



**Document 11**  
**Asset Category – Services and Terminations**  
**EPN**

Asset Stewardship Report  
2014

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**Document History**

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## Preface

UK Power Networks uses Asset Stewardship Reports ('ASR') to describe the optimum asset management strategy and proposals for different groups of assets. This optimised asset management strategy and plan details the levels of investment required and the targeted interventions and outputs needed. Separate ASRs define the most efficient maintenance and inspection regimes needed and all documents detail the new forms of innovation which are required to maximise value, service and safety for all customers and staff throughout the ED1 regulatory period. Outline proposals for the ED2 period are also included.

Each DNO has a suite of approximately 20 ASR's. Although asset policy and strategy is similar for the same assets in each DNO the detailed plans and investment proposals are different for each DNO. There are also local issues which must be taken into account. Accordingly each DNO has its own complete set of ASR documents.

A complete list of titles of the ASR's, a summary of capex and opex investment is included in '**Document 20: Asset Stewardship Report: Capex/Opex Overview**'. This document also defines how costs and outputs in the various ASR's build up UK Power Networks 'NAMP' (Network Asset Management Plan) and how the NAMP aligns with Ofgem's ED1 RIGs tables and row numbers.

Where 'HI' or asset 'Health Index' information is included please note predicted ED1 profiles are before any benefits from 'Load driven investment.'

This ASR has also been updated to reflect the feedback from Ofgem on our July 2013 ED1 business plan submission. Accordingly to aid the reader three additional appendices have been added. They are;

1. **Appendix 8 - Output NAMP/ED1 RIGS reconciliation:** This section explains the 'line of sight' between the UKPN Network Asset Management Plan (NAMP) replacement volumes contained in the Ofgem RIGS tables. The NAMP is the UKPN ten year rolling asset management investment plan. It is used as the overarching plan to drive both direct and indirect Capex and Opex interventions volumes and costs. The volume and cost data used in this ASR to explain our investment plan is taken from the UK Power Networks NAMP. Appendix 8 explains how the NAMP outputs are translated into the Ofgem RIGS tables. The translation of costs from the NAMP to the ED1 RIGS tables is more complex and it is not possible to explain this in a simple table. This is because the costs of a project in the 'NAMP' are allocated to a wide variety of tables and rows in the RIGS. For example the costs of a typical switchgear replacement project will be allocated to a range of different Ofgem ED1 RIGs tables and rows such as CV3 (Replacement), CV5 (Refurbishment) CV6 (Civil works) and CV105 (Operational IT Technology and Telecoms). However guidance notes of the destination RIGs tables for NAMP expenditure are included in the table in the Section 1.1 of the Executive Summary of each ASR.

- 2. Appendix 9 – Material changes since the June 2013 ED1 submission:** This section shows the differences between the ASR submitted in July 2013 and the ASR submitted for the re-submission in March 2014. It aims to inform the reader the changes made to volumes and costs as a result of reviewing the plans submitted in July 2013. Generally the number of changes made is very small, as we believe the original plan submitted in July 2013 meets the requirements of a well justified plan. However there are areas where we have identified further efficiencies and improvements or recent events have driven us to amend our plans to protect customer safety and service.

We have sought to avoid duplication in other ED1 documents, such as ‘Scheme Justification Papers’, by referring the reader to key issues of asset policy and asset engineering which are included in the appropriate ASR documents.

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## 1.0 Executive Summary EPN Services and Terminations

### 1.1 Scope

This document details UK Power Networks' non-load related expenditure (NLRE) replacement proposals for services and service terminations for the RIIO-ED1 period. This covers £20.4m worth of investments in ED1.

There are 3.5 million connected customers (including 78,900 multi-occupancy premises with risers and laterals) in the EPN licence area, fed from:

- c2.5 million underground services, and
- c302,700 overhead services.

The 2.5 million underground services have an estimated Modern Equivalent Asset Valuation (MEAV) of £2.9bn. The proposed investment in ED1 for underground services is 0.03% of its MEAV per annum.

The 302,700 overhead services in the EPN region have an estimated MEAV of £129m. The proposed investment for overhead services is 0.5% of its MEAV per annum.

There are 3.5 million cutouts in EPN with an estimated MEAV of £810m. The proposed ED1 investment is 0.06% of the MEAV per annum.

Replacement costs for these assets are held in the Networks Asset Management Plan (NAMP) and in sections of the RIGS tables identified in Table 1.

A full list of abbreviations is included in Section 6.0 of Document 20: CAPEX OPEX Overview.

INVESTMENT TYPE	ED1 INVESTMENT	NAMP LINE	RIGS REFERENCE
Risers and Laterals CV 110	£4.4m	1.46.04.8297 Replacement of Risers (£0.6m)	Volumes & Costs - RIGS Table CV110 Row 57
		1.46.04.8518 Replacement of Laterals (£3.8m)	Volumes & Costs - RIGS Table CV110 Row 58
Asset Replacement (Underground services)  CV3	£6.5m	1.46.01.9137 Replace Metered Services (£3,5m)	Volumes - RIGS Table CV3: Additions Row 13 – LV Service (UG) Removals Row 141– LV Service (UG)  Costs - RIGS Table CV3: Row 13 – LV Service (UG)
		1.46.02.9138 UMS Services Replaced (£0.3m)	
		1.46.06.6386 UMS Service Replacement (SWA Only) - Non Chargeable Connections Work (£2.6m)	
Asset Replacement (Overhead services)  CV3	£5.3m	1.46.03.9139 Replace Overhead Services - Ad Hoc Replacements & ESQC Response	Volumes - RIGS CV3 Additions Row 7 - LV Service (OHL) Removals Row 135 - LV Service (OHL)  Costs – RIGS Table CV3: Row 7 - Underground
Asset replacement (Cutouts) CV3	£4.2m	1.17.01.9051 Cut Outs Replaced (BAU)	Volumes - RIGS Table CV3: Additions Row 20 – LV Cutout (Metered) Removals Row 148 – LV Cutout (Metered)  Costs - RIGS Table CV3: Row 20 – LV Cutout (Metered)

Table 1 – Investment Summary (Source: 19th February 2014 NAMP Table J Less Indirect)



## 1.2 Investment Strategy

The investment strategy for services and terminations in EPN is to ensure that sufficient provisions are made available to:

- Comply with Electricity Safety, Quality and Continuity Regulations (ESQCR) and keep public risk to a minimum
- Keep Customer Interruptions (CIs) and Customer Minutes Lost (CMLs) to a minimum.

This will be achieved by:

- Replacing ESQCR non-compliant services and terminations identified during inspections.
- Replacing services and terminations in poor condition.

## 1.3 ED1 Proposals

Table 2 shows the investment profile for services and service terminations in EPN through RIIO-ED1. Inspections costs for risers and laterals are held in “*Document 14 - I&M, Faults and Trees*”.

NAMP Line(s)	Asset Category	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	ED1 Total £k
Risers and laterals										
1.46.04	Replacement of Risers	36	76	76	76	76	76	76	76	565
1.46.04	Replacement of Laterals	240	504	504	504	504	504	504	533	3,797
Underground Services										
1.46.01	Replace Metered Services	440	440	440	440	440	440	440	440	3,517
1.46.02	UMS Services Replaced	43	43	43	43	43	43	43	43	341
1.46.06	UMS Service Replacement (SWA Only) - Non Chargeable Connections Work	328	328	328	328	328	328	328	328	2,621
Overhead services										
1.46.03	Replace Overhead Services - Ad Hoc Replacements & ESQC Response	1,054	979	753	678	452	452	452	452	5,272
Cutouts										
1.17.01	Cut Outs Replaced (BAU)	1,079	720	360	360	360	432	440	440	4,190
	Total (£k)	3,220	3,090	2,504	2,429	2,203	2,275	2,283	2,312	20,316

Table 2 – ED1 Investment Proposals (Source: 19th February NAMP Table J Less Indirect)

## 1.4 Innovation

UK Power Networks has adopted a new approach to inspecting, maintaining and replacing risers and laterals located within multi-occupancy premises. A ten-year cycle of inspections is underway to confirm ownership and the condition of these risers and laterals.

## 1.5 Risks and Opportunities

	Description of similarly likely opportunities or risks arising in ED1 period	Level of (efficiencies)/ cost growth (£m)
Risk/Opportunity	UK Power Networks to confirm ownership of risers and laterals through a programme of inspections; there is still uncertainty about the number of properties we are responsible for. The programme of inspections may result in an increase or decrease in required expenditure to ED1.	Probable outcome is +/- 5% of the investment in ED1
Risk/Opportunity	The smart metering programme may result in a much higher or lower number of cutouts and service replacements allowed for in RIIO-ED1	Probable outcome is +/-5% of the investment in ED1

Table 3: Risks and opportunities

## 2.0 Description of Services and Terminations

### 2.1 Risers and Laterals

Risers and laterals (R&Ls) are cables or busbars that form part of the equipment installed within multi-occupancy premises to distribute electricity to more than one dwelling or unit. In EPN, the Company owns riser and lateral systems that are of an adoptable standard, or would have been at the time of construction, and were installed post 1972.

Analysis of the Postcode Address File (PAF) and the Meter Point Registration System (MPRS) data identified 232,000 premises in EPN containing a riser and lateral system that could be owned by UK Power Networks.

A programme of inspections has commenced to confirm ownership and the condition of R&Ls in EPN, starting initially with a 5% representative sample from the identified list of 232,000.

Postcode areas selected for inspection include urban and non-urban locations from across the entire licence area. This ensured that the sample was still representative, while also using the resources in a productive and efficient manner.

The initial 5% inspection in EPN was completed in 2012 and the results concerning ownership are shown in the following pie chart; 22% of properties were positively

identified as containing a riser and lateral system owned by UK Power Networks, with 43% of properties identified as not containing UK Power Networks-owned R&Ls.

If we distribute the 35% of properties for which there was no access proportionally between properties with and without UK Power Networks-owned R&Ls, UK Power Networks will be responsible for 34% of the 232,000 properties identified in the initial analysis. This equates to some 78,800 properties.

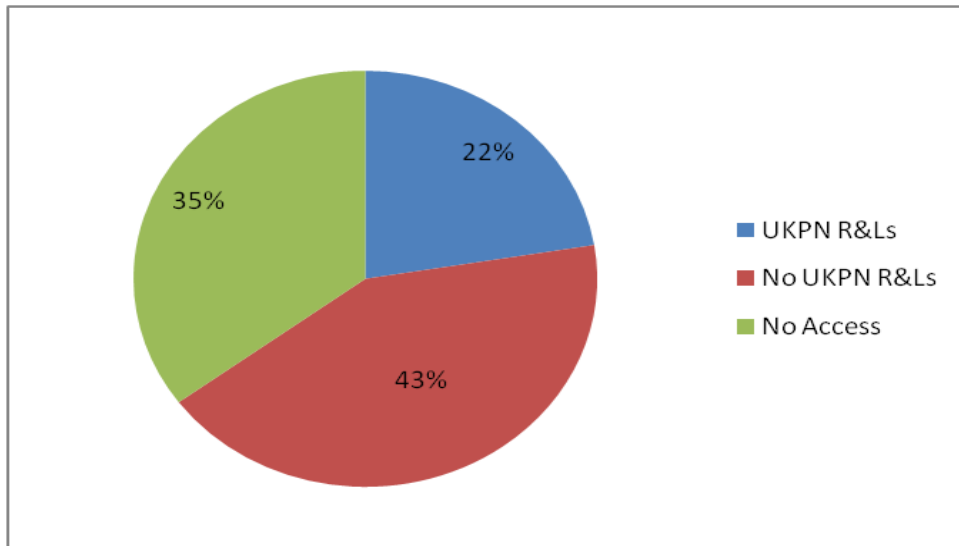


Figure 1: Ownership of risers and laterals  
(Source: 5% representative sample UK Power Networks inspection data, 2012)

The latest available inspection results show that the majority of the cables inspected (62%) are PVC insulated, with 24% being of Low Smoke and Fume design and 7% of MICC design, with the remaining 7% being Steel Wire Armoured (SWA) or other.

