SPNLT20274 Building Energy Usage

Issue 1.0

11/12/24

Building Energy Usage			
Name of Scheme	Building Energy Usage		
Investment Driver	Asset Health		
BPDT / Scheme Reference Number	SPNLT20274		
Outputs	• Civils – Buildings – Building Combined Use		
Cost	£7.29M		
Delivery Year	2027-2031		
Applicable Reporting Tables	5.1_Project_Meta_Data, 7.1_Scheme_C&V_NonLoad_Actuals, 10.2_Asset_ID, 10.3_Site_ID, 11.10_Contractor_Indirect		
Historic Funding Interactions	N/A		
Interactive Projects	N/A		
Spend Apportionment	ET2	ET3	ET4
	£0.59M	£6.70M	£0.00M

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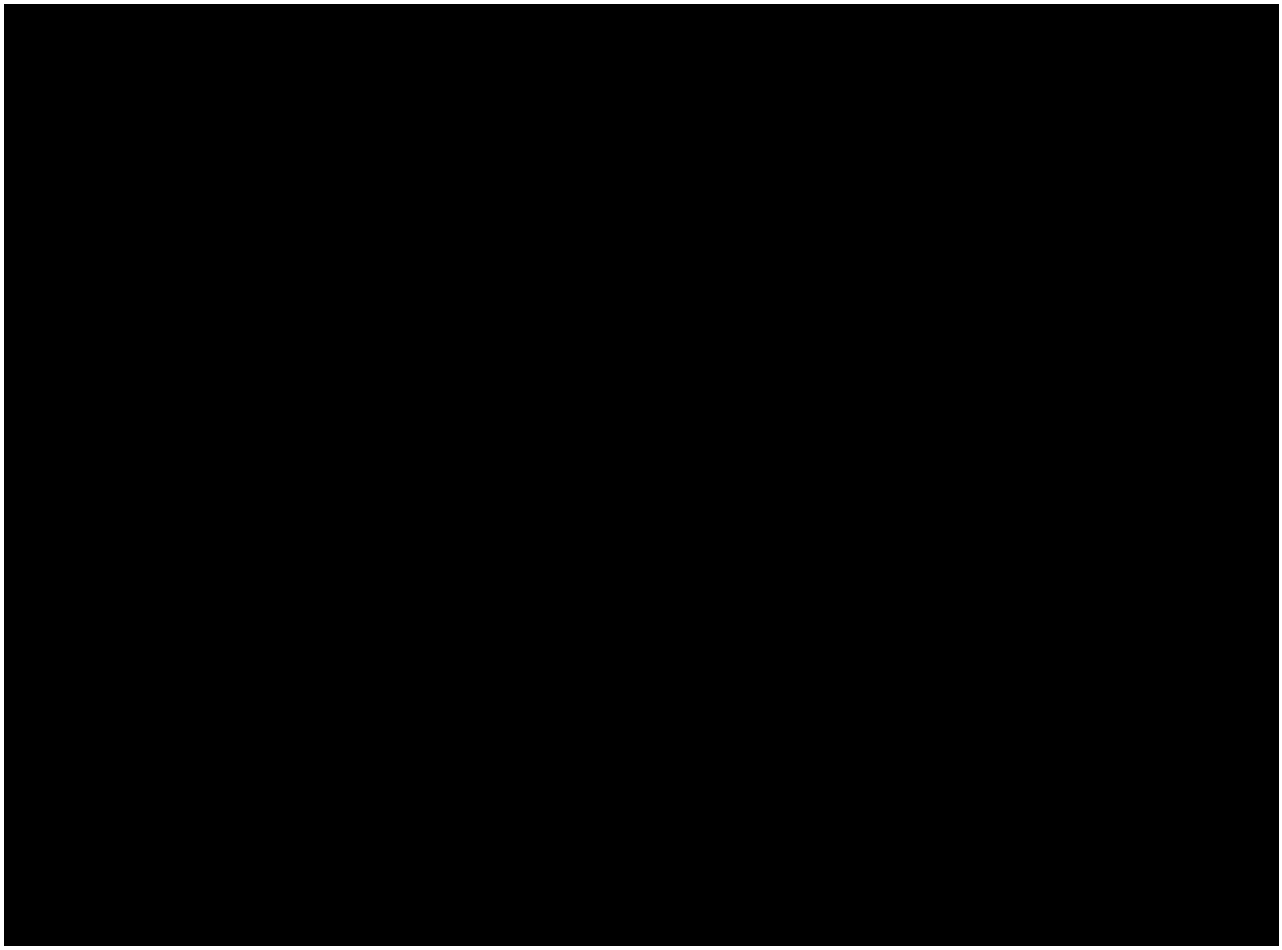
1. Introduction

