

RIIO ED2 Engineering Justification Paper (EJP)

Unst Primary Substations

Worst Served Customer Proposal

Investment Reference No: 381_SHEPD_REGIONAL_WSC_UNST



Contents

1	Executive Summary	4
2	Investment Summary Table	5
3	Introduction	6
4	Background Information and Analysis	7
4.1	Existing Network	7
4.2	WSC Network Performance	9
4.3	Fault Data Analysis	9
5	Optioneering	12
5.1	Summary of Options	12
6	Analysis and Cost	14
6.1	Option 1: Do-Minimum	14
6.2	Option 2: Enhanced Maintenance and/or Inspection (Refurbishment)	14
6.3	Option 3: Re-build existing lines (Replacement).....	14
6.4	Option 4: Reinforcing existing network (Reinforcement).....	15
6.5	Option 5: Flexible Solution	16
7	Option Analysis	17
7.1	CI/CML Analysis of refurbishing the existing line (Option 2)	17
7.2	CI/CML Analysis of re-building of the existing line (Option 3)	17
7.3	CI/CML Analysis of reinforcement of the network (Option 4).....	17
7.4	Option Analysis comparisons	18
7.5	Volume on Preferred Option.....	19
8	Validate investment plans and benefits with Stakeholders	20
9	Deliverability and Risk.....	21
10	Conclusion	22
11	Appendix 1 List of Indicators of Vulnerable Characteristics and Weighting System	23
	These indicators are applied when producing combined indexes of vulnerability.	23
12	Appendix 2: Relevant Policy, Standards, and Operational Restrictions.....	24

Definitions and Abbreviations

Acronym	Definition
EJP	Engineering Justification Paper
CBA	Cost Benefit Analysis
IDP	Investment Decision Pack
WSC	Worst Served Customer
NoSR	North of Scotland Resilience
SSEN	Scottish and Southern Electricity Network
NRN	Network Reference Number
EHV	Extra High Voltage (33kV)
CBRM	Condition Based Risk Management
MDG	Mobile Diesel Generator

1 Executive Summary

This Engineering Justification Paper (EJP) covers the strategic investment required to address the high volume of interruptions on the Unst network which serves the Isle of Unst, Shetland. Unst primary supplies 562 customers of which 319 are WSCs. Customers at Unst have experienced up to 17 interruptions over the three consecutive years between 2017 and 2019 with average interruption length of around two and half hours.

Following optioneering and detailed analysis, as set out in this EJP, the proposed scope of works to address the WSC issue at Unst are as follows:

- Install a new 4MVA 33/11kV primary substation in the southern area of the Isle of Unst with one 33kV circuit breaker and three 11kV primary circuit breakers.



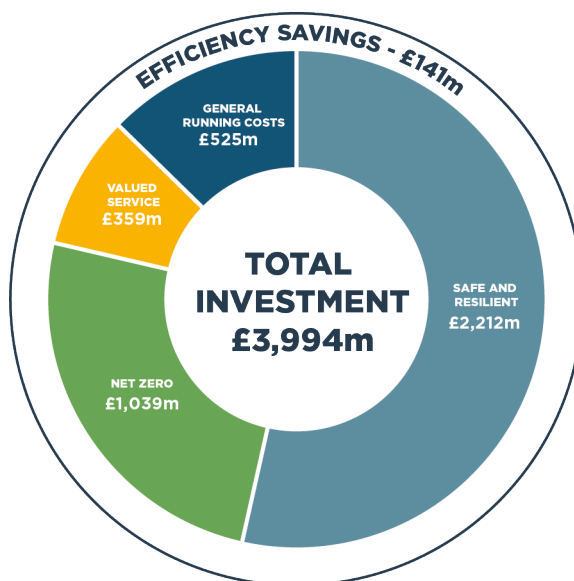
Delivering a safe,
resilient and responsive
network

The anticipated cost to deliver the proposed solution is £0.89m. The Isle of Unst is a very remote area of Scotland and on average access to this area can take prolonged lengths of time, due to the requirement for two ferry crossings, which results in longer fault interruption lengths. Due to this, the area has a higher network investment priority score, indicating higher vulnerability. The scheme is therefore prioritised for delivery in the first year in ED2 with the refinement phase commencing in the final year in ED1.

