

# RIIO-ED2 Engineering Justification Paper (EJP)

## Worst Served Customers SEPD

Investment Reference No: 339\_REGIONAL\_WSC\_SEPD



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## Investment Summary Table

Table 1 below provides a high level summary of the key information relevant to this Engineering Justification Paper (EJP) and the Worst Served Customer (WSC) schemes in SEPD licenced areas.

Table 1: Investment Summary

| Engineering Justification Paper (Non-Load)  |                        |                 |             |                 |             |             |              |
|---|------------------------|-----------------|-------------|-----------------|-------------|-------------|--------------|
| <b>Name of Programme</b>                    | Worst Served Customer  |                 |             |                 |             |             |              |
| <b>Primary Investment Driver</b>            | Non-load WSC           |                 |             |                 |             |             |              |
| <b>Investment category</b>                  | 339_ REGIONAL_WSC_SEPD |                 |             |                 |             |             |              |
| <b>Output type</b>                          | WSC                    |                 |             |                 |             |             |              |
| <b>Cost</b>                                 | ■                      |                 |             |                 |             |             |              |
| <b>Delivery Year</b>                        | RIIO-ED2 (2024 – 2028) |                 |             |                 |             |             |              |
| <b>Reporting Table</b>                      | CV19: WSC              |                 |             |                 |             |             |              |
| <b>Outputs in RIIO ED1 Business Plan?</b>   | No                     |                 |             |                 |             |             |              |
| <b>Spend Apportionment</b>                  | <b>Licenced Area</b>   | <b>ED1 (£m)</b> |             | <b>ED2 (£m)</b> |             | <b>ED3+</b> |              |
|   | SEPD                   | -               |             | ■               |             | -           |              |
| <b>RIIO-ED2 Spend (£m) – WSC Schemes</b>    |                        |                 |             |                 |             |             |              |
| <b>CV19 WSC RIIO-ED2 Spend (£m)</b>         | <b>Year</b>            | <b>2024</b>     | <b>2025</b> | <b>2026</b>     | <b>2027</b> | <b>2028</b> | <b>Total</b> |
|   | SEPD                   | ■               | ■           | ■               | ■           | ■           | ■            |
| <b>RIIO-ED2 Volumes – WSC Schemes</b>       |                        |                 |             |                 |             |             |              |
| <b>CV19 WSC RIIO-ED2 Volumes (circuits)</b> | <b>Year</b>            | <b>2024</b>     | <b>2025</b> | <b>2026</b>     | <b>2027</b> | <b>2028</b> | <b>Total</b> |
|   | SEPD                   | 6               | 5           | 6               | 7           | 8           | 32           |

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## 1 Executive Summary

Our *Safe and Resilient (Annex 7.1) and Reliability Strategy (Annex 7.2)* set out the methodology used to determine the Non-Load baseline for capital expenditure. This encompasses capital investment to invest in improving network performance and reliability for those deemed to be Worst Served Customers (WSC). The baseline encompasses all activities and investments required during the RIIO-ED2 period where there is compelling evidence of need in terms of asset replacement and improvements to quality of service.

The primary driver for this category is network quality of service. This paper identifies the need to provide Ex-Ante allowance to develop schemes that target improving network performance for those customers that meet the WSC criteria as set by Ofgem. The circuits targeted for investment have been identified using the National Faults and Interruptions Reporting Scheme (NAFIRS) which provides historic network fault performance for circuits across our network. Using the NAFIRS data, we are able to determine which circuits, and the associated customers, meet the specific criteria of a WSC.

As each circuit is impacted by different issues, i.e. tree faults, bird strikes etc, it is not possible to propose a single option that is applicable to all **32** circuits that have been identified as requiring investment to improve network performance for the WSC. As such, several options are presented, the main three solutions to target network improvement are; re-building open wire lines with BLX covered conductor, replacing underground cable sections and undergrounding existing overhead lines (OHL). There is also possible investment in additional automation points to enhancing current automation levels.

We are committing to removing at least **75%** of customers from this list in ED2 which is supported by our Stakeholders. This ambitious proportion represents all circuits where cost benefit warrants investment. The remaining 25% of WSCs are distributed over a high number of circuits that the benefit derived from each circuit investment would be limited to very few customers.

Following the entirety of optioneering and all detailed analysis, as set out in this paper, the proposed scope of works is to target **32** circuits in SEPD to improve the quality of service to our WSC. SEPD will spend ■■■■ to deliver the preferred solution for each circuit within the ED2 regulatory period.

The benefit of these works revolves around reducing the number of faults seen by those customers on the 2019/20 WSC list. This investment is integral to improving network performance for WSCs. Each option chosen for investment on each of the identified circuits is intended to reduce the number of faults experienced by WSC by driving an affordable solution to improve network performance.

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## 2 Introduction

This Engineering justification paper (EJP) describes our proposed investment for WSC for RIIO-ED2.

The primary drive for each project will differ due to the nature of the network and fault types. For RIIO-ED2 Ofgem has proposed a change in the mechanism for identifying WSC; as detailed in section 3.2 herein. SSEN covers two license areas, SEPD and SHEPD, this EJP will only cover SEPD.

Section 3 provides a high-level background into WSC, this section will detail the changes from RIIO-ED1 to RIIO-ED2. Also, an explanation into why we have WSC in certain areas of the network and works that have been completed within RIIO-ED1.

Section 4 sets out how the chosen RIIO-ED2 investment strategy has been informed through our stakeholder engagement activities. With reference to this EJP, our stakeholders have informed the investment strategy chosen for this asset category by indicating the level of risk they are willing to accept when balancing two key metrics; network reliability and affordability.

Section 5 provides a detailed summary of the options considered for investment within RIIO-ED2. These options cover the different types of investment that is proven to drive improvements at an efficient cost for WSC and how these will improve network performance.

Section 6 concludes the EJP and confirms the overall strategy that we are driving with the associated options taken forward to improve the performance of WSC with the SEPD licence area for [REDACTED].

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### 3 Background Information

This section of the report provides additional background information which has been used to inform the current investment in WSC. This includes the changes to the mechanism, our past performance, works completed to date and the approach used to identify those circuits that will require investment during RII-ED2.

#### 3.1 Reasons for high interruption rates

There are several reasons for these high interruption rates experienced by our customers. This may indicate the deterioration in condition of the circuit itself or possibly the presence of ongoing faults due to component failures. There may be other external causes as is the case with bird strikes or falling trees on overhead lines or third-party damages.

A high proportion of the WSC are in the more remote areas on the fringes of our network, these rural areas are often challenging to navigate. We also experience higher fault numbers in coastal areas where overhead lines are still present, for example the Isle of Wight on the South Coast in Ventnor, additional areas include Charminster in the Dorset area. These areas suffer from a higher level of deterioration due to corrosion from the salty coastal air.