As part of the RIIO-T3 programme of works, SPT has a building energy reduction programme. This programme addresses the energy performance of substations. Typically, these substations were built at a time when the energy performance of the building was not as strict as it is in current standards. This means that there is an opportunity to make our substations more energy efficient and align with our RIIO-T3 business plan decarbonisation targets.

The RIIO-T2 civil condition surveys have identified a number of substations for works to be undertaken during RIIO-T3 based on condition. This programme has been put in place to ensure our substations are operating efficiently.

This paper supports a proposal to undertake a programme of works to install LED motion sensor lighting, new windows & doors, draught proofing, heating & thermostat and install solar PV panels (PV) on a selected number of substations.

SPT civil condition assessments has identified a number of substations which do not currently meet the current legislation requirements or standards and are targeted for intervention during the RIIO-T3 programme of works. Please refer to the list below:



The delivery of these projects will be staged over a number of outage periods between 2027 and 2031.

2. Background Information

This paper supports a proposal to make our substations more energy efficient by upgrading a number of elements of the substation such as LED motion sensor lighting, new windows & doors, draught proofing, heating & thermostat and install solar PV panels (PV) on a selected number of substations. In total there are 31 substations which will have works undertaken. Civil assets are classed as non-lead assets. However, SPT have an asset management system in place to ensure that these assets are inspected, recorded and managed from a risk perspective.

Traditionally substations were built in a time when energy efficiency would not have been as strict as it is in current standards. This means that over time substation buildings have deteriorated in condition and are now 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 potentially fail due to these poor environmental conditions.

A comprehensive programme of civil inspections has been undertaken across the network. The inspections have revealed that at several sites the substation buildings are in a deteriorated condition and currently use more energy to maintain a controlled environment for the electronic equipment housed within them. As detailed in our Environmental Action Plan (EAP) SPT are committed to decarbonising our network and reducing energy consumption across our substations to 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.

2.1. Data Collection

As part of the SP Energy Networks (SPEN) Substation inspection regime, a detailed site review and technical assessment of the condition of the lead and non-lead assets has been carried out by SP Transmission.

