



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

Asset Stewardship Report  
2014

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**Approved by Richard Wakelen / Barry Hatton**

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**Document History**

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1.1	24.02.2014	Preface added to the document	Chino Atako	Minor	NA
		All costs reduced updated to reflect a reduction due to the impact of impact of remapping of redundant services to C26 and unplanned replacements to CV15a/CV15b	Chino Atako	Minor	1.1, 1.3, 7.1.3, 7.3, Appendix 5, Appendix 8, Appendix 10
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		Removed reference to Cutout replacements due to the smart meter rollout as this is covered in a separate document Annex 10 of our RIIO-ED1 business plan	Chino Atako	Minor	1.1, 1.3, 7.1.2, 7.3
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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 LPN Service and Terminations**

### **1.1 Scope**

This document details UK Power Networks' non-load related expenditure (NLRE) replacement proposals for services (underground) and service terminations (cutouts) for the ED1 period. This covers £5.1m worth of investments in ED1.

There are 2.3 million connected customers in the LPN licence area fed from 1.4 million underground services. The Modern Equivalent Asset Value (MEAV) for underground services in LPN is £1.7bn. The proposed investment in ED1 for this asset category is 0.03% of the MEAV per annum.

There are 2.3 million cutouts in LPN with an estimated MEAV of £754m. The proposed ED1 investment is 0.01% of its MEAV per annum.

Replacement volumes and expenditure for these assets are held in the Networks Asset Management Plan (NAMP) and associated 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 REFERENCES
Asset replacement (Cutouts)	£4.7m	1.17.01.9401 Replacement of cutouts (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)
Asset Replacement (Underground services)	£0.42m	1.46.01.9778 Replacement of metered services (Planned replacements)	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)

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 LPN 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
- Replacing services and terminations identified to be in poor condition.

## 1.3 ED1 Proposals



Table 2 shows the investment profile for services and service terminations in LPN through RIIO-ED1. Accompanying volumes shown in Appendix 5.

NAMP Line(s)	Asset Category	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	ED1 Total £k
1.46.01	Underground services	57	57	57	55	47	47	47	47	415
1.17.01	Cutout (Metered)	1,063	709	355	355	355	425	711	711	4,682
	Total	1,120	766	412	410	402	472	758	758	5,097

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

## 1.4 Innovation

Not Applicable

## 1.5 Risks and Opportunities

	Description of similarly likely opportunities or risks arising in ED1 period	Uncertainties
Risk/ opportunity	The smart metering programme may result in a higher or lower number of cutouts and service replacements allowed for in RIIO-ED1	+/-5% of the investment in ED1

Table 3: Risks and Opportunities

## 2.0 Description of Services and Service Terminations

### 2.1 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 1.4 million underground services in the LPN licence area. Figure 1 shows the age profile for these services.

Figure 1 shows that there was a peak of installation of underground service cables in the 1960s. However, it is important to note that there is a sizeable population of underground service cables installed pre-1920 and in the 1930s and 1940s. The oldest 10% of Underground services have an average age of 87 years.

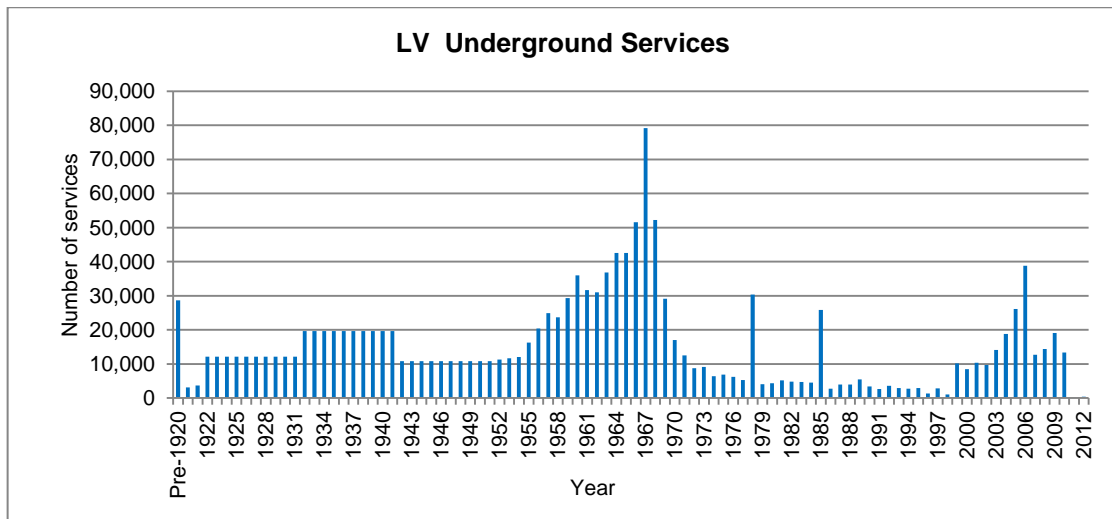


Figure 1 - LV UG service age profile (Source: RIGS 2012 CV3 Table V5)