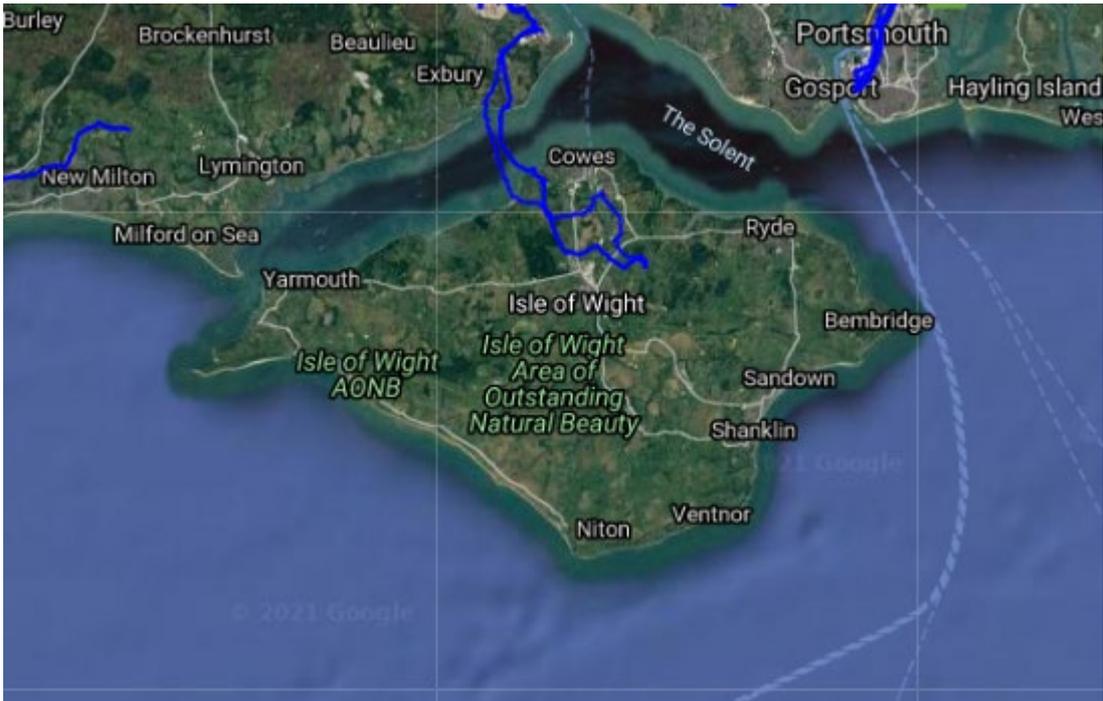


Figure 1: Isle of Wight remote network on the South

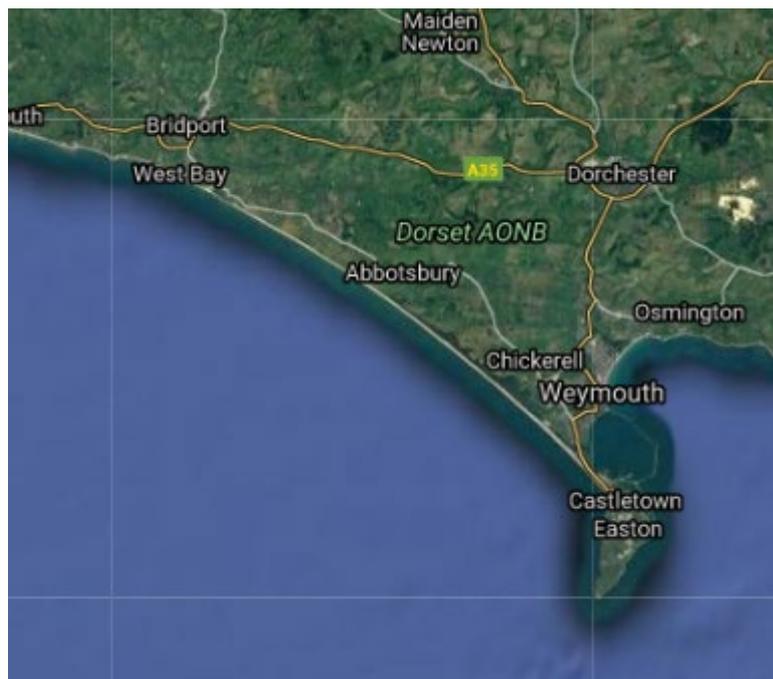


Figure 2: Dorset location both remote network on boundary of our area and Coastal

Additional areas of concern are the heavy wooded areas. Although we have a robust tree cutting programme this still presents a risk in areas where landowners refuse access and where we can only undertake restricted cuts; therefore, leaving areas at risk of faults during times of storms and high winds.

This high interruption rate is clearly unacceptable for affected customers and we are committed to improving this performance in RIIO-ED2.

### 3.2 Proposed changes for RIIO-ED2

Ofgem enhanced the WSC mechanism from DPCR5 into RIIO-ED1 and has developed this further into RIIO-ED2. The following 5 options were proposed for ED2,

1. Keep existing mechanism as it is.
2. Amend parameters of existing mechanism such as:
  - a. reducing the threshold number of faults from 12 to 9 or 6;
  - b. changing the length of the qualifying or monitoring period(s);
  - c. changing the required level of performance improvement;
  - d. revising the allowance per customer;
  - e. including LV interruptions;
3. Fund WSC schemes through ex-ante allowances.
4. Fold into the IIS.
5. Remove the WSC mechanism.

Following the release of the RIIO-ED2 Methodology Decision in December 2020, they confirmed that the principles of the definition of a WSC will be retained with the minimum number of faults in a year to be reduced to two. There is also change to the funding mechanism, moving to providing ex-ante funding for DNOs to deliver dedicated schemes that will improve reliability for specified groups of customers, and this will be

introduced as an associated Price Control Deliverable (PCD). This has driven our strategy for WSC as specified groups of customers need to be identified for dedicated schemes.

### 3.3 WSC numbers and changes

For SEPD the number of WSC’s based on the 19/20 fault numbers will increase from 2,151 to 5,436. This is an increase of 153% base on the current mechanism. This change in methodology will require dedicated schemes that are based on the 19/20 WSC numbers to achieve a positive reduction in the current levels of WSC.

### 3.4 Policies/Procedures

The guaranteed standards of performance relate to the quality of network service for DNOs to comply with. DNOs are required to meet expected levels of service and to provide payments to customers in the event of failure to achieve these standards. This is set out in the Electricity (Standards of Performance) Regulations 2010 which covers a range of areas including supply interruptions. Design and operation policies are listed in Appendix 4.

### 3.5 RIIO-ED1 Mechanism

The current mechanism for RIIO-ED1 WSC is a minimum of 12 faults over 3 years and a minimum of 3 faults per year.

Table 2 shows the current WSC volumes within SEPD and the yearly changes of WSC during RIIO ED1, this also demonstrates the number of projects completed and the number of customers that have benefited from these works.

*Table 2: RIIO-ED1 Completed Projects and spend to Date*

| Reporting Year | Number of WSC | Number of Projects Complete | WSC Benefiting from Projects complete | Spend on WSC |
|----------------|---------------|-----------------------------|---------------------------------------|--------------|
| 2016           | 8910          | 4                           | 722                                   |              |
| 2017           | 2990          | 0                           | 0                                     |              |
| 2018           | 2194          | 1                           | 189                                   |              |
| 2019           | 4267          | 2                           | 532                                   |              |
| 2020           | 2151          | 2                           | 533                                   |              |
| 2021           | 2158          | 2                           | 708                                   |              |

### 3.6 Examples of completed works

Rebuilding overhead lines that have seen an increase in deterioration has been one of the primary solutions to removing faults and improving the performance of the network. Projects examples on specific circuits are WSC 118001 KIDD E3L5 and WSC 419004 CHMI E2L5; details of which can be found in appendix 1. These projects have directly targeted open wire sections that have seen higher than average fault rates by installing BLX and replacing wood poles where needed. BLX is a covered conductor that provides protection from transient faults from trees and other airborne debris.

Additional protection devices including Air-break Switch Disconnectors (ABSD’s) have helped to sectionalise networks to reduce the number of affected customers following unplanned outages and thus enabling the restoration of customers in a timelier manner. See project example WSC 118002 UPPH in the Appendix 2.

