SP Energy Networks 2015–2023 Business Plan

Updated March 2014

Annex

Civil Strategy and Plans

SP Energy Networks

March 2014

SP ENERGY NETWORKS

Civil Strategy and Plans

March 2014

Issue Date	Issue No.	Document Owner	Amendment Details
17th March 2014	1.0	L. Speakman	First Issue

1. Scope

This annex provides additional information regarding our planned investments during the RIIO-ED1 period to manage the condition of our civil assets associated with:-

- *Substations*
- *Cable Tunnels & Bridges*
- *LV Street Furniture*

2. Table of linkages

This strategy supports our ED1 Business Plan. For ease of navigation, the following table links this strategy to other relevant parts of our plan.

Document	Chapter / Section
SP Energy Networks Business Plan 2015-2023	Chapter C6 – Expenditure
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C6 – Cost Benefit Analysis – SPEN
SP Energy Networks Business Plan 2015-2023 Annexes	ANNEX C6 – SP Manweb Company Specific Factors – SPEN

3. Summary

This annex covers the civil condition investment associated with:-

- *Substations*
- *Cable Tunnels & Bridges*
- *LV Street Furniture*

Investments to manage civil asset condition includes the replacement and refurbishment of doors, fences, roofs, lighting systems and concrete structures that support our electrical assets. The condition of our civil structures and buildings is of vital importance as they are key to maintaining safe and secure sites for both our staff and members of the public and ensuring the longevity of our asset base.

A high proportion of our electrical assets are designed for indoor use and therefore are susceptible to poor environmental conditions, which can reduce performance, cause failures and lead to increased lifecycle costs. Ensuring the substation environment is dry prevents moisture ingress and maximises the life expectancy of our equipment.

Substations are generally located in residential areas, which mean enclosures must be kept in good repair to reduce the risk of unauthorized access.

We also have a number of substation sites that are no longer fit for purpose and ongoing civil costs can be substantial, for example listed buildings, old power stations and tram depots. During ED1 we will assess these sites for lower cost alternatives.

We plan to increase expenditure compared to DPCR5 levels. This is driven by extensive civil surveys of our 132kV & 33kV substations, which have resulted in an improved understanding of the condition of our civil assets.

There are elements of expenditure in this document which relate to the SPM special factors case, details of which are contained within **ANNEX C6 – SP Manweb Company Specific Factors – SPEN**

Table 1 - NLRE for Civil Assets based on Asset Condition

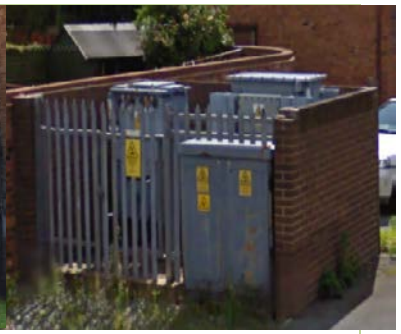
Asset	SPM		SPD	
	Volume	£m	Volume	£m
132kV substation	78	3.7	-	-
EHV substation	598	24.5	454	15.1
HV substation	5196	20.3	4057	19.8
Cable Tunnel/Bridge	12	0.2	24	0.4
LV Street Furniture	4560	1.5	1136	0.4

4. HV Secondary Substations

4.1. Overview

HV secondary substations convert high to low voltage for use in domestic homes and small business. SPEN has a wide variety of HV secondary substation types, the civil construction of each substation can vary significantly depending upon the number and type of plant installed and its geographic area. For example, the interconnected “X Type” network design used extensively throughout urban areas in SPM; each substation requires additional equipment such as protection relays, low voltage circuit breakers and batteries, which are not suited to an outdoor environment and therefore, housed in covered enclosures.

In addition to this, housing developers and local planning authorities can also influence which type of construction is used for new secondary substations regardless of the type of plant installed. A typical range of HV secondary substations can be seen below:

		
Substation in a Glass Reinforced Plastic (GRP) housing	Indoor Substation in a Brick Building	Outdoor Substation Brick & Palisade surround

Our ED1 expenditure is derived from analysis of hazards and defects relating to key investment drivers outlined further in this document.

4.2. Investment Drivers

Our condition data is derived from our substation inspectors. Routine inspections are carried out on secondary substations on an annual basis. The inspector assesses the condition of our electrical and civil assets and captures defects or hazards (referred to as anomolies) on a handheld 'Toughbook' tablet. This data is then automatically uploaded into our centralised electronic asset register system.

The key investment drivers for secondary substations civils are the condition of doors, roofs, fences and electrical systems. When anomolies relating to the above items are raised, they are placed in a programme of works. Our field staff will carry out a further detailed assessment, outlining the necessary remedial actions and associated costs at that site. Following completion of the works, the anomolies are closed in our asset register system.

These investment drivers are outlined in further detail below.

4.2.1. Doors

Doors are the primary means of access and egress into a substation and therefore must be kept in good secure working condition and replaced prior to failure. HV secondary substations contain exposed live equipment and doors in poor condition could provide ready access for members of the public, particularly curious children. Ensuring doors are kept secure will also help to address the increasing problem of criminals entering substations to steal our equipment. This activity results in power outages and additional cost to our customers.

4.2.2. Roofs

Substation roofs are vital in ensuring that equipment designed for indoor use is kept dry. Leaking roofs result in damp substations, experience has shown this can reduce performance and expected lifetime of the equipment and more criticality, result in a failure or fault of the apparatus. Post fault investigations have confirmed that leaking roofs have contributed to a number of failures of our equipment.

4.2.3. Enclosures & Surrounds

New substations that are built in a "Y type" configuration are typically fully enclosed in Glass Reinforced Plastic housings; older outdoor "Y type" substations are traditionally protected by surrounds either made of brick or palisade metal fencing. Ensuring enclosures and surrounds are kept in good condition will protect the equipment from the environment and ensure it is kept secure from public access.

