Scottish and Southern Energy
Power Distribution

energypeople

SSEPD
asset management
and non-load related proposals for RIIO-ED1

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Contents

Glossary 6

1. Executive summary 7

2. Introduction 8

3. Structure of this report 8

Part 1 9

4. SSEPD's approach to asset management 9

4.1 SSEPD's approach 9

4.2 The principles of PR-PS-432 9

4.3 PR-PS-432 in action 10

4.4 energypeople's view of SSEPD's approach to asset management 11

5. SSEPD's procedures for asset condition assessment 12

5.1 Subjectivity 12

5.2 Minimising subjective opinion 12

5.3 SSEPD's approach to the detection and measurement of partial discharge 13

5.4 energypeople's view of SSEPD's approach to asset condition assessment 13

6. SSEPD's approach to asset risk 14

6.1 SSEPD's asset risk registers 14

6.2 SSEPD's five-fold approach 14

6.3 energypeople's view of SSEPD's approach to asset risk 14

7. SSEPD's investment management process 15

7.1 SSEPD's approach 15

7.2 energypeople's view of SSEPD's investment management process 15

Part 2 16

8. SSEPD's proposals for non-load related intervention under RIIO-ED1 16

8.1 SSEPD's asset intervention business drivers 16

8.2 SSEPD's classifications for asset intervention 16

8.3 energypeople's independent review 17

9. SSEPD's 132kV and EHV circuit-breakers and isolators 18

9.1 SSEPD's proposals 18

9.2 energypeople's findings 18

9.3 energypeople's conclusions 19

10. SSEPD's 132kV and EHV transformers 20
10.1 SSEPD's proposals 20
10.2 energypeople's findings 20
10.3 energypeople's conclusions 24
11. SSEPD's HV circuit-breakers 25
11.1 SSEPD's proposals 25
11.2 energypeople's findings 26
11.3 Additional considerations 31
11.4 energypeople's conclusions 33
12. SSEPD's stakeholder engagement 35
12.1 SSEPD's historic approach to stakeholder engagement and feedback 35
12.2 SSEPD's wider approach to stakeholder engagement and feedback 35
12.3 Energypeople's views of SSEPD's approach to consultation 36
13. RIIO-ED1 submission reports 38
13.1 Report template 38
13.2 RIIO-ED1 submission reports 38
14. Summary and energypeople's overall conclusions 39
14.1 SSEPD's approach 39
14.2 SSEPD's proposals 40
Appendix A – SSEPD's document PR-PS-052 – "DMPG investment management process" 42
Appendix B – An example of a completed RIIO-ED1 submission report 55
Appendix C – Another example of a completed RIIO-ED1 submission report 59

List of Tables

Table 1 – SSEPD's scoring system for the asset condition intervention drivers 11
Table 2 – SSEPD's definitions of the asset condition categories 11
Table 3 – SSEPD's calculated risk and bands of risk 14
Table 4 – SSEPD's asset intervention business drivers 16
Table 5 – SSEPD's classification of asset intervention 17

List of Photographs

Photograph 1 – The 33/11kV transformer at SSEPD's Portsoy primary substation 21
Photograph 2 – T2 33/11kV transformer at SSEPD's Purbrook primary substation 21
Photograph 3 – Temporary pipework at SSEPD's Leoch primary substation 22
Photograph 4 – Example of PCB labelling on a 33/11kV transformer at SSEPD's Methlick primary substation 23
Photograph 5 – Example of modernised tap-change control equipment at SSEPD's Craigton Cults primary substation 24
Photograph 6 – Example of trip-testing label at SSEPD's Lyndhurst primary substation..... 27
Photograph 7 – The PD monitor at SSEPD's Broughty Ferry primary substation 28
Photograph 8 – The rope used to close 11kV feeder circuit-breakers from outside the switchroom at SSEPD's Overgate primary substation 29
Photograph 9 – The wall-mounted ring-bolts at SSEPD's Overgate primary substation..... 30
Photograph 10 – Example of parts having been removed from an obsolete 11kV circuit-breaker at SSEPD's Lochee primary substation..... 31

Glossary

Abbreviation	Meaning
CI (two uses)	**C**riticality **I**ndex (of an asset)
	Customer **I**nterruptions (as in Ofgem's Quality of Service IIS process)
CML	**C**ustomer **M**inutes **L**ost (as in Ofgem's Quality of Service IIS process)
DC	**D**irect **C**urrent
DNO	**D**istribution **N**etwork **O**perator
EHV	**E**xtra **H**igh **V**oltage – voltages above 20,000 up to but excluding 132,000
HI	**H**ealth **I**ndex (of an asset)
HV	**H**igh **V**oltage – voltages above 1,000 up to and including 20,000
IAM	**I**nstitute of **A**sset **M**anagement
IIS	**I**nterruption **I**ncentive **S**cheme (Ofgem's Quality of Service process that targets DNOs to minimise CI and CML)
kV	**K**ilo-**v**olt (i.e. 1,000 volts)
PD	**P**artial **D**ischarge
PEAR	**P**eople, **E**nvironment, **A**sset and **R**eputation (in the context of SSE's risk assessment of an event occurring)
PLACAR	**Pla**nt and **C**ircuits **A**sset **R**egister (SSEPD's asset register)
QoS	**Q**uality **o**f **S**ervice (as in Ofgem's IIS process)
RIIO-ED1	The 'name' for Ofgem's next distribution price control which will run from 01 April 2015 for a period of eight years. Where: **R**evenue will be set using **I**ncentives to deliver **I**nnovation and **O**utputs for **E**lectricity **D**istribution (period 1)
RSWG	**R**eliability and **S**afety **W**orking **G**roup (a joint electricity supply industry / Ofgem group of specialists)
SEPD	**S**outhern **E**lectricity **P**ower **D**istribution
SHEPD	**S**cottish **H**ydro **E**lectricity **P**ower **D**istribution
SSE	**S**cottish and **S**outhern **E**nergy
SSEPD	**S**cottish and **S**outhern **E**nergy **P**ower **D**istribution

1. Executive summary

This report presents the findings of the independent audit of Scottish and Southern Energy Power Distribution's (SSEPD's) approach towards asset management with particular reference to SSEPD's procedures for non-load related asset intervention.

Scottish and Southern Energy (SSE) commissioned energypeople to carry-out the audit in conjunction with SSEPD's preparations for its forthcoming submissions to Ofgem for RIIO-ED1, the next distribution price control period.

energypeople has reviewed SSEPD's asset management procedures and considered them in relation to the whole life-cycle philosophy encouraged by the Institute of Asset Management (IAM) as contained in the British Standard BSI-PAS 55:2008.

energypeople concludes that SSEPD's procedures are in accordance with both the IAM's approach and best international practice.

Many of the assets in both of SSEPD's licenced areas were manufactured between 1950 and 1968. It would therefore be expected that, irrespective of any obsolete electrical or mechanical features, the external appearance of the assets would not be good and rusted metalwork would be the norm.

energypeople is delighted to report that this is far from actuality – SSEPD's stewardship of its assets is considered to be exemplary as evidenced by grid and primary system transformers that, despite being over fifty years' old, resemble almost brand-new ones, so good is the external upkeep of them.

Accordingly therefore, energypeople is delighted to commend SSEPD's approach to asset management and considers that it demonstrates international best practice of asset stewardship.

During the various discussions with SSEPD's planning and design teams, energypeople has reviewed SSEPD's proposals for the volumes of work in its RIIO-ED1 submission and the associated costs involved. energypeople considers that SSEPD's proposals are both realistic and reasonable.

energypeople also considers that SSEPD's proposals are entirely consistent with the company's aim of maintaining an even level of risk and energypeople is therefore pleased to both endorse and support SSEPD's proposals for its asset intervention submissions under RIIO-ED1.

In reaching this conclusion, energypeople has discussed SSEPD's underlying approach to its proposals and is pleased to note that, when the proposed asset interventions are completed, the apparatus and infrastructure concerned will generally be brought to the beginning of a new life-cycle, with a minimum service life of fifty to sixty years.

The independent auditors gratefully acknowledge the help of SSEPD's personnel who freely gave of their time and discussed matters with energypeople in an open and straightforward way.

2. Introduction

SSE is currently working on its forthcoming submissions to Ofgem for RIIO-ED1, the next distribution price control period, which is due to run for a period of eight years from 01 April 2015 to 31 March 2023.

In support of its work on the proposals for asset intervention, SSE commissioned energypeople to carry out an independent audit of SSEPD's asset management procedures concerning non-load related activities.

The audit was carried out by energypeople's Gerry George, who covered the Southern Electricity Power Distribution (SEPD) licenced area and Geoff Stott, who covered the Scottish Hydro Electricity Distribution (SHEPD) licenced area.

SSEPD's procedures are held in its document library, which is located on SSEPD's intranet and energypeople's team members were given unfettered access to this facility.

To check the day-to-day application of SSEPD's procedures, energypeople examined a sample of the records held within SSEPD's asset register, known by the acronym 'PLACAR' – 'PLant And Circuits Assets Register'.

Several site visits were also undertaken to check the physical condition of the assets within SSEPD's electricity distribution networks.

energypeople's team members worked simultaneously for varying periods of time between January and June 2013, exchanging information electronically as appropriate.

3. Structure of this report

The remainder of this report is in two parts:

Part 1 contains energypeople's review and considered views of SSEPD's asset management and investment management procedures; and

Part 2 considers SSEPD's RIIO-ED1 proposals for non-load related intervention; and contains energypeople's report on the site visits undertaken to cross-check the reported condition of SSEPD's electricity distribution assets.

Part 1

Section 4 discusses SSEPD's approach to asset management as stated in its various in-house procedures;

Section 5 describes SSEPD's procedures for condition assessment;

Section 6 considers SSEPD's approach to asset risk; and

Section 7 discusses SSEPD's investment management process.

Part 2

Section 8 discusses SSEPD's non-load related proposals under RIIO-ED1 and energypeople's associated views and considerations;

Section 9 considers SSEPD's approach to the upkeep of its EHV switchgear;

Section 10 discusses SSEPD's considerations of EHV/HV primary transformers;

Section 11 considers HV circuit-breakers;

Section 12 comments on SSEPD's engagement with its stakeholders;

Section 13 provides an overview of SSEPD's RIIO-ED1 submission reports; and

Section 14 provides a summary and energypeople's overall conclusions.

Part 1

4. SSEPD's approach to asset management

4.1 SSEPD's approach

When considering the need to replace non-load related distribution assets at the higher-voltage levels, SSEPD's decisions are informed through the use of several in-house processes and procedures.

Principal amongst these is SSEPD's document *PR-PS-432* "*Non-load related distribution asset intervention – decision tool*"[1].

Most recently updated in September 2012, this procedure is based upon SSEPD's wide experience of managing distribution assets and SSEPD has applied sound engineering principles to its approach, which aligns with the company's prime aims, priorities and objectives.

In SSEPD's role as an essential service provider, these aims include providing a safe, efficient and reliable service at the lowest possible cost to its customers[2].

4.2 The principles of PR-PS-432

SSEPD's decision tool describes six asset intervention drivers. In order of relative importance, for each asset under consideration, these drivers are:

1. Its condition;
2. The security of the network of which the asset is an integral part;
3. The fault history / performance of the asset;
4. Obsolescence / the availability of spares;
5. Any safety issues concerning the asset; and
6. Its age.

Each of the six drivers is given an intervention priority score and a Health Index (HI), both of which have varying weighting factors assigned to them.

For each driver, PR-PS-432 gives various categories / descriptions, with the associated scores for both intervention priority and HI.

By completing the scoring process for all six drivers, SSEPD is able to determine its approach / intervention strategy for each asset under consideration.

SSEPD's process considers that the score attributed to the condition of an asset generally indicates the appropriate action.

If the resultant priority score is 44 or more, the asset is classed as requiring intervention within 5 years. Where the score for asset condition alone equals 44 (the maximum), the asset is categorised as requiring intervention within 2 years.

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[1] PR-PS-432 - Non-load related distribution asset intervention- decision tool – SSE - Sep '12

[2] See "Innovating for a greener, more efficient future" – SSEPD's 1st public consultation document - Sep '12; and

"Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13

Where the total priority score is less than 44, the asset is considered for intervention 'over the medium term'.

PR-PS-432 also provides for specific reviews of individual assets if the priority score for fault history and the availability of spares / obsolescence is greater than 6.

Similarly, where the priority score for safety is either 5 or 6, a specific review is required for that asset.

Designated HI 1 to HI 5, SSEPD's process uses five health indices, the lower the number, the 'healthier' the asset. For example, if the total HI score for an asset is less than 16, it is classed as HI 1. Conversely, if the total HI score is 62 or greater, it is given an HI 5 classification.

By determining the HI of a higher-voltage asset 'as-is', a re-assessment of the HI after intervention will provide a good indication of the improvements so made. SSEPD's approach is compatible with Ofgem's decision to introduce two 'secondary deliverables'; a 'criticality index'(CI), which, together with a 'health index' will be combined to produce a 'risk index'(RI)[3]. Consequently, energypeople considers that SSEPD's approach is in-line with Ofgem's decision and that SSEPD is therefore well-placed regarding compliance with Ofgem's required deliverables for these indices.

4.3 PR-PS-432 in action

The scores for the majority of SSEPD's six intervention drivers are derived from information held in the company's asset register or network connectivity model. For example, the fault rate of the asset compared to the company or national average; and the number of customers whose supplies are reliant upon the asset.

However, SSEPD's process gives the highest weighting to the 'asset condition' intervention driver and energypeople was keen to learn how SSEPD ensures consistency of approach in determining asset condition across its geographical areas.

This driver is also most important because, as noted above, where an assessment results in it attracting the maximum score of 44, SSEPD's process requires intervention sooner than later.

Without clear guidelines, energypeople considers that the asset condition driver could be an otherwise subjective assessment, potentially resulting in SSEPD spending money unnecessarily.

With this in mind, energypeople is pleased to see that SSEPD's document PR-PS-432 provides 5 distinct categories / descriptions for each intervention driver.

Table 1, which is an extract from SSEPD's document PR-PS-432 for the asset condition intervention driver, shows the five categories / descriptions as associated scores. It should be noted that, in the particular case of this intervention driver, the priority and HI scores are the same for each category / description; thus demonstrating the criticality of this intervention driver.