## 2.2 Terminations (Cutouts)

There are 2.3 million connected customers with cutouts in LPN. LPN does not have a routine inspection regime for cutouts hence there is no age profile information on cutouts. Cutouts are inspected by meter operators as part of their routine meter inspections. Meter operators report the condition of cutouts by exception (i.e. only those in poor condition) as required by the Meter Operation Code of Practice Agreement (MOCOPA).

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



Figure 2 – Cutouts

Typically, less than 0.1% of cutouts are replaced each year. Figure 3 shows the historical replacement rate per year for cutouts in LPN.

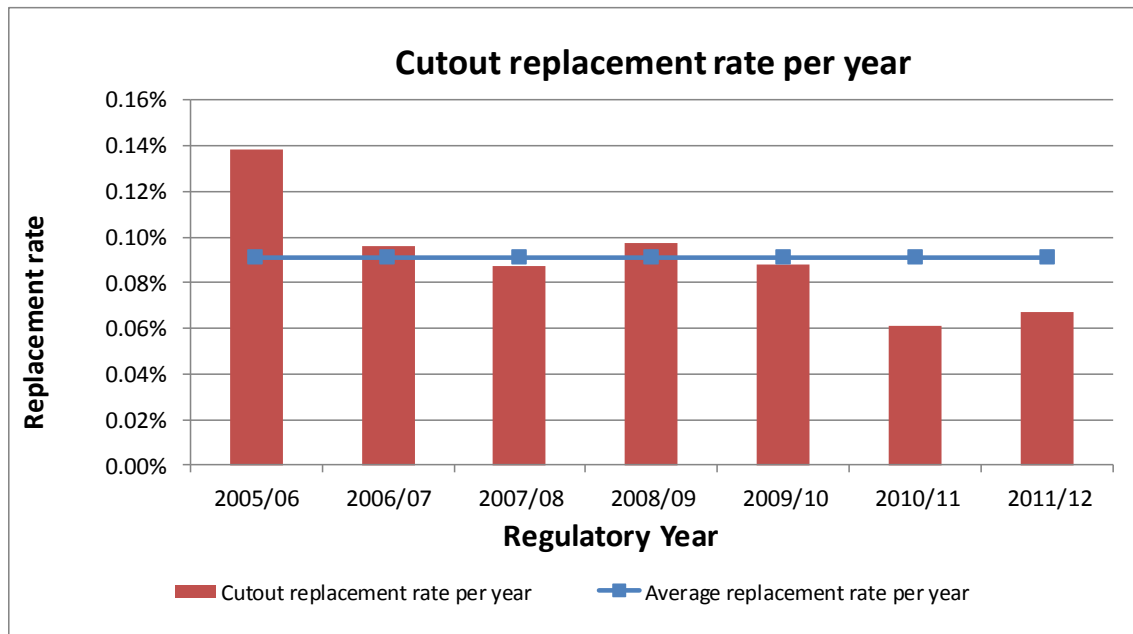


Figure 3 - Cutout replacement rate (Source – DPCR5 FBPQ and CV3 RIGS table 19<sup>th</sup> February 2014)

## 3.0 Investment Drivers and Condition Measurement

### 3.1 Investment Drivers

#### 3.1.1 Services and service terminations

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

- Electricity Safety, Quality and Continuity Regulations (ESQCR)
- 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\*
- 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 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 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.

Failures are usually reported by third parties and recorded in the ENMAC (Electricity Network Management and Control) tool.

Figure 4 shows a screenshot of the network-mapping tool, NETMAP. The locations of all underground services owned by LPN are held in NETMAP. There are processes in place to ensure that NETMAP records are updated whenever services are replaced.