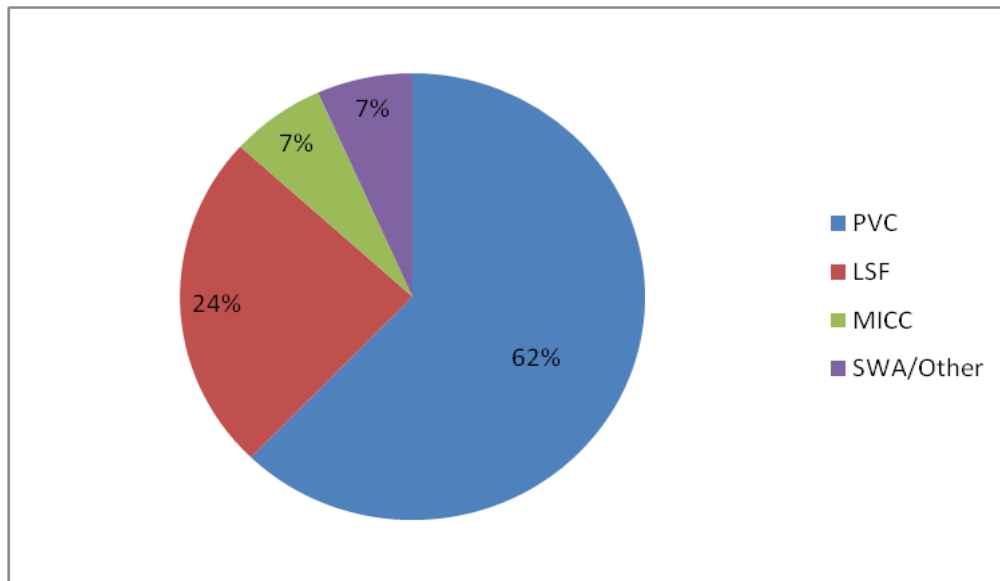


Figure 2: Types of cable installations (Source: Ellipse data extract 27 Feb 2013)

### 2.1.1 Riser and lateral statistical age profile

The age of R&L assets is difficult to determine, even from an on-site inspection by an experienced inspector. In order to produce an age profile for risers and laterals, the type of cables installed has been used to determine an age profile for the known population using the following rules:

1. Expected installation dates for different cable types have been determined. The riser and lateral population has been smoothed evenly over the entire date range for that type. Note that, in EPN, riser and lateral assets are owned by UK Power Networks post 1972.

Cable asset types and date ranges used:

MICC concentric	1972–1978
Mineral insulated	1972–1978
Busbar system	1972–1978
PVC concentric	1972–2000
PVC covered rods	1972–1980
PVC	1972–2000
Steel wire armoured	1972–2000
XLPE	1990–Present
LSF (Low smoke)	1990–Present
Other	Smooth across date range

2. The oldest quartile of the cable type recorded in a particular riser and lateral installation will be used to determine which date range the asset is placed.

## 2.2 Underground Services

A service is an electrical line that connects a distribution main to either street furniture requiring supply or up to four consumer installations in adjacent buildings.

There are 2.5 million underground services in the EPN licence area. Figure 3 shows the age profiles for these services. It is important to note that there is a sizeable population of underground service cables installed pre-1920, and in the 1930s and 1940s.

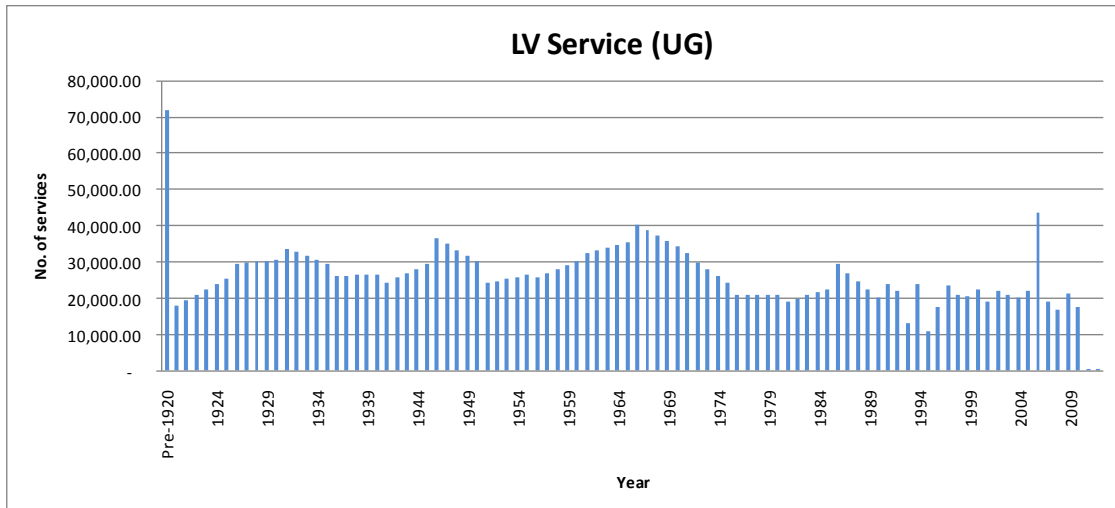


Figure 3 - LV service (UG) age profile (Source: RIGS 2012 CV3 Table V5)

### 2.3 Overhead services

There are 302,700 overhead services in the EPN licence area. Figure 4 shows the age profiles for these services. The majority of the overhead line services in EPN were installed in the 1950s and 1960s.

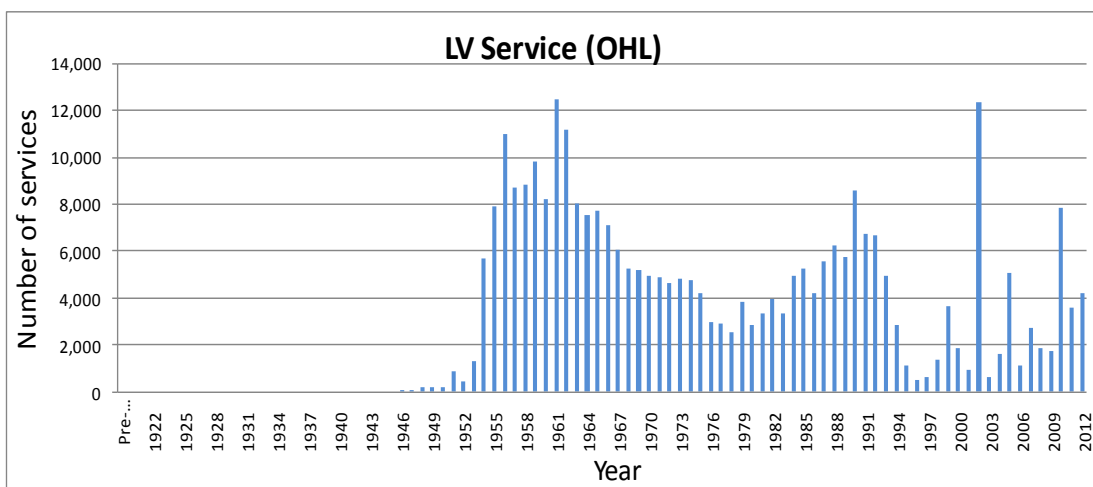


Figure 4 - LV service OHL age profile (Source: RIGS 2012 CV3 Table V5)

## 2.4 Terminations (Cutouts)

There are 3.5 million connected customers in EPN with cutouts. UKPN does not have a routine inspection regime for cutouts hence do not have age profile information for them. Cutouts are inspected by meter operators as part of their routine meter inspections. They report the condition of cutouts by exception (i.e. only those in poor condition).

The age profile of cutouts will be roughly similar to the age profiles for services, because the majority of cutouts would have been installed at the same time as the services feeding each property.



Figure 5: Cutouts

Typically, less than 0.3% of cutouts are replaced each year. Figure 6 shows the replacement rate per year for cutouts in EPN.

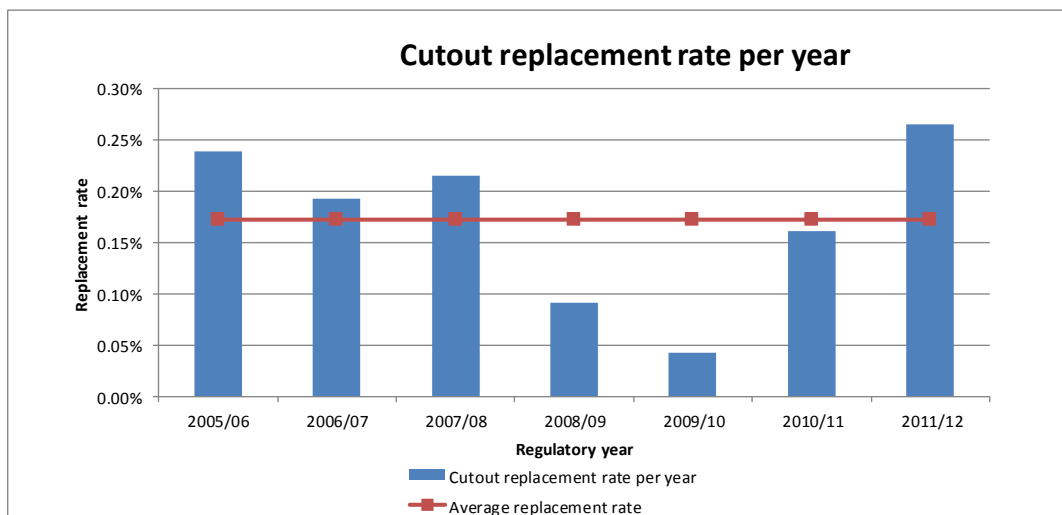


Figure 6 – Cutout replacement rate (Source – DPCR5 FBPQ and CV3 RIGS table 19th February 2014)

## 3.0 Investment Drivers and Condition Management

### 3.1 Investment Drivers

#### 3.1.1 Risers and laterals

The main drivers for the replacement of R&Ls are the following:

- Electricity Safety, Quality and Continuity Regulations (ESQCR)
- Condition of assets with known failure modes
- Security and quality of supply to customers
- Reduction in Customer Interruptions (CIs) and Customer Minutes Lost (CMLs).

#### 3.1.2 Services and terminations

The investment drivers for the replacement of services (underground and overhead) and service terminations (cutouts) include:

- Electricity Safety, Quality and Continuity Regulations
- Security and quality of supply to customers
- Condition (including defects) of services and terminations
- Reduction in Customer Interruptions (CIs) and Customer Minutes Lost (CMLs).

These drivers will be supported by:

- ESQCR risk assessments
- Asset condition\* reports
- Asset and network performance
- Analysis of current and future work costs
- Historic, current and emerging equipment and diagnostic technologies
- Stakeholder options\*\*.

*\*Specific information is obtained from UK Power Networks staff carrying out work at premises or third parties (i.e. meter operators and household occupants).*

*\*\*In setting investment levels for ED1, consideration has been given to the impact of the smart meter roll-out programme between 2014 and 2019.*

## 3.2 Condition Measurements

### 3.2.1 Inspection of risers and laterals

A methodology was developed using UK Power Networks' Meter Point Registration System (MPRS) to identify addresses where multiple occupancy/multiple supply points were located. The methodology involved searching for postal addresses where more than one electricity supply point was located. Key words were used such as Flat, House, Mansion, Court, etc.

This analysis was supplemented by the analysis of the Postcode Address Files (PAF) and identified 232,000 potential multi-occupancy premises in EPN.

UK Power Networks' policy in EPN is that the Company owns riser and lateral systems that are of an adoptable standard, or would have been at the time of construction, and were installed post 1972. For this reason, a 10-year programme of inspections has commenced to verify ownership and condition of R&Ls identified from the MPRS/PAF analysis.