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Installing additional automation on rural feeders has increase the performance of the long rural feeders that have suffered with faults in the first isolatable section from the Primary. This has demonstrated a significant improvement in performance and reduced customer interruption times to under 3 minutes. See example WSC 419005 CHMI E3L5 in the Appendix 2.

In a few isolated instants where we have seen abnormally high fault rates on underground cables, these have been replaced within the scope of the associated WSC project.

### 3.7 WSC Data Tables

Table 3 demonstrates how the number of WSC changes year to year, which creates a challenge when trying to create named schemes for RIIO-ED2. There are however a few circuits that repeat several times. A large proportion of these circuits have been addressed, namely BARS E1L5 which featured in 16/17 and 17/18, Works completed in 17/18. CHMI E2L5 features in all four lists and has an extensive amount of works complete in 20/21.

### 3.8 Worst served customer data using RIIO ED1 mechanism

Table 3: WSC Feeders and Numbers from 2016/17 – 2019/20 (RIIO-ED1 Mechanism)

| WSC 2016/17       |              |
|-------------------|--------------|
| Feeder            | Customer No. |
| ALTON LOCAL       | 533          |
| BARTON STACEY     | 57           |
| BILSHAM           | 30           |
| BIRDHAM           | 22           |
| BROMHAM           | 90           |
| CHARMINSTER       | 121          |
| CHOBHAM           | 254          |
| DEDDINGTON        | 20           |
| DUNBRIDGE         | 46           |
| FARINGDON         | 2            |
| FYFIELD           | 189          |
| HASLINGBOURNE     | 110          |
| HOLWELL           | 335          |
| HOUGHTON          | 38           |
| KIDDINGTON        | 431          |
| LITTLE HUNGERFORD | 29           |
| LYMINGTON         | 37           |
| MIDHURST          | 46           |
| MINETY VILLAGE    | 6            |
| MINETY VILLAGE    | 153          |
| NUFFIELD          | 28           |
| RAMSBURY          | 159          |
| ROWDEN            | 69           |
| ST JOHNS          | 6            |
| WARFIELD          | 78           |
| WOKINGHAM         | 5            |
| WYCOMBE MARSH     | 96           |
| <b>Total</b>      | <b>2990</b>  |

| WSC 2017/18        |              |
|--------------------|--------------|
| Feeder             | Customer No. |
| ALTON LOCAL        | 79           |
| BALL HILL          | 1            |
| BARTON STACEY      | 42           |
| BICESTER           | 19           |
| BILSHAM            | 30           |
| CHIPPING NORTON    | 30           |
| CHARMINSTER        | 612          |
| CHARMINSTER        | 21           |
| COWLEY LOCAL       | 109          |
| FYFIELD            | 174          |
| HENLEY             | 160          |
| KIDDINGTON         | 241          |
| KINGSCLERE         | 25           |
| LECHLADE           | 29           |
| LOVE LANE          | 21           |
| MINETY VILLAGE     | 156          |
| NUFFIELD           | 28           |
| ROWDEN             | 75           |
| SPRING QUARRY WEST | 110          |
| TWYFORD            | 10           |
| UPPER HEYFORD      | 69           |
| WIMBORNE           | 52           |
| WOKINGHAM          | 5            |
| WYCOMBE MARSH      | 96           |
| -                  | -            |
| -                  | -            |
| -                  | -            |
| <b>Total</b>       | <b>2194</b>  |

| WSC 2018/19          |              |
|----------------------|--------------|
| Feeder               | Customer No. |
| ARNCOTT              | 21           |
| BALL HILL            | 377          |
| BICESTER             | 22           |
| BOWERDEAN            | 12           |
| CHIPPING NORTON      | 29           |
| CHARMINSTER          | 524          |
| COWLEY LOCAL         | 348          |
| COXMOOR WOOD         | 39           |
| CRICKLADE            | 149          |
| EASTERTON            | 1052         |
| JAYS CLOSE           | 44           |
| KENNINGTON           | 372          |
| KIDDINGTON           | 18           |
| KINGSCLERE           | 25           |
| LECHLADE             | 29           |
| MINETY VILLAGE       | 37           |
| RAMSBURY             | 68           |
| ROMSEY               | 288          |
| UPPER HEYFORD        | 277          |
| WALLINGFORD          | 61           |
| WATLINGTON           | 14           |
| WEST GRAFTON VILLAGE | 126          |
| WOKINGHAM            | 5            |
| WYCOMBE MARSH        | 46           |
| YETMINSTER           | 284          |
| -                    | -            |
| -                    | -            |
| <b>Total</b>         | <b>4267</b>  |

| WSC 2019/20          |              |
|----------------------|--------------|
| Feeder               | Customer No. |
| ALDERTON             | 16           |
| BISHOPS WALTHAM      | 46           |
| CHIPPING NORTON      | 30           |
| CHARMINSTER          | 528          |
| COWLEY LOCAL         | 123          |
| DUNBRIDGE            | 289          |
| FARNBOROUGH          | 56           |
| FYFIELD              | 33           |
| GORING               | 64           |
| GROVE                | 149          |
| HUNGERFORD           | 100          |
| LECHLADE             | 10           |
| MORTIMER             | 57           |
| PETERSFINGER         | 18           |
| ROWDEN               | 143          |
| SHIPTON OLIFFE       | 56           |
| UPPER HEYFORD        | 354          |
| WALLINGFORD          | 23           |
| WANTAGE              | 30           |
| WINTERBORNE KINGSTON | 7            |
| WOKINGHAM            | 5            |
| WYCOMBE MARSH        | 14           |
| -                    | -            |
| -                    | -            |
| -                    | -            |
| -                    | -            |
| <b>Total</b>         | <b>2151</b>  |

To identify trends in performance Figure 3 and table 4 have been used to break down the WSC into regions, this has helped to understand any localised trends. Both Wessex and Ridgeway are traditionally larger geographical areas with more rural networks.

Table 4: WSC per year broken into regions

| WSC per Region | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|----------------|---------|---------|---------|---------|
| South East     | 741     | 109     | 83      | 56      |
| Wessex         | 178     | 727     | 1096    | 888     |
| Thames Valley  | 496     | 346     | 479     | 240     |
| Ridgeway       | 1575    | 1012    | 2609    | 967     |

