

EAP - Building Energy Reduction Measures - OFGEM Justification Paper	
Name of Scheme/Programme	EAP - Building Energy Reduction Measures
Primary Investment Driver	Civil works driven by condition of civil items
Scheme reference/mechanism or category	SPNLT20142
Output references/type	NLRT2SP20142
Cost	£2.76m
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Reporting Table	Tables C0.7, C2.2a AP and C2.2a CI
Outputs included in RIIO T1 Business Plan	No

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1 Introduction

Electronic protection and smart control assets are designed for indoor use and are housed within substation buildings. These electronic protection and smart control assets are susceptible to poor environmental conditions that can reduce performance, cause failures and lead to increased lifecycle costs which are ultimately passed onto consumers.

Making sure the substation building environment is dry and controlled stops moisture from entering and maximises the life expectancy of the electrical assets. We control this environment through the building fabric and the heating, lighting, ventilation and air conditioning systems (collectively called the building services systems).

The energy used to provide an appropriate environment within the building and operate these building services contributes to the overall losses on the transmission system, which SPT are committed to reducing. Old and/or poor condition building fabric and building services systems means that more energy is consumed in continually providing the required dry and controlled environment.

As detailed in our Engineering Justification Paper 'EJP-SPT-SPNLT20101 - Building Refurbishment Programme' SPT are proposing to undertake a programme of works to refurbish the building fabric and building services where they have been identified as being in poor condition and there is a significant risk that the electronic protection and smart control assets will fail due to these poor environmental conditions. It is proposed that these works are the 'do minimum' to meet our obligations and ensure the continued operation of the electronic protection and smart control assets.

As part of our goal to decarbonise our network we are proposing to supplement our 'do minimum' Building Refurbishment Programme by undertaking a further programme of works to install holistic refurbishment solutions, specifically aimed at creating low energy use substation buildings.

This programme of works will be based on the findings from one of our RIIO-T1 NIA¹ projects and informed by historical Energy Saving Opportunity Scheme (ESOS) assessments.

¹ SPT NIA Project https://www.smarternetworks.org/project/nia_spt_1608

2 Background Information

Substation buildings are classed as non-lead assets and are not within the scope of the NARM mechanism. However, SPT have an asset management system in place to ensure that these assets are inspected, recorded and managed from a risk perspective.

Where buildings and building services systems are in poor condition they consume more energy to provide the required dry and controlled environment and there is a significant risk that the electronic protection and smart control assets will fail due to these poor environmental conditions.

As detailed in 'EJP-SPT-SPNLT20101 - Building Refurbishment Programme' we are proposing to address the poor condition of our buildings and building services. However as detailed in our Environmental Action Plan (EAP) (Refer to Annex 7) SPT are committed to decarbonising our network and reducing energy consumption across our substations form part of this commitment. Therefore we are proposing to do more than the minimum requirements and refurbish our buildings such that we create a series of low energy use substation buildings.

3 Optioneering

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

	Option	Status	Reason for rejection
1	Do Nothing	Rejected	Only undertaking the minimum works outlined in our Engineering Justification Paper 'EJP-SPT-SPNLT20101 - Building Refurbishment Programme' does not align with our RIIO T2 environmental commitments to decarbonise the network where it is within our control.
2	Baseline – Implement a holistic refurbishment solution to create a low energy use building. Do nothing in RIIO-T2 period with investment deferred to RIIO-T3 period. Scope of works similar to Option 3.	Proposed	-
3	Implement a holistic refurbishment solution to create a low energy use building. Undertake works in RIIO T2	Proposed	-

The following 2 options have been considered for further review:

- Baseline option: Do nothing in RIIO-T2 period with investment deferred to RIIO-T3 period. Scope of works similar to Option 3;
- Option 3: Implement a holistic refurbishment solution to create a low energy use building that will allow us to continue towards our goal of decarbonising our network.

4 Detailed analysis

4.1 Overall Strategy

SPT has a strategy with civil assets to visually inspect annually and intervene when asset condition requires. This has been a historical approach as substation buildings have been seen as maintenance free and expected to be replaced in line with the main asset it supports. As the life of the main plant has been extended through evolution in technologies, mid-life interventions and improved maintenance regimes, the required life of the associated buildings also requires to be examined.

As part of the RIIO-T2 submission, SPT undertook condition assessments of 90 sites constructed prior to 2000, to determine the health index of the Civil Assets and to allow the development of a programme to deliver targeted refurbishment of the civil assets either at or approaching end of life, to ensure no in-service failures.

These sites were selected as it was acknowledged that any site constructed post 2000 would only just be approaching mid-life at present and as such should not require any interventions at this stage. SPT will continue to develop its proactive programme of civil asset management to ensure that all civil assets are planned for a whole life management. This programme of works will be the first step in a revised asset management policy to ensure life extension of civil assets.

4.2 Condition Assessment

4.2.1 Methodology Approach

A comprehensive programme of civil inspections has been undertaken across the network and it has been identified through these inspections that at a number of sites the substation building fabric and associated building services are in a poor condition. Without intervention these assets will degrade to a point where they cannot be repaired and this will mean the building cannot provide an environment suitable for housing the internally-installed equipment.

As part of our RIIO T2 Environmental Action Plan (Refer to Annex 7) SPT are committed to decarbonising the network and reducing energy consumption across our substations. Where we have determined that a substation building and associated building services are in poor condition we propose that to complement the 'do minimum' works outlined in our Engineering Justification Paper 'EJP-SPT-SPNLT20101 - Building Refurbishment Programme' we shall install a holistic low energy refurbishment solution at these buildings that reduces the overall building energy consumption whilst still providing an environment suitable for housing the electronic protection and smart control assets.