As part of the inspection process, condition points and defects are recorded using handheld devices (HHD). This ensures that good quality data is captured and recorded in the asset register in a timely manner and at the point of inspection. When an inspection HHD script is run, the user answers a set of questions about the condition, specific to each asset type. This allows defects to be recorded, reviewed and cleared.

Key condition points collected during the inspection process include:

- Overall condition of the riser(s)
- Overall condition of the lateral(s)
- Overall condition of the distribution board(s)/cutout(s).

These are assessed on a condition rating (CR) scale from 1 to 4, where a CR1 indicates an asset is new and CR4 indicates an asset in poor condition. Table 4 shows all the condition rating descriptions.



Condition	Description
1	Generally in 'as new' or very good condition
2	Acceptable or satisfactory condition
3	Indication that either minor work is required or the condition indicates that future repair or replacement is required
4	This category indicates that significant/urgent repair or replacement is required

*Table 4 - Condition rating descriptions*

### 3.2.2 Inspection of underground services

UK Power Networks does not have a routine inspection regime for underground service cables. They are managed via a reactive work programme, because the frequency of failures is quite small and there is no reliable or cost effective way of inspecting service cables underground.

Underground services include metered and unmetered supplies to street lighting columns, and residential and business properties.

Third parties usually report failures and these are recorded in the ENMAC (Electricity Network Management and Control) tool. The locations of all underground services owned by EPN are held in a network-mapping tool, NETMAP shown in Figure 7. There are processes in place to ensure that NETMAP records are updated whenever services are replaced.

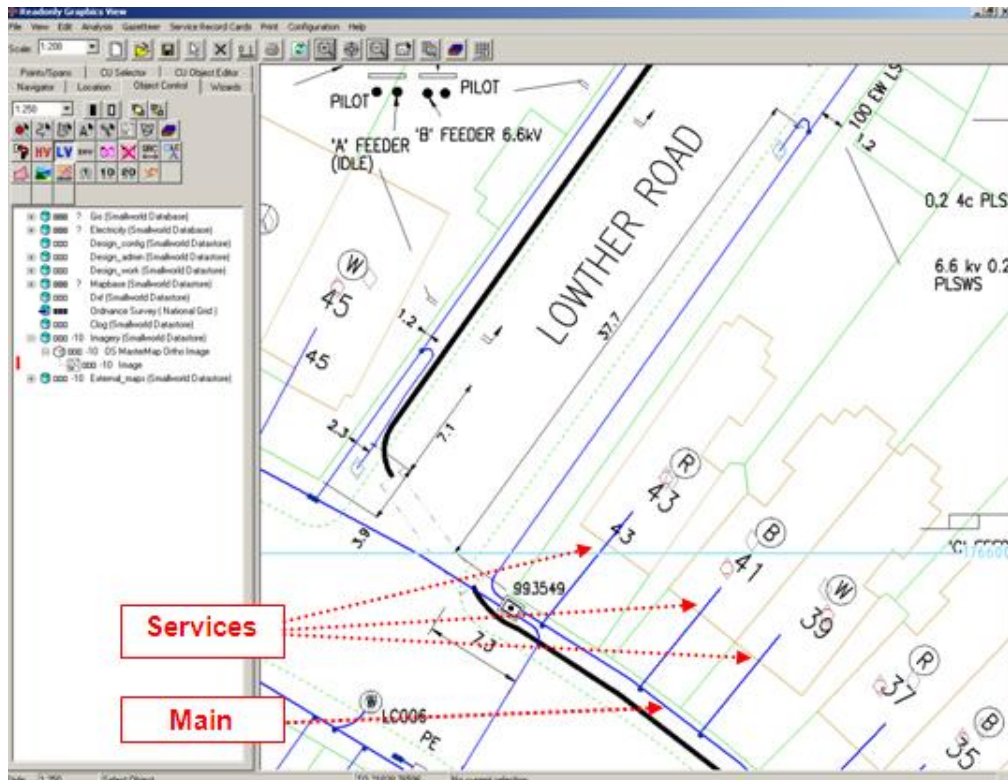


Figure 7 - NETMAP view of services and mains

### 3.2.3 Inspection of overhead services

Individual overhead line services are inspected on a four year cycle as part of routine full patrols and safety patrols for low voltage mains overhead lines. Hands held devices (HHDs) are used on site at the point of inspection to record condition, defects, ESQC ratings and ESQC compliance. The information collected is used to create and prioritise replacement or other remedial work programmes. In addition historical fault rates are examined to set budgets.

### 3.2.4 Inspection of cutouts

Condition assessment of these assets is mainly through exception reporting by metering service companies as required by the Meter Operation Code of Practice Agreement (MOCOPA) agreement.

The Meter Operation Code of Practice Agreement (MOCOPA) is an Agreement between electricity distribution businesses and electricity meter operators in Great Britain.

Following the completion of the smart meter rollout there will be fewer visits to meters by the meter operators. Issues identified at the cutout are fed back to UK Power Networks by meter inspectors or household occupants. The frequency of meter readings varies by region but is typically at least once a year.

## 4.0 Asset Assessment

### 4.1 Asset Health

#### 4.1.1 Risers and laterals

There is currently no Health Index Framework for risers and laterals. However, the inspection programme that commenced in 2011 is capturing condition points associated with the lateral, the riser and the related distribution boards. Condition Point 1 is 'As New' with Condition Point 4 being 'Poor Condition' (see table 4).

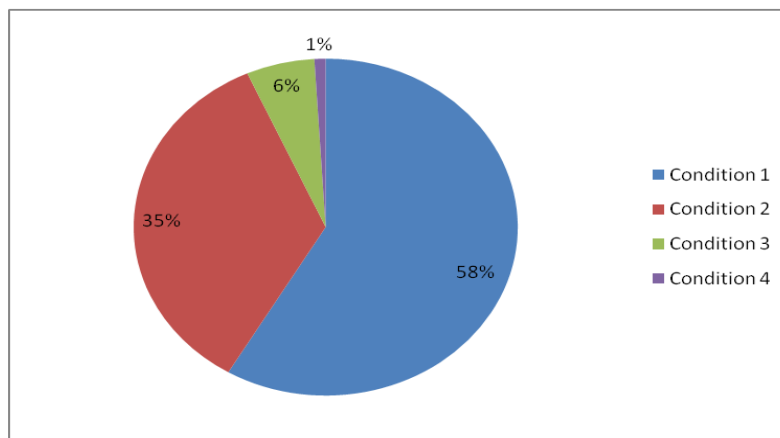


Figure 8 - Condition rating of risers and laterals (Source: Ellipse data extract 27 Feb 2013)

#### 4.1.2 Services and terminations and cutouts

There is no Health Index Framework for services. Reviews of fault rates and historical rates of replacement determine forecasting of the volume of work required on the asset population (underground services).

All faults are recorded on the ENMAC (Electricity Network Management and Control) system. UK Power Networks has developed a tool (fault cube) to extract and analyse fault data from ENMAC. Details of fault causes and trends can be extrapolated from the fault cube.

Records of remedial work, carried out historically, are held in SAP (UK Power Network's accounting tool). Analysis of historical replacement rates is also used to set the budget for cutout replacements required each year.

Figure 9 shows the five-year trends for faults on underground services in EPN. As observed from the charts, the fault rate is relatively small (less than two in every 100 services fault each year).

Specific services for replacement each year are assessed based on the intervention policies given in section 5.1.

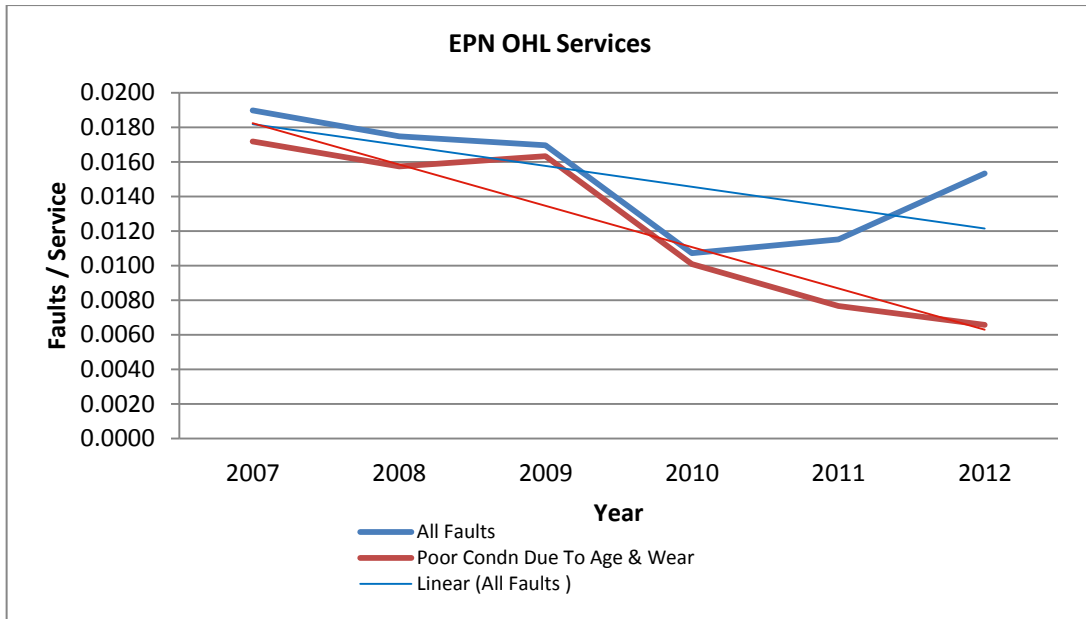


Figure 9 - Overhead services fault rates (Source - UKPN Fault Cube)

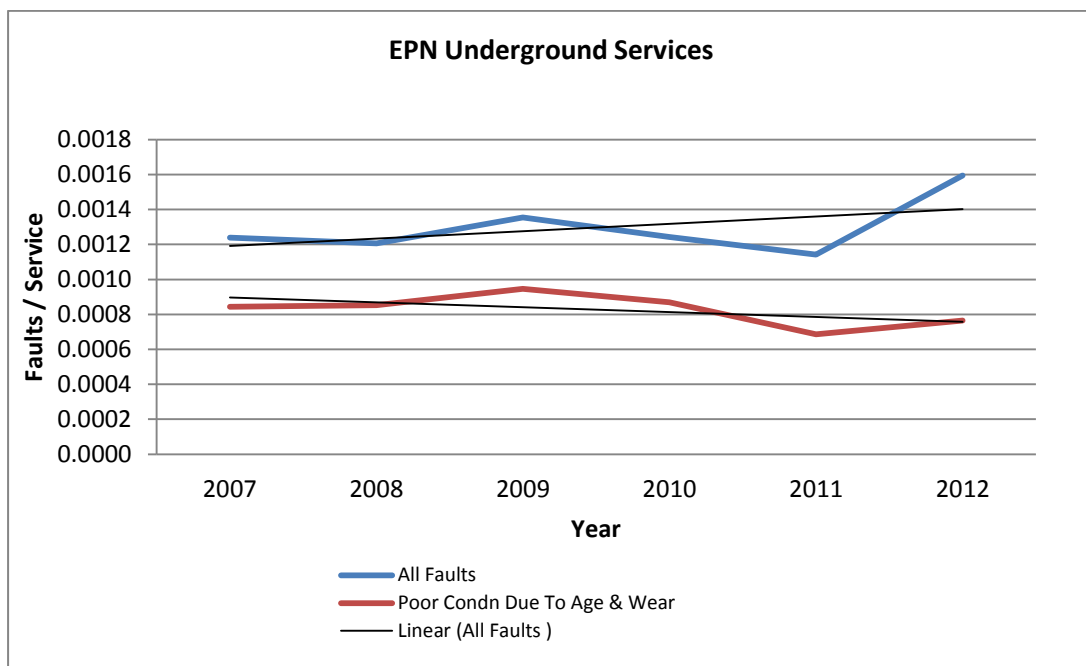


Figure 10 - Underground services fault rates (Source - UKPN Fault Cube)

## 4.2 Asset Criticality

### 4.2.1 Risers and laterals

Risers and laterals that have reached their end-of-life are prioritised for replacement based on the numbers of occupants within the premises and number of floors.