[3] See chapter 6 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Reliability and Safety" – Ofgem – reference 26f/13 – Mar '13

Table 1 – SSEPD's scoring system for the asset condition intervention drivers

Asset condition	Score	
	Priority	Health Index
Satisfactory	0	0
Additional maintenance	11	11
Minor refurbishment	22	22
Consider intervention	33	33
Immediate intervention	44	44

To remove further subjectivity from the assessment, SSEPD's document PR-PS-432 provides definitions to amplify the five categories / descriptions.

Also extracted from SSEPD's document PR-PS-432, Table 2 shows these definitions.

Table 2 – SSEPD's definitions of the asset condition categories

Category / description	Definition
Satisfactory	There is no concern about the asset provided routine inspection and maintenance is continued
Additional maintenance	The asset requires additional maintenance. For example: painting
Minor refurbishment	By expending some money, for example: contact replacement, bushing replacement, oil change; the asset will be fit for purpose. The asset must be kept under review.
Consider intervention	The asset is generally in poor condition but with minor refurbishment will be fit for purpose in the short term (3 – 5) years.
Immediate intervention	The asset is in very poor condition and must be replaced as soon as possible (< 2 years).

4.4 energypeople's view of SSEPD's approach to asset management

In reviewing the approach adopted by SSEPD towards higher-voltage asset replacement, energypeople has considered what other options are available to SSEPD in comparison to any pre-conceived, closed-mind concept often encountered elsewhere, such as "the asset is old – it should be replaced".

By SSEPD's use of the word 'intervention' instead of the more generally found word 'replacement', energypeople is pleased to note that SSEPD has incorporated the considerable experience of its engineering personnel and included credible alternative approaches within its policy.

energypeople considers that the result is a far more rounded and open-minded approach based on sound engineering principles, which readily aligns with Ofgem's RIIO-ED1 requirement[4], and for which SSEPD is to be commended.

[4] See paragraph 3.9 and Table 3.1 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Business plans and proportionate treatment" – Ofgem – reference 26b/13 – Mar '13

5. SSEPD's procedures for asset condition assessment

5.1 Subjectivity

Another area of subjectivity could be expected if the requisite inspections for asset condition were carried out by personnel who have different skills and different levels of experience within the sphere of monitoring asset condition.

Again based upon its wide operational experience of managing distribution assets, SSEPD has considered this aspect of its activities and issued its document *WI-PS-588 "Power systems primary and grid substation inspection and condition assessment work instruction"* in April 2003.

5.2 Minimising subjective opinion

Section 6 of SSEPD's document WI-PS-588 details the procedure for condition assessment, whereby the maintenance manager will record a rolling four-year programme of sites for condition assessment on SSEPD's site inspection lists.

SSEPD's document WI-PS-588 also prescribes the personnel who must carry out the condition assessments and when: condition assessments are to be carried out in the October / November / December quarter by team managers or maintenance engineers assisted by civil staff as necessary.

To provide an overall assessment of the condition of all assets based on the on-site inspection and maintenance activities, field teams are required to assign an asset condition assessment using the following scale:

0 - Above average condition: no concerns / normal maintenance regime / spares available internally;
1 - Average condition: minor corrosion or leaks / enhanced maintenance / spares easily available;
2 - Consider replacement: major corrosion / oil leaks / enhanced maintenance / spares difficult to procure externally;
3 - Requires replacement within 5 years: enhanced maintenance has failed to cure corrosion and / or oil leaks; and
4 - Requires replacement within 2 years: risk of failure if left on circuit / no spares available.

Acknowledging that the above scale remains potentially subjective and to enhance the accuracy of the assessments, SSEPD uses a comprehensive range of off-line diagnostic condition assessment procedures that includes:

- Corrosion monitoring of outdoor switchgear and ultrasonic techniques to determine metal thickness;
- Acoustic partial discharge monitoring increased to on-line monitoring when above a specified level;
- Thermal Imaging;
- Circuit-breaker timing tests;
- Regular oil sampling; and
- DC insulation tests.

The results of the condition assessments, which are used to predict the remaining useful life of an asset, are recorded on a comprehensive pro-forma known as the annual *'Primary Substation Plant Condition Summary'* and subsequently entered onto SSEPD's asset register *'PLACAR'*.

5.3 SSEPD's approach to the detection and measurement of partial discharge

Issued in April 2011, SSEPD's document *PR-PS-566* "*procedure for partial discharge testing*" describes the causation of partial discharges; their degrading effect on solid electrical insulation and the techniques and equipment used to detect them. This is the approach that SSEPD has adopted for its assets.

SSEPD's asset risk management programme relies on a robust level of information on the condition of its assets as this enables it to accurately categorise the priority score and the Health Index of its network assets. These indices are then adopted to assign the appropriate intervention strategy.

As described in its document PR-PS-566, SSEPD has adopted a two-stage approach. The first stage is to issue a handheld measuring instrument that is used to conduct surveys of all switchgear in primary and grid indoor substations for partial discharge during routine inspection visits. The results are recorded by the inspector and subsequently input to SSEPD's asset register.

Where the first-stage measurements show a higher than expected reading, SSEPD deploys the second stage by installing a highly sensitive partial discharge monitoring equipment within the substation for a week to more accurately measure the level of partial discharge activity and to pin-point its source.

Whenever the results indicate there is a high risk from the partial discharge, appropriate safety precautions are put in place to alert operational staff to the situation.

As described in its document PR-PS-566, SSEPD has purchased both handheld and more sensitive, larger instruments, the measurements from which contribute to the information SSEPD uses in determining the appropriate intervention strategy within its asset risk management programme.

5.4 energypeople's view of SSEPD's approach to asset condition assessment

In reviewing SSEPD's approach to asset condition assessment, energypeople has considered what more SSEPD could reasonably be expected to do.

energypeople concludes that SSEPD's procedures, combining as they do credible and realistic factors, is, in energypeople's experience, on a par with best practice seen in other parts of the world.

6. SSEPD's approach to asset risk

6.1 SSEPD's asset risk registers

Issued in October 2011, SSEPD's document *TG-PS-488* "*technical guidance to asset risk registers*", describes the company's development of two distinct asset registers, the *'equipment risk register'* deals with the assets associated with the power system and the *'critical risk register'* deals with wider business issues.

Both risk registers encompass SSE's risk management standard, document MS-SHE-003, which provides several impact criteria under which the level of an identified risk can be assessed.

6.2 SSEPD's five-fold approach

SSE has adopted a five-fold approach to the assessment of risk: the likelihood of the event happening and the effect on People, Environment, Asset and Reputation. The latter four criteria are known by the acronym "P.E.A.R."

Using the risk matrix in document TG-PS-488, SSEPD quantifies the level of risk for likelihood of the event happening and for each of the P.E.A.R. criteria. The results for the four P.E.A.R. elements are summed and multiplied by the result from the assessment for the likelihood to produce an overall level of risk.

The result from the above calculation is categorised into one of the four bands of risk as shown in Table 3

Table 3 – SSEPD's calculated risk and bands of risk

Calculated risk	Band
1 to 6	Low
7 to 19	Medium
20 to 40	High
41 to 100	Very high

6.3 energypeople's view of SSEPD's approach to asset risk

energypeople considers that SSEPD's approach to risk assessment is robust, fit for purpose and compares favourably with best international practice.

However, as previously discussed, Ofgem's RIIO-ED1 strategy decisions provide for the introduction of secondary deliverables which include a 'risk index'[5]. Thus Ofgem's decision on risk indices will require SSEPD to introduce a fifth category of risk, i.e. "very low risk", which will sit below SSEPD's current band of four risk categories. SSEPD confirms it is planning to revise its in-house document once Ofgem's proposals are finalised.

[5] See chapter 6 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Reliability and Safety" – Ofgem – reference 26f/13 – Mar '13

7. SSEPD's investment management process

7.1 SSEPD's approach

Updated in May 2011, SSEPD's document *PR-PS-052 "DMPG investment management process",* outlines the company's procedure that is to be followed whenever the company is undertaking projects.

Attendant upon good project management, SSEPD's process is designed to give clarity of purpose, to provide a clear audit trail for both internal and external auditors and to ensure projects are completed to cost and timescale.

The document covers each step of the process, the principal ones of which are:

- Identify customers, both internal and external, who may be party to the project and / or affected by it;
- Nominate an investment manager to oversee the project;
- Ensure regular briefings and on-going reviews are held and documented;
- Consider all credible scenarios for the project design;
- Carry-out a comprehensive investment appraisal with appropriate sensitivity analysis;
- Determine an order of preference based on overall economics and long-term asset life-cycle;
- Ensure the approach is consistent with the relevant price control;
- Throughout the course of the project, consult with all stakeholders who will be affected by it;
- Invoke any existing call-off agreements and / or carry-out competitive tendering to ensure best value for money;
- Seek innovative approaches from tenderers;
- Ensure that items procured meet the requirements of the project in terms of both cost and specification;
- Determine the risk to the network during project implementation and put in place contingencies as appropriate;
- Appoint a project manager to oversee the works and to ensure compliance with all elements of the project, including design briefs, costs and risks;
- Ensure a comprehensive snagging list is produced during final inspection / acceptance tests;
- Carry-out a post-project appraisal / review; and
- Ensure any learning points are entered into SSEPD's 'learning points database', are brought to the attention of the relevant people and thereby taken forward into future projects.

SSEPD's document PR-PS-052 is attached to this report at Appendix A.

7.2 energypeople's view of SSEPD's investment management process

energypeople considers SSEPD's approach to investment management to be most comprehensive and best practice, combining as it does all essential steps of excellent fiscal management with good project design and delivery.

Part2

8. SSEPD's proposals for non-load related intervention under RIIO-ED1

8.1 SSEPD's asset intervention business drivers

SSEPD considers that its proposals are firmly based upon the principles embodied in its various in-house asset management procedures discussed above.

As an addition to its document reference *PR-PS-432 'Non-load related distribution asset intervention – decision tool'*, SSEPD has identified six discrete intervention drivers with varying levels of priority as shown in Table 4.

Each driver has been given a weighting factor for both intervention priority and health index.

Table 4 – SSEPD's asset intervention business drivers

Business driver	All equipment – weighted relative importance	
	Priority	Health Index
Asset condition	44	44
Network security	19	6
Fault performance	15	6
Spares and obsolescence	11	6
Safety	6	6
Age	5	5

Fully in keeping with SSEPD's approach to the stewardship of its assets, it can be seen that the condition of an asset weighs far more heavily than does its age. Accordingly, SSEPD's preparations of its non-load related business plan submissions for RIIO-ED1 include a comprehensive assessment of the condition of its distribution assets.

8.2 SSEPD's classifications for asset intervention

Up-to-date reports of asset condition were compiled by SSEPD's experienced field engineers who provided an assessment of the current physical condition of the assets. To this, they added their operational experience and detailed knowledge of the electrical and mechanical performance of the assets.

Combining the field reports with asset condition information held in SSEPD's PLant And Circuit Assets Register (PLACAR), SSEPD's planning engineers have determined the appropriate level of asset intervention considered necessary to ensure continuing quality of service to the company's customers in a reliable and safe manner at the lowest cost.

Shown in Table 5, SSEPD uses five classifications of asset condition, which have recently been re-defined to align with the discussions within the industry's Reliability and Safety Working Group (RSWG).

Table 5 – SSEPD's classification of asset intervention

Old classification		New classification	
NM	Normal Maintenance	H1	New or as new
EM	Enhanced Maintenance	H2	Good or serviceable condition
R	Minor Refurbishment	H3	Deterioration - requires assessment and monitoring
5Y	Replace within 5 years	H4	Material deterioration - intervention requires consideration
2Y	Replace within 2 years (immediate)	H5	End of serviceable life - intervention required

The highlighting of the classifications within SSEPD's database provides for a readily visible indication of those assets where the most urgent level of intervention is considered necessary. To avoid confusion with 'criticality index' (CI), the classifications of asset intervention are shown as health indices (HI).

SSEPD confirms its procedure will be updated to reflect the changes required under RIIO-ED1, including the new 'risk index', thus ensuring that its processes are up to date with Ofgem's reporting requirements and that its personnel are advised accordingly.

8.3 energypeople's independent review

SSE has commissioned energypeople to review SSEPD's approach and to provide an independent assessment of the rigour and robustness of its approach, including an evaluation of SSEPD's conclusions as to the assets that require the highest level of intervention during the period of RIIO-ED1, and its proposals for them.

To check the consistency of assessment provided by SSEPD's engineers, energypeople has:

- Been provided with the information that SSEPD's planning engineers have used to determine intervention levels;
- Visited a cross-section of 24 substations in SEPD (SSEPD south);
- Visited a cross-section of 21 substations in SHEPD (SSEPD north); and
- Provided SSEPD with reports of their findings.

Where appropriate, energypeople's reports include comment upon such matters as SSEPD's perception of the availability of spare parts, particularly for on-load tap-changers, many of which were manufactured and put into service over 50 years ago.

Potential sources of replacement parts have been identified by energypeople which may enable SSEPD to further prolong the overall service life of many of its transformers with integral on-load tap-changers.

9. SSEPD's 132kV and EHV circuit-breakers and isolators

9.1 SSEPD's proposals

A number of the substations visited by energypeople are equipped with 132kV and EHV switchgear which SSEPD regards as requiring intervention.

In the particular case of 33kV circuit-breakers, SSEPD has previously trialled a refurbishment programme and generally found the costs to be similar to the cost of installing a new circuit-breaker; which has the added benefits of low maintenance and improved operational reliability.

Consequently, SSEPD's intervention proposals mainly provide for the replacement of 33kV circuit-breakers. However, in the particular case of the relatively modern GEC type OX36 outdoor vacuum-insulated 33kV circuit-breaker, SSEPD adopts a different approach as the company finds that, in an otherwise serviceable unit; the outer casing is prone to severe external rusting. This is especially the case where the circuit-breaker is situated in a location prone to the effects of salt-laden air.

These OX36 circuit-breakers are between twenty and thirty years old and, if practicable, SSEPD undertakes to refurbish the affected assets as opposed to replacing them with new units. SSEPD's intervention proposals reflect this cost-effective approach.

SSEPD's proposals include charts showing the population of its 132kV and EHV circuit-breakers plotted against its five health index categories, from which it can be seen that the majority of this type of asset fall within the HI 1 to HI 3 categories with a relatively smaller number in the HI 4 and HI 5 categories.

Based on its criteria for asset intervention, during the period of RIIO-ED1, SSEPD is proposing to replace the following 132kV and EHV circuit-breakers in its SEPD licenced area: twelve (12) at 132kV; sixteen (16) at 66kV; two hundred and forty (240) at 22/33kV.