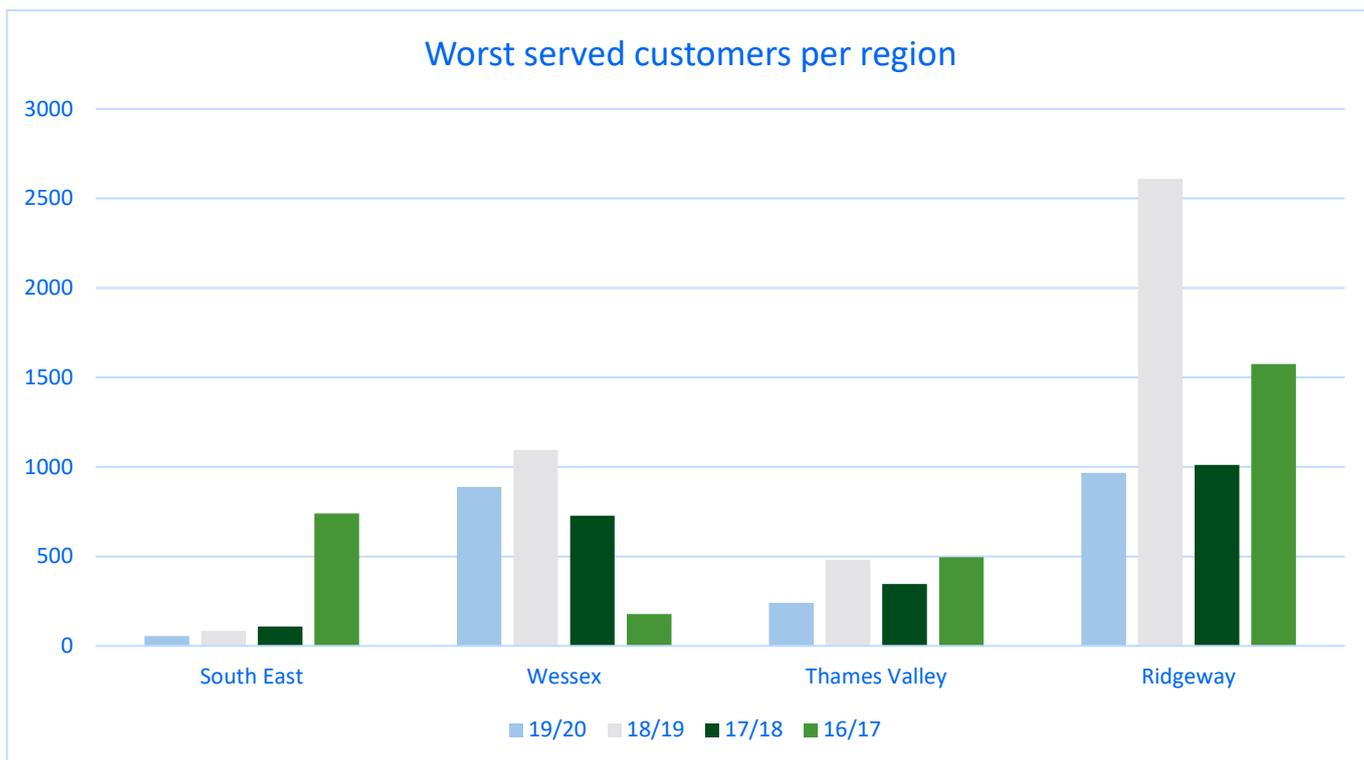


Figure 3: Worst served customers broken into regional areas

Figure 3 highlights the profile within regional boundaries that help to plan and prioritise work programmes.

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## 4 Stakeholder Engagement

This section of the EJP describes the stakeholder engagement strategy that has been implemented to inform our RIIO-ED2 submission. This includes the engagement activities that have been undertaken and reflective in our **Enhanced Engagement Strategy (Annex 3.1)** stakeholder groups that have been approached, and the feedback that has been gathered from this stakeholder engagement.

The intention of this exercise was to identify the appetite from our stakeholders for us to carry out the investment described within this document during RIIO-ED2 to improve the condition of SSEN's network assets and the quality of supply for customers during ED2 and beyond.

We conducted audience research with stakeholders via online workshops/open forums to co-create our strategies and priorities in RIIO-ED2 for improving the network for WSCs. The following insights were derived:

- There was no consensus on whether investment in worst-served circuits should be prioritised according to: number of WSCs; number of interruptions; level of customer vulnerability; or potential of low carbon technology (LCT) take-up.
- Stakeholders, however, expressed concern about the impact of power cuts on customers in vulnerable situations, and on this basis focusing investment efforts on reducing the number of worst-served vulnerable customers was supported.
- The interruption duration which is currently not considered in Ofgem's WSC definition is recognised as an important factor by our stakeholders.
- Stakeholders suggested that an annual WSC report would be welcome and raise the profile of the issue but might give the incorrect impression that these are the areas where there will be investment.
- Some stakeholders were concerned about the impact of worst-served circuits on generation as well as supply customers.

The consensus from Stakeholders clearly suggests that being worst-served is a substantial detriment to all such customers and improving these networks is extremely important. Therefore, we are committing to removing at least 75% of customers from this list in ED2 which is supported by our Stakeholders. This ambitious proportion represents all circuits where cost benefit warrants investment. The remaining 25% of WSCs are distributed over a high number of circuits that the benefit derived from each circuit investment would be limited to very few customers.

We will also ensure that we communicate effectively during power outages, particularly for remote communities where electricity is heavily relied upon, promote the PSR and the 105 power outage number, and produce an annual WSC report to be shared with wider stakeholders to embed resilience partnerships.

Based on the stakeholder feedback, the average Customer Minutes Lost (CML), Priority Service Register (PSR) and the vulnerability score from the Customer Mapping Tool are also factored in the scheme consideration.

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## 5 Summary of Options Considered

This section of the report sets out the investment options that have been considered for addressing worst served customers in relation to the intervention proposed by new mechanism.

As detailed in section 4, we held stakeholder engagement that was specifically focused on WSC, the main highlight was the desire to prioritise vulnerable customers. Currently SSEN tracks customers that have volunteered to be added to the Priority service register (PSR).

### 5.1 Summary of Options

Overall, SEPD is committed to a reduction of 75% of WSC as per our 19/20 WSC list numbers by the end of RII0-ED2 through targeted investment, options are detailed below that have been considered.

Table 5: Summary of Investment Options for Automation

| Option                                   | Description  | Advantages   | Disadvantages  | Result  |
|--|--|--|--|---|
| <b>1. No Investment in WSC</b>           | No Spend on WSC specifically.  | No additional expenditure  | Customers will experience multiple interruptions every year.                 | Not considered a viable option for RIIO-ED2 for qualifying circuits |
| <b>2. Replace Open wire lines</b>        | Focus the replacement of HV open wire lines with BLX covered conductor in areas of WSC   | Re-new overhead line assets<br>Removal of a high number of transient faults    | Will not address all WSC options<br>Possible replacement of good assets.     | Chosen investment option for RIIO-ED2 deployment                    |
| <b>3. Enhanced Automation</b>            | Install a higher level of automation in areas of WSC, customer sections will be greatly reduced giving a higher level of performance.        | More flexibly network<br>Ability to resort higher number of customers quicker  | No reduction in faults   | Chosen investment option for RIIO-ED2 deployment                    |
| <b>4. Replace Cable section</b>          | Identify cable sections that have faulted and caused WSC, replace with modern equivalent cable   | Targeted overlays will remove faults from the network and increase resilience. | Few options in WSC for this to achieve a network benefit<br>High Cost option | Chosen investment option for RIIO-ED2 deployment                    |
| <b>5. Focus on PSR customers only</b>    | Issue schemes that will focus on PSR customers only, this will be a mixture of all the options proposed but without the collective approach. | Helping Vulnerable customers<br>Lower overall spend                            | Will omit a high number of WSC   | Chosen investment option for RIIO-ED2 deployment                    |
| <b>6. Underground overhead lines</b>     | In heavily tree lined areas divert the overhead line to be underground cable.  | Removal of faults from tree lined areas<br>Increase network performance        | High cost compared to other options  | Chosen investment option for RIIO-ED2 deployment                    |
| <b>7. Invest in 100% of WSC circuits</b> | Target all WSC with investment with the above options  | Removal of current WSC   | Extremely high cost that are not beneficial to all customers                 | Not considered a viable option for RIIO-ED2 for qualifying circuits |

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## 5.2 Option 1: No investment on WSC

No investment for WSC will mean that the network will see the same level of performance over the course of RIIO-ED2. There will still be investment for tree cutting as within CV29 and asset replacement CV7 but where these are not sufficient to help WSC there will be no change. We do not consider this a viable option and will look to invest in these areas to help both WSC and PSR customers that are affected by a higher than average fault rate.