This holistic solution will incorporate a selection of the following solutions:

- Improved insulation in the walls, roof and floor of substation buildings;
- Install Photovoltaics (PV) or other suitable micro-generation to reduce the direct electrical consumption where viable;
- Draught proofing to reduce heat loss, while maintaining adequate ventilation;
- Replacement of doors and windows to improve insulation;
- Replacement of heating systems and installation of thermostatic controls;
- Implementation of a Building Energy Management System, including lowering of heating set points, taking account of the risks of condensation build-up;
- Replacement of lighting with energy efficient equivalents;
- Occupancy detection control of lighting.
- Replace mechanical ventilation systems with natural ventilation solutions;

4.2.2 Outputs from Assessment

Through this detailed and comprehensive inspection of 90 sites SPT has been able to determine a Health Index for all of the civil assets on each site. These 90 sites cover approximately 21,000 civil assets, each of which has been assigned a Health Index consistent with the standard SPT range of 1 to 5. Health Index 1 is considered to be new or as new and Health Index 5 is end of life.

Through these inspections a number of buildings across these substations have been identified, through the methodology, as being in a condition where the implementation of a holistic solution will significantly reduce our energy use.

The table below provides a breakdown of the volumes associated with this programme of works.

Voltage (kV)	No of Building Refurbishments
132	29
275	14
400	5
Total	48

4.2.3 CBA Outputs

The table below provides a summary of the CBA analysis carried out for the 2 proposed options. It should be noted that this CBA was undertaken using both the standard template and the high carbon price template.

<u>Options</u>	<u>Description</u>	<u>NPV</u> <u>(£M)</u> <i>(High Carbon Price Template)</i>	<u>NPV</u> <u>(£M)</u> <i>(Standard Template)</i>
Baseline	Do nothing in RIIO T2. Defer the proposed holistic refurbishment solution until RIIO-T3.	-2.28	-2.28
Option 3	Implement a holistic refurbishment solution to create low energy use buildings in RIIO T2.	-2.53	-2.59

Although the CBA analysis shows the baseline being the preferred option, based on the lower capital cost and the CBA analysis, it is proposed to proceed with Option 3.

This will align with SPT's commitments to decarbonise our network and reduce energy losses as outlined in the Environmental Action Plan (Refer to Annex 7)

4.3 Sustainability

As outlined in our RIIO T2 Environmental Action Plan (Refer to Annex 7), SPT are committed to reducing losses on the transmission system and decarbonising our network. This programme of works will allow SPT to reduce energy consumption at our substation buildings through the implementation of the holistic approach outlined.

4.4 Innovation

Innovation is a key component to deliver developments in all aspects of work. This programme of works will be based on the findings from our NIA² projects and informed by historical Energy Saving Opportunity Scheme (ESOS) assessments.

The majority of the technology used in the project will be standard with a proven track record and the application adopted in line with industry standards. However as outlined in the NIA project SPT will look to combine these individual solutions into an innovative holistic approach to improve the overall energy efficiency of the substation buildings. SPT will also use innovate ways of project delivery and installation to deliver this programme of works.

5 Conclusion

The historical approach to substation buildings as assets which are maintenance free and replaced with the associated plant at end of life is no longer a valid investment strategy. This is due to the development of mid-life refurbishments and improved maintenance of the main plant equipment. SPT have undertaken a comprehensive programme of condition inspections to identify which buildings require to be refurbished. This will be the first step in a revised asset management policy to ensure life extension of our buildings.

The proposed solution, Option 3, looks go beyond our minimum requirements with an ambitious target of transforming 48 substation buildings into low energy use buildings.

It is recommended to undertake the works outlined in Option 3 within RIIO T2, this is despite a lower NPV than deferring the works, to align with our business plan commitments

- Forecast costs: £ 2.76m
- Timing of investment: 2021-2026
- Declared outputs: N/A

² SPT NIA Project https://www.smarternetworks.org/project/nia_spt_1608

6 Future Pathways – Net Zero

6.1 Primary Economic Driver

The primary driver for this investment is the reduction in the energy use at substation buildings through the creation of low energy use buildings.

6.2 Payback Periods

The CBA indicates negative NPV results for Option 3 in the all payback periods (10, 20, 30 & 45 years). However it is proposed to proceed with the proposals outlined in Option 3 as this will align with SPT's commitments to decarbonise our network and reduce energy losses. For further details of this please refer to our Environmental Action Plan.

6.3 Pathways and End Points

Because the carbon intensity of electricity is non-zero, the reduction in energy use at substation buildings will make a positive contribution to our net zero targets

6.4 Asset Stranding Risks

The project is related to existing substations whose ongoing need has been confirmed.

6.5 Sensitivity to Carbon Prices

Carbon price sensitivities have been tested. As shown in Section 4.2.3 using the higher carbon price template has an influence on the NPV value but in both cases the result is a negative NPV.

However to align with our business plan commitments it is proposed to undertake the works , outlined in Option 3, within RIIO T2.

6.6 Future Asset Utilisation

The project is related to existing substations whose ongoing need has been confirmed.

6.7 Whole Systems Benefits

The project is related to existing substations whose ongoing need has been confirmed.

7 Outputs included in RIIO T1 Plans

N/A