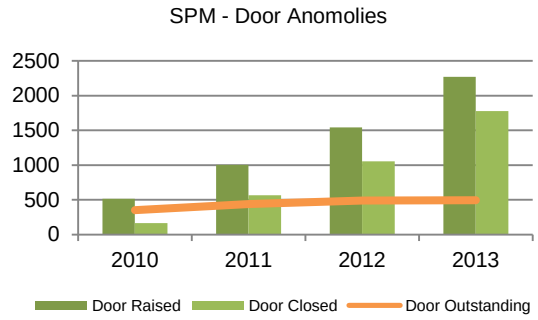
4.2.4. LV Electrical Systems

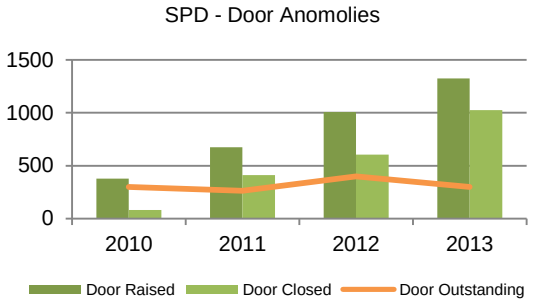
A number of our indoor substations have low voltage equipment installed such as lights and electrical sockets for equipment which is used when we need to carry out inspection, testing, maintenance and repairs at the substation. A number of these electrical systems are now showing signs of deterioration and require renewing to meet modern safety standard

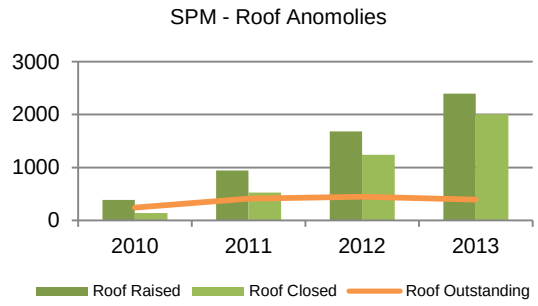
4.3. ED1 Forecast

Our ED1 strategy is to maintain the current levels of risk associated with HV substations assets. Investment in these key components will ensure our substations remain safe and secure for staff and the public.

Our expenditure forecast is based on analysis and the trending of anomalies relating to investment drivers outlined above. For example, in the cumulative chart presented below, the volume of annual roof related anomalies raised in SPM has remained constant over the DPCR5 period. As illustrated by the chart, we have effectively managed this programme to ensure the net number of outstanding anomalies has remained stable. In both licenses we have seen a reduction in the rate of roof related anomalies being raised; our planned ED1 expenditure reflects these trends**. A Cost Benefit Analysis (CBA), C6 – Cost Benefit Analysis - SPEN, Reference 51.1 was carried out to appraise investment options**.







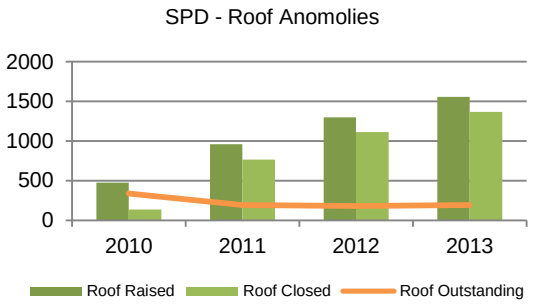


Table 2 - CV6 Civil Works

Substation Component	Description	SPD	SPM	Total	BPDT Line
Doors	Replacement of whole door	1,006	2,104	3,110	6
Roofs	Replacement or major refurbishment of substation roof	996	1,976	2,972	7
Enclosures & Surrounds	Replace or refurbishment of GRP enclosures, boundary walls, gates and fences	2,357	2,112	4,469	9,11
Others Works	Electrical, rainwater goods, pointing & drainage	1,643	3,576	5,219	8

4.4. Future developments

During DPCR5 we will implement revised substation inspection forms, which shall enable us to assess and prioritise our HV secondary substations investments by utilising the same Health Index derived methodology as our 132kV & 33kV substations outlined further in this document.

5. 132kV & 33kV Substations

5.1. Overview

Our objective for ED1 is **to improve the civil condition** of our 132kV & 33kV sites. In DPCR5 we carried out an ambitious programme of detailed civil surveys to catalogue the condition and necessary remedial costs associated with our asset base. The surveys were carried out by civil engineering specialists SKM & IEC in accordance with our policy document 'SUB-03-027 Substation Civil Asset Inspection Procedure and Specification'

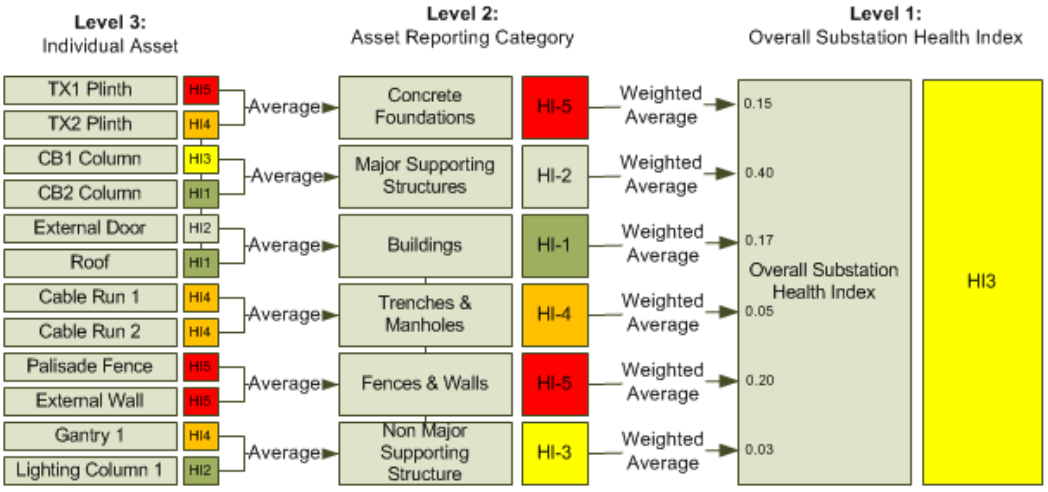
The output of the surveys has been to provide an overall Health Index for each substation derived from the individual assessment of all key civil and structural elements that make up a substation. Depending on the size of the substation up to 200 civil structural assets may be assessed and recorded.

The surveyor records and assesses the condition of each asset within the substation **(Level 3 in Figure 2 below)** and assigns it to one of six defined reporting categories. A Health Index of 1-5 relative to its condition is recorded together with any recommended remedial works that are considered appropriate to either maintain or sensibly extend the future life of the asset. A cost estimate for remedial works based on the visual assessment of each asset is also considered for each asset.

Figure 1 - High Level Survey Process

A Health Index for each reporting category **(Level 2 in Figure 2 below)** is calculated based on the average Health Index of the individual assets. Finally an overall substation civil Health Index **(Level 1 in Figure 2 below)** is calculated by applying appropriate weightings to each asset reporting category based on the relative importance of each category.

Figure 2 - Civil Survey Hierarchy



To ensure cost consistency, a standard list of agreed remedial costs is applied, for example; palisade fence replacement per meter, patch repairs to concrete columns, repointing per meter and door replacements. Where a standard remedial cost is not applicable, the surveyor uses their expert judgment based on industry experience.

Further details of our onsite survey process and a sample survey report can be found in the appendix of this document.

5.2. ED1 Forecast

Our strategy is to improve the condition of our 132kV & 33kV civil assets. This is based on a two tier plan; an integrated approach is used where we are carrying out major electrical replacement or refurbishment works, and a Health Index based approach is used for refurbishing other substations.

