Scottish & Southern Electricity Networks

RIIO ED2 Engineering Justification Paper (EJP)

Laxay Primary Substations

Worst Served Customer Proposal

Investment Reference No: 348_SHEPD_REGIONAL_WSC_LAXAY

Contents

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
33KV	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 Worst Served Customers at Laxay, on the Isle of Harris and Lewis. This site has consistently featured in the top rank of the WSC sites throughout ED1, based on the ED2 WSC definition. The proposed RIIO-ED2 scheme seeks the investment of £1.80m.

Delivering a safe, resilient and responsive network

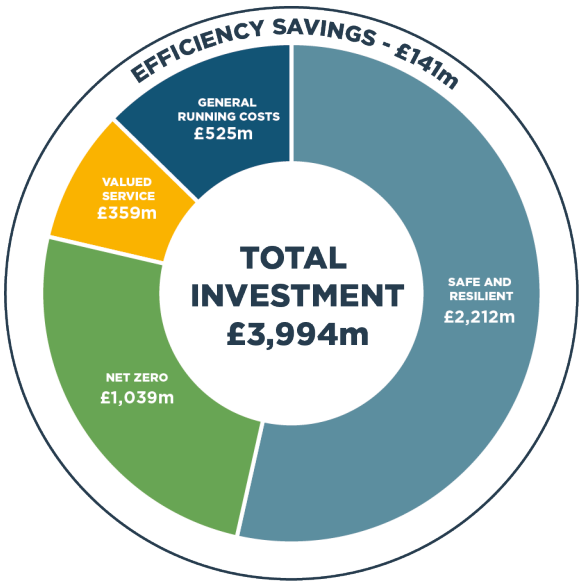
Following optioneering and detailed analysis, as set out in this EJP, the proposed scope of works to address the WSC issue at Laxay are as follows:

- Installation of 2.4km of overhead line interconnection to Keose Spur;
- Installation of 8km of overhead line for feeder 011;
- Installation of 100m of underground cable to separate Callans and Laxay Croft;
- Installation of 4 panel of 11kV switchboard;
- Installation of 2 no. PMCB for Keose Spur interconnection;
- Installation of 200m 33kV underground cable for connecting to the new 33KV switchboard;
- Installation of a new 3 panel 33kV switchboard including the associated civil works;
- Installation of 0.5km 33kV overhead line connection to the new 33KV switchboard;

The £1.80m scheme is expected to deliver following outputs and benefits:

- Improved network performance for the 1,152 WSCs at Laxay by providing the 33kV switchboard with auto-changeover arrangement and new 11kV switchboard to provide more flexible operations.
- Improved CI/CML performance as a result of the works expected volume reductions of 1,881 CI and 133,367 CMLs in the SHEPD area per year.
- Improved network operation and reliability for feeder 011 and reduced reliance on diesel mobile generators during faults or planned outages on the existing subsea cable.
- Improved network reliability for Maaruig substation downstream.

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



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	Laxay Substations WSC Proposal					
Primary Investment Driver	North of Scotland Resilience					
Scheme reference/mechanism or category	*348/SHEPD/REGIONAL/WSC/LAXAY*					
Output reference/type	As above					
Cost	*Cost for the selected Investment is £1.80m*					
Delivery year	2024/25					
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	1.80	0	0	0	**1.80**

3 Introduction

This Engineering Justification Paper (EJP) covers the non-load related investment required to improve the performance of the network at Laxay (NRN-657) supplied from Stonoway Grid (NRN - 645) feeder 305, specifically relating to the Worst Served Customers (WSC).

Laxay has consistently featured within the WSC list throughout ED1, therefore the primary investment as detailed within this EJP is to improve the network so that Laxay can be removed from the WSC list.In year 2019, all 1,112 customers at Laxay are in the WSC category. These customers experienced high number of interruptions, with interuptions number up to 22 over the 3-year period. This clearly is not acceptable to both our customers and ourselves.

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 proposed investment is to install a new 33kV switchboard and 11kV switchboard at Laxay. It also involves further installation of 11kV overhead line on feeder 011 and modification of the feeder to improve the resilience. This will make significant improvement to the network performance at both Laxay and Maaruig downstream by reducing the interruption number, hence removing these sites from WSC category.

The scheme is proposed for delivery in 2024/25 in ED2.

4 Background Information and Analysis

4.1 Existing Network

Laxay is supplied from Stornoway Grid (645-305) via a single 33kV circuit. The circuit consists of 15km of overhead line and it is teed off to provide a second supply to Callanish. The same circuit also supplies Maaruig Primary Substation further downstream via a 25.8km long overhead line.