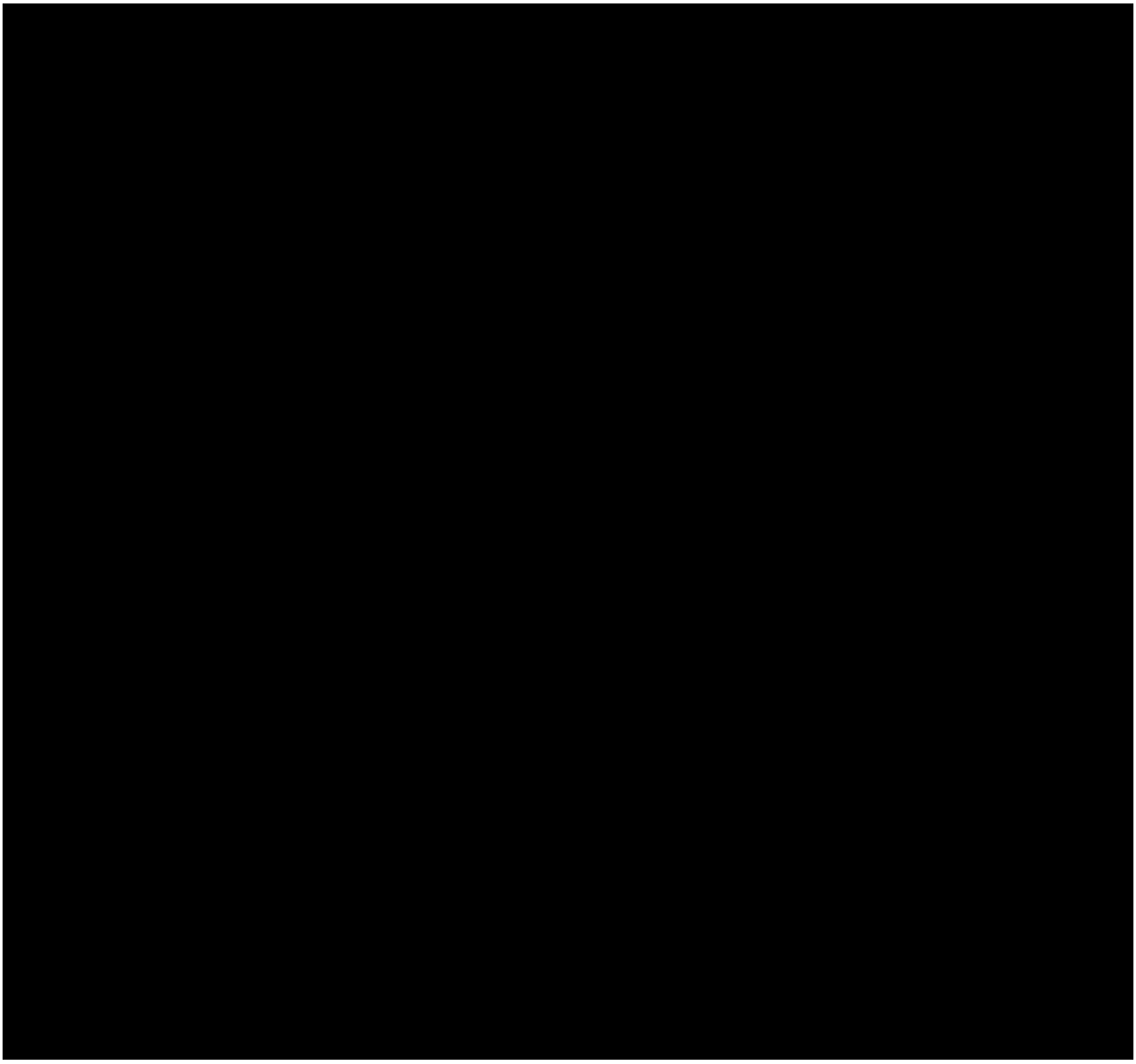
SPT has a strategy with civil assets to visually inspect annually and intervene when asset condition requires. This has been a historic approach as substation buildings have been seen as maintenance free and not expected to have work done to them during the lifespan of the substation. As the life of the main plant has been extended through evolution in technologies, mid-life interventions and improved maintenance regimes, the required life of the associated civil assets also requires to be examined.

As part of the RIIO-T2 business planning process, SPT undertook condition assessments of a number of 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 to the civil assets either at or approaching end of life, to ensure no in-service failures.

The assessment for substation buildings for RIIO-T3 has been based on the T2 civils condition surveys. Like the assessment of primary plant, a visual inspection has been carried out on the existing civil assets, including existing concrete structures and foundations, to determine the condition of these assets. This survey identified that there were 31 sites highlighted to have Issues the substation buildings.

These sites were selected as it was acknowledged that any site constructed post 2000 would use assets that would only just be approaching mid-life at present, and as such should not require any interventions at this stage.

See below examples of reports attached where upgrades are possible:



2.2. Energy Use Estimation

Transmission substations are generally unmetered. It is therefore difficult to predict energy use and potential energy savings from unmetered substations. All energy estimation is based on a project completed by SP Energy Networks in 2018 in collaboration with Napier University, entitled '*Reducing energy losses and greenhouse gas emissions from substations*'

2.3. Condition Assessment

2.3.1. Methodology Approach

A comprehensive programme of civil inspections has been undertaken across the network and it has been identified through these inspections that at 31 of these sites the substation buildings are in a poor condition and do not to fall in line with our RIIO-T3 business plan decarbonisation targets.