The scheme delivers following outputs and benefits:

- Improved network performance for the 319 WSCs at Unst by installing a new primary substation in the southern area of the island; this is expected to take all 319 WSC out of this classification;
- Improved CI/CML performance as a result of the works with expected volume reductions of 918 CIs and 40014 CMLs in the SHEPD area per year;
- Improves the fault resilience of the Isle of Unst when 11kV faults do occur by providing fault resilience options on the island.

This Non-Load investment sits within the Safe and Resilient totex spend.



2 Investment Summary Table

Table 1 below provides a high level summary of the key information relevant to this Engineering Justification Paper (EJP).

Table 1: Investment Summary

Name of Scheme/Programme	Unst Substation WSC Proposal					
Primary Investment Driver	North of Scotland Resilience					
Scheme reference/mechanism or category	381_SHEPD_REGIONAL_WSC_UNST					
Output reference/type	As above					
Cost	Cost for the selected Investment is £0.89m					
Delivery year	2023/24					
Reporting Table	CV15 North of Scotland Resilience (SHEPD)					
Outputs included in RIIO ED1 Business Plan	No					
Spend Apportionment (£m)	2023	2024	2025	2026	2027	Total
	0.89	0	0	0	0	0.89

3 Introduction

This EJP provides high-level background information for this proposed WSC scheme explaining the data and analysis undertaken, the existing network arrangement, the proposed works and improvements to the network, the expected outcomes from these works and justifications for the proposals with the Paper.

In order to establish the most economic and efficient solution, the EJP provides an exhaustive list of the options considered through the optioneering process. This is based on the background information and fault data analysis detailed in section 4. Each option is described in detail in section 6, with the justification set out for those options which are deemed unviable solutions, and therefore not taken forward to the Option Analysis in section 7.

The Primary Investment Driver described within this EJP is CV15 – North of Scotland Resilience and the proposed investment will improve the Unst 11kV network. Post improvement works, due to lower numbers of faults impacting the Unst customers, all customers will be removed from WSC classification. Unst has consistently featured in the WSC list ED1. In year 2019, 319 customers out of total 562 customers at Unst are in the WSC category. These customers experienced high volumes of interruptions, with interruptions of up to 17 over the 3-year period. This clearly is not acceptable to both our customers and ourselves.

4 Background Information and Analysis

4.1 Existing Network

Unst is the most northerly inhabited island within the United Kingdom and is the third largest in Shetland after the Mainland and Yell. It is supplied from Gremista 33kV substation (696-302) via a long radial 33kV network after it leaves the Shetland main island. This network is broken down to following elements with the supplying substations at the end of each element:

Table 2: Unst 33kV Supply

Circuit	Site	33kV Circuit Length	Total customer at the site	WSC at the site in 2019
Gremista - Voe	Voe (687) (Shetland mainland)	24.4km	1507	14
Voe-Brae	Brae (699) (Shetland mainland)	8.6km	996	109
Brae – Firth	Firth (692) (Shetland mainland)	10.9km	395	0
Firth – Mid Yell	Mid Yell (698) (Yell Island)	20km	436	0
Mid Yell – Gutcher	Gutcher (695) (Yell Island)	13.2km	234	77
Gutcher – Unst	Unst (791) (Unst Island)	20.3km	562	319

Unst has two 11kV feeders 011 and 012. However, feeder 011 is normally only supplying 6 customers at two secondary sites, one of which is a Distillery, with Feeder 012 supplying almost all of the customers on the Isle of Unst and all of the Unst WSCs. The primary substation is located in the northern end of the island. The power flow is from the Gremista 696 302 33kV circuit which tracks northwards through the island to reach the primary substation and then after the primary transformer is then distributed at 11kV southwards to all of the secondary transformers and customers on the island. The WSCs group area starts from approximately 2km south to Unst primary substation but encompasses the majority of the island.

