SP Energy Networks 2015–2023 Business Plan

Updated March 2014

Annex

Network Size Amendments Assurance

PA Consulting

June 2013

SP ENERGY NETWORKS

PA Consulting Group

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EXECUTIVE SUMMARY

Scottish Power Energy Networks (SPEN) owns and operates distribution networks in both Central and Southern Scotland and also Merseyside and North Wales.

SPEN has a regulatory obligation to report on a number of key attributes associated with its regulated power network. As part of its drive to improve the quality of asset information systems, SPEN has recently embarked upon a project to improve the quality of the asset data contained within its primary network information systems.

PA Consulting Group has been engaged to undertake an independent assessment of the process recently undertaken by SPEN to update network asset information associated with network assets.

Scope and approach of the PA review

The PA assessment aims to confirm that the process used to correct and amend the asset volume information in both SPD and SPM is robust, effectively implemented and results in a more accurate regulatory asset count.

The PA review is associated only with Distribution Network Operator (DNO) assets. The review does not include transmission assets owned by Scottish Power Transmission Limited (SPTL) under its role as a Scottish Transmission Operator (TO).

This assessment has been carried out with the support and assistance of the Networks Data Improvement Programme' (NDIP) project team in Scotland. It has included a desk-top review of the asset information systems associated with both the SPD and SPM assets. PA has not undertaken any operational site visits or inspected physical infrastructure as part of the review.

PA's approach to the audit can be described as having the following two distinct areas of focus:

- a review of the high-level approach adopted by SPEN to provide a revised assessment of the size of the regulated asset base (a review of process); and
- a more focused examination of a selected number of asset categories.

Conclusions

Completion of the assurance review evaluating the changes to the size of SPEN's electricity distribution asset bases has enabled conclusions to be drawn regarding methodology and approach adopted; implementation and execution; and the validity of outputs including the reasons for the largest asset volume divergences.

Methodology and approach to network size amendments

PA has been able to reach the following conclusions with regards to the overall methodology adopted by SPEN in its approach to re-assessing the size of the distribution network:

- The use of existing asset data from SPEN's information systems provides a reliable basis for re-estimating network size;
- Comparing asset information across multiple systems represents a pragmatic method of validating source data;
- Prioritising assets for the initial review of network size has proven an effective method of addressing the most significant asset volume divergences; and
- The underlying objective to improve asset data quality has been reinforced through senior management commitment to the project.

Implementation and execution

PA has been able to reach the following conclusions regarding the implementation and execution of its approach to reassess the size of the distribution network:

- It will be increasingly important to ensure that revised asset volumes are accurately captured in source data systems;
- In future, there should be increased emphasis on addressing the causes of data errors through policy and process improvements; and
- The processes adopted rely on multiple manual intervention techniques with inherent risk of operator errors.

Overall validity of outputs

PA believes that good quality asset information is critical, not just for regulatory submissions, but for prudent and efficient investment decision-making within the SPEN business.

- Asset volumes have been revised according to a reasonable and pragmatic assessment methodology;
- Tower Line conductor length in SPD represents the largest per unit change;
- The two largest percentage reductions are in the SPM; and
- The vast majority of MEAV increases are in the SPM area.

Charts showing the top-ten changes by volume and the top-ten changes by MEAV are provided in Figures A1 to A4.

Figure E1 - Top 10 percentage volume Increases

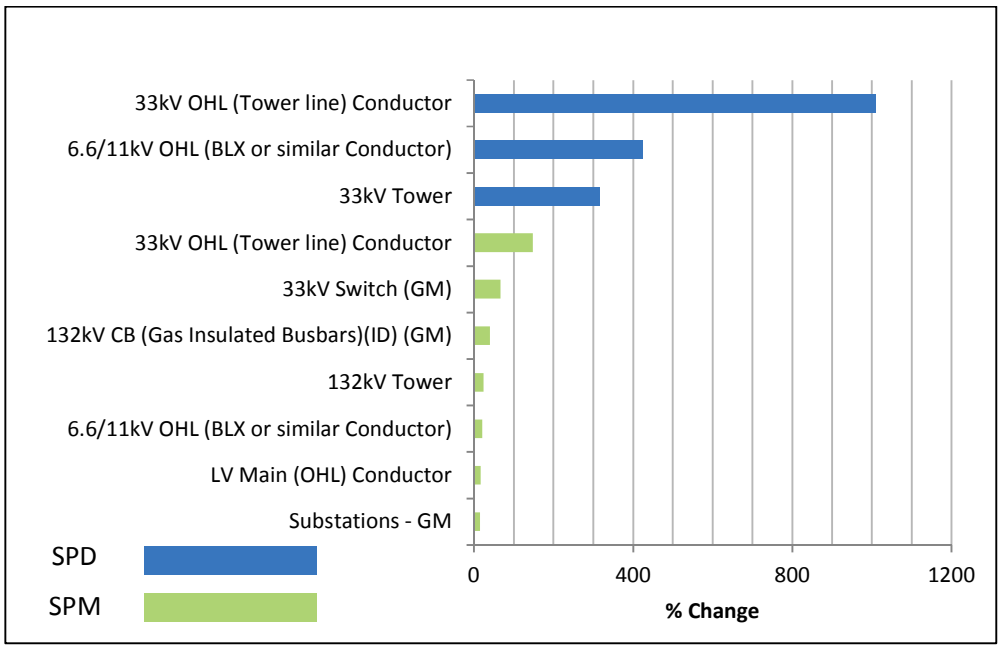
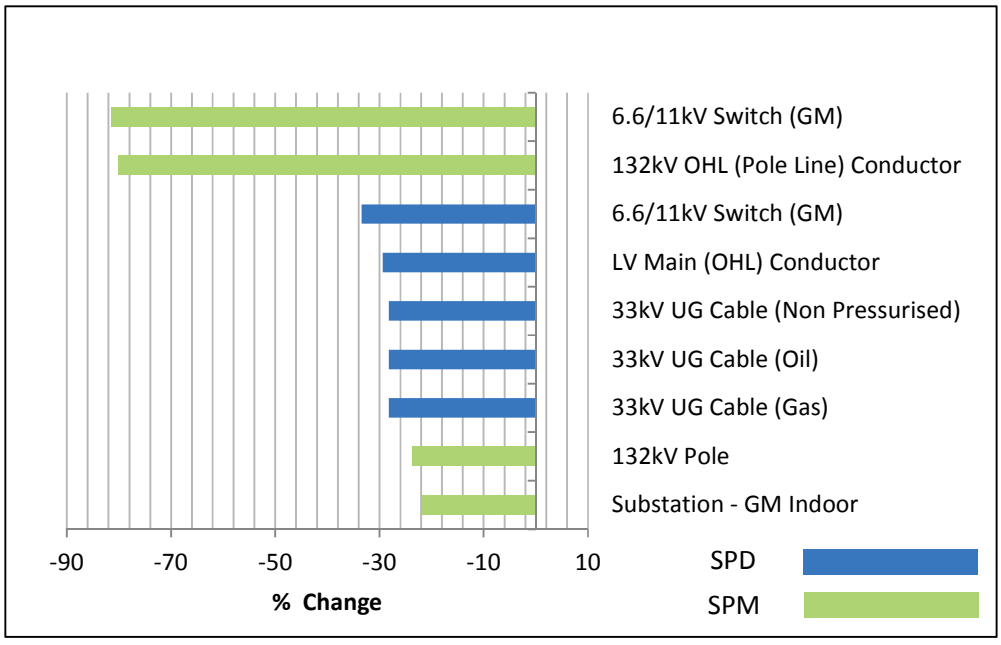


Figure E2 - Top 10 percentage volume decreases[1]



[1] Excludes 132kV OHL Tower Line conductor (SPM) which has increased from zero to 1,077km as a result of the re-assessment process.

Figure E3 - Top 10 MEAV increase (absolute)

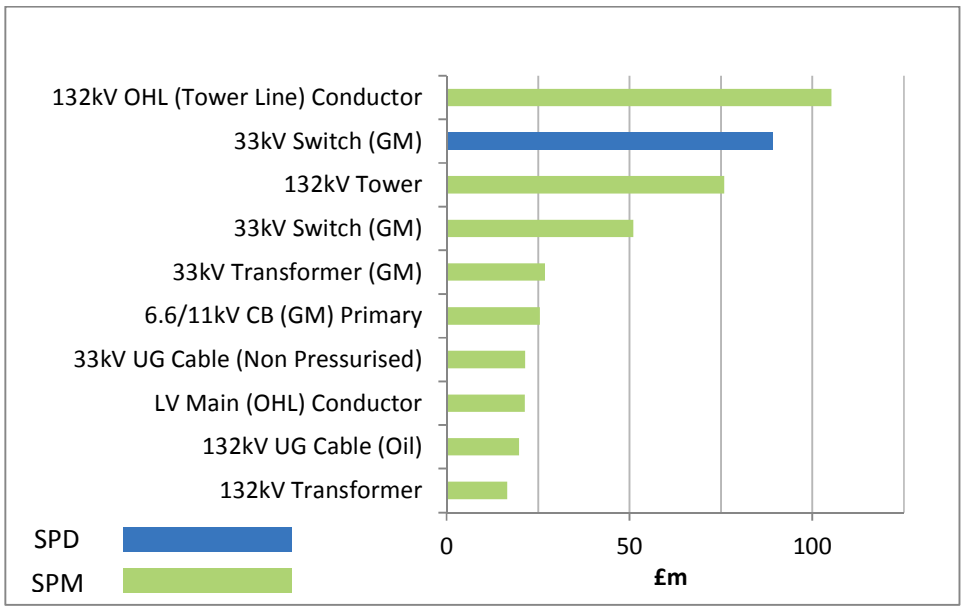


Figure E4 - Top 10 MEAV decreases (absolute)

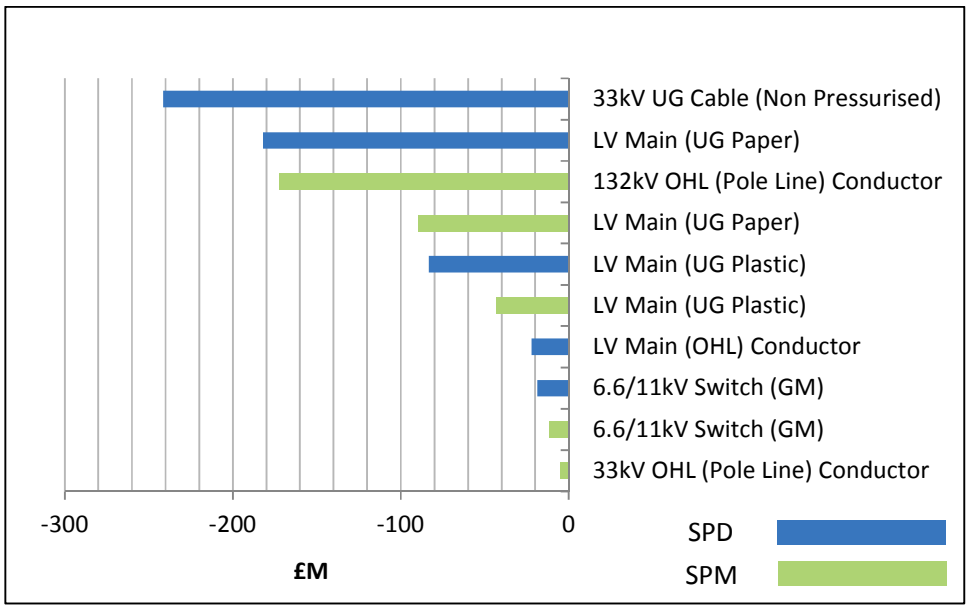


Table E1 – Summary of key reasons for major variances

Asset category	Location	Variation type	Reason for variation
33kV cables	SPD	reduction	Use of 'network length' instead of 'circuit length' for cable volumes.
132kV tower-line conductor	SPM	increase (tower line km) reduction (pole line km)	Ability to identify tower lines versus pole lines.
LV U/G main (paper)	SPD SPM	reduction	The move from bit-map (raster) images to more accurate vector graphics.
EHV CB	SPD	reduction	Incorrect allocation to SPD and subsequent correct allocation to SP Transmission
HV ground-mounted switches	SPD SPM	reduction	Correction of an over-estimation due to double-counting pole-mounted switches by continuing to include in ground-mounted definition.
33kV ground-mounted switches	SPD SPM	increase	Old SCADA system did not synchronise with SAP; assets become evident through PowerOn synchronisation with SAP.

Recommendations

Further to the completion of this review, and in the light of the conclusions reached, PA makes the following recommendations for future process refinements:

- Assess opportunities to reduce the extent of manual manipulation of data;
- Undertake regular audits of exception investigations to ensure the robustness of QC processes;
- Develop a central repository for all business rules;
- Ensure that SPEN retains the knowledge and expertise developed in the Data Quality Workstream;
- Review the benefits of implementing asset volume changes more rapidly in asset information systems; and
- Seek to address the causes of data errors through asset management policy and process improvements;

More detail on each of the Conclusions and Recommendations is provided in Sections 4 and 5 respectively.

CONTENTS

FIGURES AND TABLES

FIGURES

TABLES

1 INTRODUCTION

SPEN has a regulatory obligation to report on a number of key attributes associated with its regulated power network. As part of its drive to improve the quality of asset information systems, SPEN has recently embarked upon a project to improve the quality of the asset data contained within its primary network information systems.

PA Consulting Group has been engaged to undertake an independent assessment of the process recently undertaken by SPEN to update network asset information associated with its Priority 1 and Priority 2 assets.

In this section we provide context and background associated with the assignment. We also set out the scope of the work undertaken by PA Consulting Group in reviewing the process used by Scottish Power Energy Networks to reassess the size of the regulated distribution network.

1.1 Background and context

Scottish Power Energy Networks (SPEN) owns and operates distribution networks in both Central and Southern Scotland (Scottish Power Distribution – SPD) and also Merseyside and North Wales (Scottish Power Manweb – SPM)[2].

SPEN has a regulatory obligation to report on a number of key attributes associated with its regulated power network. A reporting template, in the form of a Regulatory Report Pack (RRP), is issued by Ofgem for completion and annual submission by SPEN.

As part of its drive to improve the quality of asset information systems, SPEN has recently embarked upon a project to improve the management of data within SPEN. The Network Data Improvement Programme has been operational within SPEN since late 2011 and comprises six principal work streams[3]. A key

[2] The SP Manweb network includes the Manweb 132kV network, which is defined as a distribution voltage in England and Wales. The 132kV network in Southern Scotland is owned and operated by Scottish Power Transmission Limited (SPTL).