2.3.2. Outputs from Assessment

Through the detailed and comprehensive inspection SPT has been able to determine a Health Index for all of the civil assets on each site. These surveys covered 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 substation buildings have been identified as being in Health Index 4 or 5. This means that the assets are either at or approaching End of Life and in need of replacement/refurbishment.

These works will commence in the RIIO-T3 period. It has been proposed that SPT will start with substation buildings with a Health index of 4 or 5.

We have developed a programme of works which prioritises substations based on:

- The Health Index of the substation building;
- The environmental risks associated with the substation;
- Alignment with our substation building maintenance programmes;

We anticipate that to align with our substation building maintenance programmes and due to network constraints this programme of work will to continue beyond RIIO-T3.

Without intervention these assets will degrade to a point where they cannot be repaired and will fail, with the potential to lead to a major impact on the building efficiency and negative impact of the natural environment.

The table below provides a breakdown of the quantities associated with these works.

	Total Sites	Total PV Sites
132kV	21	11
275kV	7	3
400kV	3	2
Total	31	16 *Refer to note 1*

Note 1: PV has been identified as applicable at 16 sites. These sites have pitched roofs which will enable easy installation of the panels in a southerly direction for optimal energy gain. The remaining 15 sites are unsuitable for PV installation because the roof is not facing in an optimal direction, are flat roofs or have been identified as containing RAAC.

3. Optioneering

This section provides a description of each intervention option and details the key considerations. A summary of each option is described at the end of this section.

The primary aim of this project is to refurbish assets prior to failure to ensure substation buildings remain in a controlled dry environment and fall in line with our RIIO-T3 business plan decarbonisation targets.

The options proposed below apply to all the substation buildings identify within this Engineering Justification Paper.

3.1. Baseline, do nothing

A 'Do nothing' option has been considered to represent ongoing maintenance and repair as part of business as usual, with the substation buildings then being re-assessed during the RIIO-T3 period. This option dose not align with RIIO-T3 environmental commitments to decarbonise the network where it is within our control.

The intervention timeline considered within this option is summarised below:

- RIIO-T3 (2027-2031): Ongoing operational activities.
- RIIO-T4 (2032-2036): Substation building energy efficiency works.

In this scenario, there are no energy use savings anticipated.

3.2. Option 1: Implement a holistic refurbishment solution to create a low energy use building.

This option considers creating a low energy use building that will allow us to continue to work towards our goal of decarbonising our network in RIIO-T3:

- RIIO-T3 (2027-2031): In situ substation building energy efficiency works.

If this Option is implemented, by the end of the programme, it is estimated that energy consumption will have reduced by approximately 750 MWh per year. This will result in a reduction of greenhouse gas (GHG) emissions used to generate electricity, saving approximately 81.87gCO2e/KWh f carbon dioxide equivalent (tCO_2e) per year from entering the atmosphere (roughly equivalent to the annual emissions of 23 households).

Options	Map	Layout of Substation / Connection	Layout of all Route Works	Relevant Survey Works	Narrative Consenting Works	Total Estimated Energy Savings (MWh/yr)	Total GHG Emission Reduction (tCO2e/yr)	Narrative Preferred Option	Narrative Rejection
Rejected - Baseline option: Do nothing in RIIO-T3, with investment deferred to RIIO-T4. Scope of works like Option 1.	N/A	-	N/A	N/A	N/A	0	0	N/A	The first option in this case would be do nothing within RIIO-T3. Through inspection and condition assessment, this would not be acceptable as it would go against out T3 decarbonisation commitments.
Preferred - Option 1: Implement a holistic refurbishment solution to create a lower energy use building	N/A	-	N/A	N/A	N/A	750	61	This option considers creating a lower energy use building that will allow us to continue to work towards our goal of decarbonising our network in RIIO-T3.	N/A

3.3. Selected Option

Option 1 achieves the main objective of aligning our commitment to the RIIO-T3 environmental commitments to decarbonise the network where it within our control.