Within its SHEPD licenced area SSEPD is proposing to replace one hundred and thirty-eight (138) 33kV circuit-breakers.

In addition to these replacements, SSEPD is also proposing to refurbish four (4) GEC type OX36 33kV circuit-breakers within its SHEPD licenced area.

In order to maintain the maximum security of supplies to its customers, SSEPD is proposing to phase this work over the eight-year period of RIIO-ED1 so as to even-out the annual number of 33kV circuit-breakers undergoing replacement, minimise the risk to its customers' supplies and thereby maximise the security afforded to them

9.2 energypeople's findings

During the site visits, energypeople noted the high standard of general upkeep and asset stewardship that are evident in the way SSEPD's approach is maintaining its distribution assets in optimum condition.

In the case of its 132kV and EHV circuit-breakers, SSEPD ensures they are maintained in accordance with its asset management policy to ensure their continuing reliability and long serviceable lives. The assets are also kept as rust-free as possible to minimise degradation due to the effects of weathering.

9.3 energypeople's conclusions

SSEPD's justification for replacing 132kV and EHV circuit-breakers as opposed to refurbishing them is considered to be sound and entirely in keeping with SSEPD's 'lowest overall cost' approach combined with providing a safe, reliable and cost-effective supply to its customers.

energypeople also considers that SSEPD's approach to even-out the workload over the eight-year period of RIIO-ED1 to be realistic and sensible when set against the practical viewpoint of planning the various schemes / projects, completing the works on site and from the perspective of minimising the network risk and thus maximising the security of supply to its customers whilst the works are being carried-out.

Accordingly, energypeople considers that SSEPD's well-reasoned proposals are:

- Essential;
- Technically sound;
- Appropriate to ensure the assets having long serviceable lives;
- Appropriate to ensure the assets continue to be as reliable as possible;
- Aimed at minimising the risk to system security;
- Cost-effective; and
- Consistent with SSEPD's published aims, objectives and priorities.

In order to seek its stakeholders' views on its approach and its proposals, SSEPD has undertaken two public consultations in which are stated the company's aims of providing a safe and reliable supply at the lowest overall cost. Feedback from these consultations indicates that SSEPD's customers are supportive of the company's aims[6], the precepts of which SSEPD's planning teams have followed in drafting the company's proposals for RIIO-ED1.

energypeople considers that SSEPD's proposals are entirely consistent with the company's aim of maintaining an even level of long-term asset risk and energypeople is therefore pleased to both endorse and support SSEPD's proposals for its EHV circuit-breaker interventions for RIIO-ED1.

[6] See "Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13; and

"Stakeholder feedback: Our First Consultant – November 2012" – SSEPD - Feb '13

10. SSEPD's 132kV and EHV transformers

10.1 SSEPD's proposals

A number of the sites visited by energypeople are equipped with 132kV and EHV transformers which SSEPD is considering for intervention during the period of RIIO-ED1.

SSEPD's planning engineers have used a combination of obsolescence, asset age and reports from field personnel to determine the level of intervention considered necessary.

Uppermost in the planning engineers' minds are the per-item cost of these assets and the crucial need to ensure that tap-changers continue to provide voltage regulation within statutory limits.

Wherever practicable, SSEPD's proposals therefore include provision for refurbishing those units fitted with high-speed on-load tap-changers and replacing the older units that are fitted with slow-speed tap-changers, especially those with separate diverter and selector tanks.

Based on its criteria for asset intervention, during the period of RIIO-ED1, SSEPD is proposing to replace the following 132kV and EHV transformers in its SEPD licenced area: twenty (20) at 132kV; six (6) at 66kV and eighty-four (84) at 22/33kV.

Within its SHEPD licenced area SSEPD is proposing to replace forty-five (45) EHV transformers. It is also proposing to replace two (2) EHV regulators and one (1) EHV static compensator within its SHEPD licenced area.

During the period of RIIO-ED1, SSEPD is also proposing to refurbish the following 132kV and EHV transformers in its SEPD licenced area: twenty (20) at 132kV and one hundred and fifty-seven (157) at 22/33kV.

Within its SHEPD licenced area SSEPD is also proposing to refurbish one hundred and thirty-five (135) EHV transformers.

10.2 energypeople's findings

Some of the reports from SSEPD's field personnel indicate that spare parts are no longer available for certain types of high-speed on-load tap-changer and that the transformers should therefore be considered for replacement.

Notwithstanding the above perception and the general age of SSEPD's transformers, energypeople is delighted to observe the excellent upkeep of these costly assets. SSEPD's approach is considered to be best practice in prolonging their service lives.

Externally, this is exemplified by the periodic cleaning, renewal of gaskets and re-painting of the transformer and associated assets, such as cooling banks and neutral earthing devices.

Internally, this is exemplified by SSEPD's programme of sampling the insulating oil to provide any early indication of such things as insulation breakdown and the presence of Polychlorinated Biphenyls (PCBs). Notices regarding the content in oil of the PCBs are prominently displayed on transformer tanks where testing has been completed.

A typical example of SSEPD's upkeep of its 33/11kV Primary Transformers is shown in Photograph 1. Depicting a transformer that was manufactured in 1960, the photograph was taken by energypeople during the site visit to SSEPD's Portsoy primary substation on 31 January 2013.

It should be noted that Portsoy is in an elevated location on the north-east coast of Aberdeenshire to the west of Banff. Consequently, SSEPD's Portsoy primary substation is exposed to the harsh coastal weather associated with the northern North Sea. Despite this, energypeople found that SSEPD's excellent approach to asset management is prolonging the life of its distribution infrastructure and thereby minimising the overall cost of providing a service to its customers.

Photograph 1 – The 33/11kV transformer at SSEPD's Portsoy primary substation

Photograph 2, taken on 12 February 2013 by energypeople during the site visit to SSEPD's Purbrook primary substation, is another example of the excellent upkeep of a 33/11kV transformer, this one having been manufactured in 1956.

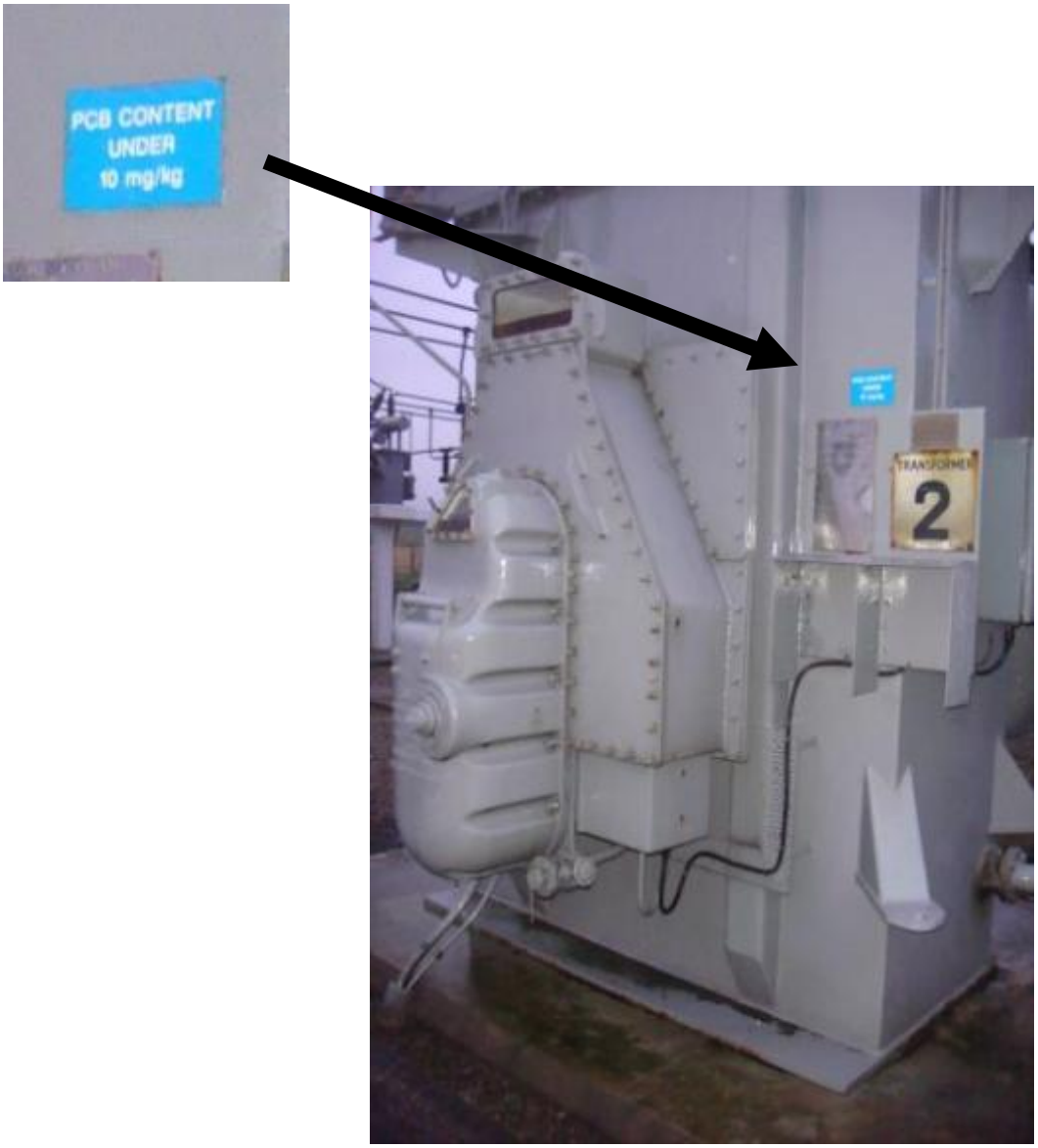
Photograph 2 – T2 33/11kV transformer at SSEPD's Purbrook primary substation

Photograph 3, taken by energypeople during the site visit to SSEPD's Leoch primary substation on 29 January 2013, shows the temporary pipework in place through which the insulating oil is circulated and re-processed. SSEPD refers to this process as 'oil regeneration'.

Photograph 3 – Temporary pipework at SSEPD's Leoch primary substation

Photograph 4, taken by energypeople during the site visit to SSEPD's Methlick primary substation on 30 January 2013, shows the clear labelling of PCB content in the transformer oil.

Photograph 4 – Example of PCB labelling on a 33/11kV transformer at SSEPD's Methlick primary substation



In many cases during energypeople's visits to SSEPD's substations, it was noted that the increasingly unreliable electro-mechanical voltage control relays have been replaced with modern solid-state devices.

Photograph 5, taken by energypeople on 30 January 2013 during the site visit to SSEPD's Craigton Cults primary substation, shows a typical example of where this modification has been carried-out; the blanking plates covering the locations of the

now-removed electro-mechanical relays are clearly visible towards the lower portions of the control panels.

They have been replaced by the modern solid-state replacements (type MVGC, manufactured by Areva) which are the rectangular perspex-covered devices situated above the three selector switches in upper halves of each control panel.

Photograph 5 – Example of modernised tap-change control equipment at SSEPD's Craigton Cults primary substation

10.3 energypeople's conclusions

In considering it to be exemplary, energypeople commends SSEPD for the stewardship of its EHV/HV transformers the company's activities being again consistent with its aim of maintaining an even level of asset risk.

SSEPD's approach and proposals for asset intervention in regard to its primary system transformers are considered most apposite.

Accordingly, energypeople confirms its support for SSEPD's RIIO-ED1 proposals, the validity of which energypeople is very pleased to confirm.

11. SSEPD's HV circuit-breakers

11.1 SSEPD's proposals

In keeping with its overall least-cost philosophy and approach to system performance, SSEPD is keen to ensure that its high-voltage (HV) circuit-breakers continue to be reliable, safe to operate, free from defect and requiring minimal preventative maintenance.

Much of SSEPD's distribution infrastructure was installed some fifty years ago, when:

- Oil was the arc-extinguishing medium;
- Disruptive failure was not uncommon;
- Closing the circuit-breaker required the operator to stand in front of it;
- Operating mechanisms were of necessity heavy;
- Circuit-breakers generally had to be withdrawable to facilitate maintenance;
- Fixed portions of HV switchboards had to be substantial;
- Switchroom floors had to withstand considerable dynamic loading;
- Post-fault overhaul was necessary after fault clearance;
- Preventative maintenance was labour-intensive;
- Remote tele-control was non-existent;
- Supervisory Control And Data Acquisition (SCADA) was in its infancy; and
- Customers were generally grateful for any supply, no matter how unreliable.

Since then, circuit-breaker technology has moved on:

- Vacuum and SF_6 have largely replaced oil as the arc-extinguishing medium;
- Vacuum and SF_6 circuit-breakers are capable of many fault-interruptions;
- Operating mechanisms are much lighter;
- Circuit-breakers do not need to be withdrawable;
- Fixed portions of HV switchboards are much lighter in structure;
- Switchroom floors do not need to withstand high dynamic loads;
- Preventative maintenance requirements are minimal;
- Reliability is greatly improved;
- Disruptive failure is rare;
- Operations on site can be carried-out from the control room;
- Operators do not need to stand in front of the circuit-breaker;
- During system fault conditions, tele-control via SCADA are the norm; and
- System automation is the modern method of speedy supply restoration.

Since the early days of widespread electrification, the expectations of SSEPD's customers have also moved on. Various surveys and feedback from SSEPD's consultations indicate that the company's customers expect a safe and reliable supply at the lowest cost, as embodied within SSEPD's philosophy.

- Today's households generally rely upon domestic electrical appliances, such as refrigerators, freezers and washing machines;
- Entertainment is commonly derived from television sets and computers;

- Working from home is more prevalent, particularly in rural areas; and
- In the event of supply interruptions, such as system faults, customers generally expect speedy supply restoration.

In other words, customer expectations are far higher than fifty years ago. Nowadays, customers generally demand more for the same, or preferably lower, cost.

This fact is not lost on the industry regulator Ofgem, where the Interruption Incentive Scheme (IIS) under the Quality of Service (QoS) initiative targets network operators to minimise the number (CI) and duration (CML) of interruptions to customers' supplies. Moreover, network operators are set targets for both CI and CML with associated monetary 'rewards' or 'penalties' for 'good' or 'bad' performance.

Recognising the vital importance of its HV circuit-breakers has always been high on SSEPD's agenda and SSEPD has accordingly paid especial attention to the condition and reliability of its HV circuit-breakers with a view to determining what interventions will be necessary during RIIO-ED1.