We believe our integrated approach will maximise the life of the newly installed / refurbished assets and represents a cost effective use of resources. Our Health Index approach will allow us to prioritise investment and return our substations to a satisfactory condition.

Our costs and volumes are based on our civil Health Index surveys.

5.2.1. Integrated Approach – Linked to Asset Replacement & Refurbishment

Our integrated approach is linked to our asset replacement and refurbishment programmes. Whilst modern switchgear is designed to work in a range of temperature and humidity conditions, experience has shown us that modern equipment is more susceptible to poor environmental conditions in comparison to older oil filled switchgear. Water, dust and pollutants can initiate or accelerate partial discharge activity in the equipment, which can reduce the performance and lifespan of the asset and result in disruptive failure.

When carrying out major electrical works at our substations, we ensure the substation is left in a condition where minimal civil refurbishment works is required in future years by returning the substation overall Health Index to a HI3**.**

At these locations the low voltage site supplies and systems such as heating and lighting date back to the original installation and are be renewed at the same time where appropriate.

This ensures the substation environment is conducive to maximising the life of the newly installed equipment and utilises project management staff and established onsite resources in a cost efficient and effective manner.

Figure 3 - 11kV switch room before & after plant replacement works

5.2.2. Health Index Approach

Where we are not undertaking programmed plant asset replacement works, there are additional requirements for expenditure on civil assets to maintain a safe and secure network. Investment in these sites will be prioritized using a combination of overall substation and individual asset Health Indices.

- *Where the **overall substation** Health Index is showing signs of **material deterioration (HI4) or end of life (HI5)** we will refurbish the whole substation in accordance with the recommendations outlined in our civil surveys.*

- *Where the **overall substation** Health Index is showing signs of **minor deterioration (<HI3),** we will only refurbish or replace individual assets that are showing signs of **material deterioration (HI4)** or are at **end of life (HI5)** in accordance with the recommendations outlined in our civil surveys.*

A summary of the number of sites and costs for each programme can be seen below, the total is the value entered into CV6 – Line 16.**A Cost Benefit Analysis (CBA), C6 – Cost Benefit Analysis - SPEN, Reference 51.2 was carried out to appraise investment options.**

Civil Works At 33kV & 66kV Substations - BDPT Line 16	SPD		SPM	
	Vol	Cost £m	Vol	Cost £m
Integrated Approach	82	2.4	168	8.6
Health Index Based	364	12.7	456	15.9
Total	454	15.1	598	24.5

5.3. Health Index Outputs

The impact of our investment in RIIO-ED1 is illustrated in the health index movement graphs below.

6. LV Street Furniture

6.1. Overview

A number of our low voltage switching points known as link boxes are located below ground and access is gained by removing a cover on the surface of the pavement. Over time, pavement covers can become dislodged or damaged presenting a tripping hazard. We intend to continue with our programme of pavement cover replacement to minimise the risk to public.

6.2. ED1 forecast

Our ED1 forecast is based on historic volumes and the run rates captured in our corporate systems.

LV Street Furniture – BDPT CV6 - Line 20	SPD		SPM	
	Vol	Cost £m	Vol	Cost £m
LV Street Furniture	1,136	0.37	4,560	1.46

7. Cable Tunnels & Bridges

7.1. Overview

Most of our electrical cables are buried in the ground although occasionally they need to cross difficult terrain such as canals or rivers. Where this is the case our cables may be carried by a cable bridge or tunnel. During ED1, we intend to replace or refurbish a number of these ageing structures to ensure we maintain quality of supply to customers.

7.2. ED1 forecast

LV Street Furniture – BDPT CV6 - Line 18/19	SPD		SPM	
	Vol	Cost £m	Vol	Cost £m
Cable Tunnels	8	0.15	0	0
Cable Bridges	16	0.22	12	0.15

8. Appendix 1

8.1. Civil Health Index Development & Survey Process

Civil Health Index Survey Methodology

Our proposed civil asset Health Index definitions are consistent with our plant Health Index definitions and were applied to our civil inspection surveys.

HI-1 - As new	In excellent working order and condition, as such fully performs its operational function
HI-2 - Good condition	No longer new but still in good condition, with no operational issues.
HI-3 - Minor deterioration	Showing some signs of deteriorating condition, but still in reasonable working order and has minimal or no operational issues.
HI 4 - Material deterioration	Significant deterioration in condition resulting in some operational issues. May become 'End of Life' within 5-10 years.
HI-5 - End of Life	Serious signs of deterioration due to age, wear and suitability that cannot be rectified. Asset is at 'End of Life' and may have critical issues that operationally restrict the network and may pose a danger to staff, public or the network. It should generally be replaced within 5 years.

9. Applying Health Indices to Civil Assets

9.1. Key substation components

In attempting to derive a Health Index for substation civil assets it has become apparent that each substation contains a wide variety of components which could all have different Health Index scores based on condition. In addition the makeup of substations varies from site to site. To achieve some measure of consistency we have identified the following substation components for assessment which are defined below:-

9.1.1. Concrete foundations

Our experience from our RIIO T1 surveys indicates that condition of concrete and metal structures is one of the key areas of focus due to the dependency of main plant on the performance and condition of these assets.

9.1.2. Major supporting structures

132kV, 33kV grid and primary substations contain concrete and metal structures which support switchgear, Voltage Transformers, Current Transformers, busbars and bushings. These are critical structures which require frequent examination to ensure that they are fit for purpose.

9.1.3. Substation buildings

Substation buildings contain critical plant such as circuit breakers and light current equipment, which ensure the reliable operation and performance of our network. The performance of this plant and equipment relies on a watertight and adequately heated substation environment. Therefore HI for the condition of the building is critical.

9.1.4. Substation trenches and manholes

132kV substation compounds in particular have a high proportion of trenches which allow cable and pilot wires to be ducted through substation sites. These often have trench covers which if not replaced can deteriorate beyond repair. These trenches can become corroded / damaged and also must be assessed for investment.

Furthermore, we have experienced damage from metal theft and vandalism, which has resulted in additional damage to trenches and covers.

9.1.5. Compound fences and retaining walls

The main drivers for civil asset expenditure on compound fences and walls include deteriorating asset condition and compliance with the Electricity Safety, Quality and Continuity Regulations (2002).

9.1.6. Non supporting structures

Other structures include lighting, telecommunication towers and access gantries. Although not critical to the system, they are critical to the health and safety to our staff. The condition of these assets is monitored as part of the overall substation Health Index approach.

Each of these components is allocated a Health Index score by an assessor when carrying out onsite condition assessments. For larger sites this will typically result in a detailed substation report with detail at a granular level.