A criticality-rating grid has been developed to assist in the prioritisation of work and the ability of the Fire & Rescue service to evacuate residents in the event of a fire using external ladders, should the internal staircase be inaccessible.

Criticality Category	Description
1	Up to 2 floors and 4 premises
2	Up to 2 floors and more than 4 premises
3	3-4 floors and up to 8 premises
4	3-4 floors and more than 8 premises
5	More than 4 floors

Table 5 - Criticality categories

### 4.2.2 Underground services and cutouts

There is no criticality framework for underground services and cutouts. However, future consideration may be given to the size of the services, and whether they are single- or three-phase supplies, to determine a criticality framework.

### 4.2.3 Overhead services

There is no criticality framework for overhead services. However, overhead services are assessed and prioritised for replacement or other remedial work based on the ESQC risk rating. The ESQC risk rating is dependent on the equipment risk rating and location risk. The relationship between the equipment risk and location risk is given in the risk matrix (see Appendix 6).

The ESQC equipment is assessed as High, Medium or Low based on the following rules:

- High risk – Service not up to UK Power Networks' specification (Refer to Overhead Line Inspectors Handbook)
- Medium risk – Service is insulated
- Low risk – Concentric, Duplex/Triplex, Service – ABC

The ESQC location risk is assessed based on the location of the service.

### **4.3 Network Risk**

There is no separate network risk framework for services and terminations. However, the number of poor condition, non-compliant services and terminations identified via routine inspections will provide a measure for assessing network risk and ESQC risk.

### **4.4 Data Validation**

R&L inspection data entered using handheld devices uses table validation when the data is input on site. This ensures only data within the specified range can be input.

All reports received from third parties or UK Power Networks staff will be assessed against the intervention policies (outlined in section 5.1) to determine the need to replace a service or cutout.

### **4.5 Data Verification**

There is a well-documented process to ensure that NETMAP is updated when services are replaced. A key part of the process requires field staff to complete System Alternation Notices (SANs) whenever services are replaced. These S.A.Ns are sent to the Network Records and Network Control teams.

Cutouts are not recorded on any EPN systems.

### **4.6 Data Completeness**

We are still carrying out surveys of risers and laterals in EPN, to verify ownership. All of our overhead services and underground services are recorded on our network mapping tool, NETMAP.

## 5.0 Intervention Policies

### 5.1 Intervention Options

The only intervention option for underground services and cutouts is replacement because repairs are not cost-effective. Overhead services may be replaced or shrouded depending on their condition and ESQC risk rating. The intervention policies for replacements are held in *EDS 02-0045 Standard for the Replacement of Service Cables and Service Terminal Equipment* and summarised in the following sections.

#### 5.1.1 Risers and laterals

The criteria for replacing rising and lateral services shall be the same as for service cables, plus the following additional reasons:

- The cables are contained with a metallic tube that is un-earthed.
- The tube is used for the customer's earthing and it is not of a screwed barrel type.
- The earth continuity and the bonding connections shall be adequate to provide the customer with an appropriate earth for the type of installation. The work undertaken to restore the earth will be kept to a minimum.
- Mineral insulated cables will not normally be replaced, except where the earth continuity and bonding is inadequate.

#### 5.1.2 Services and terminations

A service cable (overhead, underground) will only be replaced\* for the following reasons:

- It is faulty and beyond economic repair or a repair is impractical.
- It is overloaded and the conductors are too small (use *Table 6 – Single-Phase Cable Ratings* as a guide to determine whether a service cable is overloaded).
- The insulation is showing signs of deterioration.
- It is located in a loft space – in which case, where practicable, it shall be removed from the loft space.
- The overhead flight phase conductor(s) are not insulated with PVC or XLPE.
- The conductors are not of a bundled design and the phase conductor is below the neutral.
- An overhead line service does not comply with the requirements of Section 11 of the UK Power Networks Overhead Line Inspectors Handbook.

Cable Type	Size (in <sup>2</sup> )	Maximum Rating (A)
Paper insulated, lead	0.007(7/0.036)	50
Paper insulated, lead	0.01 (7/0.044)	60
Paper insulated, lead	0.0145 (7/0.052)	75
Mineral insulated	0.007	50
Mineral insulated	0.01	60
Mineral insulated	0.0145	75

*Table 6 - Single -Phase Cable Ratings*

*\*Overhead services may be shrouded with Insuline LV Conductor shrouding if they are in good condition, but there are clearance issues that cannot easily be resolved.*

Figure 11 shows a section of cable being covered with Insuline conductor. Insuline insulation is considered an effective insulation when used on bare wire overhead lines. It can be used to mitigate the risk of horizontal clearances, e.g. buildings, street lights and climbable trees.



*Figure 11 - Insuline conductor*

### 5.1.3 Cutouts

A cutout shall only be replaced under the following circumstances:

- It is damaged or faulty.
- It is of a type with fuse in the neutral.
- It is of a type with re-wireable fuses.
- The metal clad casing is unearthed.
- The cutout is deemed to be overloaded.
- A PME connection is required and the cutout is not suitable for this purpose.



## 5.2 Policies: Selecting Preferred Interventions

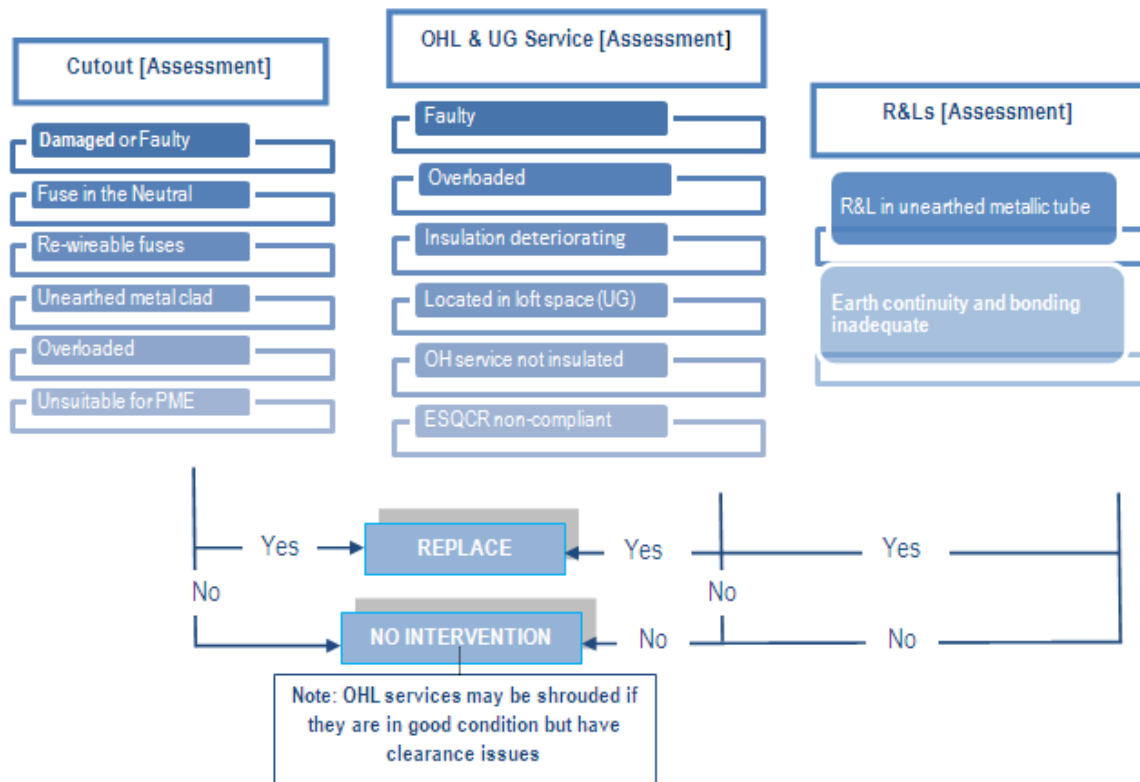


Figure 12 - Decision tree for interventions

Figure 12 shows the intervention options for cutouts, R&Ls and underground/overhead services. The decision tree summarises only services that are non-compliant with the policy *EDS 02-0045 Standard for the Replacement of Service Cables and Service Terminal Equipment* will be replaced.

### 5.2.1 Opportunities for OPEX/CAPEX trade-offs

UK Power Networks employs a proactive replacement strategy for risers and laterals and overhead line services. This will ensure that costs are kept to a minimum as reactive costs are often more expensive than planned replacement costs.

## 6.0 Innovation

UK Power Networks has adopted a new approach to inspecting, maintaining and replacing risers and laterals located within multi-occupancy premises. A ten-year cycle of inspections will be carried out to confirm ownership and the condition of these risers and laterals. In EPN, the company owns riser and lateral systems that are of an adoptable standard, or would have been at the time of construction, and were installed post 1972.

## 7.0 ED1 Expenditure Requirements for Services and Terminations

### 7.1 Constructing the Plan

#### 7.1.1 Risers and laterals

Inspection results indicate that UK Power Networks can expect to confirm ownership of 34% of the risers and laterals at 232,000 properties initially identified upon completion of the inspection programme. This equates to 78,880 properties.

The inspection results also show that 1% of the riser and lateral installations inspected were in poor condition. This means that asset replacement is required in some 789 properties.

Each property contains on average four laterals and 0.4 risers. i.e. some properties will not contain a riser, but just laterals installed from a ground-floor intake position.

Therefore 3,164 laterals and 314 risers require replacements, which have been phased over ED1.

Description	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	ED1 Total
Replacement of laterals	200	420	420	420	420	420	420	444	3,164
Replacement of risers	20	42	42	42	42	42	42	42	314

Table 7 - Risers and laterals planned replacement volumes in ED1  
 (Source: 19th February 2014 NAMP, Table O)

### 7.1.2 Underground services

The scope of this work includes the removal of metered and unmetered underground services. The investment levels have been set based on historical achievement. Figure 13 shows the historical replacement volumes and fault rates.