In an innovative approach, SSEPD is currently investigating the technicalities and long-term reliability of replacing withdrawable oil-filled circuit-breaker 'trucks' with a modern circuit-breaker that has, for example, vacuum as its interruption medium. SSEPD is presently evaluating this approach with South Wales Switchgear type C4X oil-filled circuit-breakers in a switchboard that has been tested for internal partial discharge and found to be both electrically and mechanically sound.

Whilst still at the trialling / evaluation stage, if this alternative to wholesale replacement of these HV switchboards proves feasible, there will be a consequential cost-saving to SSEPD's customers.

Based on its criteria for asset intervention, during the period of RIIO-ED1, SSEPD is proposing to replace seven hundred (700) HV circuit-breakers in its SEPD licenced area and two hundred and seventy (270) in its SHEPD licenced area.

SSEPD is also proposing to refurbish two hundred and thirty-four (234) HV circuit-breakers in its SEPD licenced area and one hundred and forty-five (145) in its SHEPD licenced area.

Also, recognising the time required in undertaking the planning, procuring, construction and commissioning work associated with its proposals, SSEPD has devised an annual programme of activity to even-out the workload over the period of RIIO-ED1.

11.2 energypeople's findings

All of the sites visited by energypeople are on SSEPD's list of primary substations where it proposes to replace obsolete HV circuit-breakers under its RIIO-ED1 submission.

energypeople is again delighted to note that SSEPD is demonstrating good stewardship of its assets. During the various site visits, energypeople observed several ways in which this is apparent in regard to HV circuit-breakers.

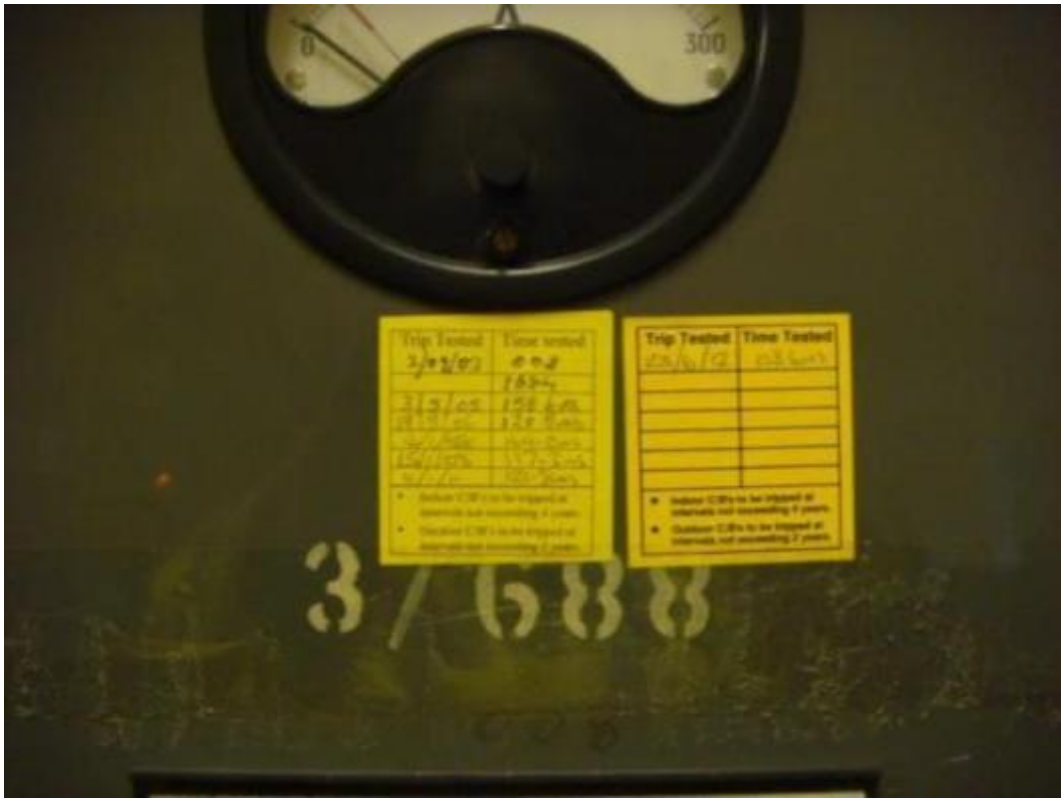
Despite regular preventative maintenance and proper lubrication, one of the problems which arises out of the infrequent opening and closing of a typical oil-filled

circuit-breaker is that the operating mechanism can become sluggish or stick. Consequently, when called upon to, say, clear a system fault, the circuit-breaker fails to operate with sufficient speed to clear the incident and so-called 'back-up protection' operates, resulting in the loss of supply to a greater number of customers.

In addition to its preventative maintenance programme; to help prevent 'sticking' circuit-breakers, SSEPD has a policy of regularly trip-testing to help ensure that, when called upon to do so, the circuit-breakers will operate correctly and thereby minimise the number of customers affected by a fault on SSEPD's HV distribution system.

Photograph 6, taken by energypeople on 29 January 2013 during the site visit to SSEPD's Lyndhurst primary substation, shows a typical example of the way in which SSEPD's trip-testing is drawn to the attention of any operator who is called upon to operate the circuit-breaker.

Photograph 6 – Example of trip-testing label at SSEPD's Lyndhurst primary substation

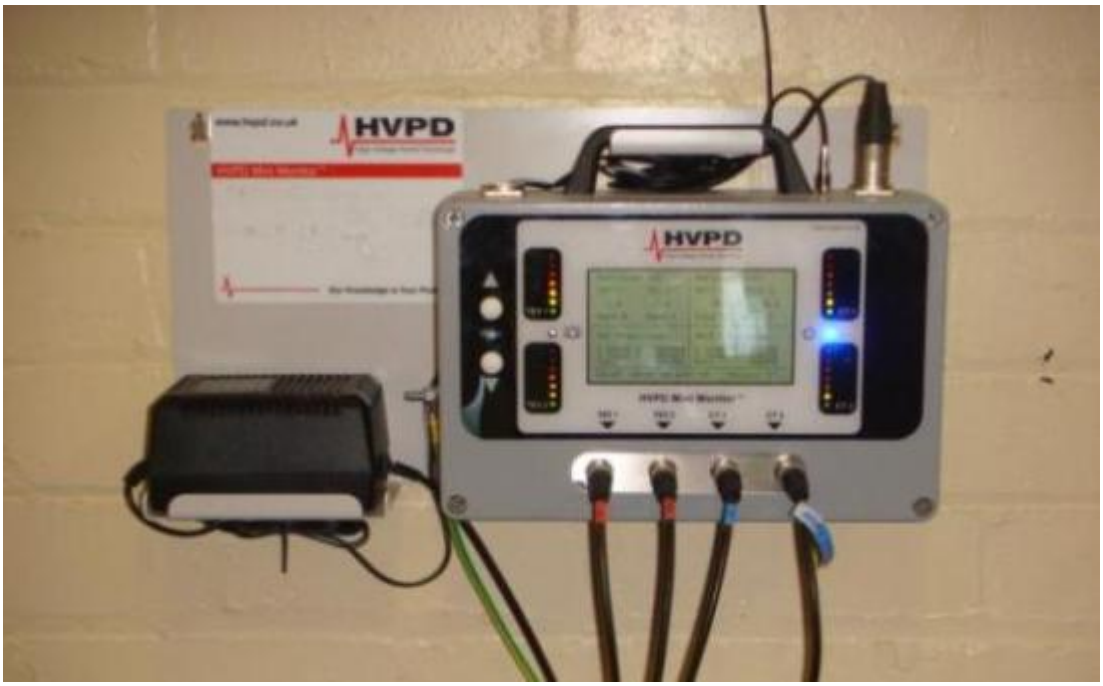


A further example of SSEPD's good stewardship associated with the application of its procedure (PR-PS-566) for Partial Discharge (PD) detection is shown in Photograph 7. Taken by energypeople at SSEPD's Broughty Ferry primary substation on 29 January 2013, it depicts a wall-mounted PD monitor. This is being used to monitor the internal health of the fixed portion of the 11kV switchboard with a view to detecting the degree of insulation degradation within the switchboard.

The 11kV switchboard in question was manufactured by "Johnson and Phillips" (J&P) in 1964 and is equipped with J&P's type PDB oil-filled circuit-breakers, of which SSEPD's SHEPD licenced area has one hundred and seventy units currently in service.

Thirty-five of these units are in the process of being replaced during DPCR5, the remainder being included for replacement in SSEPD's proposals for RIIO-ED1.

Photograph 7 – The PD monitor at SSEPD's Broughty Ferry primary substation



The modern approach to operating circuit-breakers is either via SCADA tele-control from a centralised control room or from a control panel in the control room at the particular substation. This ensures that an operator does not have to stand in front of a circuit breaker when it is being closed to, say, a possible fault and ensures the safety of operators in all cases.

Where these facilities do not exist, operators on site use a lanyard arrangement to close a circuit-breaker from a safe distance.

In the case of SHEPD's obsolete circuit-breakers, the equivalent of the lanyard is achieved by use of a long piece of rope which is fed through a series of wall-mounted ring-bolts and out of the 11kV switchroom. The switchroom end of the rope is fastened to the closing handle of the 11kV circuit-breaker and the operator closes the circuit-breaker by pulling on the other end of the rope.

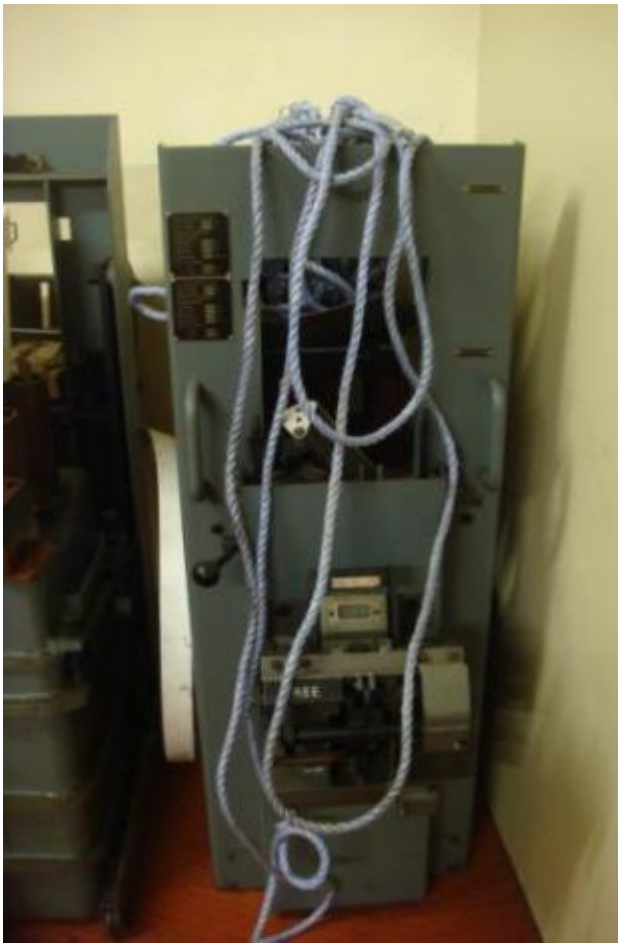
However, the characteristics of the operating mechanisms of some transformer and bus-section HV circuit-breakers is such that the tripping bar bounces in reaction to the power of the closing spring.

Overcoming this necessitates the removal of the mechanism cover and physically restraining the tripping bar to prevent the circuit-breaker going 'straight-through'. This clearly contradicts SSEPD's policy of providing safe, remote operation and is a

significant contributor to SSEPD's proposals to remove this obsolete switchgear from its distribution networks during RIIO-ED1.

By way of illustration, photograph 8, taken by energypeople at SSEPD's Overgate primary substation on 29 January 2013 shows the rope used to close the 11kV feeder circuit-breakers. The photograph also reveals the age and obsolescence of this type of circuit-breaker.

Photograph 8 – The rope used to close 11kV feeder circuit-breakers from outside the switchroom at SSEPD's Overgate primary substation



Photograph 9, also taken by energypeople at SSEPD's Overgate primary substation on 29 January 2013, shows the wall-mounted ring-bolts through which the rope is threaded to provide the lanyard technique of closing feeder circuit-breakers.

Similar methods are in use in other primary substations, such as at Rosebank Street which is currently equipped with the same type of 11kV switchboard.

As reported elsewhere, the same type of 11kV switchboard at Lyndhurst primary substation is being replaced with a switchboard equipped with vacuum-insulated circuit breakers which will have full SCADA operation and segregated alarms.

Photograph 9 – The wall-mounted ring-bolts at SSEPD's Overgate primary substation

The reliability of this type of obsolete high-voltage switchgear and the security of customers' supplies reliant upon it are of further concern when considering the lack of availability of spare parts.

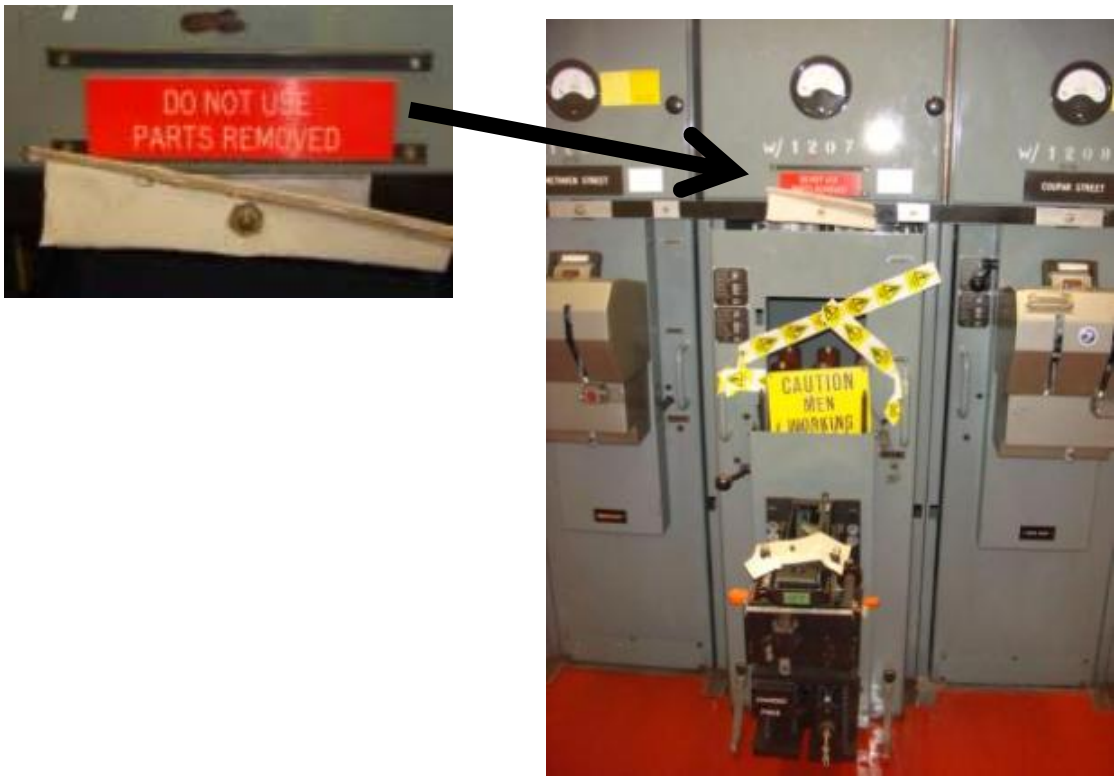
On several occasions during energypeople's site visits, instances were noted where an HV circuit-breaker had been 'cannibalised' to provide parts for another circuit-breaker.