There is a 11kV circuit interconnector with the Gutcher 11kV 695 011 circuit (on the Isle of Yell) however there is a special network arrangement in place which allows for the 11kV subsea cable section to be utilised as part a Gremista 696 302 33kV circuit, in case of 33kV subsea cable failure between the Yell and Unst islands. This requires a defined switching process with key interlocked air brake switches and therefore backfeed arrangements between the circuits cannot be fully automated. Additionally, the 11kV interconnection from Gutcher to Unst cannot in all circumstances support the full 11kV load of Unst primary and therefore this circuit cannot not provide the required level of fault resilience on Unst to address the WSC issue.

The 11kV circuit details are summarised in the table below. As shown, the 11kV 012 circuit has a significant amount of overhead line network supplying the customers.

Table 3: Unst WSCs 11kV Feeder

11kV Circuit	Number of connected customers	Number of PSR customers	Length of OHL (km)	Length of UG cable (km)
791-012	555	110	65.10	1.53

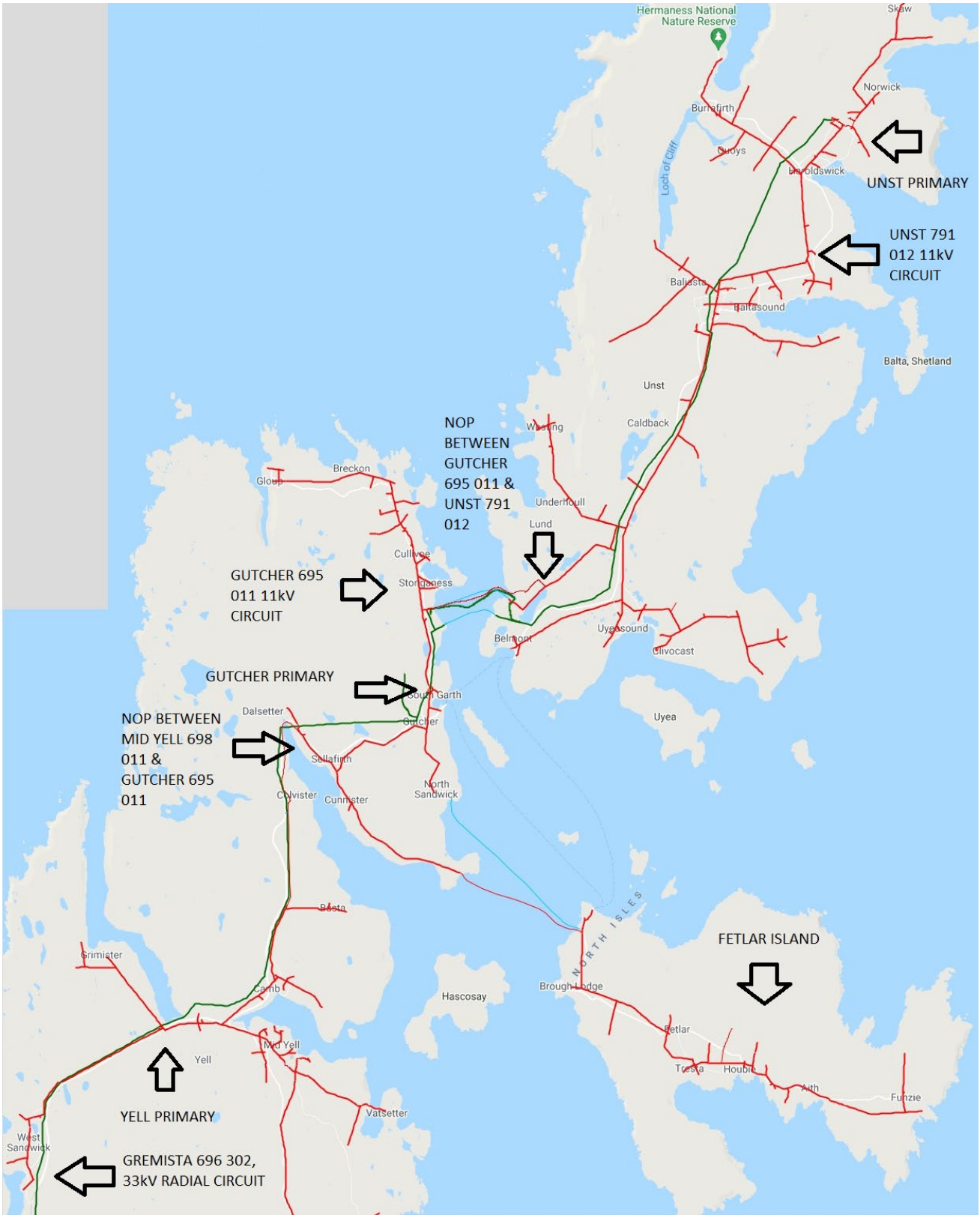


Figure 1: The existing 33kV and 11kV networks Yell, Unst and North Isles of Shetland.

4.2 WSC Network Performance

In 2019, there were 319 out of the total 562 customers falling within the WSC category. This number was in the range of 538-541 in the previous four years of ED1. The highest interruption number that these customers experienced was 17 and the average interruption length was 160 minutes.

There are 110 PSR registered customers at this site and the network investment priority score is 4.1.

The average interruption length for this circuit is significantly higher than the average SHEPD circuit. This is due to the remoteness of the site, the low level of interconnection and the requirement to obtain two ferries to reach the Isle of Unst from the Shetland mainland. There are two retained ex SSEN staff which are located on Unst. Retained staff carry out switching operations only and do not carry out damage repairs. Personnel, vehicles or equipment required to respond to a damage fault are dispatched from Lerwick depot which requires two ferries to reach the Isle of Unst.