The refurbishment of the existing substation buildings has been considered to be most cost-effective approach. The building efficiency programme will allow us to reduce carbon output, construction costs (of a new building), quick installation turn-around and versatile design will be able to adapt to site specific conditions.

4. Costs

Preferred option 1 considers installations of new windows, doors, LED lighting, heating and thermostat and PV on a selected number of substations as identified earlier through condition data, data analysis and interrogation.

4.1. Estimated Total Project Cost

A Business Plan provision and estimated cost of the project is indicated in the following table. These costs include associated Contractor Indirect. To be referred to tables "7.1_Scheme_C&V_NonLoad_Actuals" and "11.10_Contractor_Indirect".

Please find details of individual substation building projects summarised below:

Item	Description	Estimated CAPEX (£m 23/24)
1	Works at Buildings	[redacted]
2	Preliminaries, Site Establishment, H&S (Others Direct)	[redacted]
3	Risk	[redacted]
	Totals	£7.29m

Expenditure incidence is summarised below:

Estimated CAPEX value per year, £m, 23/24 price base									
Completion Year	Yr. 2026: CAPEX	Yr. 2027: CAPEX	Yr. 2028: CAPEX	Yr. 2029: CAPEX	Yr. 2030: CAPEX	Yr. 2031: CAPEX	RIIO-T2 Total: CAPEX	RIIO-T3 Total: CAPEX	Total: CAPEX
2027/2031	£0.59m	£1.25m	£1.60m	£1.64m	£1.38m	£0.83m	£0.59m	£6.70m	£7.29m

4.2. Regulatory Outputs

The primary asset outputs are identified in table below:

Asset	Intervention	Volume	Delivery Year
Building Combined Use	Refurbishment	31	2027-2031

5. Deliverability

SPT's project management approach has been applied to ensure that this project work is delivered safely, and in line with the agreed time, cost and quality commitments. We have a proven track record of delivering essential transmission network upgrade projects and will draw upon this knowledge and experience to effectively manage these works. A dedicated Project Manager will be assigned to the works at every stage who is responsible for overall delivery of the scope and is the primary point of contact for all stakeholders.

5.1. Delivery Schedule (Level 1 Programme)

A standard approach has been applied to the planning phase of these works and that will continue for the reporting and the application of processes and controls throughout the lifecycle. Table below summarises the key milestones within the delivery schedule.

Item	Project Milestone	Estimated Completion Date*
1	Technical Approval (IP2)	2024
2	ITT Documents (Transformer Call Off)	2025
3	Final Financial Approval (IP3 Stage 3)	2025
4	Tender Process (BOP Contract Award)	2026
5	Commence Site Works	2026
6	Complete Site Works	2030
7	Estimated Project Close Out	2031

**Calendar Years*

Regular meetings with the Project and Construction Management Teams shall be undertaken to assess the ongoing effectiveness of the Project Management interfaces.

The Project Manager will facilitate internal Project Team Meetings, in which project progress and deliverables will be reviewed and any arising risks or issues will be discussed and addressed.

5.2. Risk and Mitigation

A Risk Register would be generated collaboratively during the initial design stages to identify any risks, which if realised, could result in deviation from the delivery plan. Mitigation strategies would also be developed to manage the risks identified and these will be implemented by the Project Manager. The risk register shall remain a live document and will be updated regularly.

5.3. Quality Management

SPT adopts a "life cycle" approach to Quality Management in major project delivery. Our Management Systems are certified to ISO 9001, ISO 14001 and ISO 45001. Various areas applicable to these standards ensure a quality product is delivered. The significant areas detailed below:

5.3.1. Quality Requirements During Project Development

Any risk or opportunity that may affect the quality of the product are detailed in the Project Risk Register.

The suppliers of main equipment may also receive a Factory Acceptance Test Inspection when the asset is being built.