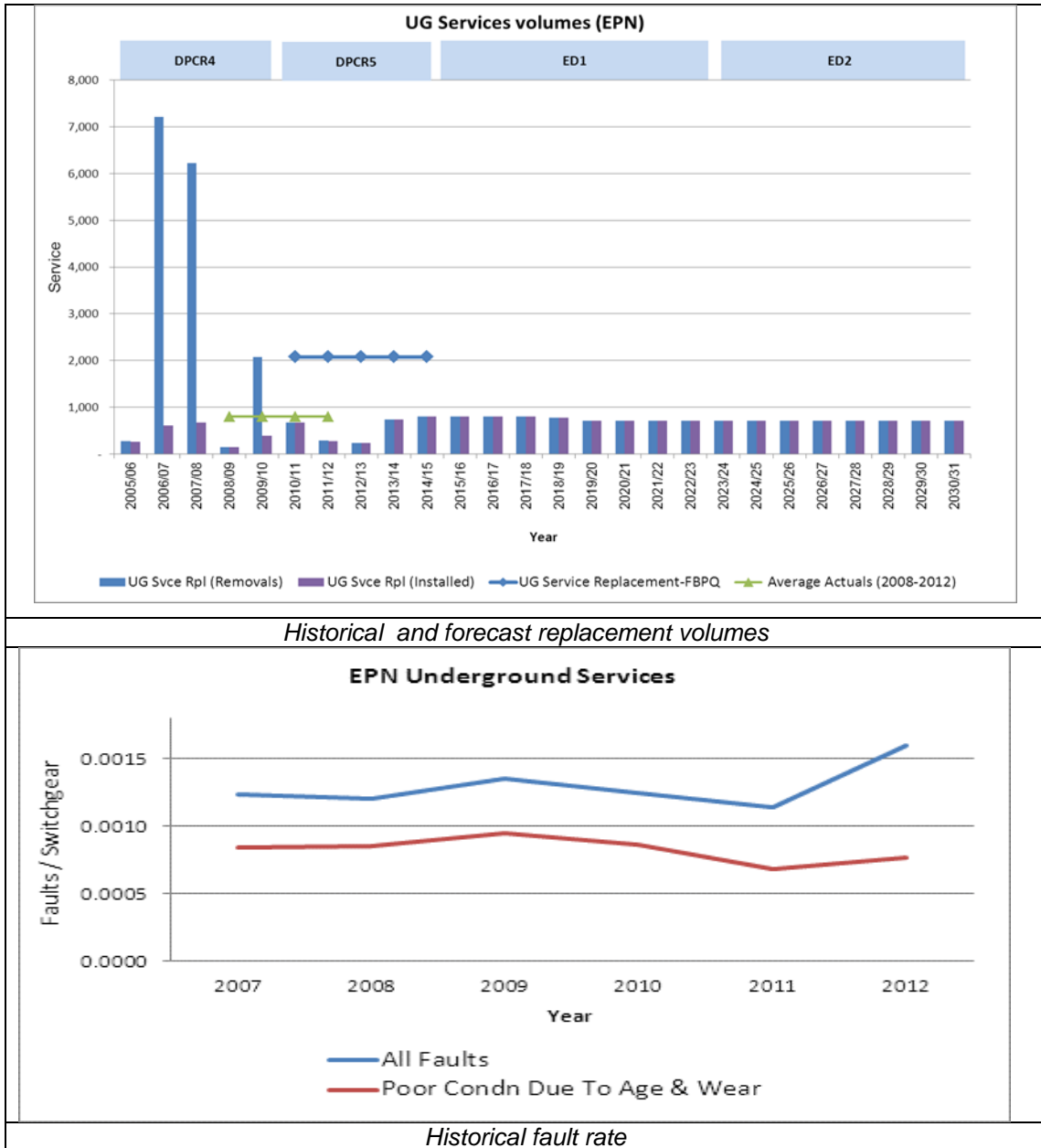


Figure 13 - Underground services justification

The volumes for replacement in ED1 have been set such that they are similar to the average achievement between 2008/2009 and 2011/2012. Table 8 shows the historical achievement volumes compared to the yearly average volume proposed in ED1

	2008/09	2009/10	2010/11	2011/12	Average - Last 4 years	Average ED1
UG Service Replacement (Count)	145	2,079	676	295	799	759

Table 8: Historical replacements and ED1 plan for underground services

The ED1 investment figures are also similar to the level of investments in DPCR5 and will help to prevent the number of condition-related failures of underground services, from increasing.

### 7.1.3 Overhead services

Overhead service replacements in ED1 have been set based on the observed number of defects raised in EPN each year. In the period 2002–2012 on average 2,941 defects are reported each year. Refer to Figure 14. The large number of defects raised each year could result in increased condition-related failures of overhead services.

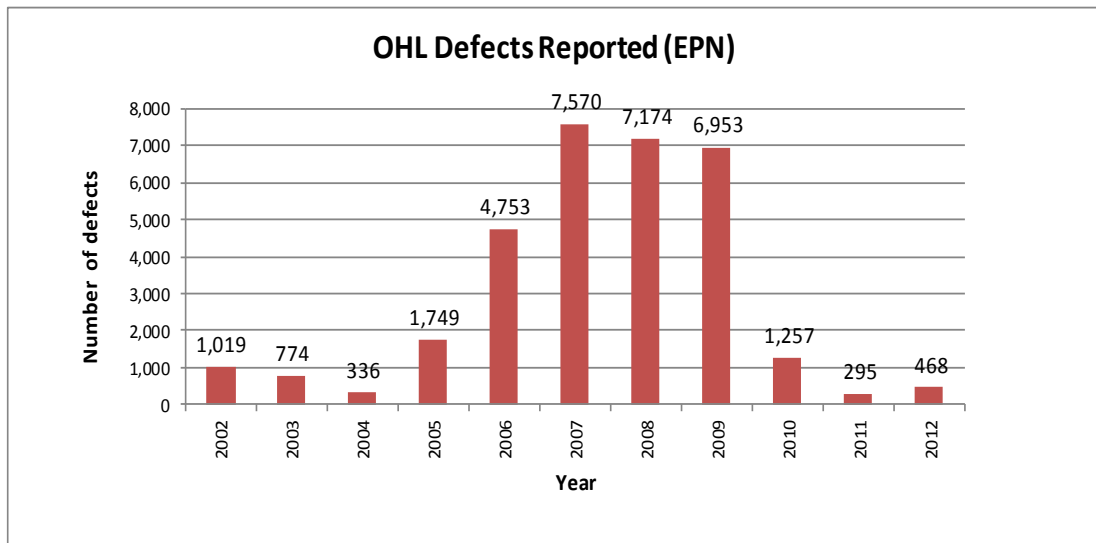


Figure 14: Defects raised each year in EPN (Source: Ellipse asset register)

We have allowed for the replacement of on average 2,187 overhead line services through ED1. Table 9 shows the replacement profile in ED1.

Ref	Description	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
1.46.03.9139	Replace Overhead Services - ad hoc replacements & ESQC response	3,500	3,250	2,500	2,250	1,500	1,500	1,500	1,500

Table 9: Summary of overhead service replacement volumes in ED1 (Source: 19th February 2014 NAMP)

The provision shows a decreasing trend through ED1 as we expect the number of new issues identified each year to decrease due to the large programme OF ESQCR risk mitigation in EPN which will involve replacement or removal of some services.

#### 7.1.4 Cutouts

The investment proposal for planned cutout replacements in ED1 is based on historical achievements and the anticipated impact of the smart meter rollout programme which will be carried out between 2014 and 2019.

During the smart meter roll out, meter operators will inspect all cutouts and service terminations associated with meters. It is assumed that approximately 2% of all cutouts will be replaced between 2013 and 2020, due to the impact of the smart meter roll out programme. As a result the number of other cutout replacements is expected to decrease in that period.

A review of historical replacements show that typically 0.16% of the cutout population is replaced each year. Following the smart meter rollout the replacement rate is expected to reduce to 0.05% of the population. Table 10 shows the comparative figures.

Licence area	Cutout volumes excluding half-hourly customers	Steady state replacement rate	Cut out replacements post-smart meter rollout (2021/2022 – 2022/2023)
EPN	3,408,047	0.16% of the population; 5,578	0.05% of the population; 1,704

Table 10: Forecast rates of cutout replacements before and after the smart meter rollout

Table 11 shows the annual replacement volumes between 2013 and 2023. The reduced cutout replacements between 2015/2016 and 2020/2021 is the anticipated decrease due to the volumes of replacement due to the smart meter rollout

NAMP Ref	Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
1.17.01.9051	Cut Outs Replaced	5,578	5,578	4,184	2,789	1,395	1,395	1,395	1,673	1,704	1,704

Table 11: Forecast rates of cutout replacements (Source: 19th February 2014 NAMP, Table O)

## 7.2 Asset Volumes and Expenditure Charts

### 7.2.1 Risers and laterals

Figures 15 and 16 show the historical and forecast work for the replacement of risers and laterals in EPN. The ramp up in the first few years will allow us to secure resources to achieve the steady state forecasts in ED1 and ED2.

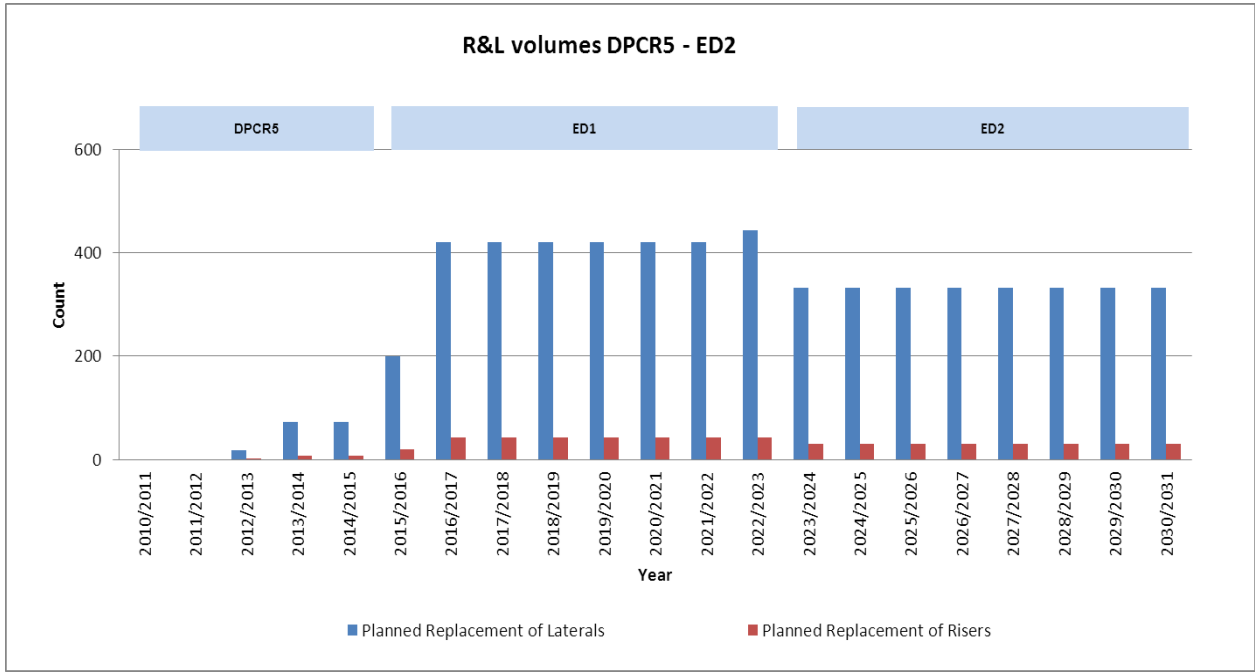


Figure 15 - R&L volumes DPCR5-ED2 (Source – 19th February 2014 NAMF Table O)

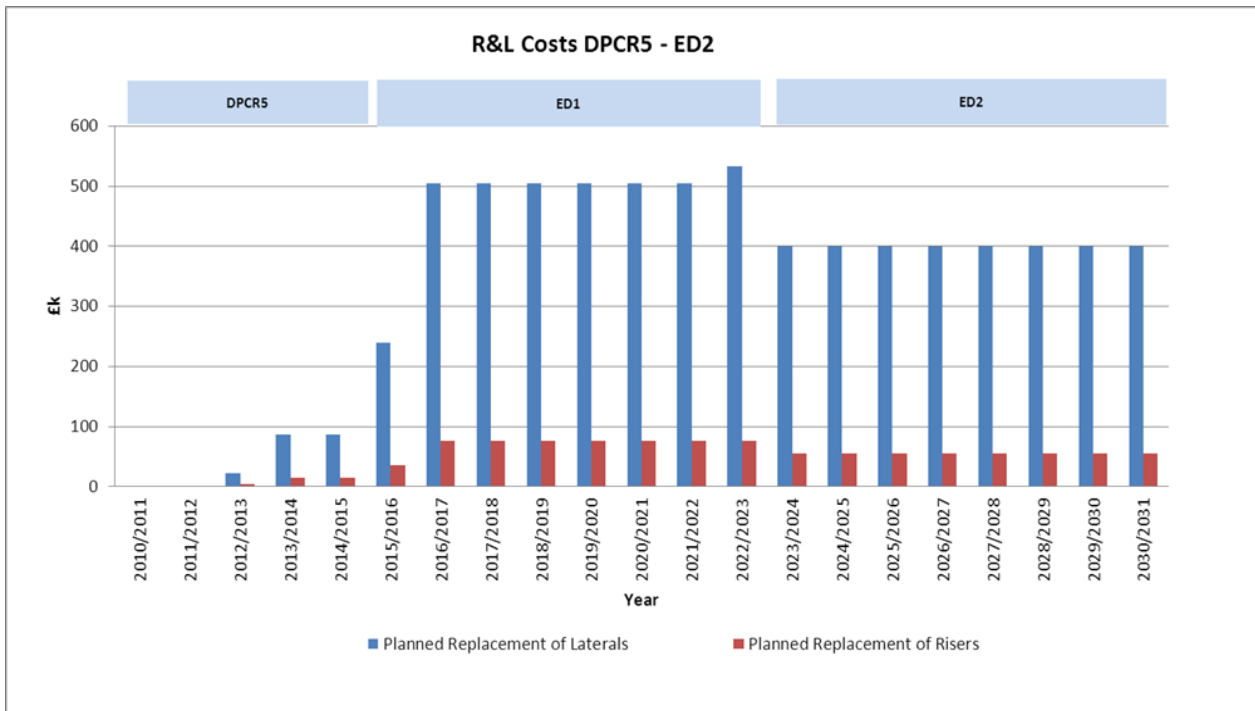


Figure 16 - R&L costs DPCR5 - ED2 (Source – 19th February 2014 NAMF Table J Less Indirect)

## 7.2.2 Underground services

Figures 17 – 18 show the forecast volumes and costs for the replacement of underground services.