The table below shows the WSC network performance on the 11kV circuit basis (although this also counts 33kV interruptions which impacted the respective 11kV circuit as well). It shows the WSC number and the range of interruptions over the 3-year period from the reporting year 2019/20 against each circuit. As part of the feedback from the stakeholder engagement event, the interruption duration and the customer vulnerability are also considered as key factors in scheme proposal. These are also shown in the table.

Table 4: WSC Network Performance

11kV Circuit	WSC No.	Range of interruption No. over 3-year	Average interruption length (mins)	Network Investment Priority score (high score = more vulnerable)
791-012	319	13-17	160	4.1

4.3 Fault Data Analysis

The list below reflects where faults have affected higher customer numbers across the proposed area for investment, there are other lower customer number faults that have occurred during the identified WSC time period which have not been listed.

Table 5: Fault History

Date	Fault Description	No. Customers Impacted
2017	11kV fault: Lightning, OHL Pole on Fire	402
2017	11kV fault: Deterioration, broken OHL conductor and insulator	541
2018	11kV fault: Deterioration, broken OHL pole	544
2017	11kV fault: Wind and Gale, broken OHL conductors	517
2017	11kV fault: Deterioration, broken OHL pole (delay in restoration due to Ferry delays)	541
2018	11kV fault: Deterioration, HV conductor on OHL pole crossarm, circuit tripped when replacing DOEF	545
2018	11kV fault: Wind and Gale, Broken OHL Insulator	109
2018	11kV fault: Deterioration, Faulty PMT	137
2018	11kV fault: Deterioration, Burning Pole due to OHL Insulator failure	137
2019	11kV fault: Deterioration, HV cable fault	554

2019	11kV fault: Transient fault caused PMCB to trip under backfed network	557
2017	33kV fault: Deterioration, OHL insulator failure, (Customers affected include wider Shetland customers)	799
2017	2017 – 33kV fault: CB failure at Firth Primary, (Customers affected include wider Shetland customers)	4107
2018	2018 – 33kV fault: Transient, delay in restoration due to comms issues, (Customers affected include wider Shetland customers)	4142

The 33kV faults have not been the major contributory factor to the WSCs on Unst with three 33kV interruptions over the last 3-year period. Due to the lengthy Unst 791-012 11kV circuit which supplies almost all customers on the Isle of Unst, a single 11kV fault can cause an outage for all the connected customers. It is 11kV faults which have been the predominant factor in the WSC performance of this network during the 2017 and 2019 period.