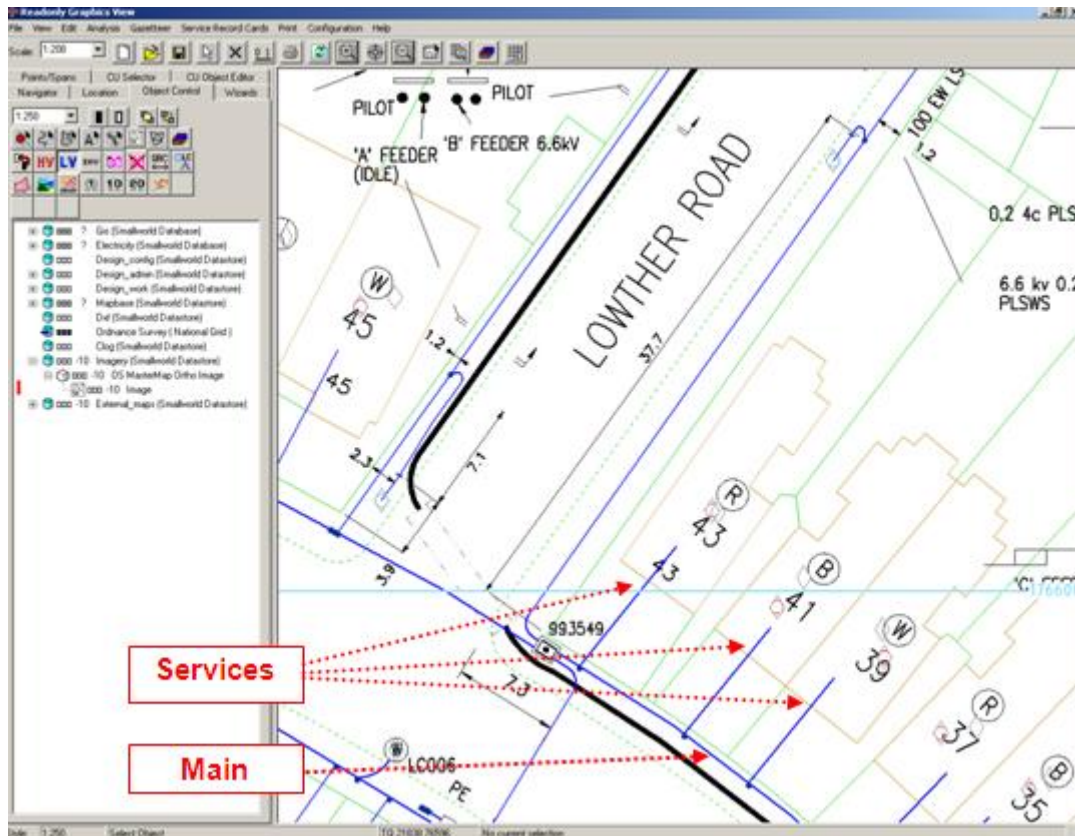


Figure 4 - NETMAP view of services and mains

### 3.2.2 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).

MOCOPA is an agreement between electricity distribution businesses and electricity meter operators in Great Britain.

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

## 4.0 Asset Assessment

### 4.1 Asset Health

#### 4.1.1 Services

There is no Health Index framework for services. Reviews of the fault rates and historical rates of replacement determine the 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. An analysis of historical replacement rates is also used to set the budget for cutout replacements required each year.

Figure 5 shows the five-year trends for faults on underground services in LPN. As observed from the charts, the fault rate is small (less than two in every 1,000 services fault each year).

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

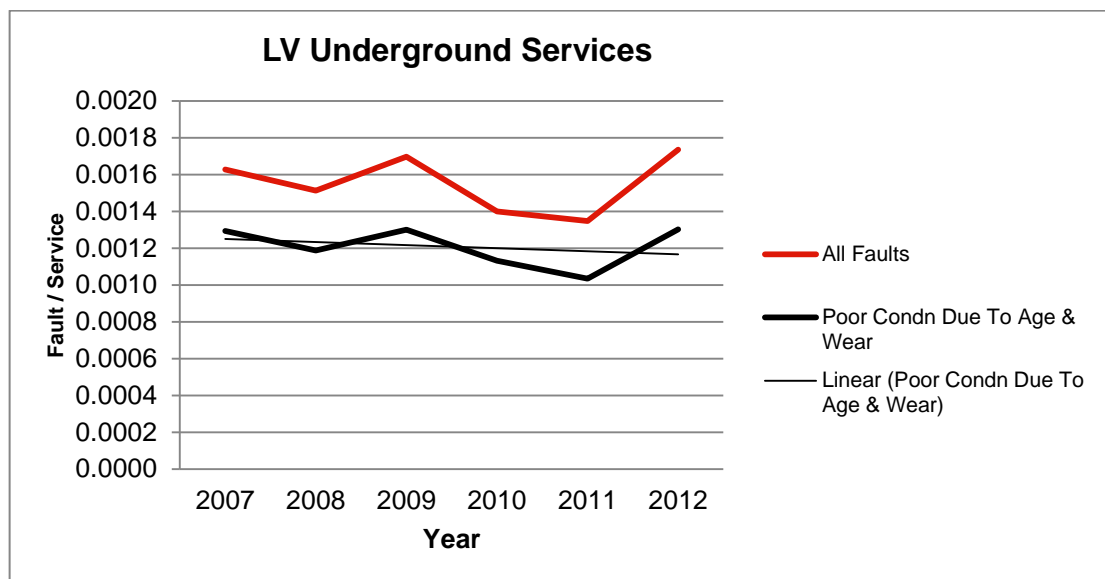


Figure 5: Services (fault trends) (Source: UKPN fault cube)