## 5.3 Option 2: Replace Open Wire lines

Open wire lines are more susceptible to transient faults via windborne material, trees, bird strikes and vermin faults. Replacing with a covered conductor such as BLX will strengthen the network and remove a large proportion of re-occurring faults as stated.

This option will be used were we have seen faults in line with the previous statement and will be identified on a circuit by circuit bases.

## 5.4 Option 3: Enhanced Automation

Automation is currently installed on many feeders on our network in accordance with TG-NET-NPL-010. WSC funding will be used to enhance this further to allow for smaller customer sections. When faults do occur, this will allow the restoration of non-affected customers to be restored much quicker. Also, with fault passage indicators fitted to all automation points fault finding will be much quicker and directed.

However, this method will not remove faults from the network it will improve customer performance in areas not affected by the faults. The enhance automation will be used on selected feeders that allow this method to be installed, long spur feeders will not benefit from this system and other options will be considered.

## 5.5 Option 4: Replace Cable sections

Replacing faulty sections of cable will be very affective at removing faults from the network as this will be directly associated with network performance. Network studies will be carried out and any opportunities for replacement will be identified.

There will be few opportunities with WSC for cable replacement but where identified will have a considerable impact, this will be significant in cost and will benefit from WSC funding.

## 5.6 Option 5: Focus on PSR customers only

Focusing on PSR customers that are WSC only will limit the amount of work that is conducted. Normal WSC are grouped together making the solution straight forward. Using PSR customer numbers may dilute the numbers and make the identification of patterns challenging.

PSR data will be used alongside WSC data to drive the best solution for all affected customers but the priority will be aimed at PSR customers.

## 5.7 Option 6: Underground overhead lines

Undergrounding overhead lines and installing cable will remove all overhead faults from a section of network. This will be costly task require legal permission and network alterations but in areas of high tree faults this will be the best solution.

This option will have limited application due to the time scales involved but where applicable will have a high impact on WSC.

### 5.8 Option 7: Invest in 100% of WSC circuits

Investing in every WSC will create a long list of schemes that will increase the proposed costs and will not represent best value for all customers. All feeders will be checked against other work programmes to make sure there is investment in these areas via CV7, CV8 and CV29, this will ensure that we are looking into feeders with low numbers of WSC.

### 5.9 Priority service register (PSR)

Highlighted in our stakeholder meeting held on the 27<sup>th</sup> January 2021, customers wanted vulnerable customers to be part of the WSC investment. Currently customers volunteer to be part of the Priority Service Register (PSR). This is different to what is used to measure vulnerable customer, vulnerable customers are listed per parish council. Unfortunately, this does not give a location for SEPD to use this for WSC however this is being used to target engagement with customers to increase the number of PSR listed customers.

*Table 6: Vulnerable customers compared to Priority Supply Register (PSR)*

|  |           |
|--|-----------|
| Total number of connected consumers SEPD | 3,114,275 |
| Vulnerable connection consumers SEPD     | 903,202   |
| PSR connected consumers SEPD             | 582,131   |

Table 6 shows the total number of connected customers in the SEPD licence area and the number of vulnerable customers. The number of customers registered within the PSR identifies a gap of 321,071 compared to the number of vulnerable customers identified, as stated SSEN will look to close the gaps within RIIO ED2.

### 5.10 New mechanism for RIIO-ED2

Section 3.2 highlighted the change to the mechanism for WSC when RIIO-ED2 starts, (minimum of 12 faults in a 3-year period with a minimum of 2 faults per year). Using 19/20 fault data this change from a minimum of 3 faults per year to 2 faults has increase SEPD's number of WSC from 2151 to 5436, table 7 highlights the number of WSC by region.

*Table 7: New mechanism applied to current network data*

| Region        | ED2 WSC*    |
|---------------|-------------|
| South East    | 177         |
| Wessex        | 1486        |
| Thames Valley | 1213        |
| Ridgeway      | 2560        |
| <b>Total</b>  | <b>5436</b> |

\*Based on 2019/20 data

This large increase in WSC numbers highlighted in table 8 would mean that more customers can potentially benefit from WSC funding.

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*Table 8: Comparison of 19/20 WSC numbers WSC ED1 mechanism and WSC ED2 mechanism*

| <b>Region</b> | <b>RIIO-ED1 WSC based on<br/>19/20 data</b> | <b>RIIO-ED2 WSC based on<br/>19/20 data</b> | <b>Change in volumes<br/>between Mechanisms</b> |
|---------------|---|---|---|
| South East    | 56  | 177   | 121   |
| Wessex        | 888   | 1486  | 598   |
| Thames Valley | 240   | 1213  | 973   |
| Ridgeway      | 967   | 2560  | 1593  |
| <b>Total</b>  | <b>2151</b>                                 | <b>5436</b>                                 | <b>3285</b>                                     |

Table 9: Detailed list of WSC numbers for RIIO-ED2 with the addition of PSR data

| Location             | ED1 WSC (19/20) | Total ED2 WSC (Based on 19/20) | Change between Mechanisms | WSC that are registered as PSR |
|----------------------|-----------------|--------------------------------|---------------------------|--------------------------------|
| CHARMINSTER          | 528             | 528                            | 0                         | 123                            |
| BEACONSFIELD         | 0               | 500                            | 500                       | 94                             |
| SHROTON              | 0               | 390                            | 390                       | 69                             |
| KENNINGTON           | 0               | 372                            | 372                       | 51                             |
| UPPER HEYFORD        | 354             | 354                            | 0                         | 89                             |
| BOWERDEAN            | 0               | 343                            | 343                       | 76                             |
| DUNBRIDGE            | 289             | 289                            | 0                         | 55                             |
| WANTAGE              | 30              | 267                            | 237                       | 70                             |
| SHIPTON OLIFFE       | 56              | 242                            | 186                       | 45                             |
| GROVE                | 149             | 173                            | 24                        | 41                             |
| BURFORD              | 0               | 169                            | 169                       | 35                             |
| YETMINSTER           | 0               | 146                            | 146                       | 30                             |
| ROWDEN               | 143             | 143                            | 0                         | 20                             |
| ALDERTON             | 16              | 141                            | 125                       | 21                             |
| WHITWAY              | 0               | 140                            | 140                       | 31                             |
| KIDDINGTON           | 0               | 133                            | 133                       | 22                             |
| COWLEY LOCAL         | 123             | 123                            | 0                         | 27                             |
| CHIPPING NORTON      | 30              | 104                            | 74                        | 7                              |
| HUNGERFORD           | 100             | 100                            | 0                         | 12                             |
| MAIDENHEAD           | 0               | 96                             | 96                        | 9                              |
| MIDHURST             | 0               | 75                             | 75                        | 6                              |
| LECKHAMPSTEAD        | 0               | 66                             | 66                        | 9                              |
| GORING               | 64              | 64                             | 0                         | 0                              |
| MORTIMER             | 57              | 59                             | 2                         | 9                              |
| FARNBOROUGH          | 56              | 56                             | 0                         | 7                              |
| CHRISTCHURCH         | 0               | 54                             | 54                        | 11                             |
| BISHOPS WALTHAM      | 46              | 46                             | 0                         | 5                              |
| WALLINGFORD          | 23              | 40                             | 17                        | 15                             |
| FYFIELD              | 33              | 33                             | 0                         | 8                              |
| WARFIELD             | 0               | 29                             | 29                        | 3                              |
| CROCKERTON           | 0               | 28                             | 28                        | 6                              |
| BRAMLEY GREEN        | 0               | 21                             | 21                        | 5                              |
| HASLINGBOURNE        | 0               | 20                             | 20                        | 8                              |
| PETERSFINGER         | 18              | 18                             | 0                         | 4                              |
| WYCOMBE MARSH        | 14              | 14                             | 0                         | 2                              |
| LECHLADE             | 10              | 10                             | 0                         | 3                              |
| BLEDINGTON           | 0               | 10                             | 10                        | 2                              |
| BERINSFIELD          | 0               | 7                              | 7                         | 0                              |
| LYMINGTON            | 0               | 7                              | 7                         | 1                              |
| WINTERBORNE KINGSTON | 7               | 7                              | 0                         | 2                              |
| WEST GRAFTON VILLAGE | 0               | 6                              | 6                         | 1                              |
| LANGLEY COURT        | 0               | 5                              | 5                         | 1                              |
| WOKINGHAM            | 5               | 5                              | 0                         | 0                              |
| TAPLOW               | 0               | 1                              | 1                         | 0                              |
| MILTON               | 0               | 1                              | 1                         | 0                              |
| RINGWOOD LANDFILL    | 0               | 1                              | 1                         | 0                              |