The 11kV feeders 011 and 012 include long radial overhead line network, particularly feeder 011 with 56km of overhead line. There is no interconnection to either of these feeders.

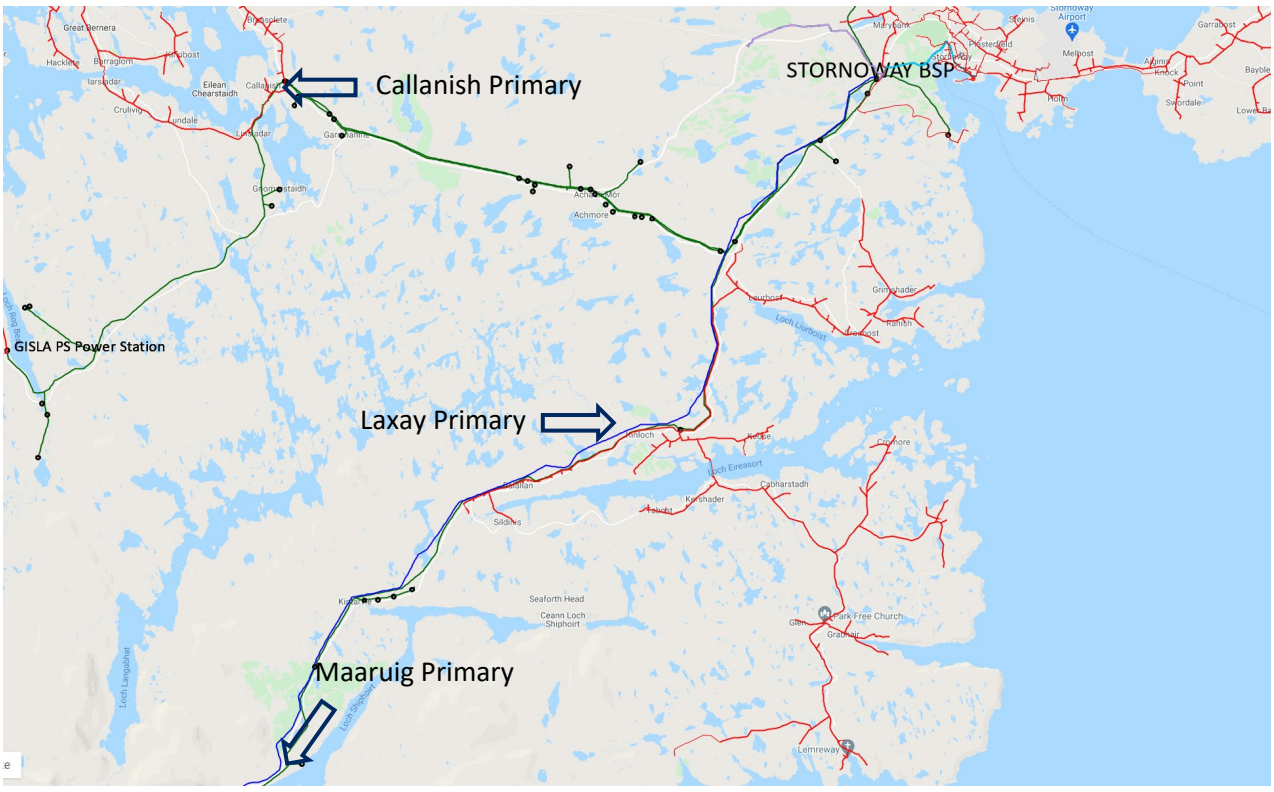


Figure 1: The geographic locations of Stornoway, Laxay and Maaruig Primary Substations

There is an existing scheme in ED1 to address the P2 compliance issue at Laxay by establishing a new 4km interconnection between the 11kV feeder 012 and Arnish Generating Station. As part of the scheme, it is also proposed to re-conductor 3.2km of the 11kV overhead line to provide enough capacity to take the entire load from Laxay. It is expected that this reinforcement scheme will improve the CML performance of this section of the feeder. It however will not improve the 33KV network performance, hence not benefit the WSC performance.

The 11kV feeders details are summarised in the table below.

Table 2: Laxay and Maaruig WSCs HV Feeder

	HV Feeder	Number of connected customers	Number of PSR customers	Length of OHL (km)	Length of UG cable (km)
Laxay	11	655	124	56.37	13.64
Laxay	12	457	83	23.55	0.66

4.2 WSC Network Performance

The total 1,112 customers supplied by Laxay are all in WSC category. The Laxay HV feeders no. 011 and 012 supply 655 and 457 customer respectively. There are 124 and 83 PSR registered customer on these respective feeders. The interruption number range up to 22 for feeder 011 and 19 for feeder 012 at Laxay over the latest 3-year period.