Figure 2: Location of faults affecting Unst customers

5 Optioneering

This section of the report sets out the investment options that are considered when resolving the WSC issues. As described below a holistic approach is taken to ensure investment options which are both least regrets and represents best value for money for network customers are identified.

5.1 Summary of Options

Table below provides a high-level summary of the 5 investment options under consideration along with the advantages and disadvantages associated with each. A more detailed description of each option is then provided within the proceeding sub-sections.

Table 6: Summary of WSC Investment Options

Option	Description	Advantages	Disadvantages	Result
1. Do Nothing (Baseline)	No upfront action taken to improve the network performance. Maintenance and Inspection activities continue as normal.	No additional cost	WSCs will continue experiencing high number of interruptions.	Rejected
2. Enhanced Maintenance and/or Inspection (Refurbishment)	Enhanced inspection and maintenance to improve asset condition or slow the rate of ageing.	Cost effective over short time period No large upfront CAPEX	Additional maintenance resource required Significant proportion of customers remain as WSCs Increase in OPEX	Taken forward to further assessment.
3. Re-build existing lines (Replacement)	Rebuilding the existing network where the WSCs are to reduce the probability of failure on components.	Improve the network performance over short term No further maintenance or inspection required	Increase in CAPEX Lower utilisation of existing assets WSCs will fall back in this category over short period of time. No new fault resilience added	Taken forward to further assessment.
4. Reinforcing existing network (Reinforcement)	Installation of additional assets to mitigate the risk of interruptions due to single circuit supply arrangement	WSCs unlikely to return to this category as new fault resilience added Long term investment Wider benefits to network users including Net Zero targets	Often costly when compared with other options Longer delivery time due to the likely requirement of additional consent	Taken forward to further assessment/preferred option.
5. Flexible solutions	Use battery storage or other alternative mean to support the network and mitigate interruptions	Reduced requirement of reinforcing the network	Technology and mechanism is yet to be proven Limited sites that can utilise such	Option rejected.

		Competitive cost comparing to the reinforcement option	arrangement to improve WSC performance	
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6 Analysis and Cost

6.1 Option 1: Do Nothing

Estimated Cost: £0k

Unst 791-012 11kV circuit runs for a significant distance to reach its customers at the southern part of the island. Without any intervention, the WSCs will experience similar level of 11kV interruptions into ED2 and beyond. Therefore, this option is not considered viable.

6.2 Option 2: Enhanced Maintenance and/or Inspection (Refurbishment)

Estimated Cost: £196k

This option is to carry out enhanced maintenance on the Unst 791-012 11kV circuit and the upstream 33kV network. This will target the assets with poor health condition and the worst performing sections with targeted measures such as pole replacement and refurbishment. This is likely to improve the network performance for a small portion of the WSCs. However, given that a number of faults are due to external factors, such as wind and gale, lightning and transient events, then this option will not resolve these potential faults. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit and so the whole 11kV circuit would remain exposed to faults arising from external factors.

Due to the lack of significant network improvement, the Unst customers could experience WSC equivalent performance during the full ED2 period. Taking account of the anticipated post works deterioration in network performance, the likely outcome is that the Option 2 refurbishment in ED2 would have to be followed by the Option 4 reinforcement in ED3.

6.3 Option 3: Re-build existing lines (Replacement)

Estimated Cost: £1,334k

Under this option, it is considered that the worst performing sections of the 11kV network are re-built and this includes approximately ■ OHL of the circuit total of 65km of the circuit 012.

As a result of the proposed works, it is expected that the network performance will result in reasonable improvements however the network performance would deteriorate over time. It is likely that significant number of customers would remain as WSCs as no fault resilience is added to the circuit in the form of circuit interconnection or splitting the circuit and so the whole 11kV circuit would remain exposed to faults arising from external factors.

During the proposed Option 3 works, it is likely that the proposals would be built as an 'online' build which requires circuit outages that would impact the respective WSC and potentially wider area customers. Also, it would lead to an increase in diesel usage and CO₂ emissions due to usage of mobile generation to ensure customers were not off supply for excessive periods of time during the works.

It is assumed that 20 years post carrying out the Option 3 works, due to deteriorating performance of the circuit, that the Option 4 reinforcement proposal would have to be implemented at that point in the future.