[3] The six work streams which make-up the SPEN Network Data Improvement Programme are: Data Governance, Data Models, Data Quality, Data Capture, Data Reporting and Data Culture

stream of this work is to improve data quality and to align, confirm and, where necessary, modify (cleanse) the asset data contained within its primary network information systems. This has inevitably led to the identification of a number of discrepancies associated with the number of assets employed in the SPD & SPM distribution networks.

Through a specially convened "Data Quality" workstream of the 'Networks Data Improvement Project', SPEN has prioritized its work associated with validating the quantity of its network assets (network size) according to four broad asset groups. The initial data improvement, and the focus of this review by PA, is on Priority 1 ("P1") and Priority 2 ("P2") asset groups[4]. P1 and P2 assets have been selected by SPEN on the basis of those being most important for inclusion in the 2012/13 Regulatory Reporting Pack (RRP) to Ofgem.

PA Consulting Group (PA) has been engaged to undertake an independent assessment of the process recently undertaken by SPEN to update network asset information associated with its P1 and P2 assets. This assessment has been carried out with the support and assistance of the Networks Data Improvement Programme' (NDIP) project team in Scotland. It has included a desk-top review of the asset information systems associated with both the SPD and SPM assets.

1.2 Scope of the assignment

The Data Quality stream of the Network Data Improvement Programme SPEN has recently completed a validation exercise to establish the correct number of P1 and P2 assets in both the SPD and SPM networks. SPEN is now seeking third-party audit of the process adopted and independent confirmation that the revised asset details provide a more accurate record of the SPEN distribution asset base for inclusion in the next RRP submission to Ofgem[5].

The PA assessment aims to confirm that the process used to correct and amend the P1 and P2 asset information in both SPD and SPM is robust, effectively implemented and results in a more accurate regulatory asset count. The asset information is managed across multiple information systems within the SPEN businesses – depending on the asset type.

The PA review is associated only with Distribution Network Operator (DNO) assets. The review does not include transmission assets owned by Scottish Power Transmission Limited (SPTL) under its role as a Scottish Transmission Operator (TO). However, PA has been informed that SPEN has undertaken a separate internal validation exercise for SP Transmission assets.

The review undertaken by PA has been a desk-top exercise aimed at validating the process. PA has not undertaken any operational site visits or inspected physical infrastructure as part of the review. The on-site time has been spent reviewing material produced by the NDIP team, interrogating reports and validating decision-making processes. It should also be noted that any technical (IT) investigation or assessment of the various SPEN information systems is beyond the scope of this review of asset information. The PA review team comprised two consultants onsite with SPEN for a period of 5 days.

[4] Priority 1 assets are mainly cables, lines, main plant and equipment operating at 11kV. Priority 2 are primarily LV network cables and lines but with some 11kV, 33kV and 132kV cables, switches and substations. Priority 1 and Priority 2 assets comprise 86 asset categories from a total number of asset classes of 161 (53%).

[5] The next RRP is due to be submitted to Ofgem by 1 July 2013.

2 OUR APPROACH TO THE WORK

PA has been asked by SPEN to undertake a critical review of the process adopted by SPEN to improve the quality of the network data associated with the P1 and P2 asset groups – as part of the business's preparation of its 2012/13 regulatory reporting pack to Ofgem. In this section of the report we set out the approach adopted by PA in its review.

PA's approach to the audit can be described as having the following two distinct areas of focus:

- a review of the high-level approach adopted by SPEN to provide a revised assessment of the size of the regulated asset base (a review of process); and
- a more focused examination of a selected number of asset categories.

2.1 High-level review

The over-arching process and approach adopted by SPEN in revisiting its asset information is central to the validation/audit undertaken by PA. Our high-level assessment of the SPEN change process has included the following:

- an explanation of, and discussions around, the aims and objective of the network data improvement initiative from SPEN management;
- the overall approach and philosophy adopted by the SPEN team in its quest to improve the accuracy and quality of its reporting capability – both internal (management) reporting and reporting to external parties, such as Ofgem;
- a review of process charts associated with the high-level data improvement process;
- a review of recent presentations to internal SPEN management and Ofgem – setting out a preliminary view on potential changes to asset information; and
- a draft internal report prepared by SPEN management to explain the changes in regulatory reporting tables between 2011/2012 and 2012/2013[6].

[6] 'RRP Narrative explaining changes in Table V1: Changes in Opening Balance', V5, SPEN, 10 June 2013.

As part of this high-level review, PA has also explored the following:

- SPEN data tables showing 'before' and 'after' asset volumes and associated Mean Equivalent Assets Values (MEAV) for affected asset categories;
- any anomalies, or potential (or apparent) anomalies, in the outturn results including, but not limited to, the following:
  - increases in MEAV coinciding with an apparent reduction in asset count/volumes (and vice-versa);
  - identical asset volume adjustments (in percentage terms) across different asset categories; and
  - seemingly spurious changes in asset volumes.

These initial, high-level assessments also informed selection of the specific asset categories for the focused review (Deep Dives).

2.2 Focussed review of specific asset categories

After having reviewed SPEN's over-arching approach to the validation of asset data, PA has undertaken a more focused review of a number of specific asset categories. The purpose of this more detailed review of the asset amendment process was twofold:

1. confirmation that the high-level process is being implemented as designed; and
2. confirm that the assessment outcomes associated with a sample of individual asset categories is reasonable.

PA selected ten asset categories for detailed, or 'Deep Dive' review. The selection criteria for selecting these asset categories were as follows:

- the greatest (percentage) difference between the revised (NDIP) information and the previously submitted 2011/12 RRP data – both in terms of asset volume[7] and asset value (MEAV);
- the number (and value) of the assets whose basic information, at first pass, did not align across key SPEN information systems – as a proportion of the total number of assets in the particular asset fleet; and
- the number (and value) of the assets which did not initially align across systems but, following an initial investigation by the NDIP team, were added to the asset count.

The selection of asset types for detailed review has also considered representation from both the north (SPD) and the south (SPM) of the SPEN business, and also achieving a reasonable cross-section of asset types (i.e. plant, cables, lines and structures).

In considering these criteria, the ten asset categories shown in Table 1 were selected for detailed examination as part of the PA review process.

For each of the selected asset categories the following items were explored:

1. how was the initial exception report generated? What systems have been used and what asset attributes were used as part of the synchronisation process?
2. what business rules have been applied to deal with the first pass set of exceptions?
3. how have outstanding exceptions (non-synchronised records) been dealt with?
4. how have any required amendments been reflected in business systems and what process has been followed?

[7] 'Number of assets' is either circuit length (km) or asset count.

5. what business measures have been taken to address the source of an identified and corrected exception such as to minimise the likelihood of inaccurate reports and data sets in the future?

Table 1 – Asset categories selected for detailed review

Licensed area	Asset type	Asset Category
SPD	Cable	LV Main (UG Plastic)
	Cable	33kV Underground cable (non-pressurised)
	Switchgear	6.6/11kV Switch (ground-mounted)
	Switchgear	33kV Switch (ground-mounted)
	Transformer	33kV Transformer (pole-mounted)
SPM	Cable	6.6/11kV Underground cable
	Overhead tower line	132kV Overhead line (tower Line) conductor
	Cable	132kV Underground cable (non-pressurised)
	Switchgear	33kV Switch (ground-mounted)
	Overhead tower line	132kV Tower

In undertaking the detailed review, PA's approach has been to work with a selected member of the NDIP team and to 'walk-through' the chronology of the SPEN network size assessment process - discussing any issues, anomalies and business decisions as addressed by the project team.

As part of the 'Deep Dive' reviews, PA has attempted to validate that changes have been accurately recorded and that an audit trail is accessible for any data ‘fixes’ implemented. PA has requested and reviewed any further investigation information where available and assessed the reasonableness - from both a technical (network engineering) and a data management perspective.

2.2.1 Key assumptions

The following assumptions have been made in undertaking the review:

- the physical attributes of assets are as recorded in source systems; PA has undertaken no physical check of assets; and
- that the reporting tools used by SPEN to generate asset information are an accurate reflection of the information contained within the asset systems

3 OBSERVATIONS AND FINDINGS

In this section we describe how SPEN has gone about re-quantifying the size of its regulated distribution network. We also set out PA's observations and findings on the SPEN methodology, in terms of a review of the high-level approach adopted by the business, and also a closer examination of how the process has been applied to specific asset categories - gained through a number of more focused reviews.

3.1 The existing approach to the determination of network size

At the time of the first requirement to provide Ofgem with detailed asset volume in 2004/05 a best estimate of network size was developed from existing SPEN systems. Information at this time was drawn from numerous systems - including cable and line lengths 'associated with', but not determined from, legacy 'raster[8]' images. SPEN has recognised for some time that the veracity of this network information was questionable, due to both the limited representation of assets in the asset registers and also the limited capability of the asset systems themselves.

Since 2004/05 SPEN, in common with many other network businesses, has made a number of significant improvements to form and quality of network asset information. Cable and line records previously limited to 'hard sheet' records have been electronically captured and vector images created, or 'vectorised'[9].

These legacy processes and information sources have, to date, been used establish a baseline for asset volumes. To date, the SPEN process for determining the number of assets in the SPEN asset base has been based on these historical baseline numbers. Consequently, the asset volume information contained within the annual RRP has been determined, for each RRP asset category, using the following approach.

1. take the annual opening balance from the previous year's agreed closing balance; and
2. adjust according to known asset additions and disposals from the year in question.

[8] A raster graphics imagine, or bit map, is a dot matrix data structure representing, generally, a rectangular grid of pixels or points of colour viewable via a monitor, paper or other display medium. When scaled, raster images exhibit a loss of quality.

[9] A higher quality alternative to raster images is the use of 'vector graphics'. Vector-based graphics can be scaled by any amount without degrading quality.

As part of its review of assurance processes and an assessment of the robustness of its network information, SPEN identified that the process used to date to determine the size of its regulated network, required review.

3.2 The revised process for the assessment of network size

A formal Network Data Improvement Programme (NDIP) was established in late 2011 to deliver improvements in the management of data within SPEN. The programme has six workstreams and aims to address Data Governance, Data Models, Data Quality, Data Capture, Data Reporting and Data Culture. Each of these programme streams is described below.

3.2.1 Data Governance

The Data Governance workstream involves a monthly review of data chaired by the ASNP Director with involvement of Connections, Operations, Business Change and the Customer Services Director. The monthly review addresses the following.

- Monthly KPIs for data returns from across the whole business associated with speed and quantities of data returns for asset additions and disposal;
- The overall vision for data;
- Terms of reference and the plan for each of the other workstreams; and
- A review of progress/success of all other data workstreams.

3.2.2 Data Models

The Data Models workstream ensures that the data requirements meet the Asset Management requirements. Cross-business groups have reviewed the data requirements for each asset group.

3.2.3 Data Capture

The Data Capture workstream is where initiatives have been implemented to improve the data returns from specific business areas (for example, PA has been advised that SPEN zones have established processes for the return of cable sketches for LV fault repairs through the roll out of ‘toughbooks’ to SPEN cable jointers. This has enabled improved tracking of this work with clear measures of performance, KPIs and targets.

Furthermore, PA has been advised that SPEN is in the early stages of implementing improvements in its processes to capture site condition information associated with Asset Health to better embed site condition data into its corporate systems.

3.2.4 Data Reporting

The Data Reporting workstream is responsible for establishing an IT project through the implementation of SAP Business Warehouse product to enable improved volume reporting for asset counts and additions and disposals. This is expected to reduce the dependence on a small number of specialised IT staff who are currently engaged in providing this data.

3.2.5 Data Culture

The Data Culture workstream is responsible for communications with field staff: recognising and rewarding good behaviours, and focussing on training and messages associated with the importance and benefits of quickly capturing quality data associated with additions and disposals of assets on the network.

3.2.6 Data Quality

The Data Quality workstream is where the (externally sourced) project team at Eurocentral is providing additional resource to deal with the volumes of exceptions to validate the size of the network asset base. PA understands that his team was implemented in January 2013 to supplement the focus of a small internal group of staff, who had done some work on Priority 1 assets during 2012, but were unable to cope with the volumes of works to complete the review of the complete asset base in a suitable timescale.

A further initiative is being implemented within the Data Quality workstream where key measures and controls on synchronisation are being established via a dedicated project.

This workstream is the principal focus of the review of network asset size undertaken by PA.

Data Quality project team

Within the Data Quality stream an externally sourced project team has been established to provide additional resource to address the exceptions and queries that are being generated as part of a focused effort to validate the size of the regulated asset base.

The NDIP Data Quality project team was established in January 2013 with a total of 25 team members - all of whom are contract staff drafted specifically to assist with the Data Quality stream of the NDIP[10]. The project is led by an independent consultant. The team has a number of Team Leaders. Two SPEN engineers provide specialist technical capability in the north (SPD) and south (SPM) respectively.

The SPEN business has an established, 'business-as-usual' Data Management function on which the NDIP Data Quality workstream draws at key stages of the validation process. Data Management undertook several information validation exercises of its own prior to the commencement of the NDIP Data Quality process and this formed a valuable starting point for validation in the case of a number of specific asset categories.

SPEN's approach to the Data Quality stream has been to use the information contained within its key asset information systems as part of a new process to determine size of the SPEN distribution networks. Importantly, this revised process has been undertaken separately from, and without direct reference to, the existing information on the size of the network - as determined through the methodology described in Section 3.1.

3.2.7 The underlying philosophy of the SPEN network size assessment

A key assumption in the SPEN asset information validation process is that the data contained with the existing asset information systems provides the most reliable basis for assessment and determination of the number and type of assets which together represent the regulated SPEN network. The three key information systems used by SPEN in its network data improvement initiate are:

- ESRI: a fully layered Geographic Information System containing vectorised geo-schematic images of 'as-installed' cables, lines and items of plant equipment;
- PowerON: used in the SPEN control room for real-time operation of the network; and
- SAP: SPEN's principal asset management systems containing full technical attribute data, also used to drive asset maintenance and work order scheduling.

[10]One member of the NDIP team is a permanent member of SPEN staff and has been seconded to the programme to provide specialist technical network knowledge.

Existing business processes regularly synchronise information across the three systems. This is particularly true of SAP and PowerOn where electrical attributes of switchgear, transformers etc[11]. need to be available to SPEN control room staff as part of the real-time safe operation of the network.