		
Concrete foundations	Major supporting structure	Building – Primary substation

		
Trenches & Manholes Cable Trench	Compound Fences & Retaining Walls Palisade Fence	Non Supporting Structures Lighting column at end of life

9.2. Deriving an Overall Health Index

Given the granularity of information collected by our substation condition assessments, we combined the data to allocate an overall Health Index to the substation. This overall substation Health Index is then used to prioritise

investment at which point SPEN uses the detailed on site survey information to target investment on the highest priority components.

An overall Health Index per substation site provides a summary of the condition of that site based on the weighted approach outlined below in Section 10.

10. Detailed Scoring Methodology

10.1. Model

To evaluate the overall substation Health Index we first categorise the substation components. An Health Index is then determined for each category, e.g. a substation has six major supporting structures with a Health Index range of HI4-HI5 and an average Health Index of HI5. This process is then carried out for each civil structure category as shown in the example below:

Asset Reference	Civil Structure	Category	Asset Health Index
1	CCTV Support Structure & Foundation	Non major supporting structures	4
2	Concrete Foundation	Concrete foundations	2
3	Concrete frame 4 column support structure with integrated concrete footings	Major supporting structures	5

To arrive at an overall Health Index these scores are then weighted based on the relative importance of each category. The weightings have been attributed based our view of risk to substation components, these scorings will be refined as the Health Index model is applied to additional substation voltages. A sample weighting is shown below which can be varied based on which components are present at each substation.

Asset Category	Weighting
Concrete Foundations	0.15
Major Supporting Structures	0.40
Buildings	0.17
Trenches & manholes	0.05
Fences & Walls	0.20
Non major supporting structures	0.03

In addition to the overall health index score, a worst component health index is provided for each substation, which shows the worst overall component at that site.

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11. On site civil asset survey inspection process

The following process has been adopted by a team of civil and structural engineers when reviewing our 132kV & 33kV Substations.

The purpose of the inspections has been to provide an Overall Health Index for each substation that has been built up from the individual assessment of all key civil and structural elements comprising each substation. In addition, a log of the "Worst Health Index" assets is recorded for each site during the inspections. Depending on the size of the substation up to 200 civil / structural assets may be assessed and recorded.

Each asset is categorised into a description and allocated a Health Index of 1-5 reflecting its condition together with recommended remedial works that are considered appropriate to either maintain or extend the future life of the asset.

A cost estimate for remedial and maintenance works based on the visual inspection of each asset is provided for each defective asset. In line with SPEN's process adopted for 'Plant Condition Surveys' the process used for 'Civil Asset Surveys' has also adopted the same Health Index definitions for each asset.

11.1. Asset recording of typical site methodology

11.1.1. Indoor primary sites with outdoor transformers

As a minimum, the following civil asset information associated with buildings is recorded and identified by a unique asset number.

- *Roof condition from ground level visual observation and internal ceiling condition*
- *External guttering*
- *Cladding generally*
- *Internal condition generally*
- *Doors & Windows requiring remedial work*
- *Any ducts and trenches within the building*
- *Any other nonstandard defects would be captured as an asset.*

If there are two or more buildings, or noticeable differences between the construction of two parts of the same building (i.e. an extension), then the assets are recorded separately for each building. In addition to the above list, the following items are recorded externally:

- *Roof condition from ground level visual observation and internal ceiling condition*
- *External condition generally*
- *Any domestic fence surrounding building*
- *Palisade Fence surrounding the building*
- *Masonry walls surrounding building*
- *Any foliage creeping into the site from neighbouring properties*
- *Any defective manholes or external gullies or lamp posts that are in need of repair*

For outdoor transformers, the civil assets associated with each transformer and cooling bank are recorded, with a description of any defects identified such as damage or degradation to bunds and sealing. Outdoor sump chambers within transformer compounds are separately recorded as assets. Similarly, the condition any palisade fencing and surrounding walls are logged separately.

Where Primary Substations have internal transformers or indoor RMUs the civil assets are categorised with concrete foundations.

Surveyors also use their judgement whilst on site to record defects with any non-categorised assets which will require civil or structural intervention over the next five years.

11.1.2. Outdoor grid sites

In addition to all the items recorded for primary sites, the following assets are included for outdoor grid sites:

- *Outdoor structures supporting plant or equipment, including foundations for marshalling kiosks, and LV pillars etc.*
- *All fences, boundary walls etc.*
- *General condition of the substation compound*

12. Methodology outputs

Condition reports are produced for every site inspected. The information captured in the civil inspection reports is used to determine the overall substation Health Index, the worst component Health Index and the key substation component asset register and associated refurbishment work costs.

The following Civil Asset Health Index reporting table is populated with survey results. This table presents the number of substations inspected and the Asset Health distribution in terms of Overall Substation HI and Worst Component HI. The table segregates the health of the civil assets by voltage level, e.g. 132kV Grid, 33kV Grid, 33/11kV Primary.

ASSET CATEGORIES	ASSET REGISTER		End of DPCR5 (31 March 2015) with investment				
	as at 31st March 2015	as at 31st March 2024	HI 1	HI 2	HI 3	HI 4	HI 5
Overall Substation Health IndexView							
132kV	98		4	25	38	31	0
33kV	539		6	154	200	177	3
11kV Pimary							
11kV Secondary							
Cable Tunnels							
Cable Bridges							
	637	-	10	179	237	208	3
Worst Component Health Index							
132kV	98		0	6	19	56	17
33kV	539		0	20	197	229	93
11kV Pimary							
11kV Secondary							
	637	-	]	27	216	285	109

13. Appendix 2

13.1. Sample Survey

NB. Detail costs have been omitted

Civil Inspection Cover Sheet

Site name	CONEY GREEN	Site Ref No	09/2929/001/E
Survey date	13/07/2012	Weather	Overcast
Address		Stand by person	N/A
Coney Green 33kV S/stn, Off Salop Road, SY11 2EF		Surveyor	
Design Type	2no. Brick bldg with ext compound.	Site Description	
Indoor/ Outdoor	Both	Indoor substation within residential area	
No of bays			
Site History: Include date of construction, major refurbishments, additions and use changes		**Site Consequence:** Overall Impact if site was non functional	
Built: 1959 (Age: 54)			

Comments on Site Inspection: General comments and observations, key recommendations & HI 4/5 assets

Summary:	Flat Roofing to be replaced. Doors to be overhauled and repainted. Wirebrush and repainting of steel. Repair lintels to doors. Weeding to be carried out. Repointing of brickwork. Clear out vents and refurbish. Clean oil from concrete foundations. Palisade fences to be wirebrushed and repainted. Gutters / downpipes / hoppers to be cleared out and repaired where necessary.
Health & Safety:	Asbestos noted on site
Other:	Allowance for repairing circular vents