6.5 Option 5: Flexible Solution

Estimated Cost: £357 k

Flexibility services could be used to support some of the remote substations in the HV fault scenario. The flexible solution needs to be made available throughout the year and be able to support the network over the period to allow the restoration. This period can be up to 2 hours based on the fault history.

The estimated cost is based on the energy storage service to support 1MW load with maximum utilisation of 30 days per annum starting from year 2 in ED2. Appendix 3 refers. The technology is still unproven for a solution that can support the network of this size for this duration. Due to the nature of the HV faults and the network, there will also be the challenge in identifying the best location for this service in the network. Under this option, It is unlikely to improve the performance for all WSCs. Therefore, this option is not considered viable.

7 Option Analysis

This section of the report provides an overview of the CI/CML results and analysis for each option. It provides an overall comparative review and analysis of the options, confirmation of the EJP preferred option and the associated justifications. The figures presented below represent the expected percentage improvement of the Ofgem CI & CML methodology ratio figures for SHEPD area per year and the expected actual volume reductions of CI and CMLs in the SHEPD area per year.

7.1 CI/CML Analysis of refurbishing the existing line (Option 2)

It is expected that following Customer Interruption (CI) and Customer Minutes Lost (CML) improvements will be achieved under this option. These figures are too low to improve the number of WSC and will make no discernible impact on the quality of supply and network performance. The assumption is that these benefits will diminish over a period of five years, by when the reinforcement option would be necessary to address the WSC issue.

Table 7: CI/CML Improvements for Option 2

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Unst (791-012)	0.004 (35)	0.005 (3824)

7.2 CI/CML Analysis of re-building of the existing line (Option 3)

It is expected that the CI & CML improvements for the re-build option would be higher than the refurbishment option but are remain low CI & CML values due to the same network arrangement being retained. The assumption is that these benefits will diminish over a period of twenty years and at this future point the reinforcement option would be necessary to address the WSC issue.

Table 8: CI/CML Improvements for Option 3

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Unst (791-012)	0.011 (87)	0.012 (9559)

7.3 CI/CML Analysis of reinforcement of the network (Option 4)

The expected CI and CML improvements based on this option is as shown in the table below. The table shows a significant improvement for CI/CML and network performance relative to the customer numbers involved and this will remove all Unst customers from WSC classification.

Table 9: CI/CML Improvements for Option 4

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Unst (791-012)	0.1147 (918)	0.05 (40014)

From the above tables, it is evident that the CI/CML improvement from the reinforcement option is significantly higher than the other proposed options. This confirms the case that Option 4 is the most preferable option as it delivers the required level of improvement to the network and will permanently remove those customers from WSC classification.

7.4 Summary of Cost

Table 10: Summary of Cost

Options	Unit	2023/2 4	2024/2 5	2025/2 6	2026/2 7	2027/2 8	Total
Option 1 – Do Nothing	£m	0	0	0	0	0	0
Option 2 – Enhanced Maintenance and Inspection	£m	0	0.2	0	0	0	0.2
Option 3 – Asset Replacement	£m	0	1.33	0	0	0	1.33
Option 4 – Reinforcement	£m	0	0.89	0	0	0	0.89
Option 5 – Flexible Solution	£m	0	0.09	0.09	0.09	0.09	0.36

Our RIIO ED2 Business Plan costs are derived from our outturn RIIO ED1 expenditure. We have modified costs per activity, capturing and reporting those adjustments in our cost-book. By tying our costs back to reported, outturn, real life data this approach provides multiple data points on which both the Regulator and we can benchmark cost efficiency.

It provides a high level of cost confidence in our Business Plan cost forecast for RIIO ED2. Through our benchmarking analysis, we recognised that not all Non-Load related RIIO-ED1 actual unit costs sit within the upper quartile efficiency band. Where this is the case, we have applied a catch-up efficiency to those cost categories.

Further detail on our unit cost approach, cost efficiency and cost confidence for RIIO-ED2 can be found within our **Cost Efficiency (Annex 15.1)**. Following our draft Business Plan, we have continued to develop project volumes and costs, utilising valuable stakeholder feedback. We have included developments of our Commercial Strategy within the updated project scope and delivery strategy.