#### 4.1.2 Services and Terminations (including cutouts)

There is no Health Index framework for cutouts or historical rates of replacement. Cutout replacements are determined based on the intervention options policies outlined in section 5.1.

## 4.2 Asset Criticality

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.

## 4.3 Network Risk

There is no network risk framework for underground services and cutouts. However, the number of non-compliant services and cutouts reported on the network will provide a measure for assessing network risk and electricity safety, quality and continuity risk.

## 4.4 Data Validation

All reports received from third parties or UK Power Networks staff will be assessed against the intervention options 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 Alteration Notices (SANs) whenever services are replaced. These SANs are sent to the Network Records and Network Control teams.

## 4.6 Data Completeness

All overhead services and underground services are recorded on the network mapping tool, NETMAP.

## 5.0 Intervention Policies

### 5.1 Intervention Options

The only intervention option for underground services and cutouts is replacement as repairs are not considered to be 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 Service cable

A service cable (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 4: 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.

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

*Table 4: Single Phase Cable Ratings*

### 5.1.2 Cutout

A cutout shall only be changed 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-wire able 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.

### 5.1.3 Intervention strategy innovation

Not applicable.



## 5.2 Policies: Selecting Preferred Interventions

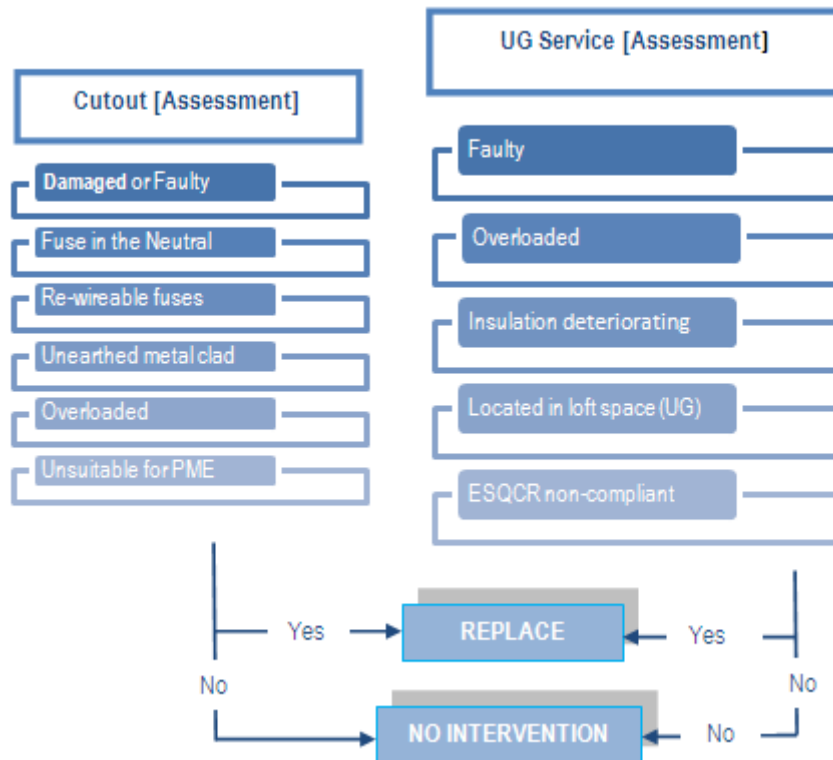


Figure 6 – Decision tree for interventions

Figure 6 shows the intervention options for cutouts and underground services. 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

Replacements of cutouts and underground services are reactive based on reports from meter operators carrying out inspections or customers reporting a fault. Hence there are no opportunities for CAPEX/OPEX trade-offs.

## 6.0 Innovation

Not applicable.

## 7.0 ED1 Expenditure Requirements for Services and Terminations

### 7.1 Constructing the Plan

#### 7.1.1 Services

The investment levels for underground services have been set based on historical expenditure and a review of fault rates.

There was a large investment in underground service replacement during the DPCR4 period which led to a decrease in fault rates from 2007 to the end of DPCR4 (refer to Figure 7).