Photograph 10, taken by energypeople at SSEPD's Lochee primary substation on 29 January 2013, shows a typical example of where parts have had to be removed from a 'spare' circuit circuit-breaker to effect repairs to one elsewhere.

Self-evidently, this situation cannot continue and, when completed, SSEPD's RIIO-ED1 proposals will remove this particular type of obsolete switchgear from its distribution system.

Whilst energypeople endorses SSEPD's historic use of recycled parts obtained from redundant items of equipment as a further example of SSEPD's determined drive to minimise costs, energypeople considers that SSEPD is fully justified in proposing to replace these long-obsolete assets during RIIO-ED1.

Photograph 10 – Example of parts having been removed from an obsolete 11kV circuit-breaker at SSEPD's Lochee primary substation



11.3 Additional considerations

As noted above, when the older parts of SSEPD's distribution infrastructure were installed some fifty years ago, the expectations of the industry's customers were vastly different to the present day; the industry was not subject to regulation and remote tele-control of distribution circuit breakers from a centralised control centre was virtually unheard of.

To further consider SSEPD's proposals for its RIIO-ED1 submissions, energypeople has used its detailed knowledge of electrical apparatus and its experience of undertaking Ofgem's Quality of Service audits to investigate SSEPD's distribution system to determine what facilities are currently available and what are considered necessary to provide the most modern, cost-effective service to SSEPD's customers.

In so doing, it is apparent that the older types of high-voltage circuit-breakers are not equipped with the facilities that are expected in today's world, where rapid supply restoration is an oft-quoted customer expectation.

This customer expectation is readily apparent in the feedback SSEPD has received from its own stakeholders[7].

[7] See paragraph 3 on page 17 of "Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13

A similar customer expectation resulted from Ofgem's 'stakeholder willingness to pay' research[8].

Also, some of SHEPD's primary substations are only equipped with a general alarm, often covering both 33kV and 11kV equipment, which means that SHEPD's control engineers have to wait for customers to telephone to advise the loss of supply before they can react to a circuit-breaker operation and consider an appropriate strategy for supply restoration.

Indeed, some of SHEPD's primary substations are not even equipped with their own SCADA facilities and the above common alarms are actually presented to the control centre via a 'parent' substation, the alarm condition having been relayed there via such means as pilot wire.

Furthermore, the lack of tele-control and system automation associated with the older 11kV circuit-breakers means that supply restoration cannot commence until operational staff are deployed.

Discussions with SHEPD's control team reveals noticeable differences in restoration times between a compact city such as Dundee, where operational staff live within its environs, and a larger city such as Aberdeen where operational staff tend to live outside the city.

It is conceivable that SSEPD's customers in the two cities will, at some stage, become aware of the above differences in restoration times and agitate for a more equitable treatment.

Whilst there are no primary substations without SCADA facilities in the SEPD licenced area, there are some obsolete HV circuit-breakers which, as is the case in the SHEPD licenced area, are not capable of tele-control.

Consequently therefore, energypeople's discussions with SSEPD's engineering teams have covered all aspects associated with upgrading SSEPD's obsolete HV switchgear, including the installation of 'Remote Terminal Units' (RTUs) where none currently exist so as to provide full SCADA facilities from the new switchboards.

SSEPD has confirmed that it is considering the situations where it does not have tele-control of HV circuit-breakers on its primary substation switchboards; including its sites that do not currently have any SCADA control; with a view to determining which of these will be incorporated into its proposals for obsolete HV switchgear replacement during RIIO-ED1.

Whilst the foregoing paragraphs have cited the Johnson and Phillips 11kV oil-filled circuit-breakers, similar considerations apply equally to other obsolete high-voltage oil-filled circuit-breakers of the 'hand-charged spring' type.

These include those manufactured by: Associated Electrical Industries (AEI) types BVP, JB and OW; British Thomson Houston (BTH) type JB: Brush type R41; English Electric types OL and OK: Ferguson and Palin (F&P) types BVRP and VDBP; General

[8] See paragraphs 4.7 and 4.70 of "Strategy consultation for the RIIO-ED1 electricity distribution price control – Reliability and Safety" – Ofgem – reference 122/2 – Sep '12; and

Paragraphs 4.43 and 4.68 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Reliability and Safety" – Ofgem – reference 26f/13 – Mar '13

Electric Company (GEC) type JB; Switchgear & Cowans (S&C) types A4 / A7; and South Wales Switchgear (SWS) type C4X.

One significant by-product attendant upon the change from oil-filled circuit-breakers to, say, vacuum-insulated types is the saving in on-going maintenance expenditure.

The routine maintenance of oil-filled circuit-breakers is more time-consuming than that required by a modern vacuum-insulated circuit-breaker. Furthermore, oil-filled circuit-breakers require additional maintenance after fault clearance, whereas vacuum-insulated types do not.

The consequential savings in expenditure are entirely in keeping with modern practice and align exactly with SSEPD's aim of 'lowest overall cost'.

11.4 energypeople's conclusions

energypeople considers that, in recognising the amount of work needed to upgrade its high-voltage circuit-breaker population and remove the obsolete, non-automated types, SSEPD has adopted a realistic approach to what is achievable during the eight year period of RIIO-ED1.

Consistent with its approach to minimising overall costs, SSEPD's proposals include the replacement of only the withdrawable portions of obsolete switchboards where this is technically feasible and the fixed portions are proved to be electrically and physically sound. Exemplified by SSEPD's proposals for South Wales Switchgear type C4X, energypeople fully endorses this approach as the most economical way of bringing SSEPD's associated assets to the beginning of a new life-cycle.

As previously discussed, energypeople considers that this approach is fully compliant with Ofgem's requirement that DNO's business plans must show that the DNO has …"demonstrated a consideration of alternative approaches to achieving value for money in the delivery of its outputs"[9].

Page 17 of SSEPD's 2nd consultation document states the company's aims of investing in system automation and the increased use of new technologies "to reduce the duration of unplanned interruptions" and to provide a "fast response to faults"[10].

Page 18 of SSEPD's 2nd consultation document states the company's aim of "improving communication with customers during unplanned interruptions", the ensuing paragraph adds that the company will be aiming at "providing specific information to customers within minutes of an unplanned interruption occurring"[11].

[9] See paragraph 3.9 and Table 3.1 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Business plans and proportionate treatment" – Ofgem – reference 26b/13 – Mar '13

[10] See paragraphs 5 and 6 on page 17 of "Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13

[11] See the first paragraph on page 18 of "Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13

SSEPD's planning engineers and network control centre personnel recognise that none of these aims will be possible without carrying-out the work proposed in SSEPD's RIIO-ED1 non-load related submission, a fact with which energypeople fully agrees.

In summary, energypeople confirms its support for SSEPD's RIIO-ED1 proposals for HV circuit-breaker interventions, including SSEPD's aim of keeping an even level of asset risk, the validity of which energypeople is pleased to confirm.

12. SSEPD's stakeholder engagement

12.1 SSEPD's historic approach to stakeholder engagement and feedback

SSEPD has long experience of obtaining the views of its customers and other stakeholders, and considering them in its project proposals.

This is amply evidenced by the several references within SSEPD's investment management process '*PR-PS-052* "DMPG investment management process", an overview of which is given in section 7 of this report. For example, paragraph 2.2.1 of PR-PS-052 requires SSEPD's responsible manager to .... "arrange and chair a stakeholder meeting" ... which .... "may include other interested parties.

Discussions with SSEPD's personnel reveal that this latter reference can be people both within and outside SSEPD so as to gain as wide a body of opinion and spread of views as possible.

This is further reinforced by the reference in paragraph 2.2.2 of SSEPD's investment management process, PR-PS-052, which requires SSEPD's responsible manager to ..."obtain feedback from stakeholders about factors which may affect the outcome of the project".

This feedback is subsequently referenced in section 3.1 of PR-PS-052 where, amongst other factors, SSEPD's design project manager is required to ... "determine input from stakeholders".

12.2 SSEPD's wider approach to stakeholder engagement and feedback

More recently, as part of its preparations for its RIIO-ED1 submissions, SSEPD has canvassed its stakeholders in a series of public consultations under the title of "*Have your say*", key elements of which are public meetings and SSEPD's "*Innovating for a greener, more efficient future"* publications.

Whilst previous sections of this report contain several footnote references to this initiative, energypeople considers SSEPD's approach to warrant further consideration here.

Published in November 2012, SSEPD's first consultation on the future of SSEPD's distribution networks contained a welcome message from Stuart Hogarth, SSEPD's Director of Distribution. In his welcome, Mr Hogarth indicates that SSEPD has ... "listened to the views of over one thousand customers during the past few months to determine the issues that matter most". He continues ... "the content of this consultation reflects those discussions".

In addition to posting the feedback from its first consultation on the company's web-site, SSEPD has responded to it in the second of its public consultations which was published in February 2013.

SSEPD's web-site includes a request from Stuart Hogarth urging stakeholders to get involved as "the feedback our stakeholders give us is invaluable in helping us understand their priorities and what they think ours should be in the future".

To canvas as wide an audience as possible, SSEPD has also used the social media to communicate with its stakeholders.

SSEPD has concluded its current round of public consultations with day-long workshops, one in each of its two licenced areas. The workshops enabled instant feedback through the use of electronic voting on key issues.

By using a common agenda, SSEPD is able to determine if any regional differences exist on what its stakeholders consider to be important. The agenda for the workshops included the following:

- An overview of SSEPD's business plan approach;
- A discussion on SSEPD's proposals for improving customer service at no extra cost;
- A presentation on SSEPD's proposals for supporting the company's most vulnerable customers;
- A talk on SSEPD's plans for enabling the connection of small-scale generation and other low carbon technologies to its electricity networks;
- A presentation on network reliability; and
- A session on environmental issues, inviting feedback on such things as undergrounding overhead lines in designated areas.

The afternoon programme finished with a question and answer session followed by a feedback session at which SSEPD asked the members of the audience for their views on the event so that SSEPD … "can improve events like this in the future".

It is therefore clear that SSEPD is considering the views of its customers and other stakeholders in its forward proposals and seeking as broad a spectrum of opinion as possible in its consultation initiative.

12.3 Energypeople's views of SSEPD's approach to consultation

energypeople has reviewed SSEPD's second consultation with particular reference to the feedback SSEPD received from its first consultation and is pleased to confirm that SSEPD has been pro-active in consulting with representatives from all categories of its stakeholders.

energypeople is also pleased to confirm that SSEPD has taken the views of its stakeholders into account in the structure and content of its second public consultation.

energypeople considers that SSEPD's consultation documents are user-friendly and use plain English to convey clear meanings where the industry's technical terms could otherwise hinder understanding for the lay reader.

energypeople is pleased to report that SSEPD's approach towards stakeholder engagement complies with energypeople's understanding of the associated objectives outlined in Ofgem's RIIO-ED1 documentation[12].

[12] See paragraph 2.7 and Section 3 of "Handbook for implementing the RIIO model" – Ofgem – Oct '10; and

paragraph 2.20 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Business plans and proportionate treatment" – Ofgem – reference 26b/13 – Mar '13

Crucially in this regard, Ofgem's criteria for assessing each DNO's business plans to be submitted under RIIO-ED1 includes an evaluation of how well the DNO has ..."engaged with its stakeholders and explained how this has influenced its business plans"[13], and energypeople considers that SSEPD's approach will enable it to readily conform to this requirement.

In conclusion, energypeople considers that SSEPD's on-going approach to stakeholder consultation is most commendable and that it reflects best practice in an industry that has previously been adversely criticised for failing to communicate with its stakeholders.

[13] See paragraph 3.9 and Table 3.1 of "Strategy decision for the RIIO-ED1 electricity distribution price control – Business plans and proportionate treatment" – Ofgem – reference 26b/13 – Mar '13

13. RIIO-ED1 submission reports

13.1 Report template

In order to standardise the presentation of individual intervention reports and provide the information in a consistent way, energypeople drafted a reporting template which was enhanced by SSEPD to include customer numbers and the electrical demand data for 2012.

The document, which has been used for the prepared reports, contains an outline of the proposal, a summary of the condition assessment, an evaluation of the Health Index, an estimated cost of the proposed intervention, the number of customers and the demand data for 2012. Where available; photographic evidence of the asset condition should be included to better inform the lay reader and her/his understanding of the situation on site.

13.2 RIIO-ED1 submission reports

The approach taken for SSEPD's RIIO-ED1 intervention reports for the primary substation switchboards comprising HV circuit-breakers introduces a further measure of standardisation.

For each type of circuit-breaker, standard paragraphs were developed for each of the six manufacturers based on available condition assessment information and personal knowledge. These have been used in the relevant RIIO-ED1 reports.

Similarly, standard paragraphs have been devised for other asset categories such as 33kV circuit-breakers.

An example of an RIIO-ED1submission report is shown at Appendix B to this report. It refers to the 33kV oil-filled circuit-breakers at SSEPD's Havant 132/33kV grid substation.

14. Summary and energypeople's overall conclusions

14.1 SSEPD's approach

As reported above, energypeople considers that SSEPD practises good stewardship of its assets, many of which would otherwise have failed in service and / or would have been replaced in an organisation with a less cost-conscious approach.

Unfortunately, a direct result of SSEPD's good stewardship is that its distribution infrastructure has many items of apparatus that are considered to be long obsolete, beyond further economic upkeep, and cannot be upgraded to modern standards which include remote tele-control and system automation schemes.