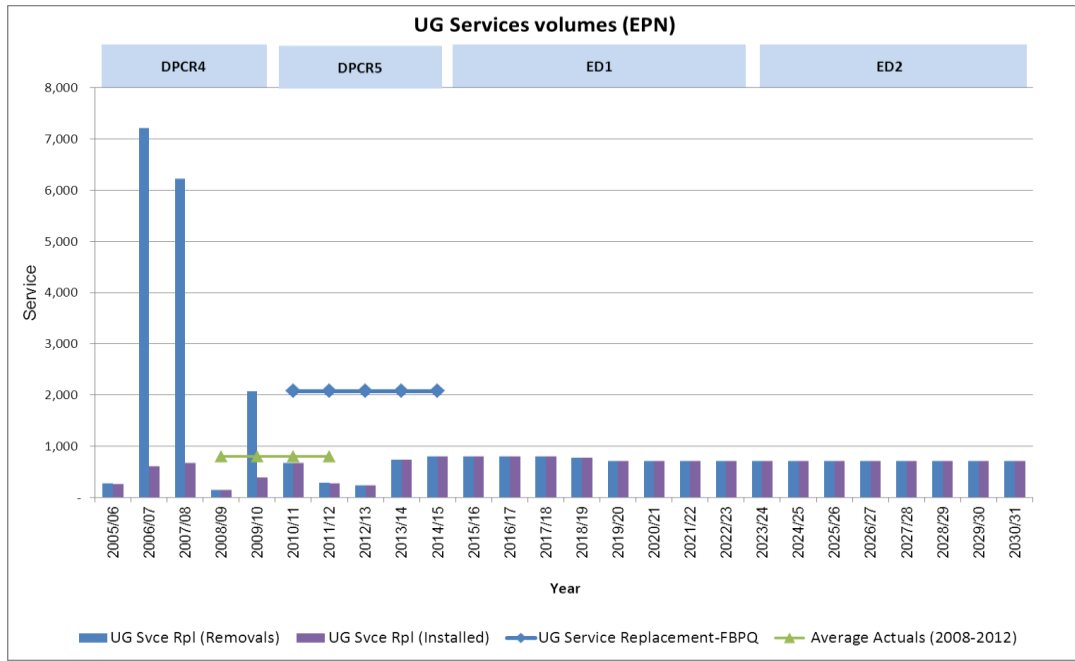


Figure 17 – Underground Services Volumes DPCR4 – ED2

Sources :

- DPCR4 & DPCR5 FB PQ - Table NL3 (DPCR5 FB PQ)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) - 2013/2014 RIGS CV3 table
- ED1 - 2013/2014 RIGS CV3 table
- ED2 - From Age-Based Analysis

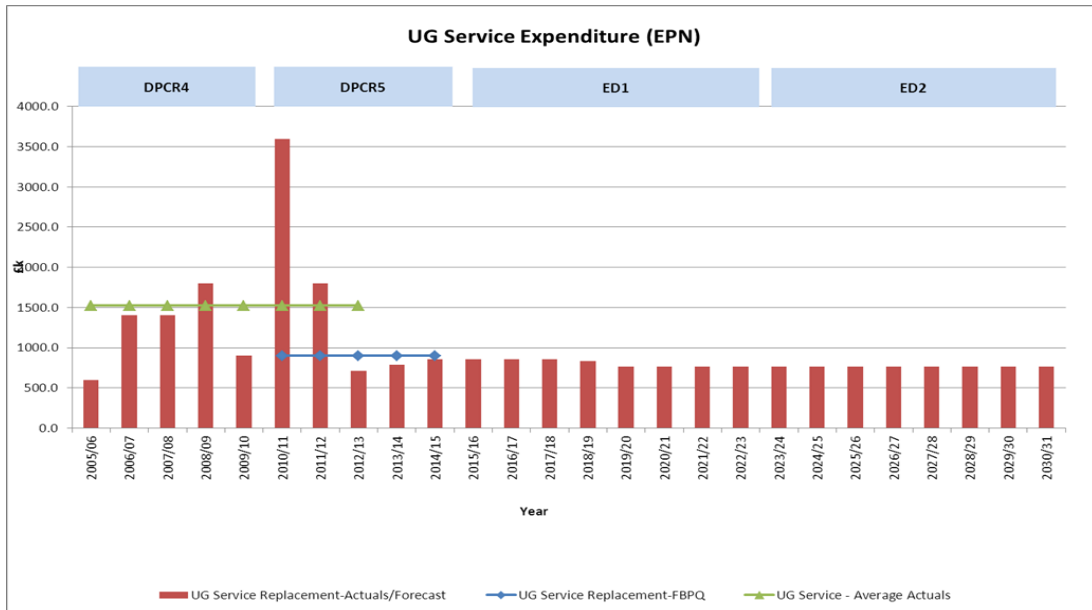


Figure 18 – Underground Services Costs DPCR4 – ED2

Sources :

- DPCR4 & DPCR5 FBPO - Table NL1 (DPCR5 FBPO)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) – 19th February NAMP (Table J LESS INDIRECT)
- ED1 – 14th June NAMP (Table J LESS INDIRECT)
- ED2 - From Age-Based Analysis

### 7.2.3 Overhead services

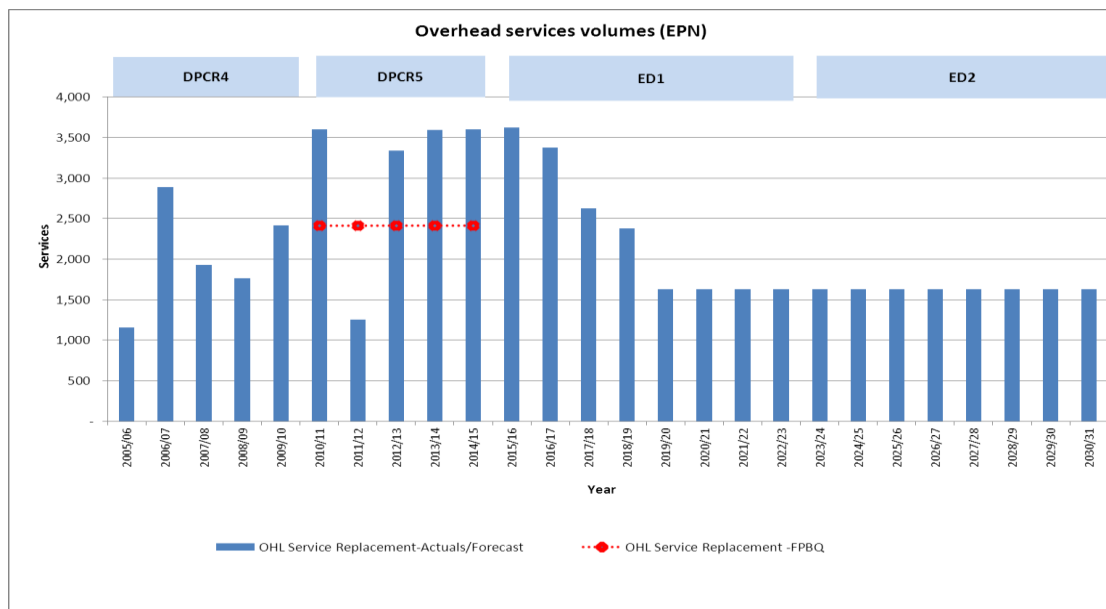


Figure 19 – Overhead Line Services Volumes DPCR4 – ED2

Sources :

- DPCR4 & DPCR5 FBPO - Table NL3 (DPCR5 FBPO)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) - 2013/2014 RIGS CV3 table
- ED1 - 2013/2014 RIGS CV3 table
- ED2 - From Age-Based Analysis



Figure 19 shows the historic replacement volumes for services as well as forecasts. The under achievement in 2011 and 2012 was due to lack of contractor resources. This has now been resolved and there is a catch-up programme planned between 2013 and 2018 to address the backlog and newly recorded issues with services.

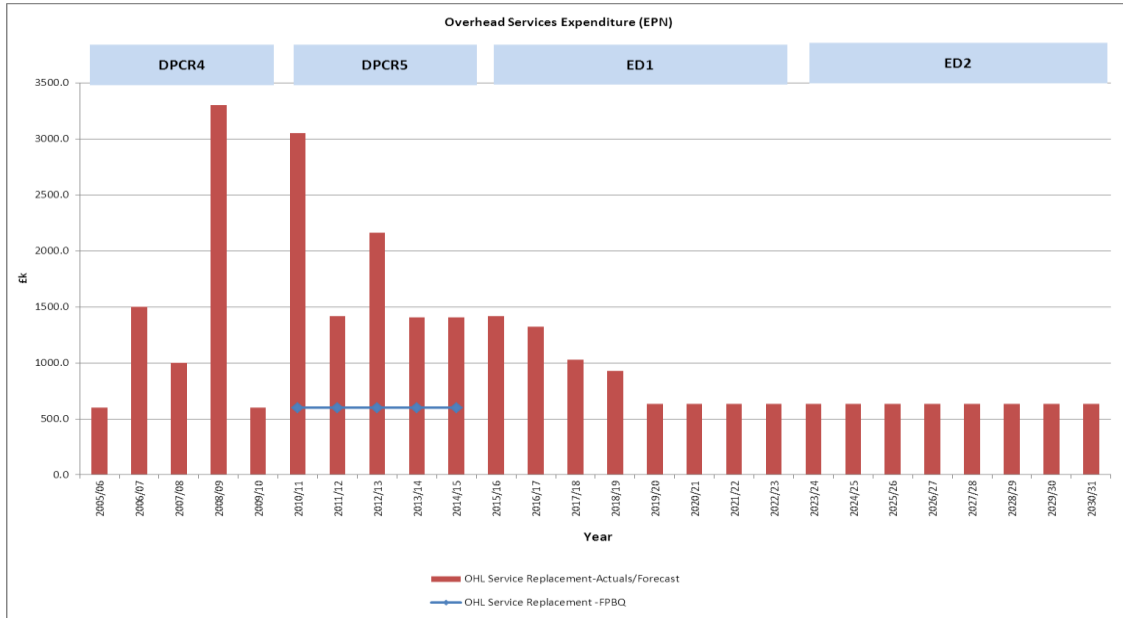


Figure 20 – Overhead Line Services Costs DPCR4 – ED2

Sources :

- DPCR4 & DPCR5 FBPO - Table NL1 (DPCR5 FBPO)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) – 19th February NAMP (Table J LESS INDIRECT)
- ED1 – 19th February NAMP (Table J LESS INDIRECT)
- ED2 - From Age-Based Analysis