The SPEN network size assessment process uses these three key asset system as part of a cross-reference (synchronization) process in order to validate asset information. A further key assumption of the NDIP Data Quality workstream is that asset information which matches across more than one information system is valid.

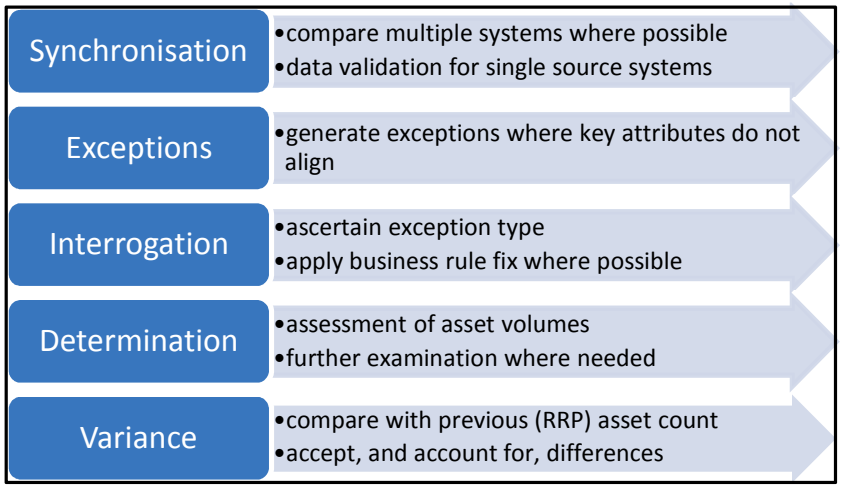
3.2.8 SPEN methodology

The methodology steps adopted by SPEN to validate asset information are shown in Figure 1.

Each particular asset type has a 'master' system within which its key attributes are stored. For example, the master system for plant items such as transformers and switches is SAP, whereas the master information system for cables and lines is the GIS system, ESRI. Furthermore, network information on plant items is stored in multiple systems (e.g. SAP and PowerOn).

There is an important difference between the way in which lines and cable data is validated and the way in which information is validated for plant items such as transformers and switches.

Figure 1 - The key methodology steps in the SPEN data validation process



Plant and equipment

For items of plant and equipment mastered in SAP, an initial validation exercise is undertaken through a simple comparison between the key asset attributes stored in SAP and those, of the same asset, stored in PowerOn.

For example, in the case of 6.6/11kV ground-mounted switchgear, three field comparison keys are used. These are:

- Energy Network Identifier (ENID) for the asset;
- the recorded location of the asset; and
- the recorded commissioned status of the asset.

[11] This information can include equipment ratings, maintenance history, notice of operational restrictions etc.

If all three attributes agree across SAP and PowerOn then the asset information is deemed to have 'synchronised' and a 'valid' asset count is generated and recorded. No further investigation or validation of asset information associated with 'valid' assets is undertaken as part of the NDIP Data Quality improvement process.

Figure 2 shows how an alignment of key asset information across SPEN systems leads to 'synchronisation' of the asset and a 'valid' asset count. An 'exception' is generated when selected data fields do not align and these 'invalid' assets form the basis for further review.

Lines and cables

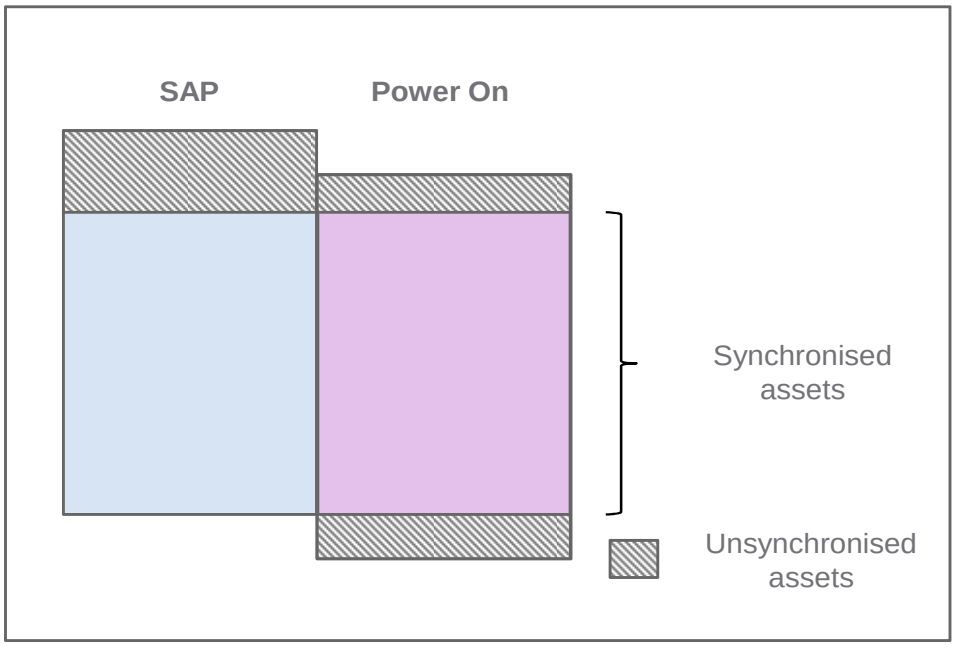
In the case of lines and cables, where information is predominantly stored only in the master system (ESRI), an inter-system comparison of data attributes is not possible and the validation process focusses on the veracity and accuracy of information contained within the single source system. In this case the initial asset count is determined by confirming the status of a number of key information fields.

In the case of Low Voltage mains cable, for example. The following ESRI fields are interrogated:

- Cable ownership: is the cable recorded as being owned by Scottish Power or by a third party (consumer-owned)?
- Commissioned status: is the cable recorded as being in service and operational (commissioned)?
- Does the cable asset have a valid 'Feeder ID' within the system?[12]

In this example, if the answer to all three questions is 'yes' then the asset is deemed to be 'valid' and contributes to the initial asset count. Assets where the answer to any one of the three questions is 'no' are added to an 'invalid' list for further investigation.

Figure 2 - Synchronisation across systems is part of the validation process for plant and equipment



[12] The feeder ID is the key field within the connectivity model linking customers to substations to provide IIS reporting. It also enables customer service to link customers to substations and onwards to HV feeders. At LV and HV the ESRI “Feeder Manager” module addresses network connectivity from the Primary circuit breaker to LV customer.

Business rules

Many of the exceptions which have been reported through the process, and subsequently investigated, have been addressed through the application of business rules. The business rules provide an internally consistent means of making a decision as to whether an exception is deemed 'valid', and therefore counted in the asset register, or 'invalid', and discounted from the asset base. The business rules have been developed as the NDIP Data Quality workstream has progressed and the errors and exceptions have arisen.

At the time of review there were 336 business rules applicable to one or more of the 86 Priority 1 and Priority 2 asset types[13].

There are Business Rules for all assets types. The Business Rules set out the required actions (decisions) associated with a number of plausible scenarios associated with identifying the asset. Typically, these business decision-making rules are captured, manually, in spreadsheet tables. They provide guidance to NDIP Data Quality workstream members on the validity, or otherwise, of the inclusion of an individual asset in the regulated asset count. Some scenarios require further investigation; in which case, a 'site visit' action is determined and a new entry created on the 'site visit' log.

For LV cable exceptions, for example, there are business rules associated with making a decision on whether or not cable marked as 'consumer-owned' is genuinely not belonging to SPEN. In this case the assessment is essentially qualitative and involves the team member examining ESRI records and observing the recorded ownership and location of adjacent and closely surrounding cables. Another example is ground-mounted 6.6/11kV switchgear (SPD) where four of the twelve business rules are associated with confirming a valid asset count; one of which confirms a valid switchgear count even though no switch is identified in SAP, provided the switch can be observed in PowerOn and the switch number matches in both PowerOn and ESRI.

In January 2013, data associated with the length of conductor on 132kV towers in SPM was not available for review due to a previous inability to distinguish between pole lines & tower lines. To address this, a bulk update was completed using agreed business rules to determine if a line was attached to a pole or a tower using spatial queries.

PA observes that the numerous business rules are captured, manually in a variety of spreadsheet formats and that there may be some value in consolidating the rules in a common format and in a single repository. This might help minimize the likelihood of errors, promote alignment of approach across asset classes (where possible) and also provide a more robust basis for future promulgation of the business rules through the broader SPEN business.

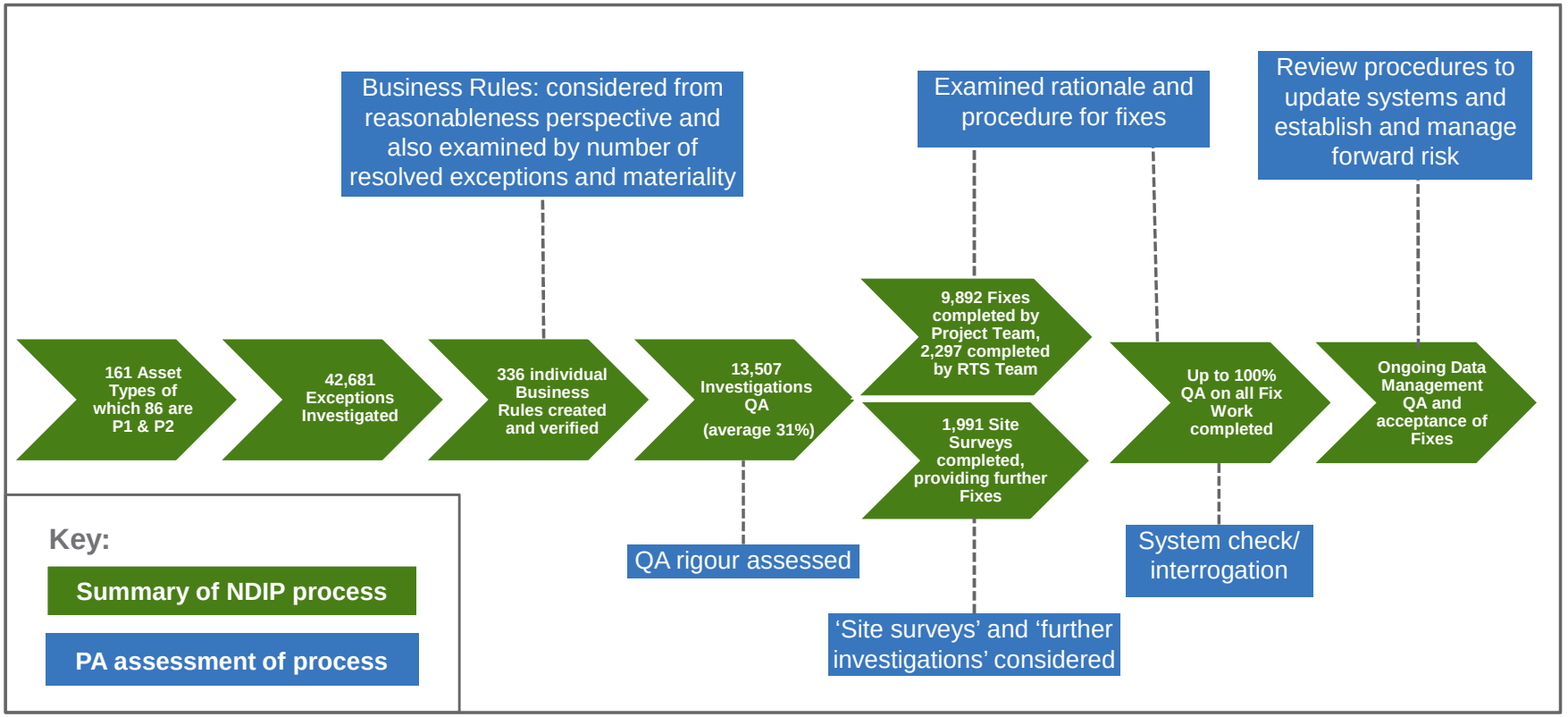
System data

Work on exploring and resolving data exceptions started on an initial synchronisation 'run' in January 2013. A subsequent synchronisation run was undertaken in April 2013 on new data sets. The results of the April 2013 synchronisation process reflect, not only work by the NDIP Data Quality project team to address exceptions generated in January 2013, but also all of the changes to the underlying data which occurred as part of business-as-usual in the three months between January and April 2013.

Figure 3 provides a high-level summary of the NDIP Data Quality workstream process, including summary numbers at each stage of the process. Figure 3 also describes the extent of the PA review process at various stages of the improvement programme.

[13] Suggesting that, on average, there are approximately four business rules per (P1 and P2) asset category.

Figure 3 - PA has assessed the high-level process adopted by SPEN



3.2.9 Summary of findings

The SPEN network size validation process draws on existing data and information contained within key asset information systems to determine a revised 'picture' of the type and population of assets which legitimately form part of the SPEN distribution asset bases in both the SPD & SPM networks. Whilst in the broader business and regulatory context it is necessary to draw comparison with the previous Regulatory Reporting Pack (RRP), this occurs at the end of the process following resolution of the asset register exceptions identified for each asset category.

The SPEN Network Data Improvement Programme Data Quality Workstream does not set out to determine the adjustments that need to be made to the previous asset count, per se. Rather, it sets out to determine, on a best endeavours basis, the number and type of SPEN distribution assets as at 2013. In this respect the process adopts a pragmatic 'clean sheet of paper' approach by comparing existing data sources and resolving exceptions using a new set of asset specific business rules.

The prioritization of effort for the review of network size - into 'P1' and 'P2' assets - has enabled early improvements to asset count estimates for inclusion in the 2013 RRP submission to Ofgem. PA endorses this approach and the defined selection process for the identification of priority assets.

PA notes that the NDIP Data Quality Workstream is ongoing and is scheduled to continue for the remainder of 2013. The project is dynamic - with exception numbers and asset counts continuing to change as work progresses. In this respect the work undertaken by PA as part of this review effectively represents a 'snap-shot' of the data improvement initiative at the time of the PA visit to SPEN.

The focus of the network data improvement programme is to undertake a realistic and pragmatic approach to the process of validating records. To take an extreme example, the validation of installed and commissioned cable length has to be achieved through a method other that direct physical inspection of the cable - something which is clearly difficult to achieve once the cable is buried in the ground.

The data improvement and validation processes have been well-considered and credibly formed. With such a complex array of information and legacy systems, it has been necessary to formulate appropriate business rules to address issues as they have emerged. This approach does not specifically target particular errors originating from common causes in the past. However, the process is sufficiently robust to identify and rectify such errors in a consistent manner.