In short, SSEPD's approach considers the on-going reliability of these obsolete assets and their ability to provide a safe, cost-effective and modern quality of supply to the company's customers.

In considering the remaining life expectancy of its 132kV and EHV primary transformers, SSEPD recognises that items such as high-speed on-load tap-changers are capable of being cost-effectively refurbished, whereas the older slow-speed types are not. SSEPD's approach therefore acknowledges this fundament difference in approach necessitated by these distinct differences in asset type.

Consistent with its own long-publicised aims, SSEPD's approach includes minimising costs over the long-term view, entirely in keeping with the requirements of RIIO-ED1. Hence its approach in only replacing withdrawable portions of HV switchboards wherever possible is consistent with bringing its assets to the beginning of a new life-cycle in the most economical way.

SSEPD's approach also considers how best it can realistically tackle the sheer number of obsolete oil-filled circuit-breakers currently in service on its distribution networks by adopting an order of priority for their replacement.

In discussions with SSEPD's engineering teams it is apparent that they are looking well beyond the end of the RIIO-ED1 period in their approach to the on-going stewardship of the company's distribution assets and are designing their approach and their proposals around this long-term view.

In conclusion, energypeople considers that SSEPD's approach is fully in keeping with the precepts of value-for-money associated with long-term asset life-cycles contained in Ofgem's RIIO-ED1 documentation[14].

Furthermore, these precepts are clearly espoused in SSEPD's own aims, published in the company's public consultation documents, and supported by the feedback it has received from those consultations, which include as wide a cross-section of stakeholders as possible.

[14] See bullet-points 4 and 5 of Section 1.10 of "Handbook for implementing the RIIO model" – Ofgem – Oct '10

A further element of SSEPD's approach concerns the management of risk. In this regard, energypeople is pleased to note that SSEPD's approach is consistent with its policies and procedures, the validity and robustness of which energypeople has commended as reported above.

energypeople considers that SSEPD's proposals are entirely consistent with the company's aim of maintaining an even level of risk.

Accordingly, energypeople has no hesitation in supporting SSEPD's approach towards its long-term non-load related RIIO-ED1 submission.

14.2 SSEPD's proposals

In recognising all the above matters in its approach, SSEPD has adopted a realistic stance in its proposals, whereby it accepts that it will not be able to tackle all it would ideally like to do in the eight-year period of RIIO-ED1.

SSEPD's proposals therefore include challenging yet sensible and realistic annualised programmes to even-out the considerable workload and to minimise the impact upon the security of supply afforded to the company's customers.

Recognising that many of its obsolete distribution assets are not capable of being upgraded or refurbished to modern standards, SSEPD's proposals provide for their economic replacement when viewed in the long-term life-cycle expectancy for the new assets.

That said; conscious of its affirmation for providing reliable and safe supplies to its customers on a cost-effective, 'least overall cost' long-term basis, SSEPD proposes to continue with its trialling / evaluation of replacing obsolete oil-filled HV circuit-breaker trucks with modern versions, such as vacuum insulated types. If this alternative approach proves to be technically sound and of long-term cost-benefit, SSEPD proposes to adopt this approach wherever practicable.

energypeople considers the above combination of partial discharge testing and replacement of only the withdrawable portions to be an excellent example of cost-effective innovation and, again, fully in line with SSEPD's published aims of exploring alternatives wherever technically acceptable.

energypeople also considers that, as with its approach, SSEPD's proposals are consistent with SSEPD's aim of maintaining an even level of network asset risk.

SSEPD has been pro-active in engaging its stakeholders, including seeking views on its proposals, in a comprehensive consultation process. In discussions with SSEPD's personnel, energypeople is pleased to note that SSEPD is taking the feedback from these consultations into account when reviewing the various elements of its proposals.

An example of this is where customer feedback on the reliability of SSEPD's distribution system has been considered in relation to SSEPD's proposals for RIIO-ED1, particularly in regard to the eleven schemes for system reinforcement shown in SSEPD's second consultation document[15].

[15] See stakeholder response to question 5 in "Stakeholder feedback: Our First Consultant – November 2012" – SSEPD - Feb '13; and

In considering SSEPD's proposals for the volumes of work in its submissions under RIIO-ED1, energypeople has reviewed SSEPD's processes and procedures and found them to be fit for purpose and as streamlined as any seen elsewhere.

Conscious of what can be practically achieved during the period of RIIO-ED1, energypeople considers that SSEPD's proposals for both work volumes and associated costs are entirely justified. Consequently, energypeople is pleased to fully support them.

Taken as a whole, energypeople considers that SSEPD's RIIO-ED1 proposals are designed to deliver real, long-term value for money to the company's customers.

In conclusion, energypeople considers that SSEPD's RIIO-ED1 proposals for non-load related asset intervention are credible, realistic and well thought-through.

Consequently, energypeople is pleased to whole-heartedly support SSEPD's non-load related proposals for asset intervention contained in its RIIO-ED1 submission.

Figure 9 on page 21 of "Innovating for a greener, more efficient future" – SSEPD's 2nd public consultation document – Feb '13

Appendix A – SSEPD's document PR-PS-052 – "DMPG investment management process"

NB:

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Applies to: Power Systems	**DMPG INVESTMENT MANAGEMENT PROCESS**	**PR-PS-052**
Prepared by: David Ivory	Uncontrolled if printed	Rev: 4.03

Approved by: Paul Barnes	Issue Date: May 2011	Review Date: June 2013

1.0 Introduction

1.1 This document outlines the process to be followed by Distribution Major Project's staff when undertaking projects. Its purpose is to ensure that good project management practice is adhered to, provide a clear audit trail for internal and external auditors and to ensure completion to cost and timescale.

1.2 The project process is to be carried out using 'Commitment Based Management'. Customers and performers are to be identified for each part of the process, and interaction will be by means of making offers, requests and promises.

1.3 Each project / investment will have a nominated 'Investment Manager', this will normally be the 'System Planning Engineer' associated with the project.

1.4 Regular briefing and on-going reviews form an integral part of good project and investment management. Distribution Major Projects Managers and Investment Managers are to review project managers and projects to meet the demands of the current OFGEM Transmission & Distribution Price Control Review.

1.5 Financial control is to be carried out in accordance with current financial Policies, Procedures and Work Instructions and in conjunction with the Power Systems Finance team. However, managers may implement local financial management tools in addition to these formal controls, to manage costs associated with their projects.

1.6 For projects in excess of £10M the "Large Capital Project Governance Framework Manual MA-COR-LCP-001" is to be considered, and the project aligned with it so far as practical. This will include establishing a Project Owner and Project Review Board.

1.7 The project management approach will be one of:

- Design Office, design & managed for large complex projects
- Design Office design, with Field Unit managed delivery
- Field Unit Project for clearly defined smaller projects
- Faults using the £1 EAF procedure
- Tranche Works

2.0 Need Case & Scope of Works

2.1 Project Request Inputs

Input Type	Received From	Project Type
Technical Report	System Planning	Design Office, Field Unit
Rechargeable works	Various, Technical Report	Design Office
Fault repairs & tranche works	Major Project Field Units, Depots & Programme Groups	Faults

2.2 Technical Report

The Technical Report issued by System Planning will contain some or all of the following dependent on the Project requirements

- Initial analysis
- Feasibility study
- Assessment of options based on:
  - Ability to meet requirements
  - Investment/Strategic Consideration
  - Outage Risk Assessment

2.2.1 Following the issue of the technical report, the System Planning Investment Manager will arrange and chair a stakeholder meeting. This meeting will include the DMPG designer chosen by the Design Mobilisation Manager / Senior Design Engineer, and may include other interested parties e.g. Field Unit and Operations Depot where work is being carried out, Programmes / OPG, System Control, Civil Engineer, Protection Engineer, Wayleave Officer, CAD Engineer, policy / specialist engineers, and the Customer for rechargeable projects.

2.2.2 The Investment Manager will seek to:

- Obtain feedback from stakeholders about factors which may affect the outcome of the Project.
- Evaluate scope options
- Evaluate targets & time scales

2.2.3 Following the meeting the Investment Manager will:

- Prepare a Scope of Works
- Prepare and issue a Design Brief, including:
  - Investment Appraisal
  - Initial Design Risk Assessment
  - Time Scales
  - Initial cost estimate
  - Annual load graphs for sub-station/circuit.

2.3 The Major Projects Group may also be involved prior to the receipt of a Design Brief in this process by way of:

- Informal request for information
- Providing advice or budget costs.
- Providing a Quotation as per WI-PS-166 & WI-PS-583

2.4 Rechargeable & Apportioned CAPEX Works

Rechargeable projects with or without cost apportionment relate to works requested and funded by a third party, and a Technical Report or Design Brief will also normally have been issued. A Construction Brief will also be issued prior to the construction phase.

These projects will follow the same process and requirements as the Design Office Project following payment by the third party and or the production of a design EAF.

The current OFGEM timescales for 'New Connections – Guaranteed Standards' for providing customer quotations, and The Electricity (Connections Standards of Performance) Regulations 2010 are to be adhered to at all times.

2.5 Fault Repairs

2.5.1 Fault related Projects relate to major works, minor works & fault repairs where the request for a project has not been initiated from the Design Office Project route; hence a Technical Report or Design Brief will not normally have been issued. Fault related projects only require the appropriate design office managed activities applicable to the project. These activities will be defined by the DMPG Delivery manager and the Investment Manager, prior to beginning each phase of the project.

2.5.2 These projects are to be carried out using the £1 EAF procedure. When this procedure is implemented the £1 EAF must be authorised to its final value within 90 days.

3.0 Detailed Design

3.1 Design Office Projects

For Design Office projects the Design Mobilisation Manager / Senior Design Engineer will receive the Technical Report and allocate to a Design Engineer. Where appropriate, a Project Team will be formed comprising some or all of the following: Delivery Project Manager, Field Unit Engineer, specialist engineers, Procurement, CAD operators, Wayleave Officer and Planning Consultants. At this time a project team organogram and directory will be produced and issued.

The Design Project Manager will where appropriate determine:

- Budget and risks are realistic
- Time scales are realistic
- Project deliverables & whether they are realistic
- Design & development stages of the project
- Input from the other Stakeholders
- Design risk assessment findings

In the event that any of the budget, timescale or deliverables are not realistic, then the Investment Manager should be advised.

3.2 Project Reviews

As mentioned in 1.4, regular project Investment Review meetings will take place from the commencement of the detailed design phase until the end of the construction phase.

These reviews will take place between the Investment Manager and Design Engineer or Delivery Project Manager.

The Investment Manager will chair and arrange the meeting at no more than monthly intervals. During both the detailed design and construction phases of the projects the Investment Manager will use these meetings and the Project Manager's monthly report to determine the status / health of the project, then prioritise and arrange the meetings accordingly.

The Investment Review meeting will review financial, programme and risk & opportunities.

A senior manager's team as noted under "The Senior Team" will be set up to review those projects that fit the label "failure to deliver". In addition this team will also review routinely and regularly the status of other named and high profile (high cost, important customer related, PR sensitive), as well as the overall spend / forecast of the complete portfolio of projects.

3.3 The Senior Team

The Senior team as mentioned above will comprise the following members:

System Planning Manager and Investment Manager

Head of Major Projects

Distribution Major Projects Manager (North / South)

Procurement

Programme Management Office (PMO) Representative.

These Senior Team Review meetings are to be scheduled and held once a month, however if the need arises more regular meetings can be called at more frequent intervals.

The senior team will resolve any project issues, provide direction for the project team and escalate to the Risks & Opportunity meeting (ROM) if required.

At these review meetings the Investment Manager will be the customer and will be the owner of taking the minutes and actions / promises, which will be provided to the PMO.

3.4 Field Unit Projects without Design

3.4.1 These projects are deemed to not require a design, and therefore a design office input. Following the issue of the Technical Report and Design / Construction Brief, the project will be issued to the relevant Field Unit Manager to raise a construction EAF and deliver.

3.4.2 If the field unit require specialist advice from the Design Office they are to contact the Design Mobilisation Manager who will allocate the appropriate resources.

3.5 Project Detailed Design

3.5.1 Following the issue of the Design Brief the Design Engineer will arrange and chair a Design Start Up meeting on site with the whole design team. Following this meeting the Design Engineer will establish the project promises,

and prepare and circulate a Design Intent Document (DID) in the standard format in line with the meeting.

3.5.2 The Design Project Manager will then ensure the following activities relevant to the Project are prepared and undertaken:

- Establish a procurement strategy & complete tendering
- Conduct site visits / site surveys with other relevant persons
- Continually review and update the design stage risk assessment
- Establish a project filing system
- Establish a project drawing register as detailed in PR-PS-331 / PR-PS-326.
- Produce CDM pre-construction information
- Produce and update a Project Plan, which is to be in the form of a Gantt Chart showing key dates & responsibilities
- Discuss, agree and document outage requirements with Network Management Centre
- Arrange for NRSWA (TMA) notices to be raised, and establish the project with the relevant HAUC committee, if applicable.
- Establish the project with the Programme management office.
- Hold formal monthly design progress meetings with the project team, including any contractors and consultants, to a set agenda, prepare and circulate minutes.
- Complete and circulate a monthly project report
- Review and update the 'learning points' database

3.5.3 Following the Design Start Up meeting the Design Engineer will if required, raise a design EAF or use the customer contribution to cover design costs only, and commence work to finalise the detailed design.

3.5.4 Where contracts are required the project manager will follow section 3.7 (Procurement).

3.5.5 For overhead line works proposed to be carried out by the Programmes Group (North only) the project manager will follow WI-PS-419 - Management of Major Projects Undertaken by Programmes Group (North)

3.5.6 The Design Engineer will determine the requirements for and keep records relevant to the Project on the following as appropriate

- Finance
- Safety & Environmental concerns / expectations e.g. for CDM requirements follow PR-PS-053
- Other essential design & development requirements e.g. temporary works & contingency planning

3.6 Programme Management Office (PMO)

Following the issue of a Technical Report & Design Brief the project is to be set up with the PMO. The PMO hold no responsibility for the project, but

collate, hold, manage and display the projects financial and programme / progress status.

The PMO will review project status and create exception reports for the management and senior management team.

The PMO will also collate financial information and the status of the overall project portfolio for the senior management team.