## 7.2.4 Cutouts

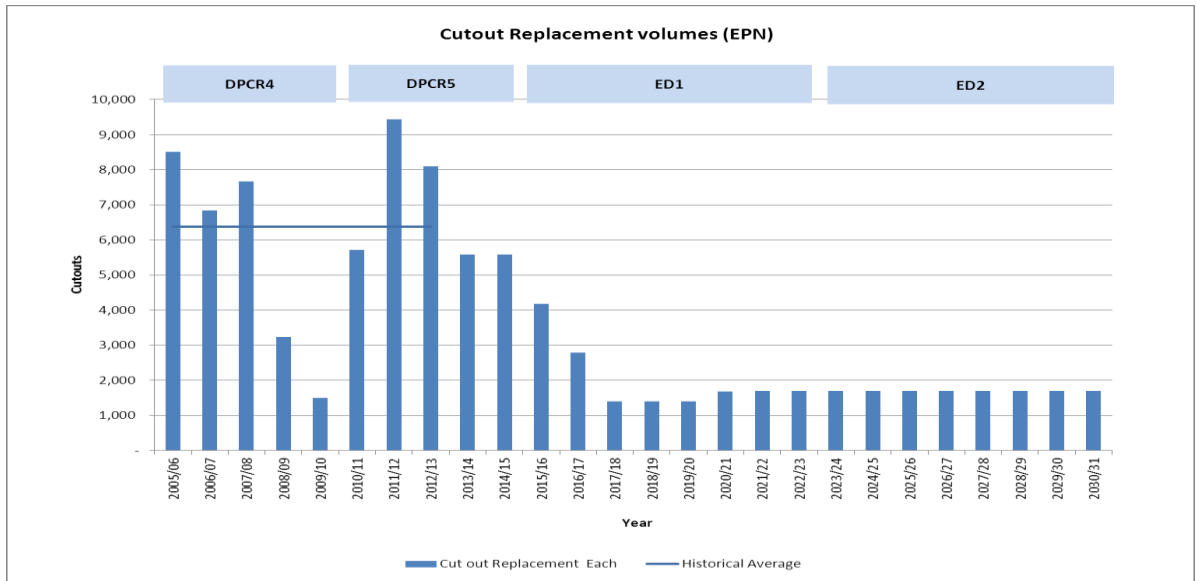


Figure 21: – Cutout Volumes DPCR4-ED2)

Sources :

- DPCR4 & DPCR5 FB PQ - Table NL3 (DPCR5 FB PQ)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) - 2013/2014 RIGS CV3 table
- ED1 - 2013/2014 RIGS CV3 table
- ED2 - From Age-Based Analysis

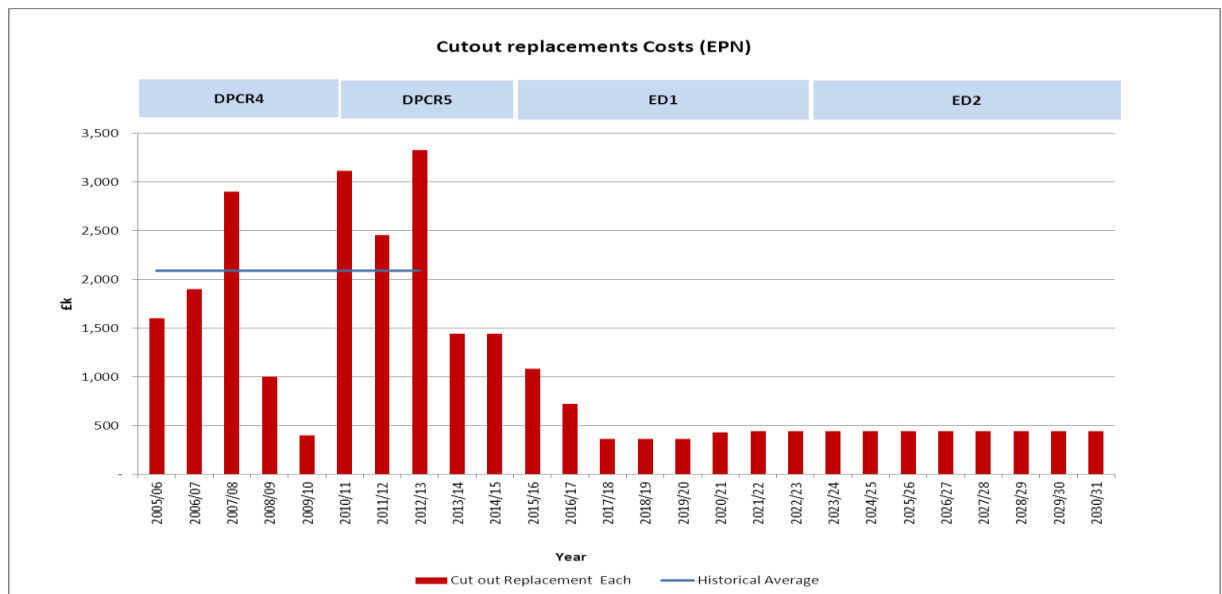


Figure 22– Cutout costs DPCR4 – ED2

Sources :

- DPCR4 & DPCR5 FB PQ - Table NL1 (DPCR5 FB PQ)
- DPCR5 (First three years) - 2013/2014 RIGS CV3 table
- DPCR5 (Last Two years) – 14th June NAMP (Table J LESS INDIRECT)
- ED1 – 14th June NAMP (Table J LESS INDIRECT)
- ED2 - From Age-Based Analysis

## 7.3 Commentary

The proposed investment programme for the replacement of R&Ls in RIIO-ED1 in EPN is £4.4m, with ramp-up in DPCR5. No allowance was agreed for proactive inspections and replacement of R&Ls in DPCR5 because there was no proactive replacement policy. In 2011, a review of the policy on R&Ls was carried out, which resulted in the inspection of a sample of R&Ls in EPN. The results of the inspections were extrapolated to determine investment requirements in RIIO-ED1. The investment levels in RIIO-ED1 have been set as such that there is a gentle rise in investment from 2012 onwards. This will give time to secure the additional resources required to complete the work programme in RIIO-ED1.

The proposed investment programme for the replacement of services is £11.8m (£6.5m - underground services, £5.3m - overhead service). The proposals are based on condition data, fault rates and historical achievement. The peak expenditure proposal between 2013 and 2015, for overhead services, is to clear the backlog of outstanding ESQC non-compliant services. The forecasts from 2015 onwards have been set such that there is sufficient provision to address the new defects. The replacement profile also shows a decrease through ED1 to account for the impact of structural mitigation work on other work programmes.

The proposed investment programme for the replacement of cutouts is £4.2m. This excludes cutout replacements due to the smart meter rollout programme. The investment profile shown takes in to account the large scale replacements due to the smart meter rollout. It is estimated that the installation of smart meters by meter operators will result in a 2% replacement rate of all cutouts inspected. Details of replacements due to the smart metering rollout can be found in Annex 10 of our RIIO-ED1 business plan. Following the completion of the smart meter roll-out programme, the replacement rate of cutouts is expected to reduce to 0.05% of the population.

## 7.4 Sensitivity Analysis

No sensitivity analyses have been carried out on the services and terminations ED1 proposals.

## 8.0 Deliverability

Primarily, directly employed staff will replace R&Ls, with the use of some contractors. We have set the R&L replacement plan as such that there is a ramp-up in DPCR5 to the desired investment level in ED1.

Replacement of cutouts are done live and will not require loss of supplies to other customers. A review of the historical cutouts replacements through DPCR4 and DPCR5 show that there is a steady increase in the number of replacements each year. The increase in overall cutout replacements is expected throughout the smart meter rollout period. However there will be a corresponding decrease in other planned cutout replacements (if we exclude the replacements due to the smart meter rollout). Additional resources will be sought where necessary to manage the increased replacements due to the smart meter rollout activities as well as other planned cutout replacement activities.

## Appendices

### Appendix 1 – Age Profiles

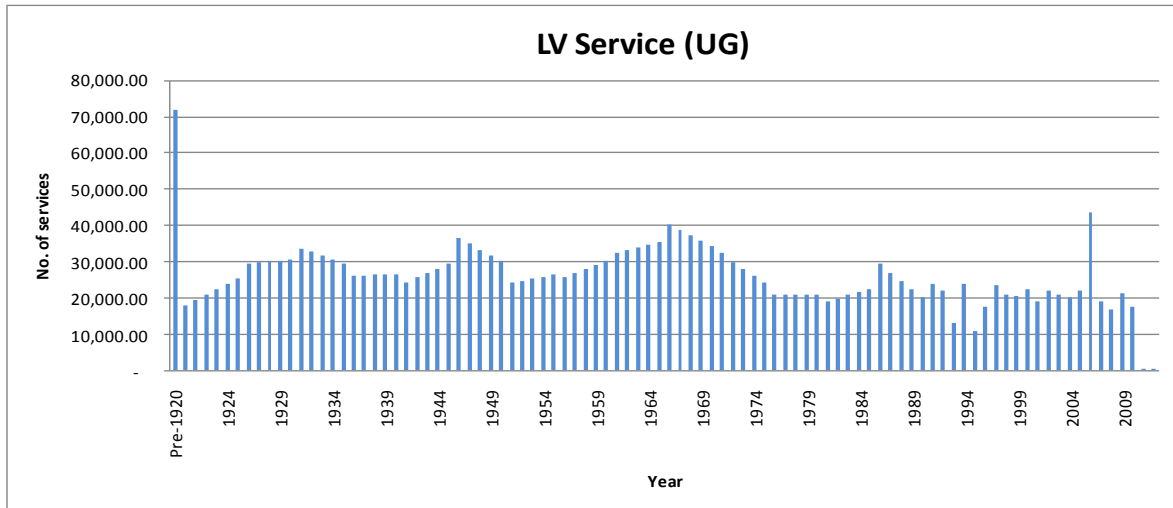


Figure 23 - Underground Service Age Profile (Source – RIGS 2012 CV3 Table V5)

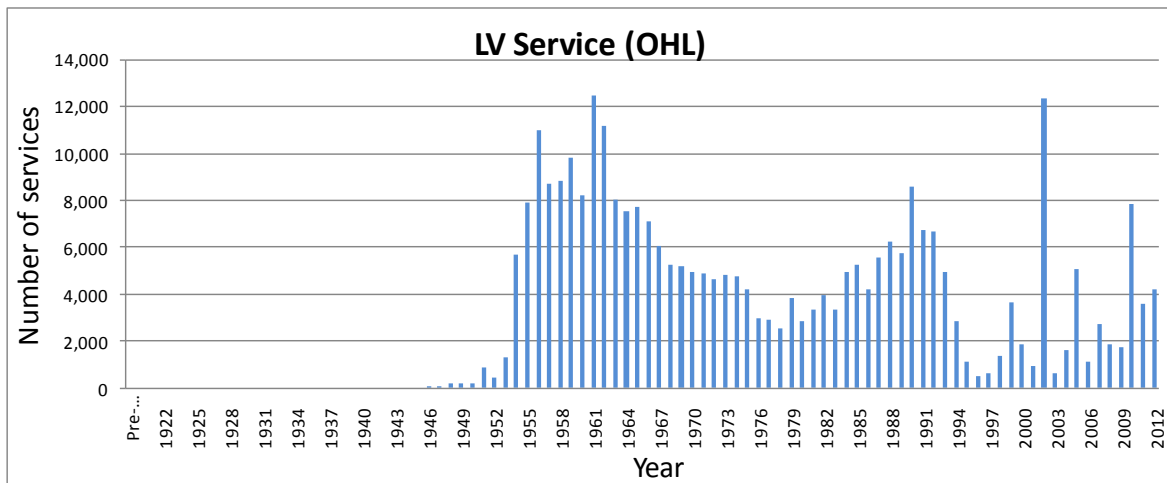


Figure 24 - Overhead LV Services (Source – RIGS 2012 CV3 Table V5)