The table below shows the WSC network performance on Laxay and Maaruig WSC HV feeder. It shows the WSC number and the range of interruption numbers over the 3-year period from the reporting year 2019/20 against each feeder.

Table 3: WSC Network Performance

	HV Feeder	**WSC No.**	**Range of interruption No. over 3-year**	**Average interruption length (mins)**	**Network Investment Priority score (high score = more vulnerable)**
Laxay	11	655	12-22	124	4.5
Laxay	12	457	12-19	142	4.5

4.3 Demand Forecast

Under the Consumer Transformation scenario, the demand forecast for Laxay is shown in the table below between 2021 and 2033. The average annual growth rates for Laxay is 4.84%.

Table 4: Demand Forecast for Laxay

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Laxay Demand (MW)	1.72	1.72	1.75	1.81	1.89	2.01	2.12	2.24	2.39	2.60	2.79	2.90	3.02

4.4 Fault Data Analysis

The figure below highlights the fault history on the circuits associated with both Laxay 33kV and 11kV between 2017 and 2019.

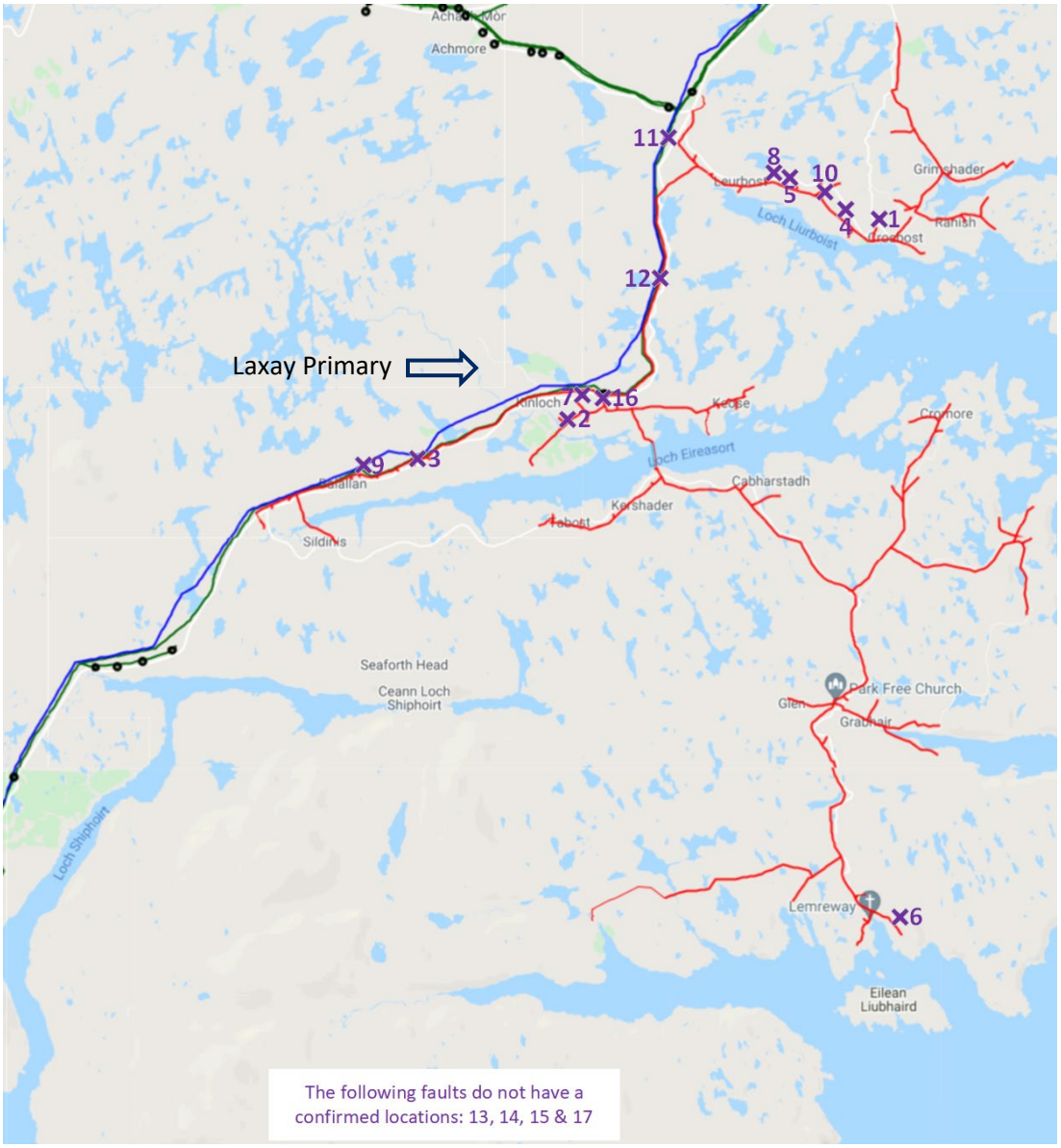


Figure 2: Fault Data Analysis

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, Wind and Gale, Broken Jumper	221
2017	11kV Fault, Birds, Bird Strike Caused Broken Conductor	651
2017	11kV Fault, Wind and Gale, Broken Jumper	163
2017	11kV Fault, Lightning, Burnt Pole	323
2017	11kV Fault, Deterioration due to Ageing or Wear, Burnt Pole and Broken Conductor	452

2018	11kV Fault, Deterioration due to Ageing or Wear, Broken Binder and Conductor	165
2018	11kV Fault, Deterioration due to Ageing or Wear, Broken Pin Insulator Caused Burnt Pole	653
2018	11kV Fault, Operational or Safety Restriction, Operational disconnection for fault on 33kV	397
2020	11kV Fault, Wind and Gale, Broken Jumper	652
2020	11kV Fault, Deterioration due to Ageing or Wear, Broken Binder caused Burnt pole	221
2017	33kV Fault, Deterioration due to Ageing or Wear, Failed Compression Joint Resulting in Broken Conductor	1208
2017	33kV Fault, Wind and Gale, Broken Binder and Burnt Pole	2204
2018	33kV Fault, Transient Fault - No Repair, Unidentified fault	1206
2018	33kV Fault, Transient Fault - No Repair, Unidentified fault	1206
2018	33kV Fault, Transient Fault - No Repair, Unidentified fault	1207
2018	33kV Fault, Lightning, Faulty Surge Arrestor	1107
2019	33kV Fault, Transient Fault - No Repair, Unidentified fault	1211

Due to the long radial 33KV network supplying Laxay, there have been seven interruptions due to faults occurring on the line from Stornoway Grid over the last 3-year period. The fault restoration period is also much higher than average due to the remoteness of these sites and lack of interconnections.

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 4 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 Minimum (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	Additional maintenance resource required	Taken forward to further assessment.

		No large upfront CAPEX	Significant proportion of customers remain as WSCs Increase in OPEX	