3.7 Procurement

3.7.1 Procurement Strategy

Where Procurement are to be involved, the Design Engineer must as soon as possible after receiving the Design Brief, discuss the requirements with Procurement and agree a procurement strategy based on the following:

3.7.2 Call off Contract / Framework Agreement

If a Call off Contract or Framework Agreement exists, then orders may be placed without the need to tender by agreement with the relevant procurement officer, refer to PR-PS-001 Requisitioning and Ordering & WI-PRS-011 Ordering & Receiving Using BOSS.

Installation contracts for small low value projects will be awarded to a framework contractor at the discretion of the DMP Delivery Manager. Medium sized projects will be subject to a mini-tender between the framework contractors, and large high value projects will not use the framework contracts and will be tendered.

3.7.3 Invitation to tender (if required)

The Design Engineer will submit tender documentation to Procurement. This documentation must include a technical specification approved by the author & their line manager, and information relating to quality, safety and environmental requirements.

Other information provided will include:

- Time scales for tender issue, return and, preferred contract issue date via BOSS and a CPSF.
- Timescales for construction, preferably in the form of a Gantt chart.
- Preferred contractors
- Whether a site meeting is required
- Any special requirements
- Contact names(s)
- CDM pre-construction information
- Existing site surveys

3.7.4 Procurement will advise the name of the designated buyer.

3.7.5 The Design Engineer will (as appropriate):

- Hold pre – tender meetings / site visits with tendering contractors
- Seek opportunities and innovation from the Tenderers
- Respond to technical queries via Procurement
- Undertake technical evaluation of tender responses, and assess the risks

identified

- If a tender submission suggests alternative methods or equipment, the Project Manager will assess the tender and if required carry out a full engineering assessment of the offer. This may be returned to Procurement for further negotiations.

Procurement will:

- Undertake commercial evaluation of tender responses, and assess the risks identified.
- Negotiate prices
- Recommend vendor and agree with Design Project Manager
- Return relevant documentation to the Project Manager

3.8 Cost Calculations

During the detailed design process it is important that two costs are established

- Base Cost to deliver the project:

  This cost is the known cost and includes framework based estimates, tender prices (where appropriate), quoted prices, estimated costs of those elements of works which have a high confidence level.
- Risk Schedule based cost:

For both capital and rechargeable projects during, and at the end of the detailed design process the Design Project Manager and Investment Manager must develop a risk register covering item such as Contractual risks, Customer risks, safety/environmental risks, third party damage risk, other utilities plant risk, traffic management risk, Investment risk and an element of unknown risk. A mitigation cost and probability of risk arising must be assigned to each risk element. This diversified total risk schedule cost is termed as Risk Register based Cost.

The base cost plus risk schedule cost will be the project budget cost.

3.9 Completion of Detailed Design

Following completion of the detailed design the Design Engineer will either revise the Design Intent Document (DID), or create a new document in line with the 'as designed' status, and name it the Construction Intent Document (CID), in the standard format.

This will incorporate the following information:

- An overview of the scope of works
- A detailed description of each element of the project
- Timescales
- Material schedule/s
- Site surveys, asbestos, earthing etc
- Contingency & ERT's plans
- Calculated base cost to deliver project

- Risk register based cost & schedule
- Procurement strategy & PEP (FO-FIN-006, PR-FIN-001)
- Project organogram & directory
- Complete set of construction drawings
- Wayleave / landowner schedule and consents if applicable
- Relevant plant & installation specifications
- Procurement tender recommendations
- CDM pre-construction information
- CDM design risk assessments
- CDM F10 form

3.10 Project Acceptance & Authorisation

3.10.1 Upon receipt of the Construction Intent Document the Investment Manager will prepare a Construction Brief and Project Acceptance Document. The Project Acceptance Document is to be signed by the System Planning Manager, DMPG Delivery Manager, and the Delivery Project Manager. This confirms that the said parties are in agreement with the technical, timescale and commercial elements of the Detailed Design Report package.

3.10.2 The Investment Manager will then issue a Construction Brief which will state the following:

- Reference to the detailed design report
- Calculated base cost to deliver project
- Risk register based cost of the project
- Project timescales and spend / invoice profile

3.10.3 The Delivery Project Manager will:

- Prepare, sign as responsible officer and submit the EAF form and supporting information for authorisation as per PR-PS-021. This will be for the base cost of the project excluding the risk register cost.
- Ensure project set up on FINESSE for base cost only.
- Request Procurement to place orders
- Update the Project Plan and financial control data
- Send any necessary documentation to contractors
- Arrange on site start up meetings
- If applicable, ensure the project is established in accordance with CDM as per PR-PS-053.
- If the project is valued in excess of £10M, and lessons learned meeting and report is to be completed. This is in accordance with the LCP process.

4.0 Construction

4.1 Works Start up Meeting/s

4.1.1 The Delivery Project Manager will provide both the SSE and contractors Site Manager (the persons who will manage the works, e.g. Field Unit Engineer/Technician, Principal Contractor, Operations Supervisor) a construction pack including the relevant items from the following:

- Construction Brief (SSE Staff Only)
- Detailed design report (SSE Staff Only)
- Project Plan
- Project organogram & directory
- Responsibility Schedule & Matrix (SSE Staff Only)
- Work Programmes
- Contract Progress Meeting Schedule
- Policies
- Site surveys
- Material schedules
- Invoice & variation (CSI) procedure
- Outage programmes
- Contract enquiry documents, drawings, specifications & document transmittal notes
- Scope of works and agreed variations
- Safety & Environmental information e.g. F10, CDM pre-construction information
- Design Risk Assessments, Risk assessments & method statements (RAMS)
- Contingency plans
- Wayleave details, e.g. land owners & neighbours affected by the works
- Site specific issues, e.g. Investment restrictions, SSSI, AONB, local issues etc

4.2 Construction / Installation & Commissioning

4.2.1 During the works, the Project Manager will ensure (as appropriate):

- All phases are monitored for compliance with the Risk schedule and Project Plan
- Continually ensure timescales and deliverables are still applicable
- Pro-actively manage risks and opportunities to achieve cost savings on the project.
- If the Project deliverables have changed, re-calculate costs & if applicable seek Supplementary EAF authorisation (refer to PR-PS-021) in conjunction with the System Planning Investment Manager.
- Ensure the Project Plan is up to date
- All activities are carried out in accordance with the approved Project Plan and CDM regulations as appropriate
- Contingency plans are developed to ensure network security
- Payments are made to suppliers as per the relevant contract and payment schedules , including completion of Payment Certificates if appropriate
- Changes to contract values are agreed with Procurement and Variation Certificates are issued to the Contractor when required
- Inspections and tests have been completed and comply with technical specifications

- If appropriate, factory acceptance testing is carried out in accordance with the Project Plan
- Commissioning test results are approved to validate installation works. Records must be held in the Project File
- Ensure the requirements of the Traffic Management Act (TMA) are met
- Financial controls are maintained with details of the project expenditure using the Expend spreadsheet
- Complaints received from client, customer, external parties, etc. are immediately brought to the attention of the Delivery Manager.
- Appropriate handover documentation is compiled to meet customer and/or SSE needs
- Changes to project specification are documented and approved
- Formal project contract progress meetings are held monthly to a set agenda (minutes and/or action logs are to be circulated to relevant parties and a copy held in the Project File). Records of issues and observations must be kept as they may provide useful information for the Post Project Review.
- Safety / site audits are carried out in line with the requirements of the Distribution Major Projects annual Safety, Health & Environment Improvement Plan. Site audit details are to be recorded on Distribution Major Projects Audit of Site Activities pads (FO-PS-192).
- Monthly progress reports and Quad reports for projects in excess of £10M are submitted to the programme management office (PMO) in the standard format
- Update record systems such as PLACAR, GIS, ENMAC, etc through-out the project.

4.3 Completion

The Delivery Project Manager will ensure:

- The requirements of the Project and Safety Plans have been completed
- A snagging list has been compiled and agreed with the Customer (where appropriate)
- Outstanding issues are documented along with a resolution plan
- Appropriate handover documentation is completed and checked including the Health and Safety File if required
- Contractors have signed and returned a 'full and final' agreed settlement letter.
- The appropriate records are updated e.g. GIS, ENMAC, PLACAR etc
- Power Systems Finance are requested to set the project closure marker to "1".

5.0 Project Review & Closure

5.1 Within two months of completion of works, all projects are to be reviewed by the Delivery Project Manager and the project team. The minutes of this review meeting are to be approved by the DMP Delivery Manager, who is to

ensure any learning points are entered on the 'learning points' database, and brought to the attention of those concerned.

5.2 Field Unit projects which do not qualify for a full post project review are to have an end project report completed by the Delivery Project Manager. This report is to be copied to the DMP Delivery Manager, who is to ensure any learning points are brought to the attention of those concerned.

The review should include where appropriate:

- An assessment of the overall success of the Project
- review of the final costs and timescales compared to budget and expectations
- A review of Contractors and Project Team performance
- Confirmation that the Project deliverable have been achieved
- Learning points for future projects
- Implementing improvements e.g. to process documents

5.3 For projects in excess of £10M, Power Systems Finance are to be invited to hold a "Post Investment Appraisal", in line with the LCP process.

5.4, At the time of the closure review meeting the following items are to be confirmed as complete:

- Completion certificates exchanged
- Placar database has been updated
- Cost transfers to 'late cost' provision completed where applicable
- Transformer data & test certificates issued to System Planning
- HV cable data (ratings, zero sequence etc) issued to System Planning
- PSSE updated
- JOA/SRS updated
- Contingency analysis file updated

5.5 Project End

The Delivery Project Manager will ensure:

- System Planning Investment Manager declares satisfaction with the investment.
- All relevant documents are archived
- All non-essential documents are destroyed
- Power Systems Finance are requested to set the project closure marker to "2".

6.0 Appendices

6.1, Table 1.0: Standard Document List

Document	Document Owner	Design Office Project	Field Project
Technical Report	System Planning	✓	✓
Scope of Works	System Planning	✓	✓
Design Brief	System Planning	✓	✓
Design EAF	Major Projects	✓	
Design Progress Meeting	Major Projects	✓	
DE/PM Monthly Report	Major Projects	✓	
IM / PM Project Review Meeting Agenda	System Planning	✓	✓
Design/Construction Intent Document	Major Projects	✓	
Estimate Schedule	Major Projects	✓	✓
Risk Schedule	Major Projects	✓	✓
Project Acceptance Document	System Planning	✓	✓
Construction Brief	System Planning	✓	✓
Construction EAF	Major Projects	✓	✓
Contract Start Up Meeting & Agenda	Major Projects	✓	
Contract Progress Meeting & Agenda	Major Projects	✓	
Supplementary EAF	Major Projects	✓	✓
Closure Review Meeting & Agenda	Major Projects	✓	

Appendix B – An example of a completed RIIO-ED1 submission report

Development Plan for Havant 33kV switchgear intervention

1. Investment appraisal

Budget Year	Site	N° of Customers	2012 Demand (MVA)
2018/2019	Frome	54,714	92.9

2. Site Summary

Havant 132/33kV grid substation is located in an urban area. The site layout includes a large 33kV compound with outdoor 132/33kV transformers, 33kV busbars and 33kV switchgear.

3. Project Summary

This report proposes the replacement of sixteen 33kV oil-filled circuit-breakers installed outdoors at Havant 132/33 kV grid substation as identified in SSEPD's RIIO-ED1 submission.

These sixteen 33kV circuit-breakers, Type OKM4, were manufactured by English Electric in 1967 and have been in operational use at this substation since commissioning. These oil-filled circuit-breakers have developed problems with the operating mechanism and, following routine maintenance, a complete condition assessment is now scheduled.

Similar problems on this type and age of English Electric circuit-breakers have been recorded at other primary substation sites within SSEPD's geographical areas resulting in circuit-breaker replacement. The decision has therefore been taken to follow the actions taken previously with respect to these circuit-breakers; namely replacement. SSEPD has therefore decided to schedule replacement in 2018/2019.

Note: energypeople inspected this grid substation as part of the random survey of operational sites. Visual inspection revealed external signs of deterioration. The regular findings identified during normal routine maintenance of these assets are entered by SSEPD's Operations and Production Groups (OPGs) into PLACAR. This is SSEPD's database currently used by SSEPD to record and monitor asset condition. Photographs of the existing 33 kV circuit-breakers are included in this report.

The recommended intervention is the replacement of the sixteen 33kV oil-filled circuit-breakers with vacuum-insulated circuit-breakers in 2018/2019, which should produce overall economic benefits as the in-service maintenance requirements for the new switchgear is minimal.

4. Limitations

The SSEPD methodology for selecting assets for non-load related intervention is based on six main business drivers ranked in order of relative importance

that are used to assign an intervention priority score. In addition, each asset is assigned a Health Index (HI) based on the same drivers using a different weighting. The HI indices are ranked from HI 1 to HI 5, HI 1 being a new or as new asset and HI 5 being assets at the end of their serviceable life.

5. Health Index (HI)

SSEPD's Health Index for the existing 33kV circuit-breakers at Havant 132/33kV grid substation indicates that intervention is required.

Health Index Reference Date	HI
February 2013	HI 5
End of RIIO-ED1 Score – without intervention	HI 5
End of RIIO-ED1 Score – with intervention	HI 1

Definitions

Health Index (HI)	Assessment of plant condition
HI 1	New or as new
HI 2	Good or serviceable condition
HI 3	Deterioration requires assessment and monitoring
HI 4	Material deterioration, Intervention requires consideration
HI 5	End of serviceable life, intervention required

The Health Index for the asset intervention proposed in the form of the Scoring Template is shown in Appendix 1. (See attached)

6. Benefits

Without Intervention

With no intervention it is reasonable to expect that the condition of these outdoor 33kV circuit-breakers will continue to degrade and the HI at the end of the RIIO-ED1 period (April 2023) would increase to HI 5.

With intervention

Refurbishment of the 33kV circuit-breakers has been considered as a means of improving the HI but this is now not a viable economical solution. Replacement of the 33 kV oil-filled circuit-breaker**s** with new 33kV vacuum-insulated units will improve the plant condition to HI 1.

All the existing problems associated with the sixteen 33 kV oil-filled circuit-breakers at Havant 132/33kV grid substation will therefore be removed for the foreseeable future.