5.3.2. Quality Requirements in Tenders

Each contract that SPT issues has a standard format. Specifically in relation to quality, this will include a Contractors' Quality Performance Requirement (CQPR). This CQPR represents a specification that details roles and responsibilities for all parties during the works, frequency and format of reporting. It will also specify the document management process to be adhered to during the delivery of the project. In addition to the CQPR, each project has a contract specific Quality Management Plan, detailing the inspection and testing regime for works as well as the records to be maintained.

5.3.3. Monitoring and Measuring During Project Delivery

SPT Projects undertake regular inspections on projects and contractors to monitor and measure compliance with SPT Environmental, Quality and Health and Safety requirements, as detailed in the contract specifications for the work. All inspections are visual, with the person undertaking the inspection ensuring that evidence of the inspection and any actions raised are documented.

The following inspections are completed:

- Quality Inspections (monthly)
- Environmental Inspections (monthly, with weekly review by third party Environmental Clerk of Works)
- Safety Assessments & Contractor Safety Inspection (daily, with full time Site Manager)
- Project Management Tours (monthly)

The scope of audits and Inspections is to determine compliance with:

- Procedures & Guides
- Planned arrangements for ISO 9001, 14001 & 18001
- Legal and other requirements.

5.3.4. Post Energisation

SPT Projects and SPT Operations carry out a Defect Liability Period Inspection within the Contract Defect Liability Period with the aim of identifying any defects and rectifying them with the contractors.

5.4. Environmental and Wayleave Considerations

5.4.1. Environmental Planning

Not applicable for this scheme. All works contained within substation footprint.

5.4.2. Wayleave Issues

Not applicable for this scheme. All works contained within substation footprint.

5.4.3. Environmental Sustainability

ENV-01-007 encompasses all activities undertaken within and in support of SP Energy Networks three Licences. This includes operational and business support functions concerned with management of SP Transmission, SP Distribution and associated regulatory and commercial interfaces, products, services and their associated environmental, social and economic impacts. The policy makes the following commitments which shall be respected in any works associated with this scheme.

"SP Energy Networks will incorporate environmental, social and economic issues into our business decision-making processes, ensuring compliance with or improvement upon legislative, industry, regulatory and other compliance obligations. We will deliver this by being innovative and demonstrating leadership on the issues which are important to us and our stakeholders, and will:

- Ensure the reliability and availability of our Transmission and Distribution network whilst creating value and delivering competitiveness by increasing efficiency and minimising losses
- Reduce greenhouse gas emissions, working towards a zero carbon emissions target by end of 2050, with interim targets of 15% by 2023 and 80% by 2030 from a baseline of 2013/2014
- Integrate climate change adaptation requirements into our asset management and operations processes to support business resilience and reduce the length and time of service interruptions;
- Consider whole life cycle impacts to reduce our use of resources to sustainable levels, improve the efficiency of our use of energy and water and aim for zero waste;
- Improve land, air and watercourse quality by preventing pollution and contamination and protecting and enhancing biodiversity in our network areas;
- Improve our service to local communities, supporting their economic and social development, protecting vulnerable customers and respecting human rights;

ENV-04-014 gives specific guidance on the management of incidents with environmental consequence, or potential for environmental consequences, over and above the general requirements for the management of incidents.

6. Conclusion

The historical approach to civil assets which are assumed to be 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 assets require refurbishment. This will be the first step in a revised asset management policy to ensure life extension of civil assets.

The proposed option 1 solution delivers a programme to ensure that the life and condition of the substation buildings is in line with our RIIO-T3 business plan decarbonisation targets.

- Scheme Total Cost: £7.29M
- Timing of investment: 2027 - 2031
- Declared outputs: The lead asset outputs are identified in table below:

Asset	Intervention	Volume	Delivery Year
Building Combined Use	Refurbishment	31	2027-2031

- Price control period of outputs: 2027-2031
- Energy savings (at completion of all works): 750MWh/yr
- GHG Emissions reduction (at completion of all works): 61tCO2e/yr

7. Appendices

a. N/A