### Appendix 2 – HI Profiles

N/A

### Appendix 3 – Fault Data

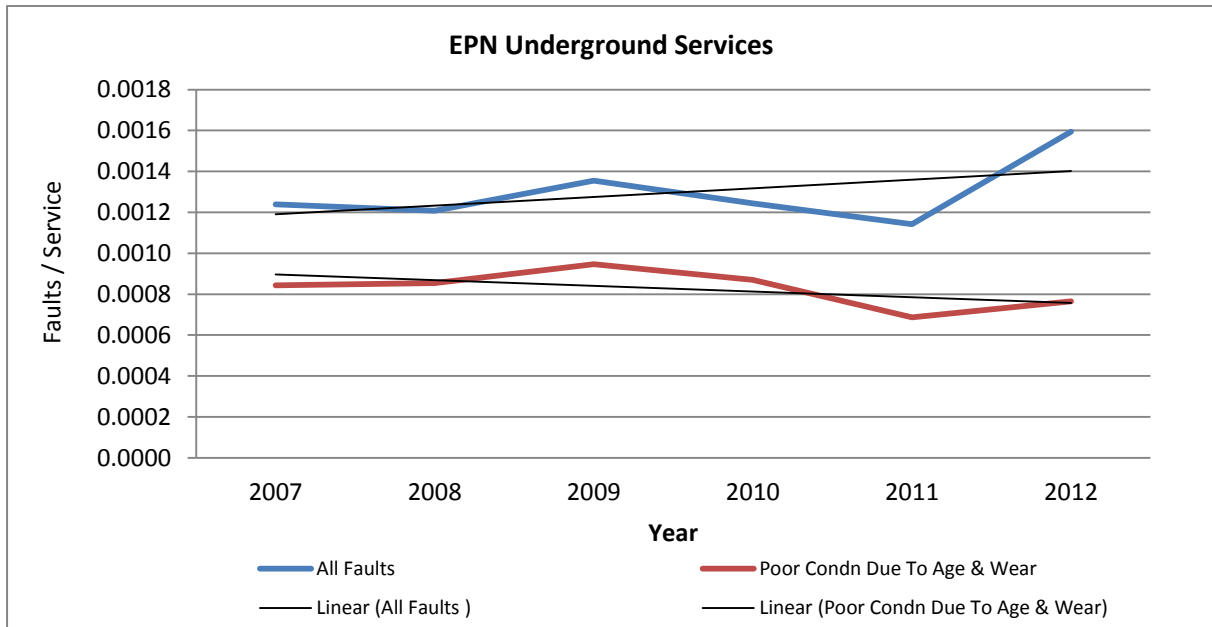


Figure 25 – Underground Services Fault rates (Source - UKPN Fault Cube)

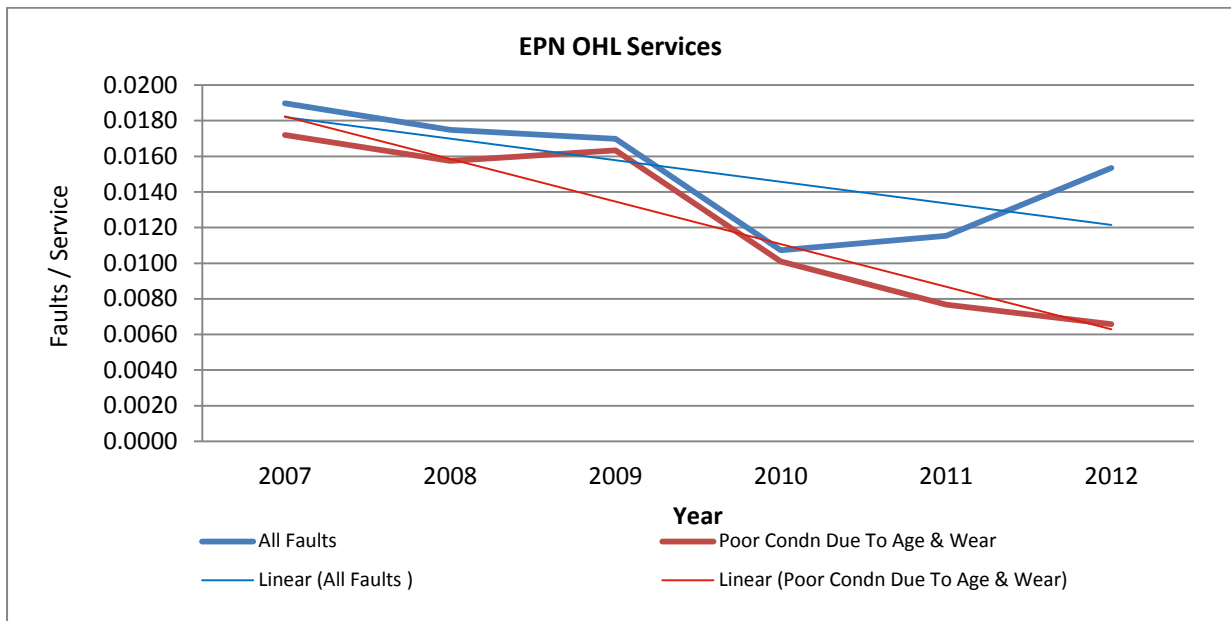


Figure 26 – OHL Services Fault Graphs (Source - UKPN Fault Cube)

### Appendix 4 – WLC Case Studies

Not applicable.

## Appendix 5 – NLRE Expenditure Plan

NAMP Line(s)	Asset Category	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	ED1 Total £k
Risers and laterals										
1.46.04	Replacement of Risers	36	76	76	76	76	76	76	76	565
1.46.04	Replacement of Laterals	240	504	504	504	504	504	504	533	3,797
Underground Services										
1.46.01	Replace Metered Services	440	440	440	440	440	440	440	440	3,517
1.46.02	UMS Services Replaced	43	43	43	43	43	43	43	43	341
1.46.06	UMS Service Replacement (SWA Only) - Non Chargeable Connections Work	328	328	328	328	328	328	328	328	2,621
Overhead services										
1.46.03	Replace Overhead Services - Ad Hoc Replacements & ESQC Response	1,054	979	753	678	452	452	452	452	5,272
Cutouts										
1.17.01	Cut Outs Replaced (BAU)	1,079	720	360	360	360	432	440	440	4,190
	Total (£k)	3,523	3,393	2,807	2,732	2,506	2,578	2,586	2,615	22,732

Table 12 – ED1 Expenditure Plan (Source 19th February 2014 NAMP Table J Less Indirect)

NAMP Line(s)	Asset Category	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	ED1 Total
Risers and laterals										
1.46.04	Replacement of Risers	20	42	42	42	42	42	42	42	314
1.46.04	Replacement of Laterals	200	420	420	420	420	420	420	444	3164
Underground Services										
1.46.01	Replace Metered Services	412	412	412	412	412	412	412	412	3,296
1.46.02	UMS Services Replaced	40	40	40	40	40	40	40	40	320
1.46.06	UMS Service Replacement (SWA Only) - Non Chargeable Connections Work	307	307	307	307	307	307	307	307	2,456
Overhead services										
1.46.03	Replace Overhead Services - Ad Hoc Replacements & ESQC Response	3,500	3,250	2,500	2,250	1,500	1,500	1,500	1,500	17,500
Cutouts										
1.17.01	Cut Outs Replaced (BAU)	4,184	2,789	1,395	1,395	1,395	1,673	1,704	1,704	16,239
	Total	8,663	7,260	5,116	4,866	4,116	4,394	4,425	4,449	43,289

Table 13 - ED1 Forecast Volumes (Source 19th February 2014 NAMP Table O)

## Appendix 6: Sensitivity Analysis

Not Applicable

## Appendix 7: Named schemes

Not Applicable

## Appendix 8: Output NAMP/ED1 RIGS reconciliation

DNO		EPN																				
Outputs		Asset Stewardship reports										RIG Table										
Investment description	NAMP Description	NAMP Line	2015/6	2016/7	2017/8	2018/9	2019/20	2020/21	2021/22	2022/23	Total	RIG Table	RIG Row	2015/6	2016/7	2017/8	2018/9	2019/20	2020/21	2021/22	2022/23	Total
Risers & Laterals	Replacement of Risers	1.46.04.8297	20	42	42	42	42	42	42	42	314	CV110	57	20	42	42	42	42	42	42	42	314
	Replacement of Laterals	1.46.04.8518	200	420	420	420	420	420	420	444	3,164	CV110	58	200	420	420	420	420	420	420	420	3,140
Underground services	Replace Metered Services	1.46.01.9137	412	412	412	412	412	412	412	412	3,296											
	UMS Services Replaced	1.46.02.9138	40	40	40	40	40	40	40	40	320	CV3	141	759	759	759	759	759	759	759	759	6,072
	UMS Service Replacement (SWA Only) - Non Chargeable Connections Work	1.46.06.6386	307	307	307	307	307	307	307	307	2,456											
Overhead services	Replace Overhead Services - Ad Hoc Replacements & ESQC Response	1.46.03.9139	3,500	3,250	2,500	2,250	1,500	1,500	1,500	1,500	17,500	CV3	135	3,500	3,250	2,500	2,250	1,500	1,500	1,500	1,500	17,500
Cutouts (Metered)	Cut Outs Replaced (BAU)	1.17.01.9051	4,184	2,789	1,395	1,395	1,395	1,673	1,704	1,704	16,239	CV3	148	4,184	2,789	1,395	1,395	1,395	1,673	1,704	1,704	16,239
<b>Total</b>			<b>8,663</b>	<b>7,260</b>	<b>5,116</b>	<b>4,866</b>	<b>4,116</b>	<b>4,394</b>	<b>4,425</b>	<b>4,449</b>	<b>43,289</b>			<b>8,663</b>	<b>7,260</b>	<b>5,116</b>	<b>4,866</b>	<b>4,116</b>	<b>4,394</b>	<b>4,425</b>	<b>4,449</b>	<b>43,289</b>

Table 14 NAMP to RIGS mapping [Source: 19th February 2014 Namp Table O / 21st February 2014 ED1 Business Plan Data Tables]



### Appendix 9: Material changes since the June 2013 ED1 submission

Asset type	Action	Change type	2013	2014	Difference (Reduction)
Risers and Laterals CV110	Replace	Volume Additions/Disposals	3454	3454	0
		Investment (£m)	4.36	4.36	0
		UCI (£k)	1.26	1.26	0
LV Service (UG) CV3	Replace	Volume Additions/Disposals	9,435 / 23,251*	6,072/6,072**	(3,363)/(17,179)
		Investment (£m)	24.81	6.48	18.33
		UCI (£k)	2.62	1.07	1.55
LV Service (OHL) CV3	Replace	Volume Additions/Disposals	17,500 / 17,500	17,500 / 17,500	0
		Investment (£m)	5.27	5.27	0
		UCI (£k)	0.3	0.3	0
Cutouts CV3	Replace	Volume Additions/Disposals	16,239 / 16,239	16,239 / 16,239	0
		Investment (£m)	4.19	4.19	0
		UCI (£k)	0.26	0.26	0

Table 15 - Material changes to the July 2013 ED1 submission [Source: October 2013 ED1 Submission / 21st February 2014 ED1 Submission]

\*The volume of disposals of underground services in the 2013 business plan submission was more than the volume of additions because it included the removal of 13,816 redundant services in ED1. Following a review of the mappings to the reporting tables, all of the redundant services costs have been remapped to "C26: Network Operating Costs – Other" and the volumes removed from CV3.

\*\*In addition the proposal for replacements for underground services was revised from 9,435 to 6,072 in ED1. The revision was to ensure that the forecast aligns more closely to historical achievements.

This document now only includes costs relevant to asset replacement (CV3) and replacement of rising and lateral mains (CV110). Unplanned replacements of services (NAMP lines 2.50) are now included in the Inspection and Maintenance Asset Stewardship reports.