A key focus of the network data improvement programme[14] is the determination of a more accurate assessment of network size, as a separate and parallel exercise to business as usual processes. Providing an up-to-date and accurate count of the SPEN distribution network assets is the main priority of the NDIP Data Quality Workstream. A key driver for this is the requirement to submit accurate details of asset volumes, by asset type, to Ofgem on an annual basis. In addition to providing a more accurate assessment of network size, PA supports the aims of the data improvement programme to remediate any data issues in key information systems and also take steps to minimise the likelihood of data errors re-occurring in future.

In summary, and in order of priority, the NDIP Data Quality Workstream project team aims to:

1. provide an updated and more accurate determination of the number and type of assets which collectively comprise SPEN's regulated distribution network;
2. reflect any newly validated asset information, remediation actions or 'fixes' in the source asset data systems; and

[14] It is noted that this is not the only focus of the Network Data Improvement Project.

3. identify preventative measures and/or business process improvements to address any shortcomings in processes, policies or procedures in the broader network business.

PA is of the view that significant effort is being expended by SPEN on accurate determination of the number of assets employed within SPEN's regulated distribution network. Following completion of this stage of the process, it will be important to ensure that all validated changes are reflected in source systems in a timely manner. In the short time of the review, PA did not assess the measures aimed at addressing the root cause of business-generated (rather than IT-generated) exceptions in a subsequent phase of the programme. However, we recognise that the Data Quality Workstream is part of a broader ongoing initiative aimed at improving the management of asset information within SPEN and that the business is deploying process improvement specialists ('Black Belts') through other workstreams within the NDIP, aimed specifically at ensuring that the Data Quality findings and outcomes are integrated within the broader business.

Furthermore, PA notes that the process focusses on the determination of 'valid' assets; once the NDIP Data Quality process determines a particular asset to be 'invalid' there is little further consideration of remediating the source of the original exception. PA accepts this to be a reasonable approach given the external timeline and the need to ensure an accurate asset count, but observes that there may be value in reviewing and, where necessary, addressing these exceptions at a later stage of the project.

3.3 Overall outcome and impact on network size

In this section we provide information on how the revised NDIP position on regulated asset numbers varies from the most recent (2011/12) RRP submission to Ofgem. Whilst consideration of this is outside of the direct remit of the NDIP Data Quality workstream, it is of relevance to the broader SPEN business and, in the opinion of PA, is likely to attract the attention of third party stakeholders, such as Ofgem.

All of the charts presented in this section show the proposed asset count when compared to the 2011/12 RRP numbers submitted to Ofgem[15]. This includes both changes in length (km) for lines and cables and changes in unit numbers for other assets. Changes in Mean Equivalent Asset Values (MEAV) are with regard to the values previously submitted to Ofgem, for each asset category[16]. Charts shown are for SPD and SPM combined but separate charts for SPM and SPD are provided in Appendix A.

Figure 4 shows the top ten asset categories in terms of percentage increase. The ten-fold increase in the revised assessment of 33kV OHL Tower Line conductor length in SPD represents the largest per unit change. Figure 5 shows the corresponding ten largest decreases in percentage terms. The two largest percentage reductions are in SPM and represent 81% and 80% associated with 6.6/11kV ground mounted switches and 132kV pole line conductor respectively.

Figure 6 and Figure 7 show the top-ten asset MEAV increases and top-ten asset MEAV decreases respectively - in absolute (rather than percentage) terms. Figure 6 shows that the majority - approximately 80% by value - of the total MEAV increase associated with the top ten asset categories, are in the SPM area; with 132kV towers and tower line conductor alone adding £181m to the revised assessment of MEAV. Conversely, almost two thirds (63%) of MEAV reductions are in the SPD area; this can be seen from Figure 7.

[15] The proposed asset count is as per the NDIP Data Quality Stream numbers which have been extracted from the spread sheet provided to PA on 10 June 2013. PA understands these to be the numbers used to prepare the presentation to SPEN Directors on 8 May 2013.

[16] It is noted that SPEN analysis of the change in MEAV also includes a unit-cost normalised variance - that is, the difference between the revised MEAV assessment and that previously submitted to Ofgem adjusted appropriately for changes (increases) in unit costs.

These changes are in the context of a total reduction in SPD MEAV of <£400m on a revised total MEAV of £6bn. The total reduction in SPM MEAV is <£150m on a revised total MEAV of £6bn.

Figure 4 - Top 10 percentage volume Increases

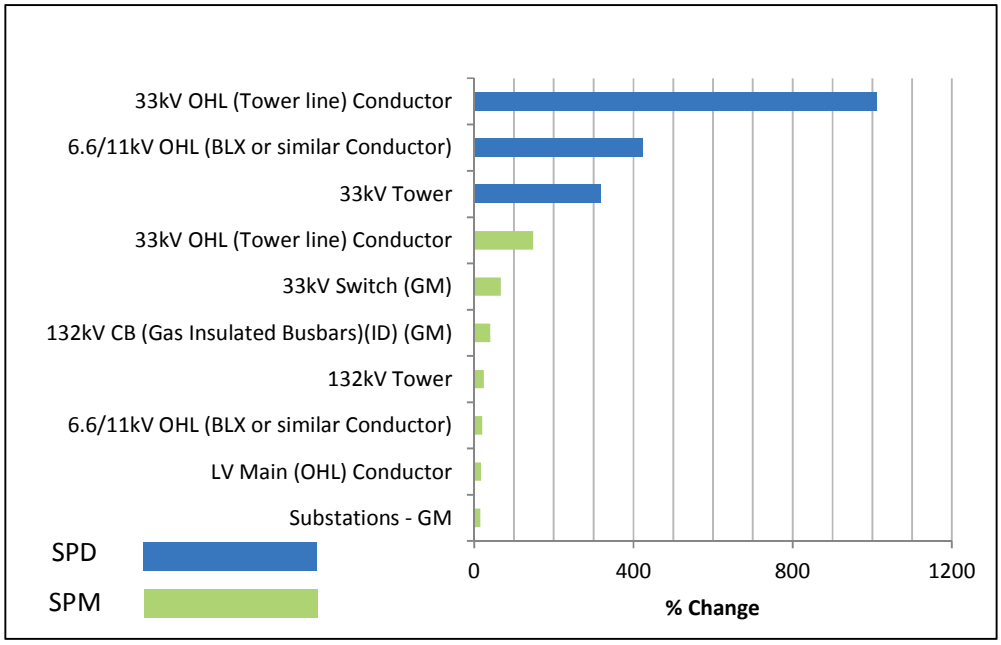
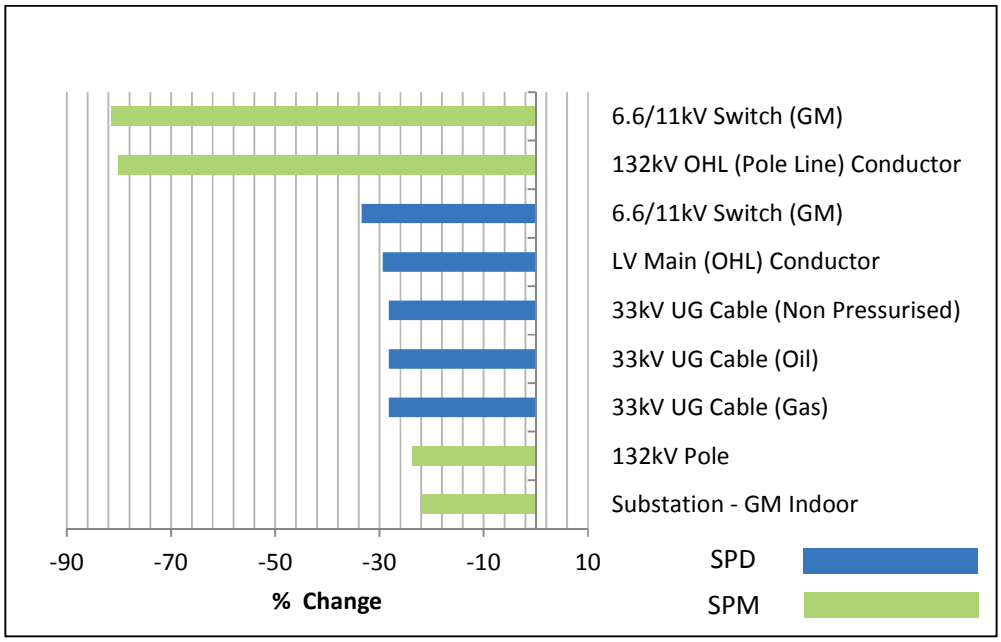


Figure 5 - Top 10 percentage volume decreases[17]



[17] Excludes 132kV OHL Tower Line conductor (SPM) which has increased from zero to 1,077km as a result of the re-assessment process.

Figure 6 - Top 10 MEAV increase (absolute)

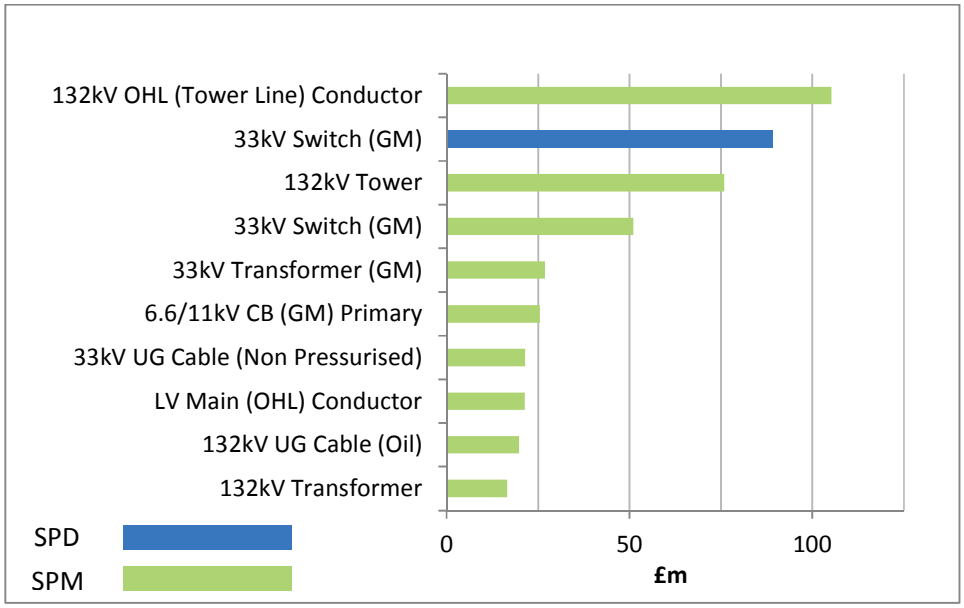
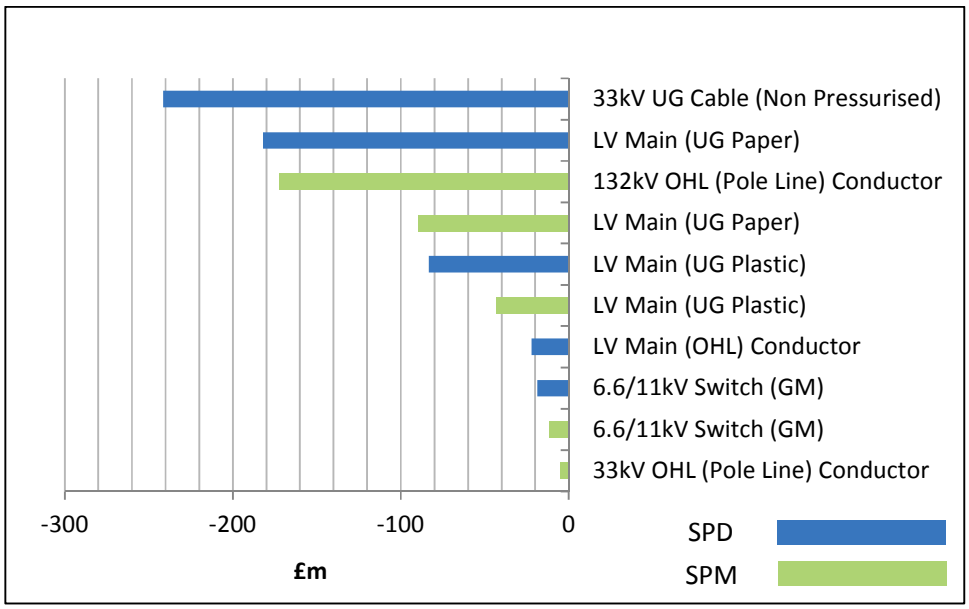


Figure 7 - Top 10 MEAV decreases (absolute)



Summaries of the changes between the 2011/2012 RRP submitted to Ofgem, and the revised assessment – as per the SPEN network data improvement process – for SPD and SPM, are provided in Table 2 and Table 3 respectively.

Table 2 - Comparison of variances per asset group for SP Distribution

SP Distribution: Summary	Voltage	Units	2011/2012 RRP Volume	2012/2013 Proposed Volume	Variance Volume	Variance Volume %
Plant	HV/EHV	Each	73,265	73,581	316	0.4%
Poles & Towers	LV/HV/EHV	Each	282,860	288,470	5,610	2.0%
Cable	LV/HV/EHV	km	42,845.6	38,321	-4,525	-10.6%
Line	LV/HV/EHV	km	20,960.4	19,478	-1,482	-7.1%
Totals			**419,931.0**	**419,850**	**-81**	**0.0%**

Table 3 - Comparison of variances per asset group for SP Manweb

SP Manweb: Summary	Voltage	Units	2011/2012 RRP Volume	2012/2013 Proposed Volume	Variance Volume	Variance Volume %
Plant	HV/EHV/132KV	Each	70,251	71,146	895	1.3%
Poles & Towers	LV/HV/EHV/132KV	Each	291,551	294,366	2,815	1.0%
Cable	LV/HV/EHV/132KV	km	28,055.4	25,997	-2,058	-7.3%
Line	LV/HV/EHV/132KV	km	20,197.2	20,931	734	3.6%
Totals (Subject to TBC's being completed)			**410,054.5**	**412,441**	**2,386**	**0.6%**

3.4 Reasons for major asset volume variances

There are a number of important issues which PA understands have materially contributed to some of the variances and are worthy of specific mention. These are listed below.