Table 9 further highlights the difference in proposed WSC volumes breaking these down into feeders between the old mechanism and the new. This table uses the Primary substation and feeders to demonstrate the change to our landscape of WSC.

There are 24 new feeders identified on the list that meet the new WSC criteria. These circuits will now qualify for investment, utilising the available WSC funding to allow improvement in these areas. The remaining 22 feeders are either unchanged or have seen an increase in numbers that qualify for additional funding.

Table 9 has the additional column that includes the number of WSC that are included on the PSR list. This will be factored into any investment and help with setting priorities over when the work will be planned.

During the last two years of RIIO-ED1, SEPD has plans to complete additional investment for WSC. These projects will be considered to ensure they are not double counted when utilising the data evidenced within table 9 above.

*Table 10: Outstanding RIIO-ED1 schemes*

| Primary and Feeder | Total PSR that are WSC | Total WSC | ED1 project year complete |
|--------------------|------------------------|-----------|---------------------------|
| Charminster        | 123                    | 528       | 2020/21                   |
| Kennington         | 51                     | 372       | 2021/22                   |
| Upper Heyford      | 89                     | 354       | 2022/23                   |

Table 10 covers the current RIIO-ED1 projects on the feeders highlighted in table 9 and the current target completion year. The Charminster project is completed and reported.

### 5.11 Proposed WSC RIIO-ED2 projects

To identify the works for each circuit a review of the current performance and a detailed technical report will be issued. This will identify what works are required and how best to improve the existing performance. The key areas for investment will be in the following areas.

- 6.6/11kV Cable
- 6.6/11kV HV Pole
- 6.6/11kV HV Conductor (BLX or Similar)
- 6.6/11kV Switchgear – Other (PM)
- 6.6/11kV CB (PM)

We are proposing targeted investment during RIIO-ED2 on 75% of the circuits identified within table 11 and improve network performance for these customers.

The work list highlighted within table 11 shows the number of projects that will need to be raised and issued for completion within RIIO-ED2. The key areas identified below will be applied to all future investment opportunities, ensuring value for money for our connected customers is achieved.

**Reliability** – All customers, regardless of location, will have the minimum level of network reliability as directed by DNO licence conditions and engineering recommendations. We are committed to maintaining and, where necessary, improving customer reliability.

**Affordability** – We are keeping the operating cost to a minimum and with WSC the focus will be to achieve the biggest reduction in WSC and PSR customers with the optimum level of funding.

Table 11: RIIO-ED2 List of feeders for investment to achieve improvement

| Location        | No of WSC   | No of PSR  | % of WSC to PSR | Costs |
|-----------------|-------------|------------|-----------------|-------|
| BEACONSFIELD    | 500         | 94         | 19%             |       |
| BOWERDEAN       | 343         | 76         | 22%             |       |
| WANTAGE         | 267         | 70         | 26%             |       |
| SHROTON         | 390         | 69         | 18%             |       |
| DUNBRIDGE       | 289         | 55         | 19%             |       |
| SHIPTON OLIFFE  | 242         | 45         | 19%             |       |
| GROVE           | 173         | 41         | 24%             |       |
| BURFORD         | 169         | 35         | 21%             |       |
| WHITEWAY        | 140         | 31         | 22%             |       |
| YETMINSTER      | 146         | 30         | 21%             |       |
| COWLEY LOCAL    | 123         | 27         | 22%             |       |
| KIDDINGTON      | 133         | 22         | 17%             |       |
| ALDERTON        | 141         | 21         | 15%             |       |
| ROWDEN          | 143         | 20         | 14%             |       |
| WALLINGFORD     | 40          | 15         | 38%             |       |
| HUNGERFORD      | 100         | 12         | 12%             |       |
| CHRISTCHURCH    | 54          | 11         | 20%             |       |
| MAIDENHEAD      | 96          | 9          | 9%              |       |
| LECKHAMPSTEAD   | 66          | 9          | 14%             |       |
| MORTIMER        | 59          | 9          | 15%             |       |
| FYFIELD         | 33          | 8          | 24%             |       |
| HASLINGBOURNE   | 20          | 8          | 40%             |       |
| CHIPPING NORTON | 104         | 7          | 7%              |       |
| FARNBOROUGH     | 56          | 7          | 13%             |       |
| MIDHURST        | 75          | 6          | 8%              |       |
| CROCKERTON      | 28          | 6          | 21%             |       |
| BISHOPS WALTHAM | 46          | 5          | 11%             |       |
| BRAMLEY GREEN   | 21          | 5          | 24%             |       |
| PETERSFINGER    | 18          | 4          | 22%             |       |
| WARFIELD        | 29          | 3          | 10%             |       |
| WYCOMBE MARSH   | 14          | 2          | 14%             |       |
| GORING          | 64          | 0          | 0%              |       |
| <b>Total</b>    | <b>4122</b> | <b>762</b> |                 |       |

Table 11 above identifies the list of feeders that will be targeted for investment during ED2 in order to achieve a 75% reduction of WSC numbers from the 19/20 fault data. These projects will benefit approximately 4122 WSC and 762 PSR customers.

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## 6 Conclusion

The purpose of this Engineering Justification Paper (EJP) has been to describe the overarching investment strategy that we intend to take during RIIO ED2 for WSC.

We explored the background of the current WSC mechanism, how this will be changing at the start of RIIO-ED2 and detailed how we will be improving specific circuits to remove WSC from the network.

Seven potential investment options have been described and assessed:

Option 1: No investment

**Option 2: Replace open wire overhead lines**

**Option 3: Enhanced Automation**

**Option 4: Replace cable sections**

**Option 5: Focus on PSR customers only**

**Option 6: Underground overhead lines**

Option 7: Invest in all WSC

Option 1 has been discounted as we do not believe this is best for WSC as there will be no investment and little improvement in the dedicated areas that are affected. As per section 3.1 these customers are predominately in rural areas.

Option 7 is not considered viable due to over investment which will be an extremely costly to all connected customers. This will be due to the amount of investment required to remove the lower numbers of customers on feeders. As mentioned within section 5.8 we will still be investing in these areas under normal asset replacement and tree cutting programmes but there will be no dedicated WSC projects.

The five other options 2 - 6 are to be considered on all feeders identified for investment for WSC. We will review the main causes and determine which course of action should be undertaken within the options.

**32** circuits have been identified as fulfilling the criteria for investment within RIIO-ED2. All these circuits will be studied, and a detailed technical report will be issued to demonstrate the impact of the works considered to achieve a reduction of WSC.

