterioration requires intervention in the RIIO-T2 period.

4 Detailed analysis

A summary of the options considered for interventions for the CTs were as follows:

Option 1 – No Intervention
Option 2 – Refurbishment in RIIO-T2
Option 3 – Replacement in RIIO-T2
Option 4 – Refurbishment in RIIO-T3
Option 5 – Replacement in RIIO-T3

Option 1: No Intervention

The Do Nothing approach has been discounted due to the high risk of asset failure from the thermal faults recorded. The have identified faults and are approaching end of life.

Option 2: Refurbishment in RIIO-T2

There is no feasible option to refurbish CTs. This option was discounted.

Option 3: Replacement in RIIO-T2

A like-for-like replacement is considered as there is no proposed change to the substation configuration. Based on previous projects the total cost for all 16 bays (39 CTs) is £0.92m.

Option 4 & 5: Intervention in RIIO-T3

The CTs are approaching end of life. These options have been discounted due to the network risk presented by failing CTs. Historical experience with the FMJL type issue has informed this decision.

Selected Option

The option that has been determined to be feasible and progressed for detailed consideration is replacement of 39 CTs in 15 bays.

No CBA has been carried out however due to the nature of the faults and the high risk of delaying the works, replacement of 39CTs is the preferred option.

The project 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 Energy Networks MoSC (Manual of Standard Costs) tool which makes reference to costs incurred during previous similar projects.

5 Conclusion

48 of the 51 CTs at Cockenzie are oil filled Reyrolle units installed in 1965. Through extensive assessments and reviews, these have been identified as approaching end of life through oil sampling and thermal surveys. The CTs are now unsupported by the OEM and no refurbishment is possible. Given the high risk and impact of a CT failure in service it is proposed to replace 39 CTs in the RIIO-T2 Period.

- Forecast cost: £0.92m
- Timing of investment: RIIO T2 period, construction during 2024-2025.
- Declared outputs: Addition – 39 units, Removal – 39 units.

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

This scheme does not contain any outputs or costs included in the RIIO-T1 business plan.