3.4.1 'Circuit Length' versus 'Network Length'

The reduction in 33kV underground cables in SPD was partly due to the previous use of 'network length' in the assessment of total installed and commissioned length against the revised (and correct) use of 'circuit length' in the more recent assessment. In the case of 33kV circuits having separate cables for each phase, this adjustment will have had the effect of reducing the volume count by two-thirds. Restatement of all cables on the basis of circuit length has substantially reduced the EHV cable lengths in SPD.

3.4.2 Improved assessment of the volume of 132kV tower-line conductor in SPM

At the time of the 2011/2012 RRP submission to Ofgem SPEN was unable to accurately determine whether a section of 132kV overhead line section was a pole-line or a tower-line. Consequently, all 132kV OHL assets in SPM were designated as pole-lines which led to an over-estimation of 132kV pole-line conductor in the SPM area. To address this, SPEN has undertaken a 'bulk update' using agreed business rules applied to spatial queries to determine if a line is attached to a pole or a tower using.

This was further in improved through the application of manual rules to determine the 'tower' or 'pole' designation of 132kV lines. The result was dramatic increase in the number of 132kV tower lines in SPM, and a reduction in 132kV pole lines in SPM.

3.4.3 LV U/G Main (paper): the move from bit-map images to vector graphics

The gradual move from 'bit-map' (raster) images for cable records to higher quality vector graphics has enabled a far more accurate assessment of circuit lengths – particularly for LV cables – which had previously been estimated and over-stated.

3.4.4 Misallocation of EHV circuit breakers between SPD and SPT asset registers

Work to clarify the ownership of assets at the SPT/SPD boundary led to the reallocation of approximately 200 circuit breakers, most of which were EHV, from the SPD asset register to the SP Transmission asset register.

3.4.5 Double-counting of HV ground-mounted switches

Ground-mounted 11kV switches were overstated in both SPD and SPM due to the double-counting of pole mounted switches. The requirement to segregate pole mounted from ground mounted 11kV switches was only partially completed. A new asset category of 11 kV pole mounted switches was created (still to be validated as Priority 3) although the total number of GM switches was not reduced accordingly resulting in the double counting of 'pole-mounted' switches in the 'ground-mounted' category.

3.4.6 33kV Ground-mounted switches missing from asset register

A significant number of 33kV ground-mounted switches were found to be missing from the asset registers. Of the 2,260 omitted, approximately 60% were in SPD and 40% in SPM. The problem was that the operational system used before PowerOn (Thales NMS) was not synchronised with the SAP asset

register. This only became apparent with synchronisation between PowerOn and SAP and subsequent interrogation of the previous SCADA system as part of the exception investigation process.

3.5 Review of specific asset categories (‘deep dives’)

Ten 'deep dives' were carried out following the selection of specific asset categories as outlined in Section 2.2. The aim of these 'deep dives' was to scrutinise the procedures adopted to see if they were rational and capable of producing accurate network size amendments.

3.5.1 SPEN methodology

The review has focused on the number of exceptions recorded and the changes in exceptions between January and April 2013. In some instances, particularly with P1 assets, the validation work undertaken by the NDIP Data Quality project team has built on progress previously made by the SPEN Data Management group.

Exceptions were classified as 'valid', 'invalid' or 'site visit'. Valid exceptions were of most interest as these were deemed 'valid' for the network size count, whereas 'invalid' exceptions were of less concern for this particular exercise. 'Site visit' acted as an indicator to conduct further research on an asset to help classify it as 'valid' or 'invalid'. An escalation procedure is in place for 'site visit', ranging from conducting further desktop research to carrying out a physical inspection as appropriate.

For each of the focused ('deep-dive') reviews, the logic of the business rules created was evaluated and individual assets were selected at random to ascertain whether or not the rules had been successfully applied.

3.5.2 Summary of findings

In this section we present a summary of the analysis of the focused ('deep-dive') reviews. The information presented aims to provide views on the following:

- the extent to which asset information across key systems aligns (synchronises) - leading to a 'valid' asset count
- the number of exceptions generated as a result of the information not aligning across key systems - leading to an initial assessment of the asset count being 'invalid'
- a breakdown of the 'invalid' results in terms of contributing systems and factors (where the information was available)
- the change in the number of exceptions generated between the synchronisation run in January 2013 and that in April 2013 (where the information is available)[18]

Comparable figures are presented where appropriate numbers have been made available as part of the focused review process.

[18] Changes in the number of exceptions generated between January 2013 and April 2013 are due not only to exceptions addressed as part of the NDIP Data Quality project, but also all of the changes to the underlying data which occurred as part of business-as-usual in the three months between January and April 2013. Nevertheless, it is felt that this is a valid indication of the appropriateness of the business rules and also the extent to which the business is successfully addressing the root cause of the exceptions, as defined.

Understanding this section

This section set out summaries of the PA findings of the focused reviews by asset category. There are several different approaches associated with the 'deep-dive' reviews reflecting (i) the type and extent of information available for the particular asset; and (ii) the methodology adopted by the NDIP Data Quality project team to identify and resolve issues and exceptions.

Where a 'validated asset count' column is presented then this represents the number of individual asset items whose key information attributes either:

- align across systems (as in the case of plant items), or
- are deemed to be correct by virtue of the validity of several key fields in the asset's master database (as in the case of lines and cables)[19].

'Exceptions' are generated when the abovementioned validation conditions do not occur and these form the basis for the subsequent analysis and investigation by the NDIP Data Quality project team. All exceptions are processed or considered and are subsequently determined either to be 'valid' - in which case they are included in the regulated asset count - or 'invalid', in which case they are not. The determination is made either through the application of business rules or through further detailed investigation, or both[20].

Also reviewed are the number of exceptions recorded for the asset category at two different times: during the synchronisation run in January 2013, and during a second run in Aril 2013. It should be noted that normal business operations continued in the three months between the two synchronisation operations and this will modify the underlying information held in the master systems.

Low Voltage Underground Cable (SPD)

SPEN appears to have made favourable progress in this asset category; the length of exceptions has fallen by almost 60km and an additional 28km has been validated between January and April 13. Only approximately 1% (1.18%) of the total LV underground cable asset in SPD had attributes in ESRI which were deemed not to be valid. The majority of exceptions generated were due to invalid feeder identifiers; most of these were subsequently validated following NDIP review. All cables marked in ESRI as being 'consumer-owned' were investigated as part of the validation process. In the majority of cases[21] investigations by the NDIP Data Quality project team confirmed the cables as being 'consumer-owned' and discounted them from the regulated asset count (status 'invalid').

PA reviewed five 'consumer-owned' exceptions in this category. In two cases the NDIP Data Quality project team review found that the cables were Scottish Power-owned and not consumer-owned and were therefore deemed valid for the purposes of determining the regulated LV cable asset count. It was noted, however, that the required changes had not yet been made to ERSI where the cables continued to be identified as being 'consumer-owned'. In one case, subsequent consideration by the SPEN team confirmed that the cable was 'consumer-owned' and therefore 'invalid' in terms of regulated asset count.

In one further case, records showed NDIP Data Quality project team investigation as determining a cable not to be 'consumer-owned' and therefore validated to be count as part of the SPEN cable asset base. However, further examination during the audit revealed the cable to be surrounded by 'consumer-owned'

[19] For example, in the case of LV main cables initial synchronisation is achieved provided that in ESRI the asset is recorded as (i) being owned by Scottish Power asset; (ii) being in a 'commissioned' state; and (iii) having a valid Feeder ID.

[20] It should be noted that exceptions for cables and lines are measured in linear length (km) and can therefore be non-integer values, whereas exceptions for unit items such as transformers and switchgear can only be integer values.

[21] 81.5% in January 13 and 97.8% in April 13.

cables and therefore suggesting that it was not SPEN-owned. This observation was confirmed and agreed by the NDIP Team Leader. It was noted that this apparent incorrect assessment had also been confirmed by an independent member of the team via the quality control process.

The NDIP Data Quality project Team Leader later confirmed that a general error with Consumer Owned data items had been identified through the verification process. This affected a number of objects particular to LV UG Cable. PA was subsequently advised that all errors have now been rectified.

33kV Underground Cable (SPD)

This category refers all 33kV cable type in SPD - including paper insulated, plastic insulated and all non-pressurised cable systems.

Some work to validate 33kV underground cable length in SPD was undertaken by the SPEN Data Management team in 2012, prior to the commencement of the NDIP Data Quality project team in January 2013.

The ability to model EHV connectivity (as for HV and LV circuits) is not yet available in ESRI but there are plans to implement this within the next 18 months, which necessitated the use of a full manual trace to gauge network size.

The deep-dive review on this asset revealed some conflicting logic with regard to 'valid' and 'invalid' categorisation. This could be a potential source of confusion, but was deemed by the PA review team to have been correctly interpreted for the assessment of network size.

The use of both 'network length' and 'circuit length' in determining asset count also has the potential to lead to the miscalculation of network size. This potential confusion is exacerbated by the various permutations and combinations of number of conductors per phase, number of phases and number of conductors. Notwithstanding this, PA has been unable to identify any material errors as part of its focused review and considers the revised asset count accurate.

6.6/11kV Ground-Mounted Switchgear (SPD)

Some work to validate HV ground-mounted switchgear in SPD was undertaken by the SPEN Data Management team in 2012, prior to the commencement of the NDIP Data Quality project team in January 2013. NDIP Data Quality project team undertook a comparison between the exception reports generated by the Data Management team and the exceptions generated by the initial NDIP Data Quality process.

6.6/11kV switchgear data is 'mastered' in SAP. Exception reports are generated by first attempting to synchronise the asset 'Energy Networks Identifier' (ENID). Commissioned status and then geographical location field are used as second and third synchronising parameters respectively.

In some examples examined by PA it was found that the asset status was 'not-commissioned' in SAP but was 'commissioned' in PowerOn. Further examination of PowerOn revealed that although the asset has 'commissioned' it also has 'not connected' status in PowerOn. The result was that the asset was correctly counted as 'invalid' and excluded from the regulated asset count. The exception excluded from the April 13 exception reporting and so PA is satisfied that the 'fix' has been correctly applied and/or the actual status of the asset has changed as part of business-as-usual processes.

Discounting new exceptions introduced between January and April 2013 PA observes that a significant fall in the number of exceptions in this asset category has been achieved.

33kV Ground-Mounted switchgear (SPD)

The level of detail available from January 2013 made it more difficult to track progress made. SPEN was unable to demonstrate progress due to system limitations preventing data correction or fixes to be conducted on the valid assets. Interestingly there were 35 fewer synched items between January 2013

and April 2013. However, significant progress is being made with cleansing actions taking place for over 75% of assets. Investigating a random sample of assets validated that relevant amendments had been implemented; however, restricted access to PowerOn prevented further dives from taking place.

PA notes that a significant issue associated with this asset category was the definition of a switch and when it is valid to count a switch as a separate asset item (as opposed to a switch which is integral to another plant item). PA understands that SPEN Asset Management team has made the decision that all indoor switches should be considered integral to the indoor circuit breaker (where appropriate) and therefore not counted as a separate asset. Outdoor switches however, should be counted as separately identifiable assets. PA believes this to be a reasonable assumption and notes that it is a definition which is both easily understood and implemented. PA notes that this business decision has yet to be reflected in business systems and so continues to be a source of non-synchronisation.

33kV Pole-Mounted transformer (SPD)

The symbology available in PowerOn does not allow full synchronisation with SAP as SAP does not have the voltage-transformer (VT) classification to be able to reconcile and synchronise. This has hindered progress as only 2 assets were synchronised in both January and April, with no changes made in the interim. The PA review brought about results which were both expected and considered reasonable.

6.6/11kV underground cable (SPM)

There has been little change in the synched length of 6.6/11kV UG cable and progress has been confined to Feeder ID Null and 'out-of-use' (OOU) type exceptions. A random investigation of specific assets produced results which were both expected and, considered by PA to be, reasonable for the purposes of validating the regulated HV cable length in the SPM area.

132kV Tower (SPM)

A limited amount of prior validation work was undertaken by the SPEN Data Management team but this was not used by the NDIP Data Quality project team due to formatting difficulties.

173 of the 185 exceptions generated in ESRI were due to a reporting failure. All of these errors were subsequently confirmed as being valid in terms of inclusion in the 132kV tower regulatory asset base. All four SAP errors were the result of replacement towers having new Energy Identifiers (ENID) with the existing ENIDs decommissioned in SAP. These were all confirmed to be invalid and rightfully not included in the asset count. Six of the 12 remaining ESRI exceptions were confirmed to be 'consumer-owned' and therefore invalid (confirmed by site visit) and excluded from the count. Four were the result of incorrect voltage designation and were changed and marked as 'valid'. One of the remaining two was without route ID but subsequently confirmed valid and the final ESRI exception was confirmed to be out of use - again, confirmed by site visit.

The number of synchronised assets fell slightly, but the number of exceptions grew, although the magnitude of change is marginal at best. A random examination of assets produced results as expected.

132kV Overhead Line Conductor (SPM)

A review of the initial data set for 132kV overhead line conductor in SPM was undertaken. This conductor has been classified by the NDIP Data Quality Workstream as Priority 1 assets.

January data was not available for review due to the previous inability to distinguish between poles and towers. To address this, a bulk update was completed using agreed business rules to determine if a line was attached to a pole or a tower using spatial queries. Appropriate attributes were added in March 2013. The creation of the initial data set showed that there is a greater length of mixed line than tower line. A random examination of assets produced results as expected and considered, by PA, to be reasonable.

132kV Underground Cable (SPM)

Inconsistent statistics between network and circuit lengths make comparisons between January and April 2013 difficult. However, from a position of no synchronisation, there is now over 60km of synchronised circuit cable. Dives brought about expected results.

The number of exceptions has seen a minor fall with the most significant changes realised in SAP. A random investigation of specific assets produced expected results.

3.5.3 Recommendations

During the course of these deep dive reviews, a number of potential refinements were identified which could improve the robustness of the process in future. These included:

- The use of drop down menus with pre-defined comments to enable consistent exception resolution.
- Embedding knowledge of business rules and standardisation of practices across SPM and SPD should ensure that large changes to network size don't become a repeated occurrence.
- Exceptions which require amendments to information contained in master systems should be carried out promptly to ensure that the wider business has access to the changes. From a NDIP process perspective this will also simplify exception remediation by reducing the occurrence of repeat exceptions in future synchronisation runs.

4 CONCLUSIONS

Asset information is central to investment decision-making in the SPEN network. Good quality information – that is, information that is accurate and complete – leads to network investment which is both prudent and efficient. The case for SPEN to improve the quality of its asset information is clear, and is supported by external stakeholders.