7. Recommendation

Investigate the possibilities of replacing the existing outdoor 33kV circuit-breakers installed at Havant 132/33kV grid substation with the following apparatus:

Sixteen 33kV outdoor vacuum-insulated circuit-breakers

8. Estimated Cost

The total estimated cost of this proposal is £1.2m

9. Photograph of an existing 33kV oil-filled circuit-breaker

10. SSEPD's asset condition scoring spreadsheet – Havant 33kV switchgear

Procedure for Non Load Related Asset Replacement - Appendix 1

Transmission and Distribution Substation Condition Assessment Scoring Form

Substation Name: Havant	**Equipment Manufacturer:** English Electric
Asset Voltage: 33kV	**Type:** 33kV Outdoor Switchgear -Type OKM4
Date of Assessment: 20th February 2013	**Year of Manufacture:** 1967

Asset Condition

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Satisfactory	0				The existing 33kV oil circuit breakers are now showing signs of irrepairable operating mechanism failure
Additional Maintenance	11				
Minor Refurbishment	22	44	44	0	
Consider Replacement	33				
Immediate Replacement	44				
Priority Contribution		44	44	0	
Health Index Contribution		44	44	0	

Network Security

(Number of customers at risk)	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
< 100	0				Supplies to all the 54,714 customers will not be adversely affected in the event of a fault.
< 1000	6				
< 2000	12	0	0	0	
≥ 2000	19				
Priority Contribution		0	0	0	
Health Index Contribution		6	6	6	

Fault Rate

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
≤ Company / National Average	0				
0 - 10% Over Company / National Average	3				
11 - 20% Over Company / National Average	6				
21 - 30% Over Company / National Average	9	0	0	0	
31 - 40% Over Company / National Average	12				
> 40% Over Company / National Average	15				
Priority Contribution		0	0	0	
Health Index Contribution		0	0	0	

Spares and Obselesence

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Satisfactory (Internally and externally available)	0				Replacement mechanisms for this switchgear are no longer being manufactured.
Minor Issue (Only externally available)	6	11	11	0	
Major Issue (No spares available)	11				
Priority Contribution		11	11	0	
Health Index Contribution		6	6	6	

Safety

Failure	Likelihood: Low (<1-10^6)	Likelihood: Med (10^4-10^6)	Likelihood: High (>1-10^6)	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Severity: Negligible	0	1	3	See Chart	5	6	0	
Severity: Minor	1	3	5					
Severity: Major	3	5	6					
Priority Contribution					5	6	0	
Health Index Contribution					5	6	0	

Age

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
≤ Mean asset life	0				
0 - 10% above mean life	1				
10 - 20% above mean life	3	3	5	0	
> 20% above mean life	5				
Priority Contribution		3	5	0	
Health Index Contribution		3	5	0	

Conditon Assessment - Total Score

	MAX. POSSIBLE SCORE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Asset Condition	44	44	44	0	
Netwotk Security	19	0	0	0	
Fault Rate	15	0	0	0	
Spares and Obselesence	11	11	11	0	
Safety	6	5	6	0	
Age	5	3	5	0	
PRIORITY Score		63	66	0	
HEALTH INDEX Score		64	67	12	
HEALTH INDEX		HI 5	HI 5	HI 1	

Overall Priority Decision Table

Score	Action
≥ 44	Replace within 5 years (although an asset condition score of 44 indicates replace witnin 2 years.)
< 44	Consider for replacement over the medium term. The Asset Condition score indicates in general terms the action appropriate. Scores of > 6 in the Fault Rate and Spares & Obselesence categories and 5 or 6 in the Safety Category will require a specific review of indiviual assets.
HI	0-15 = HI 1, 16-30 = HI 2, 31-46 = HI 3, 47-61 = HI 4 and above 61 = HI 5

Conclusion

The proposed new 33kV vacuum circuit breakers will reduce the maintenance workload on the 33 kV circuit breakers at this Grid Sustation.

REV. 6 HYH 23/07/2012

Appendix C – Another example of a completed RIIO-ED1 submission report

Development Plan for Horndean 11kV switchgear intervention

1. Investment appraisal

Budget Year	Site	N° of Customers	2012 Demand (MVA)
2017/18	Horndean	14,463	21.7

2. Site Summary

Horndean primary substation is an urban substation with enclosed 33/11kV transformers (coolers located outdoors) and indoor switchgear.

3. Project Summary

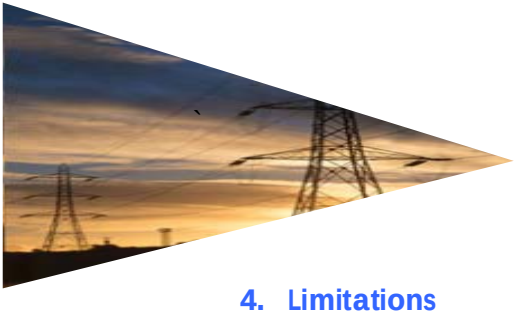
This report proposes the complete replacement of 12 - 11kV oil-filled circuit-breakers at Horndean primary substation as identified in RIIO-ED1 submission.

The 11kV oil-filled circuit-breakers, manufactured by Brush Electric from the early 1960s through to the late 1970's, include types R41, R42 and R12-MK4. It is no coincidence that during the eight-year period covered by the RIIO-ED1 submission that the majority of the 11kV circuit-breakers identified for intervention were manufactured by Brush.

The 11 kV switchboard Horndean primary substation comprises 12 - 11kV oil-filled circuit-breakers, Type R41 manufactured by Brush Electric in 1963. The design of these circuit-breakers makes maintenance procedures very difficult resulting in a steady degradation in the condition of these units. Furthermore, the auxiliary switches are now proving to be unreliable, resulting in poor performance and a number of the 11kV circuit-breakers are also showing signs of unintentional operational misuse. Finally, to acerbate these problems, there are major issues with obtaining spares for these obsolete circuit-breakers.

(Note – energypeople inspected this primary substation as part of its random survey of SSEPD's operational sites. Visual inspection did not reveal internal signs of deterioration. The regular findings identified during normal maintenance these assets are entered by SSEPD's Operations and Production Groups (OPGs) into PLACAR. This is the database currently used by SSEPD to record and monitor asset condition. The OPG records for 2012 have not assigned an estimated remaining life for these assets. A photograph of the 11 kV oil-filled circuit-breakers now considered to be nearing the end of their useful life is attached to this report)

The recommended intervention is the replacement of the twelve 11kV circuit-breakers with similar units in 2017/18.



4. Limitations

SSEPD's methodology for selecting assets for non-load related intervention is based on six main business drivers ranked in order of relative importance that are used to assign an intervention priority score. In addition each asset is assigned a Health Index (HI) based on the same drivers using a different weighting. The HI indices are ranked from HI 1 to HI 5, HI 1 being a new or as new asset and HI 5 being assets at the end of their serviceable life.

5. Health Index (HI)

Health Index for the existing switchboard at Horndean primary substation indicates that intervention is required.

Health Index Reference Date	HI
February 2013	HI 4
End of RIIO ED1 Score – No Intervention	HI 5
End of RIIO ED1 Score – With Intervention	HI 1

Definitions

Health Index (HI)	Assessment of plant condition
HI 1	New or as new
HI 2	Good or serviceable condition
HI 3	Deterioration requires assessment and monitoring
HI 4	Material deterioration, Intervention requires consideration
HI 5	End of serviceable life, intervention required

The Health Index for the asset intervention proposed in the form of the Scoring Template is shown in Appendix 1. (See attached).

6. Benefits

Without Intervention

With no intervention it is estimated that the condition of the 11kV circuit breakers will continue to degrade and the HI at the end of the RIIO-ED1 period (April 2023) would increase to HI 5.

With intervention

Refurbishment of the 11kV circuit-breakers has been considered to improve the HI but this is not a viable economical or technical solution for this type of switchgear.

Replacement of the 11kV circuit-breakers with similarly rated 11kV circuit-breakers would improve the plant condition to HI 1. It should be noted that the de-commissioned switchgear may be used to provide spares on similar Brush Electric 11kV switchgear in order to extend the life of these switchgear assets. SSEPD has a large population of similar 11 kV circuit-breakers manufactured by Brush Electric that was installed in the 1960's.

All the existing problems associated with this 11 kV switchgear at Horndean primary substation will therefore be removed for the foreseeable future.

7. Recommendation

Investigate the possibilities of replacing the 12 – panel 11kV indoor switchboard at Horndean primary substation with the following apparatus:

2 - 11kV Transformer circuit-breakers

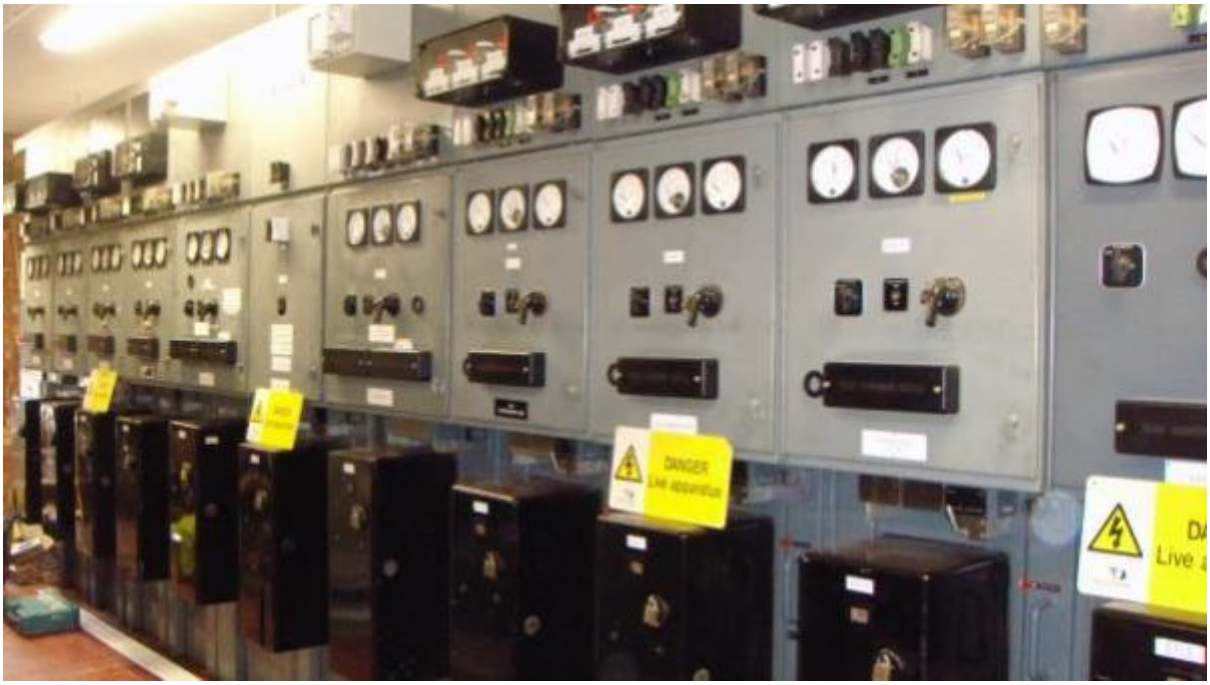
1 - 1kV Bus Section circuit-breaker

9 – 11kV Feeder circuit-breakers

8. Estimated Cost

The total of this proposal is £1.01m

9. Horndean primary substation – Photograph of a section of the 12 panel 11kV witchboard (Brush Type R4/1)



10. SSEPD's asset condition scoring spreadsheet – Horndean 11kV switchboard

Procedure for Non Load Related Asset Replacement - Appendix 1

Transmission and Distribution Substation Condition Assessment Scoring Form

Substation Name: Horndean	**Equipment Manufacturer:** Brush
Asset Voltage: 11kV	**Type:** R41
Date of Assessment: 6th February 2013	**Year of Manufacture:** 1963

Asset Condition

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Satisfactory	0	33	44	0	Internal condition poor
Additional Maintenance	11				
Minor Refurbishment	22				
Consider Replacement	33				
Immediate Replacement	44				
Priority Contribution		33	44	0	
Health Index Contribution		33	44	0	

Network Security

(Number of customers at risk)	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
< 100	0	12	12	12	Average 1607 customer/feeder
< 1000	6				
< 2000	12				
≥ 2000	19				
Priority Contribution		12	12	12	
Health Index Contribution		6	6	6	

Fault Rate

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
≤ Company / National Average	0	0	0	0	
0 - 10% Over Company / National Average	3				
11 - 20% Over Company / National Average	6				
21 - 30% Over Company / National Average	9				
31 - 40% Over Company / National Average	12				
> 40% Over Company / National Average	15				
Priority Contribution		0	0	0	
Health Index Contribution		0	0	0	

Spares and Obselesence

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Satisfactory (Internally and externally available)	0	11	11	0	Spares are an issue for this age of switchgear
Minor Issue (Only externally available)	6				
Major Issue (No spares available)	11				
Priority Contribution		11	11	0	
Health Index Contribution		6	6	6	

Safety

Failure / Severity	Likelihood: Low (<1-10^6)	Likelihood: Med (10^4-10^6)	Likelihood: High (>1-10^6)
Negligible	0	1	3
Minor	1	3	5
Major	3	5	6

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
SeeChart		1	3	1	
Priority Contribution		1	3	1	
Health Index Contribution		1	3	1	

Age

	SCORE RANGE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
≤ Mean asset life	0	3	5	0	
0 - 10% above mean life	1				
10 - 20% above mean life	3				
> 20% above mean life	5				
Priority Contribution		3	5	0	
Health Index Contribution		3	5	0	

Conditon Assessment - Total Score

	MAX. POSSIBLE SCORE	PRESENT SCORE	END OF DPCR5 SCORE NO INTERV.	END OF DPCR5 SCORE WITH INTERV.	COMMENT
Asset Condition	44	33	44	0	
Netwotk Security	19	12	12	12	
Fault Rate	15	0	0	0	
Spares and Obselesence	11	11	11	0	
Safety	6	1	3	1	
Age	5	3	5	0	
PRIORITY Score		60	75	13	
HEALTH INDEX Score		49	64	13	
HEALTH INDEX		HI 4	HI 5	HI 1	

Overall Priority Decision Table

Score	Action
≥ 44	Replace within 5 years (although an asset condition score of 44 indicates replace witnin 2 years.)
< 44	Consider for replacement over the medium term. The Asset Condition score indicates in general terms the action appropriate. Scores of > 6 in the Fault Rate and Spares & Obselesence categories and 5 or 6 in the Safety Category will require a specific review of indiviual assets.
HI	0-15 = HI 1, 16-30 = HI 2, 31-46 = HI 3, 47-61 = HI 4 and above 61 = HI 5

Conclusion

Replacement is now recommended as a matter of urgency. This decision is based on the deterioration in performance and reliability that cannot be improved by current maintanance standards.

REV. 6 HYH 23/07/2012