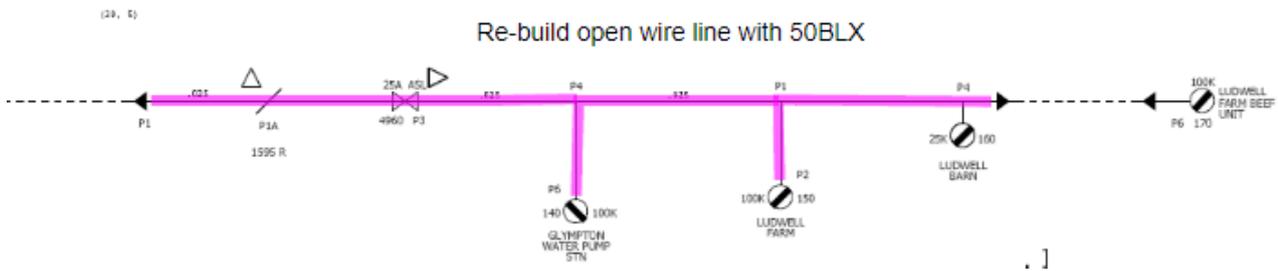
By investing in these **32** circuits we have proposed to spend **█** over RIIO-ED2 this will benefit the service quality for **4122** customers and **762** PSR customers based on the 2019/20 fault data. We will endeavour to look for the best cost solution for the WSC's making sure to see a reduction and removal from the WSC list.

## Appendix 1: RIIO-ED1 Scheme Examples

### WSC 118001 KIDD E3L5 – RIIO ED1 project

|                 |                  |         |                              |
|-----------------|------------------|---------|------------------------------|
| Kiddington E3L5 | PSR customers 89 | WSC 354 | Total number of faults 13-15 |
|-----------------|------------------|---------|------------------------------|

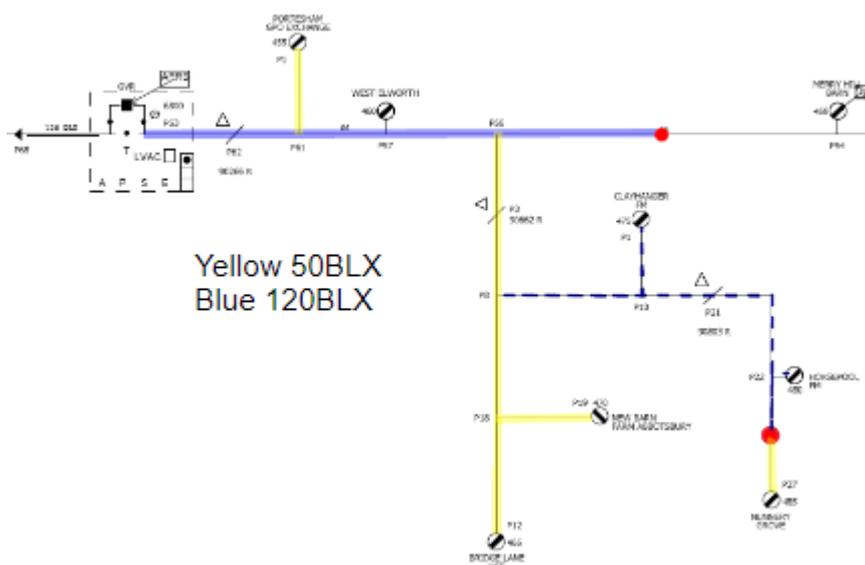
The section towards Ludwell farm had seen 5 overhead related faults within its qualifying period, these faults all resulted in the wires being brought down.



### WSC 419004 CHMI E2L5 – RIIO ED1 Project

|                  |                   |         |                              |
|------------------|-------------------|---------|------------------------------|
| Charminster E2L5 | PSR customers 123 | WSC 528 | Total number of faults 13-15 |
|------------------|-------------------|---------|------------------------------|

The section of overhead line to Bridge lane PMT is in an exposed section near the coast in Dorset. This section has seen a number of faults in its qualify period and has been a feeder that has repeated been on the WSC list.

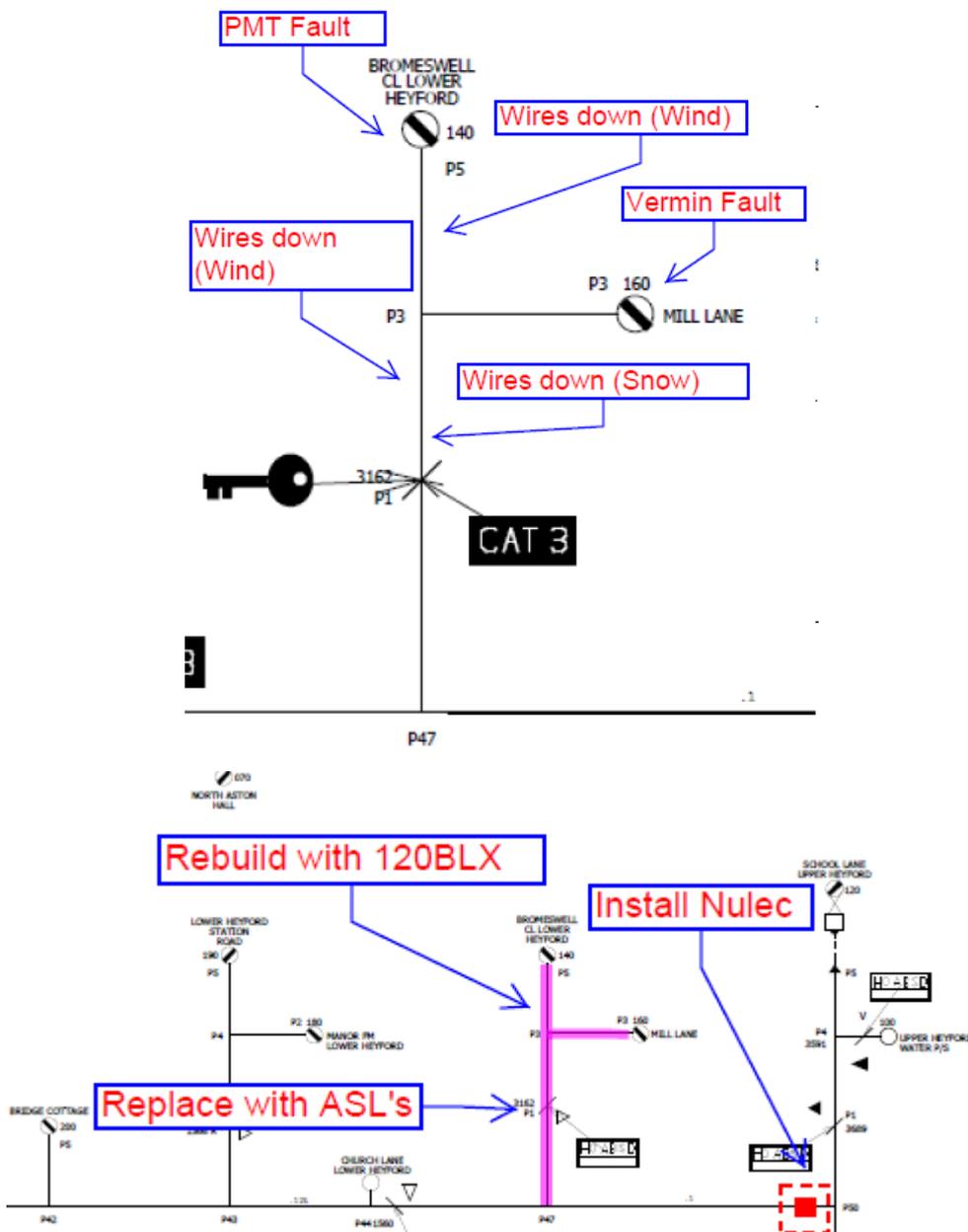


## Appendix 2: RIIO-ED2 Scheme Example

### WSC 118002 UPPH E4L5 – RIIO ED1 Project

|                    |                  |         |                              |
|--------------------|------------------|---------|------------------------------|
| Upper Heyford E4L5 | PSR customers 89 | WSC 354 | Total number of faults 13-15 |
|--------------------|------------------|---------|------------------------------|

Upper Heyford E4L5 has 354 WSC this circuit has been worst served for the past few years. There have been multiple faults in the area marked below these faults are all related to the open wire line. The pole mounted transformer fault is not related to the open wire but with the additional protection device to be installed at switch 3162 this will mitigate other customers from further faults like this.