In broad terms, the business case for asset improvement projects such as NDIP is self-evident for as long as the value of the information collected outweighs the cost of collection (including storage, management and upkeep). PA's conclusions are provided in the following sections:

- Methodology and approach to network size amendments;
- Implementation and execution; and
- Overall validity of outputs.

Overall PA believes that the changes to asset volumes identified and implemented so far by SPEN provide a more accurate statement of network size in both the SPD and SPM areas and that this situation will improve further as the data quality projects progress further. PA's more detailed conclusions regarding the various aspects of this review are provided below.

4.1 Methodology and approach to network size amendments

Following its review, PA has been able to reach the following conclusions with regards to the overall methodology adopted by SPEN in its approach to re-assessing the size of the distribution network.

4.1.1 The use of existing data in SPEN's asset information systems provides a reliable basis for re-estimating network size

A key assumption in the SPEN asset information validation process is that data contained within the existing asset information systems provides the most reliable basis for assessment and determination of the number and type of assets which together represent the regulated SPEN network. PA agrees with this approach. Alternative approaches, including a full re-assessment of asset population would be impractical and costs would far outweigh any potential benefits to customers.

4.1.2 Comparing asset information across multiple systems represents a pragmatic means of validating source data

The concept of comparing information across multiple systems as the primary means of validating asset data is, in the opinion of PA, reasonable given the over-arching aim of achieving an improvement in the

quality of asset information in a comparatively short time frame[22] and the likely cost-benefit equation of alternative approaches.

Whilst we note that any systemic or historical errors in the data set which may have been replicated across information sources in the past would not be captured by this approach, we do accept that it does represent a reasonable starting assumption for a data validation process. We therefore believe that it is reasonable to assume that asset information which aligns across data systems is valid and is therefore a prudent and cost efficient approach within the context and aims of SPEN's data improvement efforts.

4.1.3 Prioritising assets for the initial review of network size has proven effective

The prioritisation of effort for the review of network size - into 'P1' and 'P2' assets - has enabled early improvements to be captured for the most significant asset categories for inclusion in the 2013 RRP submission to Ofgem.

PA supports this targeted approach and the defined selection process for the identification of priority assets.

4.1.4 The underlying objective to improve asset data quality has been reinforced through senior management commitment to the project

It is clear from PA's review that the requirement to improve the management of asset information within SPEN has received support and commitment from senior management. This is evidenced by a robust governance framework, commitment of a significantly sized full-time team and regular formal reports to SPEN Directors.

PA found that the Network Data Improvement Programme has recognition and profile within the SPEN organisation. Improving the quality of network information appears also to have broad support within the business.

4.2 Implementation and execution

Following its review, PA has been able to reach the following conclusions with regards to the implementation and execution by SPEN in its approach to re-assessing the size of the distribution network.

4.2.1 The processes adopted rely on multiple manual interventions with inherent risks of operator errors

PA notes that the process adopted by the NDIP Data Quality project team has a high level of manual involvement. Much of the initial data manipulation and data analysis is undertaken manually using report extracts and spreadsheets. Almost all 'further investigation' associated with exceptions and data anomalies are undertaken manually. Many of the business rules used to resolve exceptions are also applied manually or mechanistically – most notably where qualitative or subjective assessment of geo-schematic information contained within ESRI is required.

PA observes that the numerous business rules are captured, manually in a variety of spreadsheet formats and that there may be some value in consolidating the rules in a common format and in a single repository. This might help minimise the likelihood of errors, promote alignment of approach across asset

[22] A short timeframe compared to the time period over which SPEN asset information has been developed and captured.

classes (where possible) and also provide a more robust basis for future promulgation of the business rules through the broader SPEN business.

Whilst there may be some benefits associated with this manually intensive methodology to data quality improvement and, in many cases, no other economic option, this can, in the experience of PA, lead to a higher probability of errors and mistakes occurring. PA notes that SPEN does have measures in place to control this risk – through a formal Quality Control process for example.

4.2.2 Ensuring that revised asset volumes are accurately captured in updated source data systems

The Data Quality Initiative within the Network Data Improvement Programme is focused on determining a more accurate assessment of network size, as a separate and parallel exercise to business as usual processes. Providing an up-to-date and accurate count of the SPEN distribution network assets appears to be the main priority of the NDIP Data Quality project. A key driver for this is the requirement to submit details of asset volume, by asset type, to Ofgem on an annual basis. However, in addition to providing a more accurate assessment of network size, PA observes that the Network Data Improvement Programme has a broader remit to improve the management of asset data within the SPEN business. PA's view is that timely and accurate remediation of data issues in key information systems - which have been highlighted through the Data Quality efforts to confirm network data size – is an important part of the broader data quality issue. Moreover, not doing so may result in future inefficiencies through rework of exceptions and information inaccuracies.

PA is of the view that whilst significant effort is being expended by SPEN on 'getting the right numbers' in the short-term, there will need to be increased focus on ensuring that all changes are reflected in source systems in a timely manner[23].

4.2.3 Increased emphasis on addressing the causes of data errors through policy and process improvements

In the short time of the review, PA was unable to identify any significant measures aimed at addressing the root cause of business-generated exceptions (rather than IT-generated exceptions) through, for example, changes to internal policies, processes and guidelines in the broader business. We do note however that the business is deploying a process improvement specialist ('Black Belt') aimed specifically at ensuring that the NDIP outcomes are integrated with the broader business.

4.3 Overall validity of outputs

PA is of the view that good quality asset information is critical, not just for regulatory submissions, but for prudent and efficient investment decision-making within the SPEN business.

4.3.1 Asset volumes have been revised according to a reasonable and pragmatic assessment methodology

The approach taken by SPEN, a comparison of the information contained within its master IT systems, is reasonable and is likely to yield asset volume results which are more accurate that those previously determined through the simple use of additions and disposals based on a legacy view of asset size.

[23] For example, a business decision made that all outdoor 33kV switches will be treated as separate assets and all indoor switches will not, is still not reflected in PowerOn and/or SAP and so still flags as exception when systems are synchronized.

4.3.2 Tower Line conductor length in SPD represents the largest per unit change

The ten-fold increase in the revised assessment of 33kV OHL Tower Line conductor length in SPD represents the largest per unit change. However this large percentage change, based on a small initial asset population, is largely offset by a corresponding reduction in 33 kV pole line conductor length caused by an initial misallocation of conductor length to pole circuits so the net change is relatively small.

4.3.3 The two largest percentage reductions are in the SPM

The two largest percentage reductions are in the SPM and represent 81% and 80% associated with 6.6/11kV ground mounted switches and 132kV pole line conductor respectively. However, the reduction in the number of 11 kV ground mounted switches is largely attributable to double counting of pole mounted switches incorrectly included within this asset category. The reduction in SPM 132 kV pole line conductor is largely linked to a corresponding increase in 132 kV tower line conductor which was inadvertently classified a pole supported previously.

4.3.4 The majority of MEAV increases occur in the SPM area

The vast majority - approximately 80% by value - of the total (absolute) MEAV increase associated with the top ten asset categories, are in the SPM area; with 132kV towers and tower line conductor alone adding £181m to the revised assessment of MEAV. Conversely, almost two thirds (63%) of MEAV reductions are in the SPD area.

These changes are in the context of a total reduction in SPD MEAV of <£400m on a revised total MEAV of £6bn. The total reduction in SPM MEAV is <£150m on a revised total MEAV of £6bn.

4.4 Summary of reasons for major asset volume variances

SPEN has identified a number of important issues which have materially contributed to some of the variances and are worthy of specific mention. These are summarised in Table 4.

Table 4 – Summary of key reasons for major variances

Asset category	Location	Variation type	Reason for variation
33kV cables	SPD	reduction	Use of 'network length' instead of 'circuit length' for cable volumes.
132kV tower-line conductor	SPM	increase (towers) reduction (poles)	Ability to identify tower lines versus pole lines.
LV U/G main (paper)	SPD SPM	reduction	The move from bit-map (raster) images to more accurate vector graphics.
EHV CB	SPD	reduction	Incorrect allocation to SPD and subsequent correct allocation to SP Transmission
HV ground-mounted switches	SPD	reduction	Correction of an over-estimation due to double-counting pole-

	SPM		mounted switches by continuing to include in ground-mounted definition.
33kV ground-mounted switches	SPD SPM	increase	Old SCADA system did not synchronise with SAP; assets become evident through PowerOn synchronisation with SAP.

5 RECOMMENDATIONS

Following its review, and in the light of the Conclusions set out in Section 4, PA makes the following recommendations.

5.1.1 Assess opportunities to reduce the manual manipulation of data

Reducing the amount of manual manipulation of data has the potential to save time, reduce errors and introduce a greater level of internal consistency in the results.

5.1.2 Undertake regular audits of exception investigations to ensure the robustness of the QC process

The Quality Control (QC) process is a critical safeguard against material error in a manual-intensive data cleansing processes. The quality of the QC system should be audited frequently and independently to protect against erosion of the project value.

5.1.3 Develop a central repository for all business rules

PA observes that the numerous Business Rules developed through the NDIP Data Quality process are captured, manually, in a variety of spreadsheet formats. PA recommends that SPEN considers the merit of consolidating the rules in a common format and in a single repository. This could help minimize the likelihood of errors, promote alignment of approach and consistency across asset classes (where possible) and also provide a more robust basis for future promulgation of the business rules through the broader SPEN business.

5.1.4 Ensure that SPEN retains the knowledge and expertise developed in the Data Quality workstream

PA recognises the extent of external contractor support on the Data Quality workstream and recommends that formal processes are introduced to ensure that knowledge and intellectual property are captured by SPEN ahead of termination of contractors and contract teams. This will serve to maximise the return on the project's investment and also minimise forward risks associated with data management in SPEN.

5.1.5 Review the value of updating changes rapidly within asset information systems

Consider the merit of reflecting any newly validated asset information, remediation actions or 'fixes' in the source asset data systems more quickly than occurs at present. It is suggested that a cost-benefit

assessment be undertaken to determine the optimum timing for the update of systems and that these timings be captured in a set of internal service standards which form part of the project KPIs.

5.1.6 Address the causes of data errors through asset management policy and process improvements

PA recommends that any identified sources of error in processes, policies or procedure in the broader network business are captured and addressed through appropriate business process improvement actions.

PA notes both the remit of the broader Network Data Improvement Programme and the involvement of a process ‘black-belt’ and recognises the importance of this in capturing the full value of the work being undertaken in the Data Quality workstream – in particular, that of the (Eurocentral) project team.

APPENDICES

A OVERALL CHANGES IN PORTFOLIO

Below we provide some additional charts associated with overall changes in volume and in MEAV resulting from SPEN's re-valuation of network size.

Figure A1 - Top 10 percentage increase in MEAV

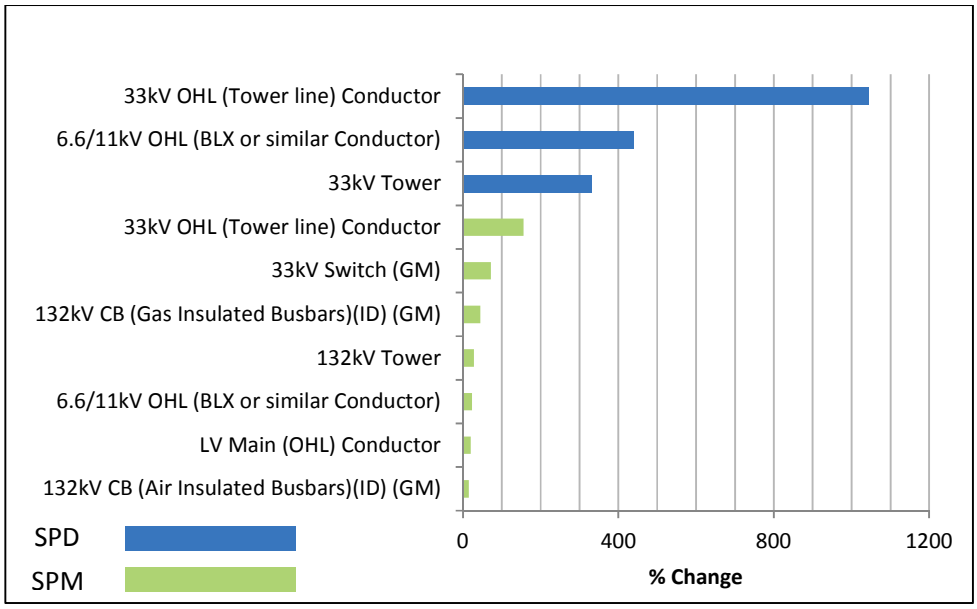


Figure A2 - Top 10 percentage decrease in MEAV

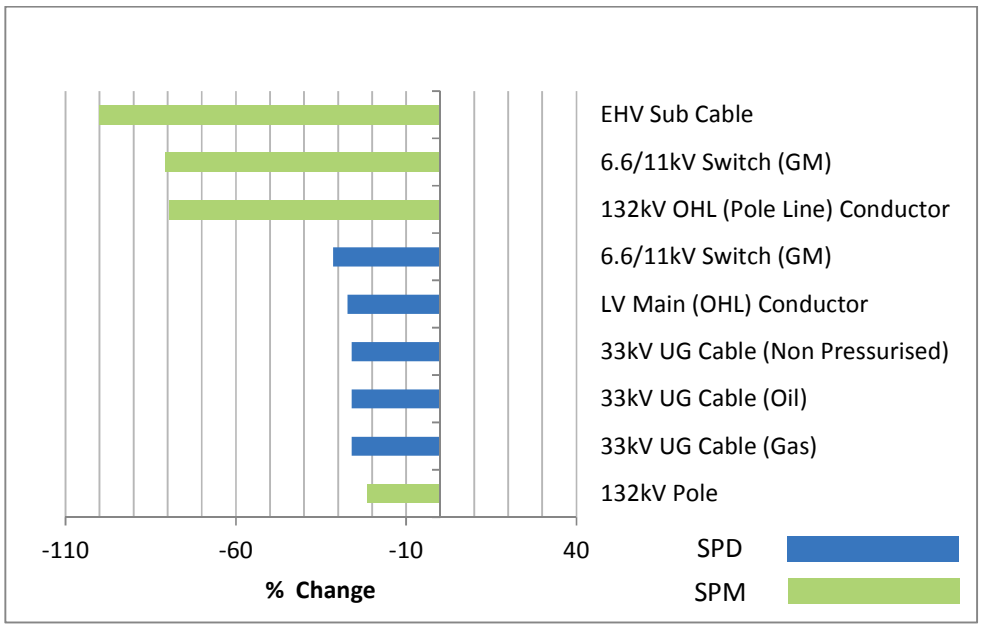


Figure A3 - Top 10 increases by volume (SPD)