7.5 Option Analysis comparisons

As outlined in the EJP, due the remoteness of the Isle of Unst from the main island of Shetland, this significantly lengthens the fault interruption duration experienced by the customers because ferry crossings are needed to reach the island. Therefore, any enhancements which can improve fault resilience on the Isle of Unst itself are of significant benefit.

The tables above demonstrate that the reinforcement option is the preferred option as the other options are either rejected as non-viable, have poorer CI/CML performance or higher investment cost. As Options 2 and 3 do not introduce any new fault resilience to the Isle of Unst; they only deliver marginal improvement in CI/CML and network performance; which will deteriorate in future years and therefore they cannot be chosen as the preferred option.

The preferred option allows the customers to benefit from investment in ED2 and improved CI/CML and network performance. Both Option 2 and Option 3 are envisaged to incorporate the works in Option 4 with reinforcement in the future years to achieve the improved performance delivered by Option 4.

As such, it is understood that delaying the investment does not provide the best value for money solution, reinforcing the case for Option 4.

7.6 Volume on Preferred Option

Table 11: Volume on Preferred Option

Asset Category	Unit	2023/24	2024/25	2025/26	2026/27	2027/28	Total
11kV OHL (BLX or similar conductor)	Km	1	0	0	0	0	1
11kV Poles	#	5	0	0	0	0	5
11kV UG Cable	Km	0.5	0	0	0	0	0.5
11kV CB (GM) Primary	#	3	0	0	0	0	3
11kV CB (PM)	#	2	0	0	0	0	2
11kV Switch (PM)	#	2	0	0	0	0	2
33kV UG Cable (Non Pressurised)	Km	0.1	0	0	0	0	0.1
33kV Transformer (GM)	#	1	0	0	0	0	1
33kV OHL (Pole Line) Conductor	Km	0.2	0	0	0	0	0.3
33kV Pole	#	3	0	0	0	0	3
33kV CB (Air Insulated Busbars)(OD) (GM)	#	1	0	0	0	0	1
33kV Switch (PM)	#	1	0	0	0	0	2
33kV Switch (GM)	#	2	0	0	0	0	2
11kV Pole Refurbishment	#	111	0	0	0	0	111
33kV Pole Refurbishment	#	34	0	0	0	0	34

8 Validate investment plans and benefits with Stakeholders

This section of the EJP describes the stakeholder engagement strategy that has been implemented to inform SSEN's RIIO-ED2 submissions. This includes the engagement activities that have been undertaken, the 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 SSEN 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 in 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. Following insights were derived:

- Stakeholders suggested that, based on the remote location of some Scottish islands, investment for the WSCs there should be a priority, as it will potentially take far longer to restore power there compared to mainland areas.
- There was no consensus on whether investment in worst-served circuits should be prioritized 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 recognized 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 lack of consensus on stakeholders on how to prioritise worst-served areas for improvement clearly suggests that being worst-served is a substantial detriment to all such customers, albeit playing out in different ways and therefore remedying these is extremely important. Therefore, we are committing to remove at least 75% of customers from this list in ED2; this ambitious proportion represents all circuits where cost benefit analysis warrants investment; the remaining 25% of WSCs are distributed over so many 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.

9 Deliverability and Risk

Between our draft and final Business Plans we have carried out a more detailed deliverability assessment of our overall plan as a package and its component investments. Using our draft Business Plan investment and phasing as a baseline we have followed our deliverability assessment methodology. We have assessed any potential delivery constraints to our plan based on:

- In-house workforce capacity and skills constraints based on our planned recruitment and training profile and planned sourcing mix as well as the efficiencies we have built into our Business Plan (detailed in our ***Ensuring Deliverability and a Resilient Workforce (Chapter 16)*** and ***Cost Efficiency (Chapter 15)***)
- Assessment of the specific lead and delivery timelines for the asset classes in our planned schemes
- We have evaluated our sourcing mix where there were known delivery constraints to assess opportunities to alleviate any constraints through outsourcing
- We have engaged our supply chain (detailed in our ***Supply Chain (Annex 16.2)***) to explore how the supply chain could support us to efficiently deliver greater volumes of work and how we could implement a range of alternative contracting strategies to deliver this
- We have also engaged with the supply chain on the delivery of work volumes that sit within Uncertainty Mechanisms to ensure we have plans in place to deliver this work if and when the need arises
- We have assessed the synergies between our planned load, non-load and environmental investments to most efficiently plan the scheduling of work and minimise disruption to consumers
- Based on our assessment of delivery constraints and potential solutions to resolve them, we have revised our investment phasing accordingly to ensure our Business Plan is deliverable, meets our consumers' needs and is most cost efficient for our consumers

Scottish National Heritage and Scottish Environment Protection Agency may object to the siting of the new primary substation and request an alternative location or impose various conditions related to archaeological or environmental or ecological requirements to carry out the works.

10 Conclusion

The purpose of this Engineering Justification Paper (EJP) has been to describe the overarching investment strategy that SSEN intends to take during RIIO ED2 for the NoSR related investment in Unst substation.

Five investment options have been described which could be carried out to address the WSC issue at these sites. As detailed within Section 7, a holistic approach is taken when selecting the most viable option for each investment, where the primary and secondary investment drivers are assessed together within the Option Analysis and Assessment section. This includes careful consideration of the financial, safety, and environmental implications of each investment option.

- Option 1: Do Minimum
- Option 2: Enhanced Maintenance and Inspections
- Option 3: Asset Replacement
- Option 4: Asset Reinforcement
- Option 5: Flexible Solution

A thorough stakeholder engagement exercise was undertaken to gather feedback on each of these strategies to determine which approach should be proposed within SSEN's RIIO ED2 business plans.

As a result, the following costs are proposed for delivery during RIIO ED2. The preferred investment for Unst substation in RIIO ED2 is Option 4: Reinforcement.

Table 12: Summary of CV Table

CV Table		Unit	2023	2024	2025	2026	2027	Total
CV15	North of Scotland Resilience	£m	0.89	0	0	0	0	0.89
RIIO ED2 Spend								

11 Appendix 1 List of Indicators of Vulnerable Characteristics and Weighting System

These indicators are applied when producing combined indexes of vulnerability.

Indicator of vulnerable characteristic	Network investment priority: score (high score = more vulnerable)
Under 5 years	0.5
Under 16 years	0
Over 65 years	0.1
Over 75 years	0.4
Over 85 years	0.6
Fuel poverty levels (Scotland; 1=low, 4=v.high)	0
Fuel poor households (England)	0
Dwellings without a mains gas connection	0
Dwellings without central heating system	0
Dwellings rated in EPC bands EFG	0
Households with no car	0
Combined distances to services (Score; high=most remote)	0
Children in low income households	1
People with low qualifications	0
People in low income employment	1
Long-term unemployment	1
Disability benefits	1
Child disability benefits	1
Mental health benefits	1
Universal credit claimants	0
People in bad or very bad health	0.5
People whose health condition limits activities a lot	0.5
Access to health services (Score; 0=best access, 100=worst access)	0
People providing over 20hrs/week of care	0.5
Number of residential care homes	0
Number of care home beds	0
Households in privated rented dwellings	1
Lone parents	1
Ethnic minorities	1
Unable to speak English well or at all	0
Lone pensioners	1

12 Appendix 2: Relevant Policy, Standards, and Operational Restrictions



TG-NET-NPL-012.pdf

13 Appendix 3. Assumptions for Flexible Solutions Costing

Contract Year	Availability Price – CMZ Secure (£/MW/Day)	Capacity offered (MW)	Potential Days Required	Maximum Total Availability price paid	Utilisation Price – CMZ Secure (£/MWh)	Maximum Potential Energy Required (MWh) for 30 days per annum	Total Utilisation Cost (£) per annum	Yearly total
Year 1	■	1	365		■	720		
Year 2	■	1	365	■	■	720	■	■
Year 3	■	1	365	■	■	720	■	■
Year 4	■	1	365	■	■	720	■	■
Year 4	■	1	365	■	■	720	■	■