Overall substation health index	3.22	**Costs Total**	£28,875	**Worst component health index**	5	**Costs WHI > 4 or 5**	£27,450

An overall health index per substation site which would provide a summary of the condition of that site based on a weighted approach which is outlined in section 3 of Civil Asset health Methodology

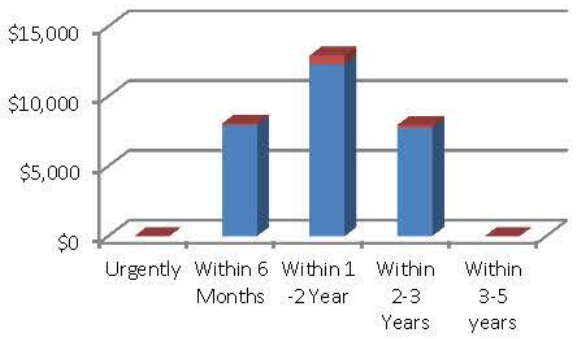
In addition to the overall substation health index SPEN believe that a worst component view of the site would also help to identify sites where one or more of the major components requires investment but the overall substation condition is at an acceptable level.

HI – Key Substation Components	HI	Assets	Costs	HI – Key Substation Components	WHI	Asset	Cost
Concrete Foundations	2.00	1	£775	Concrete Foundations	2	1	£775
Major Supporting Structures		0		Major Supporting Structures			
Substation Buildings	4.60	5	£27,450	Substation Buildings	5	3	£20,400
Substation Bunds Trenches and Manhole covers		0		Substation Bunds Trenches and Manhole covers			
Compound fences and retaining walls	3.00	1	£350	Compound fences and retaining walls	3	1	£350
Non Supporting Structures	3.00	1	£300	Non Supporting Structures	3	1	£300
Total Assets		**8**		Number of Assets > 4 or 5		5	

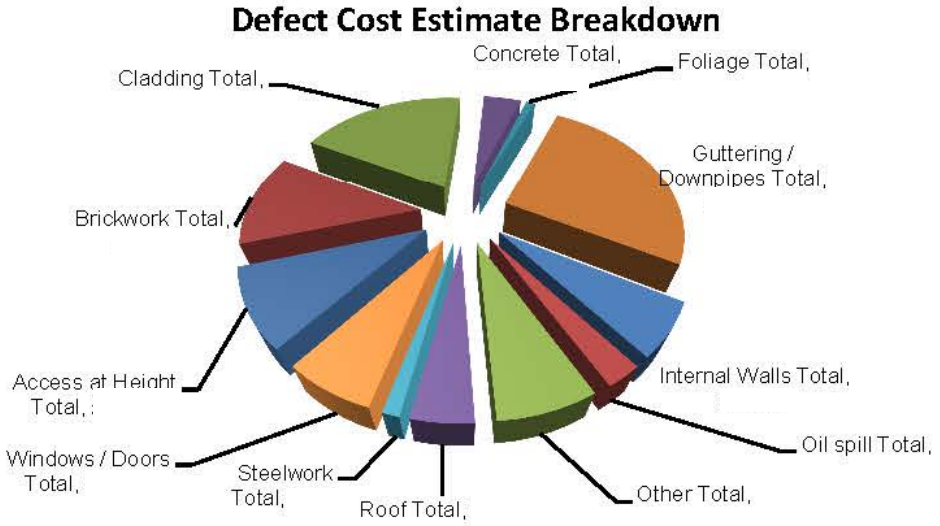
Total Asset Register	HI1	HI2	HI3	HI4	HI5	WH1	WH2	WH3	WH4	WH5
		1	2	2	3		1	2		3

Key Statistics	1-New	2-Ok / As New	3-Minor Deterior'tn	4-Material Deterior'tn	5-End of Life
Concrete foundations		1 No £775			
Major supporting structures					
Substation buildings				2 No £7,050	3 No £20,400
Bunds, trenches & manholes					
Fences and retaining walls			1 No £350		
Non supporting structures			1 No £300		
Total HI expressed as %	0%	13%	25%	25%	38%

Defect Spend Profile



Defect Cost Estimate Breakdown



Defect Class (£)		
	Warranty	£0
	Maintenance	£28,150
	Vandalism	£0
	Environmental	£775
	Attempt Break In	£0
	Theft	£0
	Accidental	£0
	Health & Safety	£0
(Links to Maps)	Latitude	Longitude
	52.858987	-3.051256939

100% Assets with Defects

No Assets with Urgent Defects

Type: Transposition Site

First Issue	23.8.13	Rev		Rev Date		Prepared:	RP
Revision Description						Reviewed:	KS
						Approved:	CB

SKM

Aerial Photographs Courteously of Bing Mapping in order to provide Site Context

USER GUIDE & INTRODUCTION TO THIS REPORT:

1. *Summary Cover Sheet*
2. *User Guide*
3. *Cost Report Listing every defect recorded*
4. *Photographic record and commentary on every asset and defect recorded*
5. *A Reference Plan of the assets number and locations on site*

General Notes relating to Costing:

Approximate remedial cost is an estimate based on the surveyors judgement from a visual inspection only from ground level. The estimate does not include:

- *Management overheads for procuring, tendering & administrating repairs*
- *Contractors preliminaries for site establishment , site security, insurances etc.*
- *Access and supervision costs (Stand by men and CDM compliance)*
- *Management & Administration associated with any necessary circuit outages*
- *Contingency (particularly in relation to concrete repairs)*

The costs are limited to an estimate of direct materials and labour, since it is not possible for SKM to anticipate what impact the above aspects will have on the cost of the definite works. Similarly as the means for procurement of repairs are not fully understood at this stage, preliminaries are also excluded. A robust contingency should also be considered for the prospect of additional concrete repairs at the sites. Due to the live operational status of substations only a ground level visual survey was permitted, it is not unreasonable that if future non-destructive testing is carried out to a high level concrete structure, this could highlight other defects which were not previously detected or included within the scope of this report. Even excluding the provision of scaffolding, this could well increase the cost of concrete repairs alone by a factor of 2 or 3 but remains a speculative assumption until works commence or access is available.

Guide to Defect Criticality (Effectively Timeframe for when defect should be addressed)

<5 Yrs. long term maintenance issue should be planned within 5 years.
<3 Yrs. medium term maintenance issue to be carried out within 2-3 years.
<2 Yrs. short term maintenance issue to be carried out within 6 months to 2 years
<0.5 Yrs. Carry out within 6 months to avoid further deterioration
URGENT - Any asset that needs attention immediately

Guide to Defect Class: For each defect, the root cause of what likely caused the defect is listed. These are as follows: Possible Warranty, Maintenance, Vandalism, Environmental, Attempted Break in, Theft, Accidental Damage, Health & Safety. (Possible Warranty is where the surveyor believes there might be an opportunity to pursue original contractor or installer if defective works appear recent).