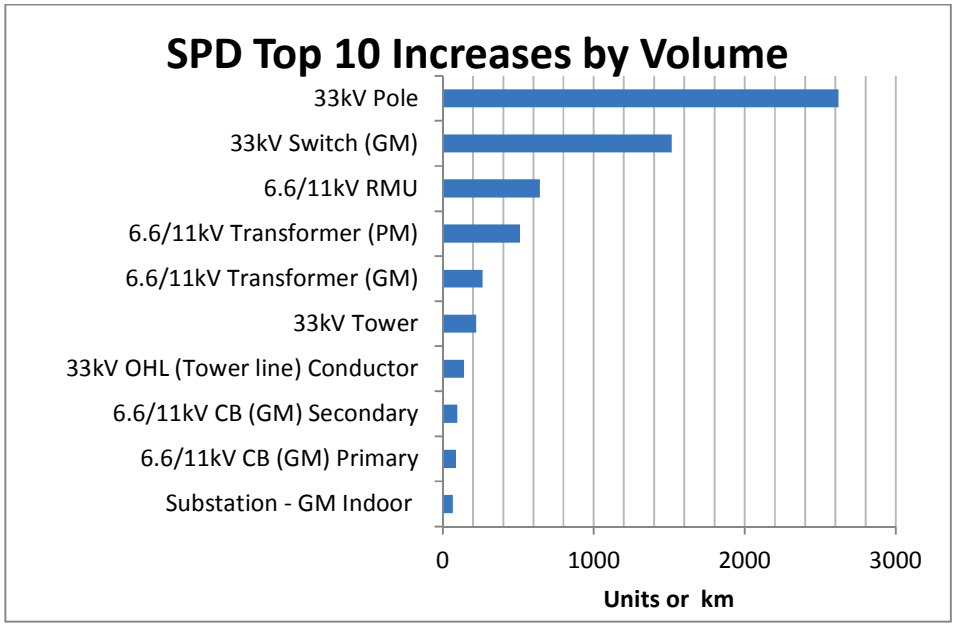


Figure A4 - Top 10 decreases by volume (SPD)

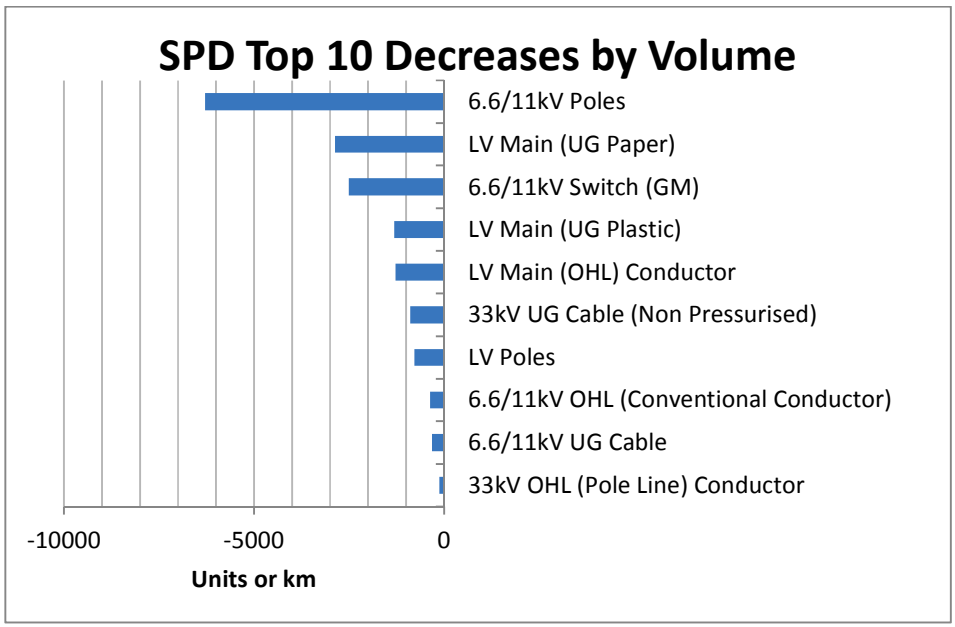


Figure A5 - Top 10 increases by volume (SPM)

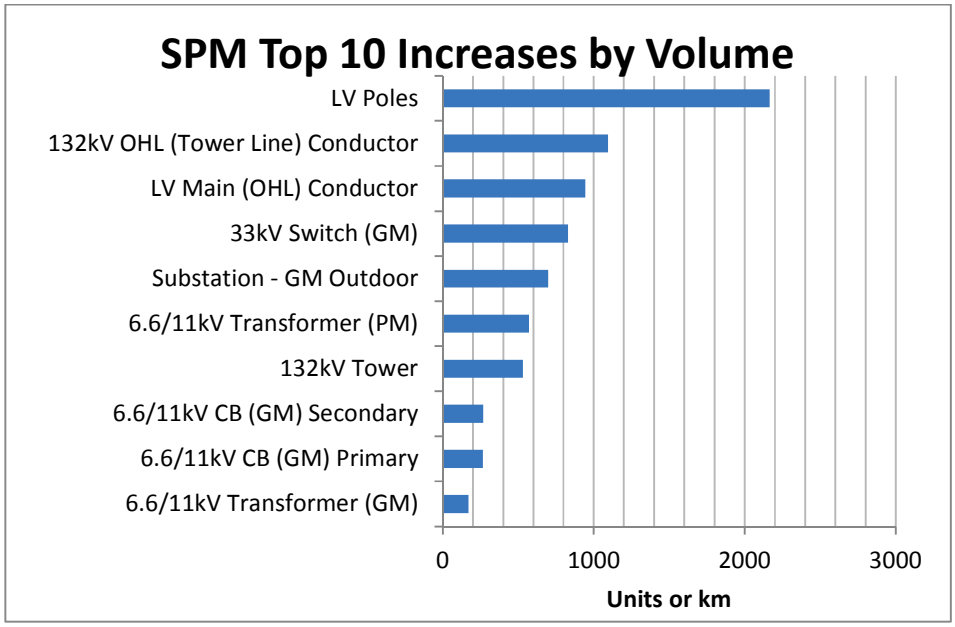


Figure A6 - Top 10 decreases by volume (SPM)

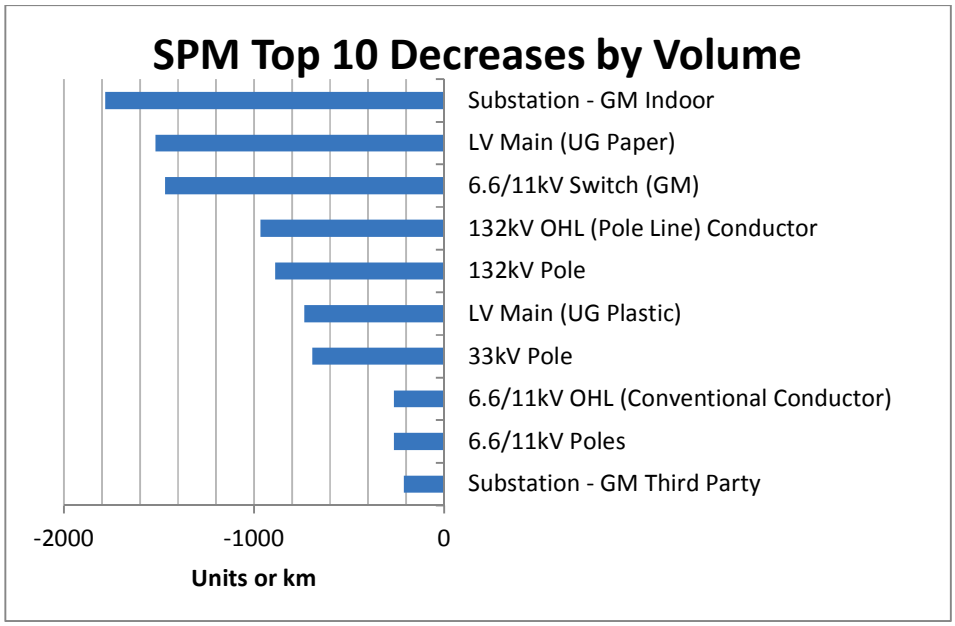


Figure A7 - Top 10 percentage decreases by volume (SPD)

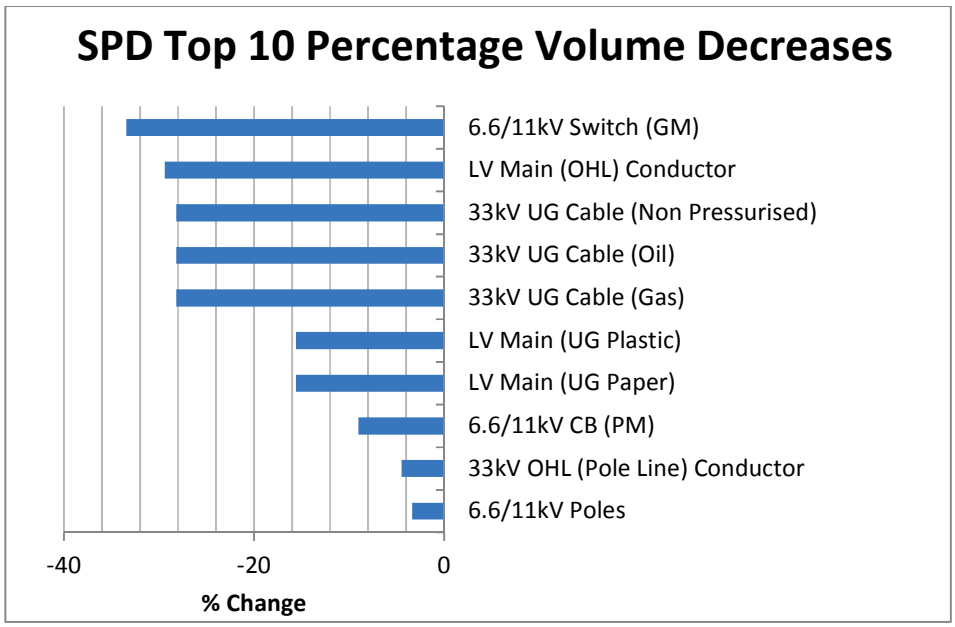


Figure A8 - Top 10 percentage increases by volume (SPD)

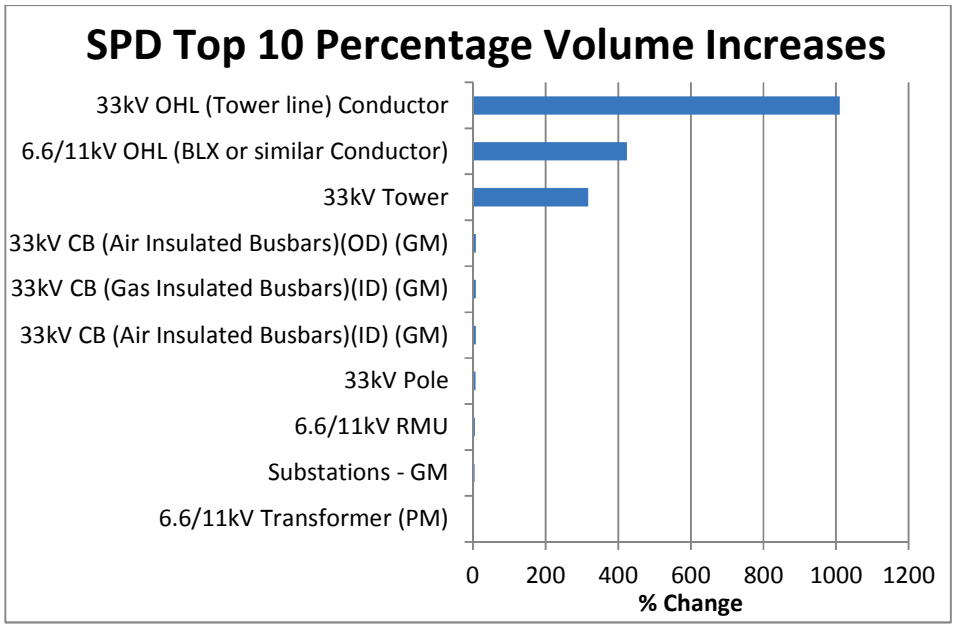


Figure A9 - Top 10 percentage decreases by volume (SPM)

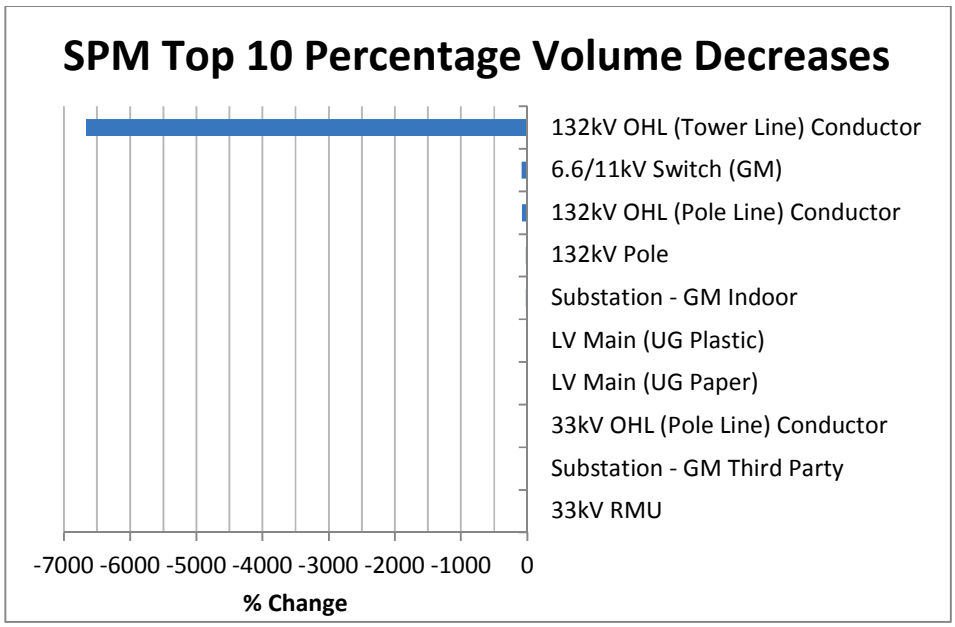


Figure A10 - Top 10 percentage increases by volume (SPM)