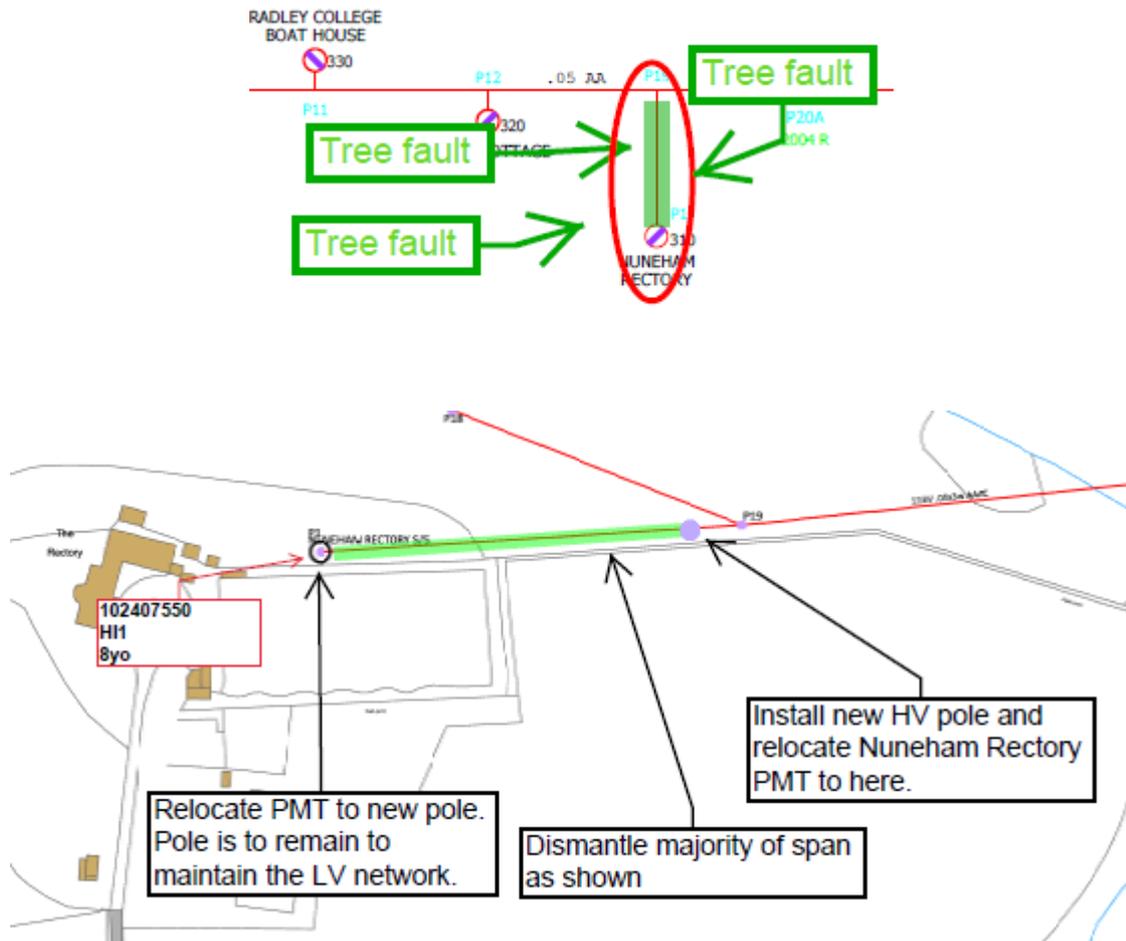




## Appendix 3: RIIO ED2 Scheme Example

### WSC 122001 COLO E6L5 – RIIO-ED2

|           |         |        |   |                           |
|-----------|---------|--------|---|---------------------------|
| COLO E6L5 | 123 WSC | 27 PSR | █ | Total number of faults 12 |
|-----------|---------|--------|---|---------------------------|



The technical report for the above scheme included the current underlying issue.

Five of these faults can be prevented with regular tree cutting on the Nuneham Rectory spur. However, there is a preservation order on the trees and therefore a minimum cut is all that is allowed. In the past, the trees have been allowed to grow and cause multiple auto reclosures on the network in adverse weather due to the trees touching the OHL.

By removing the overhead line and relocated the pole mounted transformer this section will improve both the transient faults and permanent faults that have occurred in the past 3 years.

#### Appendix 4: Relevant Policy, Standards, and Operational Restrictions

The policies and standards which govern the design of the network are listed below in Table 12.

*Table 122: Network design documents for WSC*

| <b>Policy Number</b>  | <b>Policy Name / Description</b>  |
|-----------------------|---|
| <b>TG-NET-NPL-010</b> | Planning Standards for 11kV and 6.6kV Distribution Networks   |
| <b>ST-NET-ENG-006</b> | Distribution Automation   |
| <b>TG-NET-OHL-005</b> | Fuses and Automatic sectionalising links for HV Pole Mounted Plant- Design, Installation and Maintenance standard |
| <b>WI-NET-OHL-029</b> | Pole Erection – Installation and maintenance instruction  |

## Appendix 5 Acronym table

| Acronym  | Description   |
|----------|---|
| ASL      | Auto sectionalising link  |
| BLX      | Belagt Line System  |
| BPDT     | Business Plan Data Table  |
| CapEx    | Capital Expenditure   |
| BLX      | Belagt Linesystem XLPE  |
| CBA      | Cost Benefit Analysis   |
| CI       | Customer Interruption   |
| CML      | Customer Minutes Lost   |
| CV       | Cost and Volume   |
| DNO      | Distribution Network Operator   |
| DPCR5    | Distribution Price Control Review for five years from 1 April 2010 to 31 March 2015                                     |
| EHV      | Extra High Voltage, Voltages > 22kV and < 132kV , in SSEN these assets are usually 33kV and 66kV.                       |
| EJP      | Engineering Justification Paper   |
| HV       | High Voltage, Voltages > 1kV and < 22kV , in SSEN these assest are usually 6.6kV and 11kV.                              |
| kV       | Kilovolt  |
| LV       | Low Voltage, Voltages < 1kV, in SSEN these assest are usually ~400V.  |
| NaFIRS   | National Fault and Interruption Reporting Scheme  |
| OHL      | Overhead Line   |
| RIIO     | Ofgem's price control framework first implemented in 2013   |
| RIIO-ED1 | First price control for Electricity Distribution companies under the RIIO framework from 1 April 2015 to 31 March 2023  |
| RIIO-ED2 | Second price control for Electricity Distribution companies under the RIIO framework from 1 April 2023 to 31 March 2028 |
| SDI      | Secondary Deliverable Intervention  |
| SEPD     | Southern Electric Power Distribution PLC  |
| SHEPD    | Scottish Hydro Electric Power Distribution PLC  |