GUIDE TO REPORTING HEALTH INDICES USED IN SURVEYS

6. ***As new*** *- In excellent working order and condition, as such fully performs its operational function.*
7. ***Good condition*** *- No longer new but still in good condition, with no operational issues.*
8. ***Minor deterioration*** *- Showing some signs of deteriorating condition, but still in reasonable working order and has minimal or no operational issues.*
9. ***Material deterioration*** *- Significant deterioration in condition resulting in some operational issues. May become 'End of Life' within 5-10 years.*
10. ***End of Life*** *- Serious signs of deterioration due to age, wear and suitability that cannot be rectified. Asset is at 'End of Life' and may have critical issues that operationally restrict the network and may pose a danger to staff, public or the network. It should generally be replaced within 5 years.*
11. ***URGENT*** *- Any asset that needs attention immediately*

	TOTAL COST	DEFECT COST	CALL-OUT COST	Defect Class
Urgently	£0	£0	£0	DC U
Within 6 Months	£8,050	£7,950	£100	DC 4
Within 1 -2Year	£12,925	£12,275	£650	DC 3
Within 2-3 Years	£7,950	£7,750	£200	DC 2
Within 3-5 Years	£0	£0	£0	DC 1
Total	£28,925	£27,975	£950	

Asset Ref	Cost Split								
	Material	Type of Repair	Subtype	Qty	Unit	Callout Cost	Cost	Defect Criticality	Class
1	Roof	Renew Entirely	Flat Felt Roof	30	m2			<3	M
1	Access at	Mewp Access (Day Rate)		6	day			<3	M
1	Cladding	Replace/Repair Facia Board		54	m			<3	M
2	Windows	Lintels	Simple Repair with Sika Type Products	6	Nos			<2	M
2	Internal	Paint	Light Prep and Two Coats Emulsion	150	m2			<2	M
2	Concrete	Spalling Concrete	Medium size Patch Repair	2	Nos			<2	M
2	Access at	Temp Scaffold Access to 5 m height	Local 2m x6m platform	3	Day			<2	M
3	Oil spill	Within Bund	Dispose & Replace gravel chippings	4	m2			<2	E
3	Oil spill	Within Bund	Clean off Concrete generally	4	m2			<2	E
4	Steelwor	Wirebrush & repaint	1 primer & 1 overcoat	10	m2			<2	M
5	Gutterin	renew entire gutter & downpipe system		50	m			<0.5	M
5	Access at	Mewp Access (Day Rate)		3	day			<0.5	M
6	Windows	Prepare & Repaint Doors	Double Leaf Door primer + 2 coats	3	Nos			<2	M
6	Windows	Prepare & Repaint Doors	Single Leaf Door primer + 2 coats	3	Nos			<2	M
7	Other	Non standard defect (see comments)	Surveyors judgement					<2	M
7	Brickwor	Repoint 1 face		100	m2			<2	M
7	Access at	Mewp Access (Day Rate)		4	day			<2	M
7	Brickwork	dismantle & rebuild (1.5 Brick Thick)		2	m2			<2	M
8	Foliage	Weeding within compound	Light Coverage (up to 5 cm growth)	100	m2			<3	M

Site Name	CONEY GREEN
Asset Description	Control Building Roof (Aerial photos only)
Electrical Reference	
Elec Plant Description	

Drg Ref	1
Defect Criticality	<3
Reporting Health Index	5
Approx Remedial Cost	.

Structural Category:
Buildings

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
							X

Comments:

Water ingress in corner of the building internally in the RMU building with worn and tired fascia boards. Original survey notes flat roof of RMU building is to be replaced including fascias. It also states that the slate roof of switch room is also to be replaced, although there does not appear to be any damage or signs of damp internally to the walls. SPEN decision whether to carry this out, not costed at this stage.

View on Map Full size photo

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Roof : Renew Entirely : Flat Felt Roof	30 m2		<3	M
Access at Height : Mewp Access (Day Rate) :	6 day		<3	M
Cladding : Replace/Repair Facia Board :	54 m		<3	M

View on Map Full size photo

View on Map Full size photo

View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Control Building Internal Condition
Electrical Reference	
Elec Plant Description	

Drg Ref	2
Defect Criticality	<2
Reporting Health Index	5
Approx Remedial Cost	.

Structural Category:
Buildings

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
	X	X					X

Comments:

There is cracking of the lintels and movement at the door openings. Repair lintels and fill in cracks in the floor.

View on Map Full size photo

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Windows / Doors : Lintels : Simple Repair with Sika Type Products	6 Nos		<2	M
Internal Walls : Paint : Light Prep and Two Coats Emulsion	150 m2		<2	M
Concrete : Spalling Concrete : Medium size Patch Repair	2 Nos		<2	M
Access at Height : Temp Scaffold Access to 5 m height : Local 2m x6m platform	3 Day		<2	M

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View on Map Full size photo

View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Concrete Foundations
Electrical Reference	
Elec Plant Description	

Drg Ref	3
Defect Criticality	<2
Reporting Health Index	2
Approx Remedial Cost	

Structural Category:
Concrete Foundations

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other

Comments:

Oil spill on concrete base of transformer. Clean off concrete and replace surrounding gravel.

View on Map Full size photo

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Oil spill : Within Bund : Dispose & Replace gravel chippings	4 m2		<2	E
Oil spill : Within Bund : Clean off Concrete generally	4 m2		<2	E

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View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Compound Fencing
Electrical Reference	
Elec Plant Description	

Drg Ref	4
Defect Criticality	<2
Reporting Health Index	3
Approx Remedial Cost	

Structural Category:
Fences and walls

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
			X				X

Comments:

Palisade fence shows signs of corrosion. Wirebrush and repaint as necessary.

View on Map Full size photo

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Steelwork : Wirebrush & repaint : 1 primer & 1 overcoat	10 m2		<2	M

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View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Building Rainwater Goods (Gutters/ Downpipes etc.)
Electrical Reference	
Elec Plant Description	

Drg Ref	5
Defect Criticality	<0.5
Reporting Health Index	5
Approx Remedial Cost	

Structural Category:
Buildings

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
		X					X

Comments:

Gullies are silted or blocked. Roof outlets are blocked/ not working. Guttering/ downpipes are in poor condition or broken. Original survey suggests replacement of full drainage system as part of roof replacement works. Overhaul the drainage on slate building.

View on Map Full size photo

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Guttering / Downpipes : renew entire gutter & downpipe system :	50 m		<0.5	M
Access at Height : Mewp Access (Day Rate) :	3 day		<0.5	M

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View on Map Full size photo

View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Building Doors
Electrical Reference	
Elec Plant Description	

Drg Ref	6
Defect Criticality	<2
Reporting Health Index	4
Approx Remedial Cost	

Structural Category:
Buildings

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
							X

Comments:

Timber doors have peeling and flaking paint. Overhaul the doors and repaint.