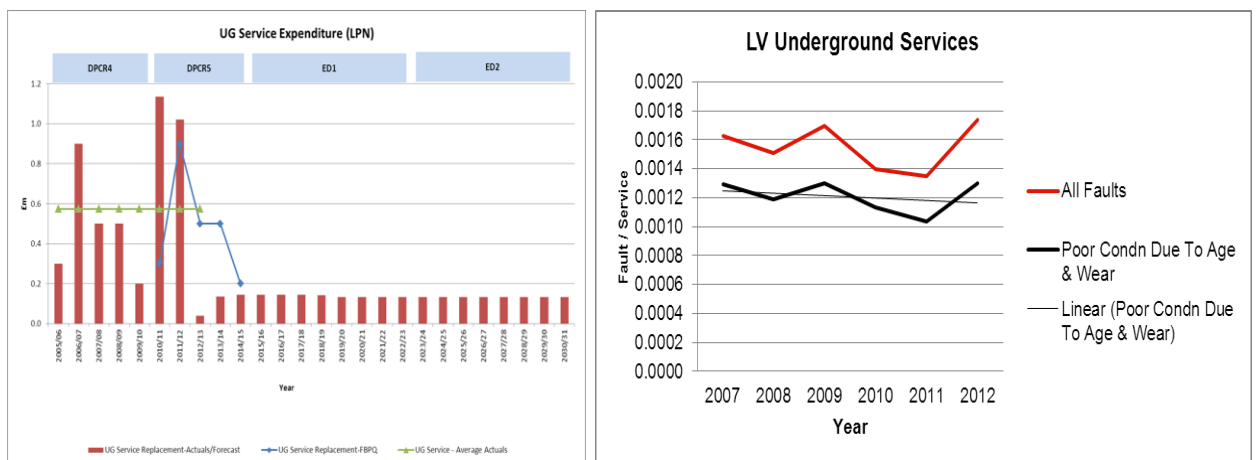


Figure 7: UG service expenditure plan (DPCR4-ED1) and fault rates (Source: 19th February 2014 NAMP Table J LESS INDIRECT, UKPN fault cube)

A decrease in investment for replacement of underground services in LPN led to a corresponding increase in the observed number of condition related failures witnessed in 2012. For this reason the investment levels for replacement of underground services in LPN has been increased from 2013 onwards.

### 7.1.2 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 planned 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. Following the smart meter rollout the replacement rate is expected to reduce to 0.05% of the population. Table 5 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)
LPN	2,160,917	0.1% of the population; <b>2,154</b>	0.05% of the population; <b>1,080</b>

Table 5: Comparative cutout replacement volumes during and after the smart meter rollout.

Table 6 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 Reference	Description	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
1.17.01.9401	Cut Outs Replaced (BAU)	2154	2154	1,616	1,077	539	539	539	646	1,080	1,080

Table 6: Comparative cutout replacement volumes during and after the smart meter rollout

## 7.2 Asset Volumes and Expenditure

### 7.2.1 Services

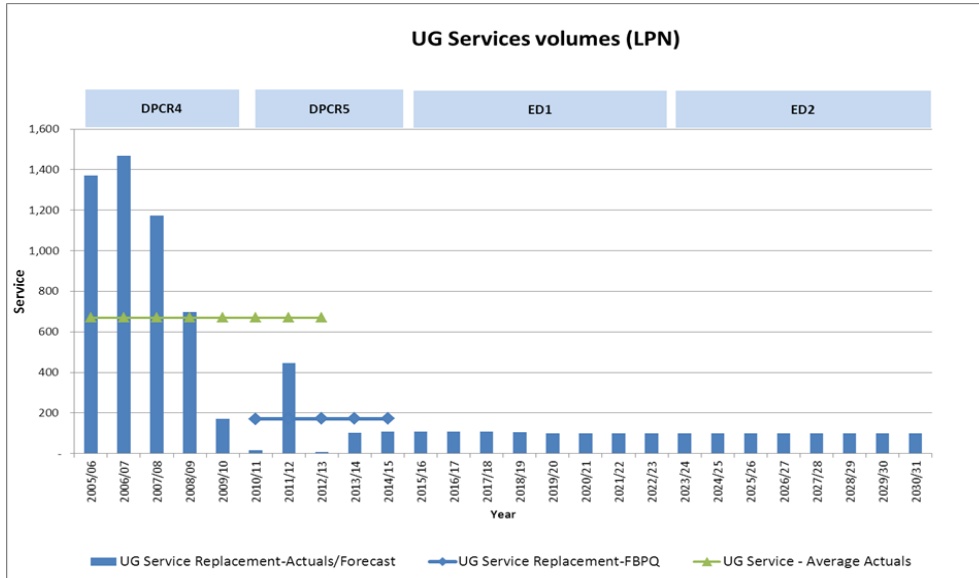


Figure 8 - UG Services Replacement volumes – LPN

Sources:

DPCR4 & DPCR5 FBPQ - Table NL3 (DPCR5 FBPQ)

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

Note: 2010/11, 2011/12 and 2012/13 volumes are 'equivalent' volumes from expenditure observed in the three years

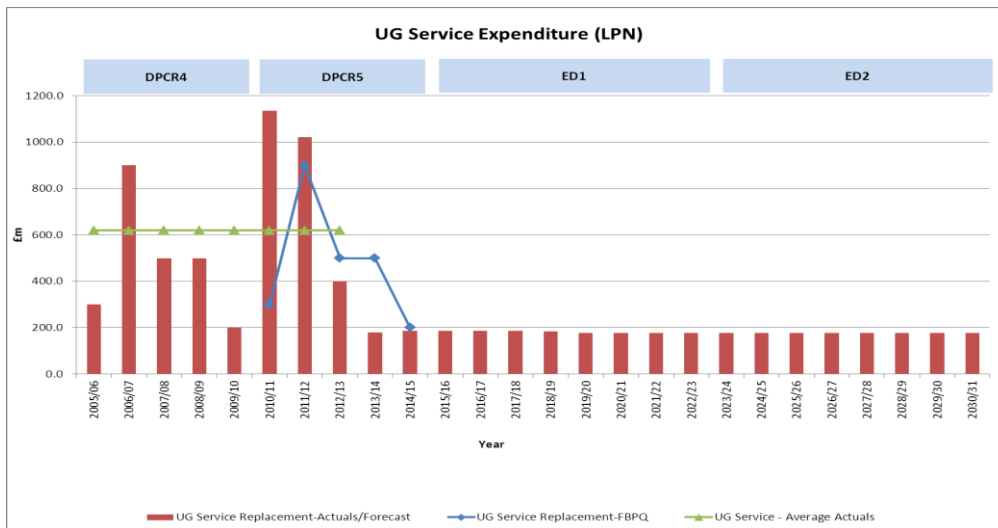


Figure 9 - UG Services Replacement Expenditure – LPN

Sources:

DPCR4 & DPCR5 FBPQ - Table NL1 (DPCR5 FBPQ)

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

## 7.2.2 Cutouts

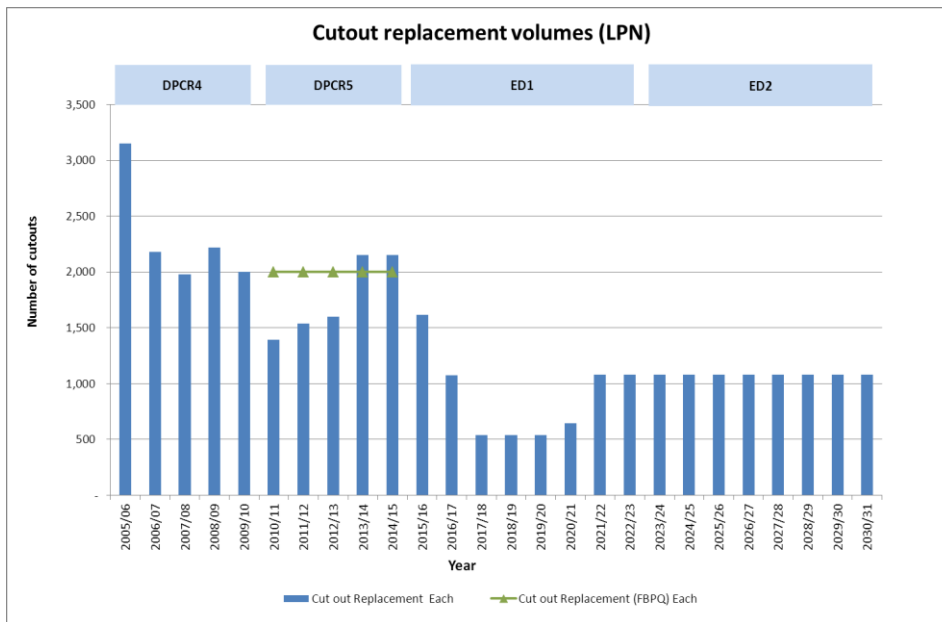


Figure 10 - Cutout replacement volumes – LPN

Sources :

- DPCR4 & DPCR5 FBPQ - Table NL3 (DPCR5 FBPQ)
- 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