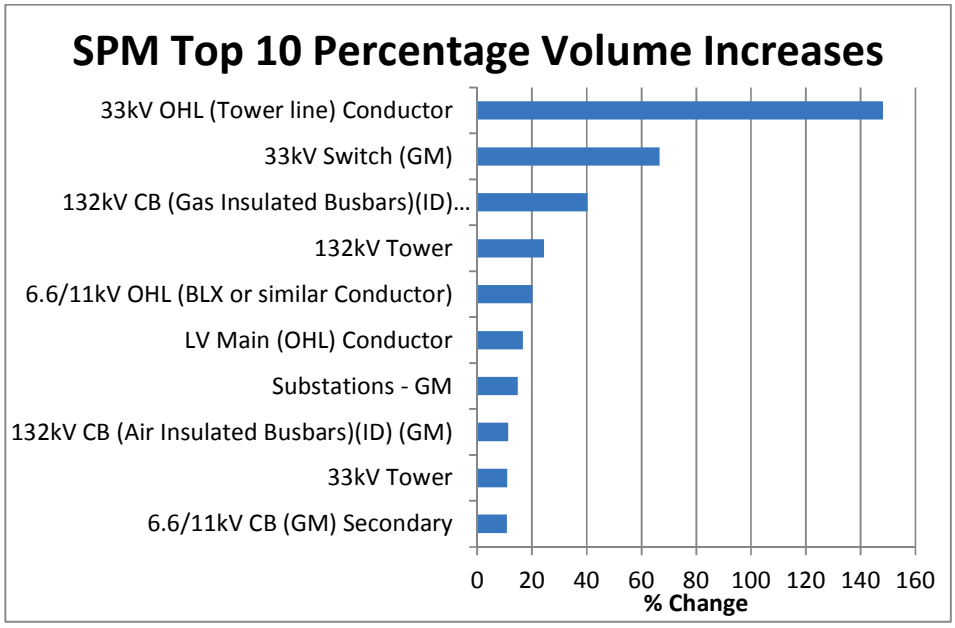


Figure A11 - Top 10 decreases in MEAV (SPD)

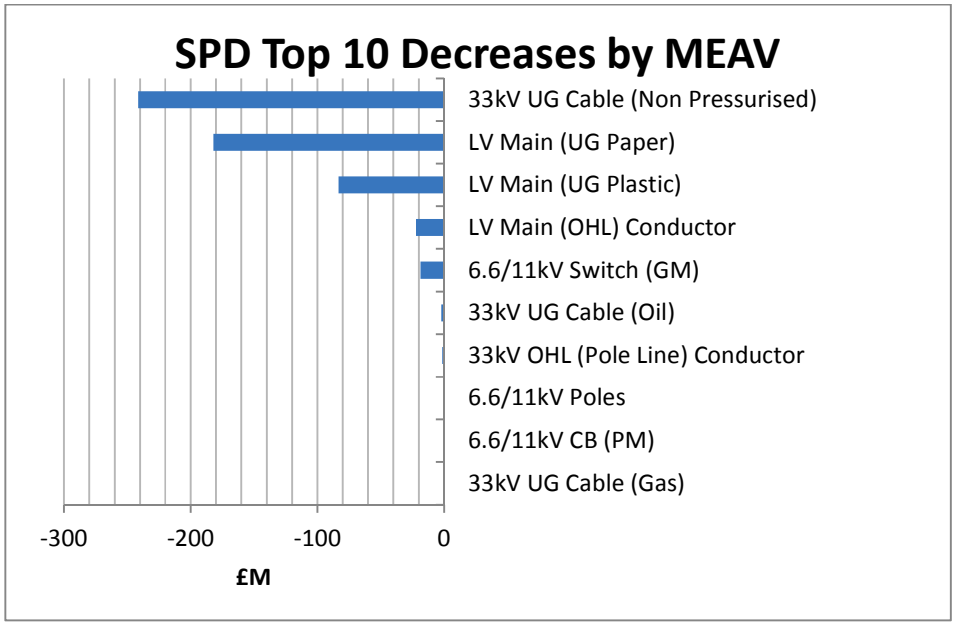


Figure A12 - Top 10 percentage decreases in MEAV (SPD)

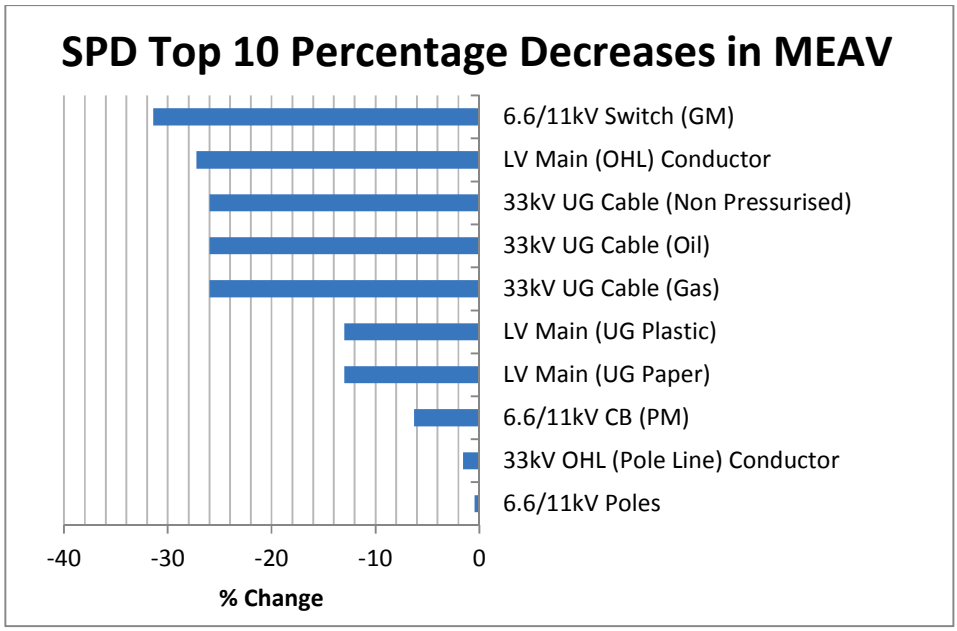


Figure A13 - Top 10 increases in MEAV (SPD)

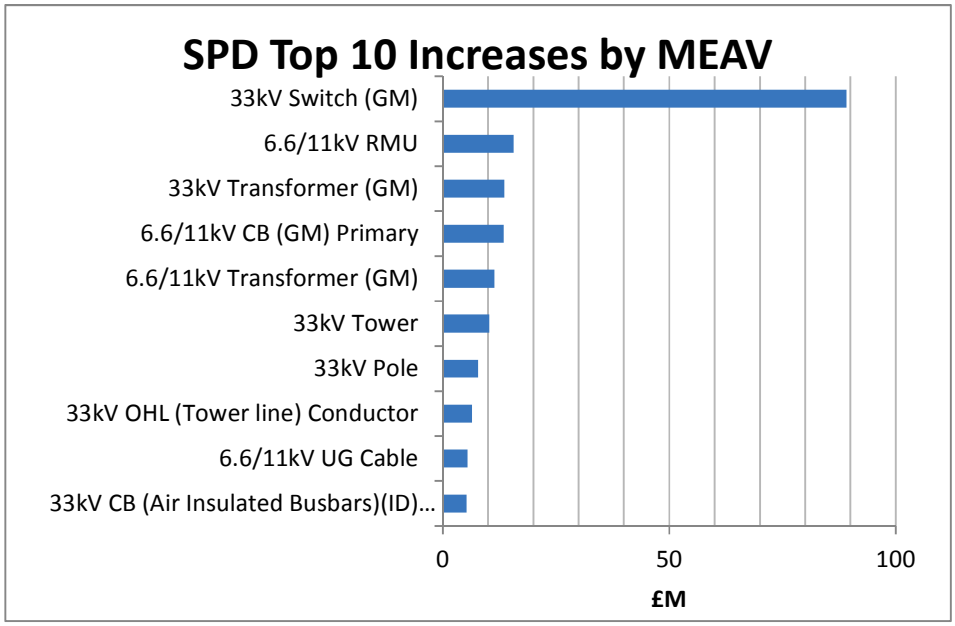


Figure A14 - Top 10 percentage increases in MEAV (SPD)

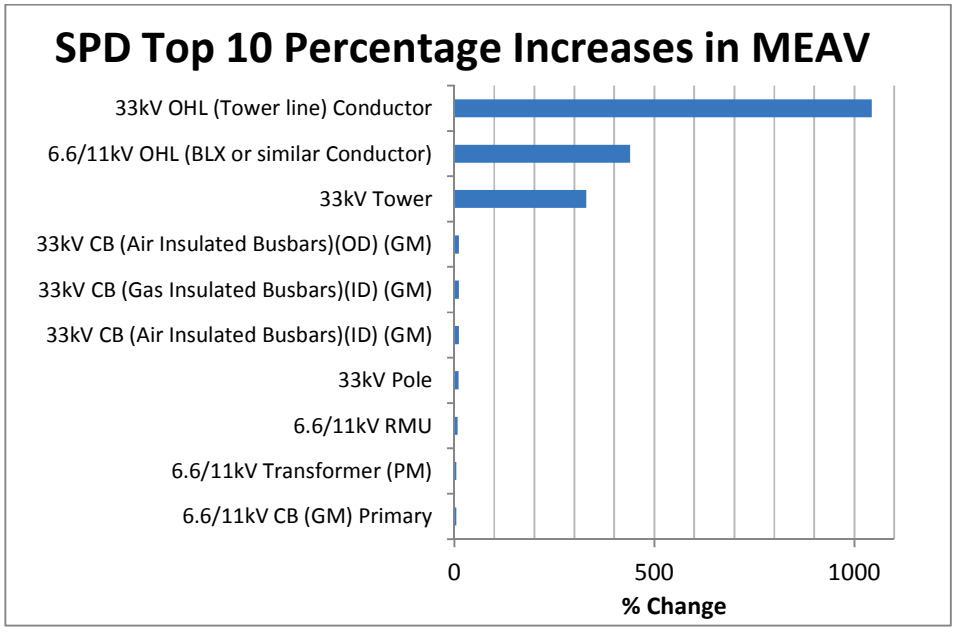


Figure A15 - Top 10 percentage increases in MEAV (SPM)

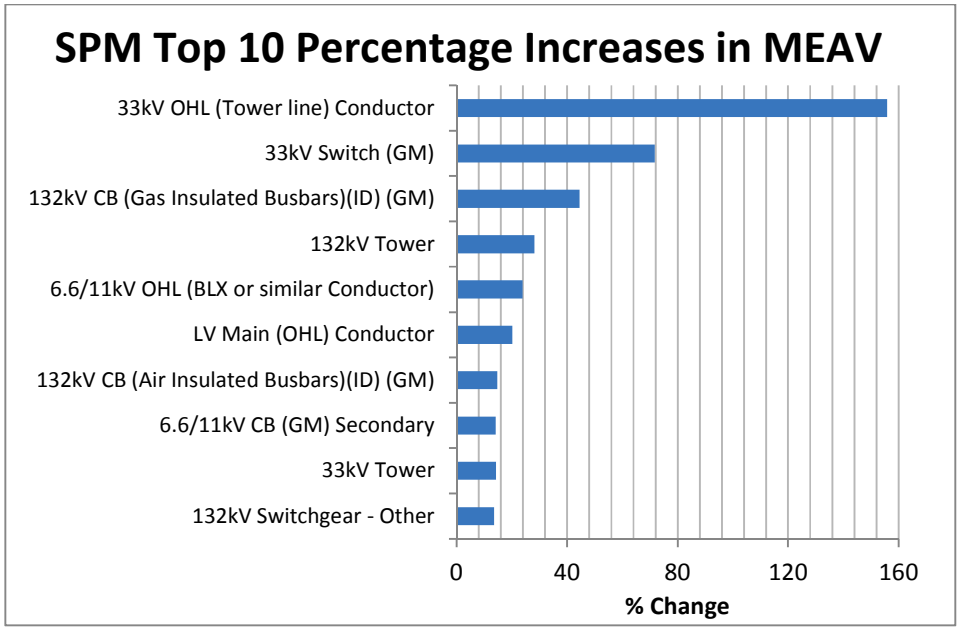
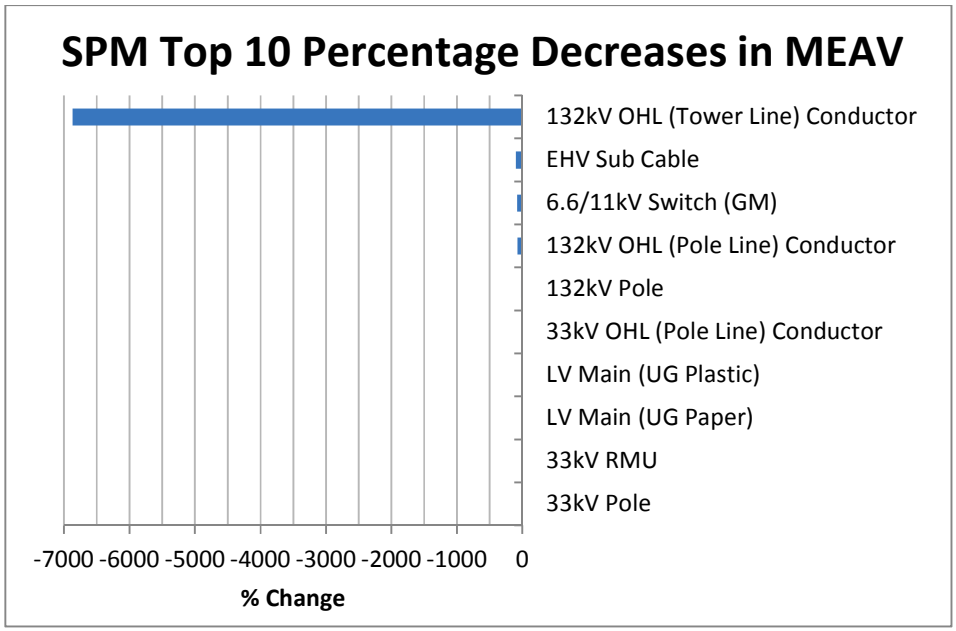


Figure A16 - Top 10 percentage decreases in MEAV (SPM)



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