View on Map Full size photo

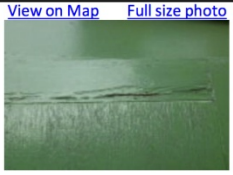
Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Windows / Doors : Prepare & Repaint Doors : Double Leaf Door primer + 2 coats	3 Nos		<2	M
Windows / Doors : Prepare & Repaint Doors : Single Leaf Door primer + 2 coats	3 Nos		<2	M

View on Map Full size photo

View on Map Full size photo



View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Building Walls
Electrical Reference	
Elec Plant Description	

Drg Ref	7
Defect Criticality	<2
Reporting Health Index	4
Approx Remedial Cost	

Structural Category:
Buildings

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
		X				X	X

Comments:

No defects are noted in survey for external brickwork, although photographs show some areas of brickwork on the buildings and boundary walls in poor condition and in need of repointing work. Other structural issues have been covered under asset 2. Survey recommends bricking up of circular vents to switch room to prevent ingress of rain, however this will then cause problems with damp internally. Renovate vents.

Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

View on Map Full size photo

Defects / Actions

	Qty / Unit	Cost	DC	Cls
Other : Non standard defect (see comments) : Surveyors judgement	2000 £		<2	M
Brickwork : Repoint 1 face :	100 m2		<2	M
Access at Height : Mewp Access (Day Rate) :	4 day		<2	M
Brickwork : dismantle & rebuild (1.5 Brick Thick) :	2 m2		<2	M

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View on Map Full size photo

View on Map Full size photo

Site Name	CONEY GREEN
Asset Description	Compound External Condition
Electrical Reference	
Elec Plant Description	

Drg Ref	8
Defect Criticality	<3
Reporting Health Index	3
Approx Remedial Cost	

Structural Category:
Non-major supporting structures

Spalling	Exposed rebar	Cracking	Staining	Poor Compaction	Corrosion	Frost Shattering	Other
							X

Comments:

General external maintenance and weeding

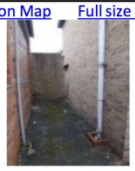
Survey Date	13/07/2012
Prev Repair	
Abandoned	
Approx Age	1959

View on Map Full size photo

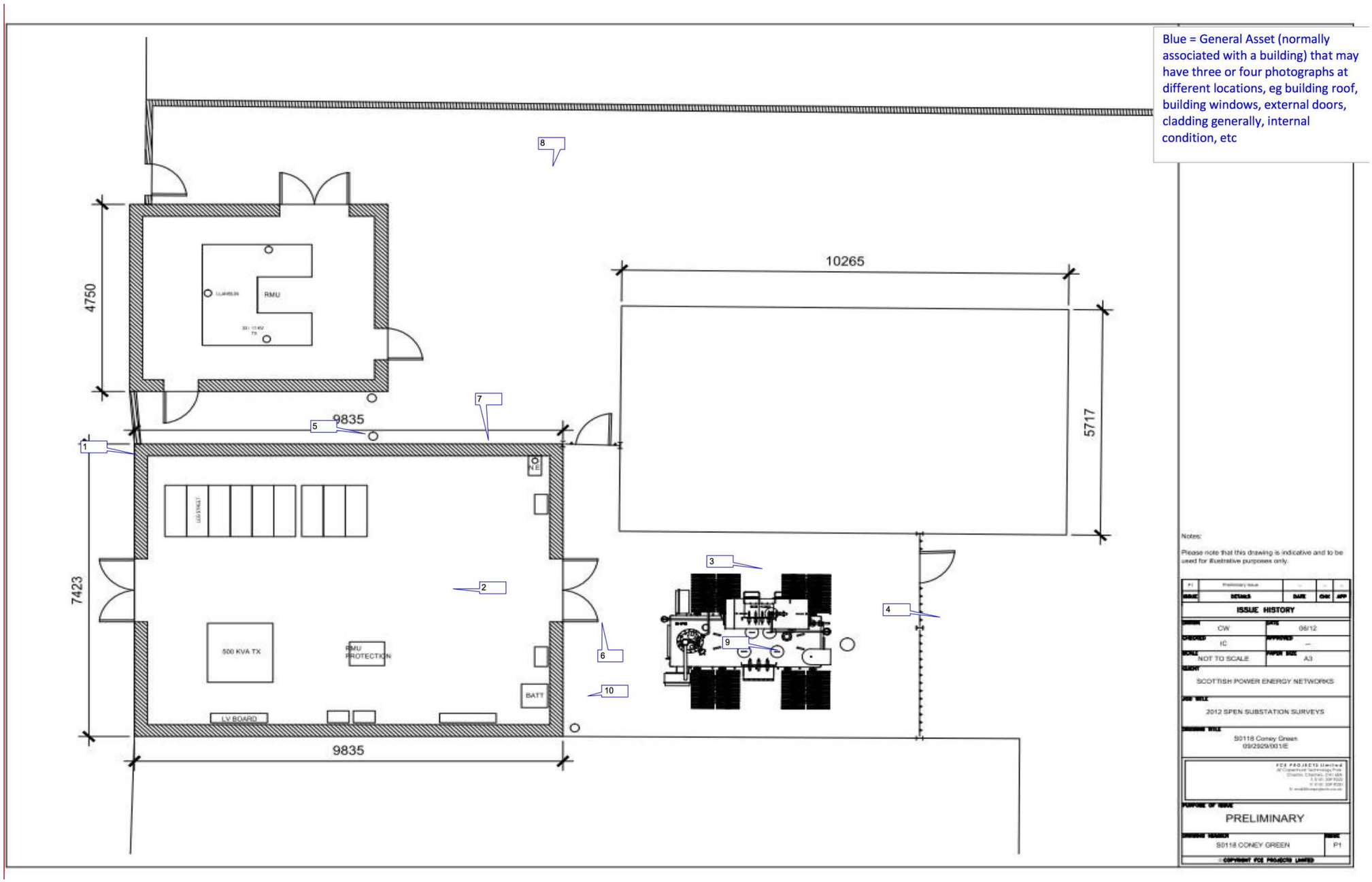
Defects / Actions

	Qty / Unit	Cost	DC	Cls
Foliage : Weeding within compound : Light Coverage (up to 5 cm growth)	100 m2		<3	M