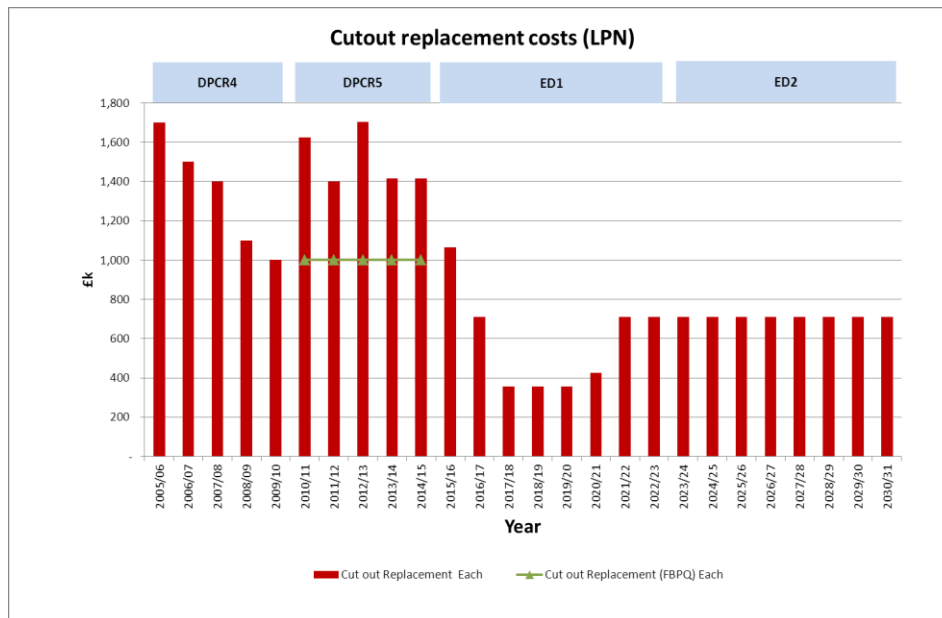


Figure 11 - Cutout replacement costs – LPN

Sources:

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

### **7.3 Commentary**

The proposed investment programme for the replacement of underground services is £0.4m. This is an increase on the level of investment in the first three years of DPCR5 and is required to address the rising fault trends in the last two years.

The proposed investment programme for the replacement of cutouts is £4.7m. 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**

Not applicable.

### **8.0 Deliverability**

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

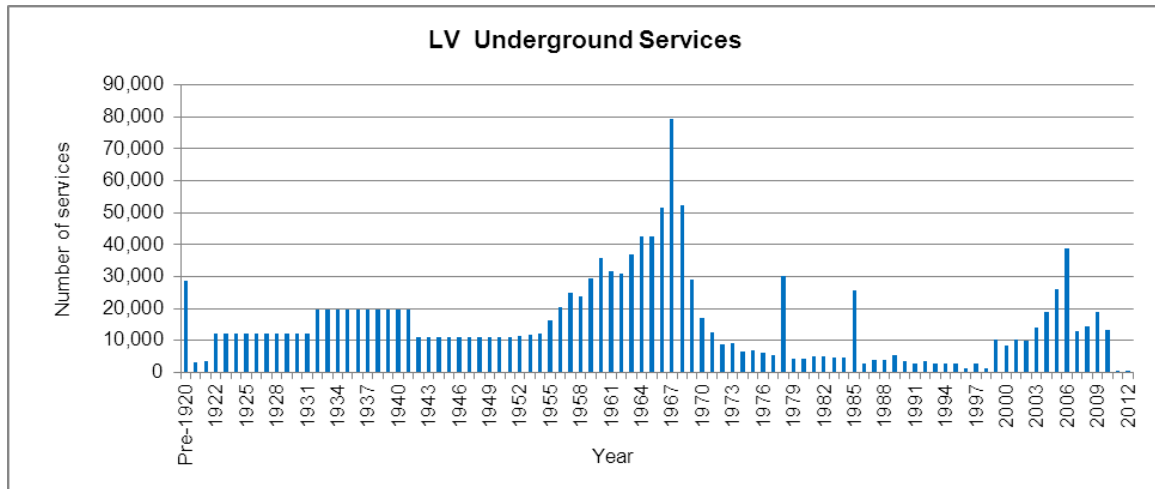


Figure 12 – Underground Services Age Profiles (Source: RIGS 2012 CV3 Table V5)

### Appendix 2 – HI Profiles

Not applicable.

### Appendix 3 – Fault Data

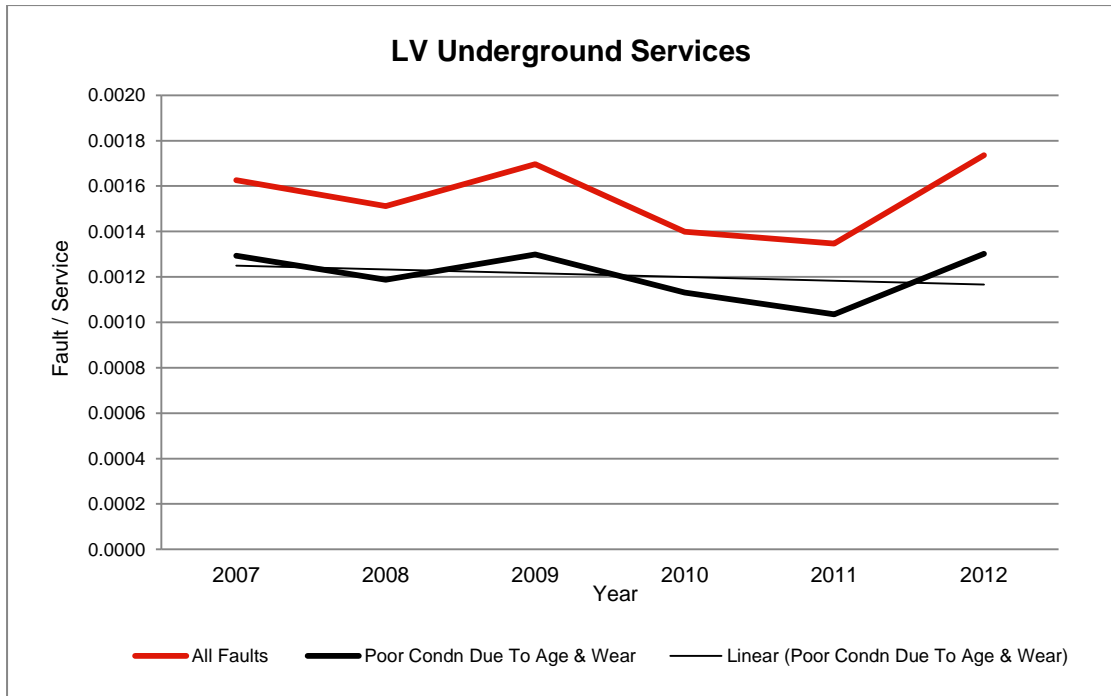


Figure 13 – Fault Data Underground Services (Source: UKPN fault cube)



## 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
1.46.01	Underground services	57	57	57	55	47	47	47	47	415
1.17.01	Cutout (Metered)	1,063	709	355	355	355	425	711	711	4,682
	Total	57	57	57	55	47	47	47	47	415

Table 7 – 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
1.46.01	Underground services	48	48	48	46	40	40	40	40	350
1.17.01	Cutout (Metered)	1,616	1,077	539	539	539	646	1,080	1,080	7,116
	Total	1,664	1,125	587	585	579	686	1,120	1,120	7,466

Table 8 - 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

Outputs	Asset Stewardship reports										RIG Table										
	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
Investment description																					
Underground services	1.46.01.9778	48	48	48	46	40	40	40	40	350	CV3	141	48	48	48	46	40	40	40	40	350
Cutout (Metered)	1.17.01.9401	1,616	1,077	539	539	539	646	1,080	1,080	7,116	CV3	148	1,616	1,077	539	539	539	646	1,080	1,080	7,116
<b>Total</b>		<b>1,664</b>	<b>1,125</b>	<b>587</b>	<b>585</b>	<b>579</b>	<b>686</b>	<b>1,120</b>	<b>1,120</b>	<b>7,466</b>			<b>1,664</b>	<b>1,125</b>	<b>587</b>	<b>585</b>	<b>579</b>	<b>686</b>	<b>1,120</b>	<b>1,120</b>	<b>7,466</b>

Table 9 NAMP to RIGS mapping [Source: 19th February 2014 NAMP Table O / 21st February 2014 ED1 Business Plan Data Tables]

## Appendix 10: Material changes since the June 2013 ED1 submission

Asset type	Action	Change type	2013	2014	Difference (Reduction)
LV Service (UG) CV3	Replace	Volume Additions/Disposals	350/8,670*	350/350	0 / (8,320)
		Investment (£m)	10.28	0.42	9.87
		UCI (£k)	29.37	1.18	28.19
Cutouts CV3	Replace	Volume Additions/Disposals	7,116/7,116	7,116/7,116	0
		Investment (£m)	4.68	4.68	0
		UCI (£k)	0.66	0.66	0

Table 10 - 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 8,320 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.

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