View on Map Full size photo



View on Map Full size photo


Blue = General Asset (normally associated with a building) that may have three or four photographs at different locations, eg building roof, building windows, external doors, cladding generally, internal condition, etc
8
10265
4750
RMU
9835
7
5
1
5717
7423
500 KVA TX
RMU PROTECTION
BATT
LV BOARD
9835
2
3
4
9
6
10
Notes:
Please note that this drawing is indicative and to be used for illustrative purposes only.
ISSUE HISTORY
CW
08/12
IC
NOT TO SCALE
A3
SCOTTISH POWER ENERGY NETWORKS
2012 SPEN SUBSTATION SURVEYS
93118 Coney Green
09/2929/0011E
PRELIMINARY
93118 CONEY GREEN
P1

CIVIL ASSET INSPECTION - Asset Record
Site: CONEY GREEN

CAI Form2: Asset Sheet
Approximate Remedial Cost £28,875
No of Assets Recorded

12. *As new - In excellent working order and condition, as such fully performs its operational function.*

13. *Good condition - No longer new but still in good condition, with no operational issues.*

14. *Minor deterioration - Showing some signs of deteriorating condition, but still in reasonable working order and has minimal or no operational issues.*

15. *Material deterioration - Significant deterioration in condition resulting in some operational issues. May become 'End of Life' within 5-10 years.*

16. *End of Life - Serious signs of deterioration due to age, wear and suitability that cannot be rectified. Asset is at 'End of Life' and may have critical issues that operationally restrict the network and may pose a danger to staff, public or the network. It should generally be replaced within 5 years.).*

Asset Ref	Civil Structure	Electrical Plant (optional)	Electrical Ref	Structure Category	Date of Constr. Default = Site Age	Defect Criticality	Status A= abandoned	Defect								Reporting Health Index	Approx Remedial cost	Previous Repair	Comments
								Spalling	Exposed Rebar	Cracking	Staining	Poor }Compactin	Corrosion	Frost Shattering	Other				
1	Control Building Roof (Aerial photos only)			Buildings	1959	<3									X	5			Water ingress in corner of the building internally in the RMU building with worn and tired fascia boards. Original survey notes flat roof of RMU building is to be replaced including fascias. It also states that the slate roof of switch room is also to be replaced, although there does not appear to be any damage or signs of damp internally to the walls. SPEN decision whether to carry this out, not costed at this
2	Control Building Internal Condition			Buildings	1959	<2			X	X					X	5			There is cracking of the lintels and movement at the door openings. Repair lintels and fill in cracks in the floor.
3	Concrete Foundations			Concrete Foundations	1959	<2										2			Oil spill on concrete base of transformer. Clean off concrete and replace surrounding gravel.
4	Compound Fencing			Fences and walls	1959	<2					X				X	3			Palisade fence shows signs of corrosion. Wirebrush and repaint as necessary.
5	Building Rainwater Goods (Gutters/ Downpipes etc.)			Buildings	1959	<0.5				X					X	5			Gullies are silted or blocked. Roof outlets are blocked/ not working. Guttering/ downpipes are in poor condition or broken. Original survey suggests replacement of full drainage system as part of roof replacement works. Overhaul the drainage on slate building.
6	Building Doors			Buildings	1959	<2									X	4			Timber doors have peeling and flaking paint. Overhaul the doors and repaint.
7	Building Walls			Buildings	1959	<2				X				X	X	4			No defects are noted in survey for external brickwork, although photographs show some areas of brickwork on the buildings and boundary walls in poor condition and in need of repointing work. Other structural issues have been covered under asset 2. Survey recommends bricking up of circular vents to switch room to prevent ingress of rain, however this will then cause problems with damp
8	Compound External Condition			Non-major supporting structures	1959	<3									X	3			General external maintenance and weeding

General Notes relating to Approximate Remedial Cost:

Approximate remedial cost is an estimate based on the surveyors judgement from a visual inspection only. The estimate does not include management overheads, access and supervision and costs to SPEN of temporary remedial work. The costs are limited to an estimate of direct materials and labour, since it would not generally be possibly for external civil engineers to evaluate other aspects. The remedial cost breakdown code relates to indicative guide prices that the surveyors and reviewers use to help inform the total approximate remedial costs. The total 'approximate remedial cost' takes precedence with regard to SKM's indicative estimate for remediation and repair .

Picture A	Picture B	Picture C	Picture D	Remedial Cost Breakdown Code	Remedial Cost Text
				Ro4,30,<3,M,Ac6,6,<3, M,Cl6,54,<3,M	Roof, Renew Entirely, Flat Felt Roof:30 m2, Defect Index: <3, Defect Class: M Access at Height, Mewp Access (Day Rate), :6 day, Defect Index: <3, Defect Class: M Cladding, Replace/Repair Facia Board, :54 m, Defect Index: <3, Defect Class: M
				Wd1,6,<2,M,Iw3,150,<2 ,M,Co5,2,<2,M,Ac3,3,<2 ,M	Internal Walls, Paint, Light Prep and Two Coats Emulsion:150 m2, Defect Index: <2, Defect Class: M Concrete, Spalling Concrete, Medium size Patch Repair:2 Nos,, Defect Index: <2, Defect Class: M Access at Height, Temp Scaffold Access to 5 m height, Local 2m x 6m platform: 3 Day, Defect Index: <2, Defect Class: M
				Oi1,4,<2,E,Oi3,4,<2,E	Oil spill, Within Bund , Dispose & Replace gravel chippings:4 m2, Defect Index: <2, Defect Class: E Oil spill, Within Bund, Clean off Concrete generally:4 m2, Defect Index: <2, Defect Class: E
				St2,10,<2,M	Steelwork, Wirebrush & repaint, 1 primer & 1 overcoat:10 m2, Defect Index: <2, Defect Class: M
				Gd4,50,<0.5,M,Ac6,3,<0 .5,M	Guttering / Downpipes, renew entire gutter & downpipe system, :50 m, Defect Index: <0.5, Defect Class: M Access at Height, Mewp Access (Day Rate), :3 day, Defect Index: <0.5, Defect Class: M
				Wd6,3,<2,M,Wd7,3,<2, M	Windows / Doors, Prepare & Repaint Doors, Double Leaf Door primer + 2 coats:3 Nos, Defect Index: <2, Defect Class: M Windows / Doors, Prepare & Repaint Doors, Single Leaf Door primer + 2 coats:3 Nos, Defect Index: <2, Defect Class: M
				Ot1,2000,<2,M,Br1,100, <2,M,Ac6,4,<2,M,Br2,2, <2,M	Brickwork, Repoint 1 face, :100 m2, Defect Index: <2, Defect Class: M Access at Height, Mewp Access (Day Rate), :4 day, Defect Index: <2, Defect Class: M Brickwork, dismantle & rebuild (1.5 Brick Thick), :2 m2, Defect Index: <2, Defect Class: M
				Fo1,100,<3,M	Foliage, Weeding within compound, Light Coverage (up to 5 cm growth):100 m2,, Defect Index: <3, Defect Class: M