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.	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 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 Competitive cost comparing to the reinforcement option	Technology and mechanism is yet to be proven Limited sites that can utilise such arrangement to improve WSC performance	Rejected

6 Analysis and Cost

6.1 Option 1: Do-Minimum

Estimated Cost: £0k

Due to the remoteness of the Laxay and Maaruig substation and its feeder, it is supplied through a single long radial feed circuit from Stornoway Grid. Without any intervention, the WSCs will experience similar level of interruptions into ED2 and beyond. Therefore, this option is not considered viable.

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

Estimated Cost: £253k

This option is to carry out enhanced maintenance on the WSC HV feeders at both sites and the 33KV feeder. This will target the asset with poor health condition and the worst performing sections with measures such as pole replacement and refurbishment, installation of covered conductors and further provision of automatic switching devices. This is likely to improve the HV and 33KV network performance and reduce the probability of failure over the short term.

However, it will not warrant the improved performance for WSCs long term due to the nature of radial feed. These customers would continue to endure fault interruptions in excess of 12 interruptions over any three year period.

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

Estimated Cost: £1,115k

This option will replace the 15km of 33kV overhead line between Stornoway and Laxay and the 3km of 11kV network, feeder 012, that form part of the worst performing network. Whilst it is expected that the network performance at 33KV level will see improved performance under this option, this option does not represent the best utilisation of the current asset and no material impact on the interruption performance due to the nature of long radial feed in the long term. It is likely to continue causing interruptions caused by issues such as transient faults, bird strikes and lightning.

6.4 Option 4: Reinforcing existing network (Reinforcement)

Estimated Cost: £1,768k

The proposed option is to install a new 3 panel 33kV switchboard and 4 panel 11kV switchboard. The 33kV switchboard should have the auto-changeover arrangement to switch the supply of Laxay from Stornoway to Harris in the case of 33kV fault. The new 11kV switchboard would enable the reconfiguration of the feeder 011 to separate Callans and Laxay Croft. By having this third feeder, the protection grading will be made easier to improve the efficiency of spur isolation downstream.

To improve the reliability of the Kershader section of the feeder 011, it is proposed to install 8km of 11kV overhead line to connect Kinloch Erisort and Habost Units. This creates a land connection to Kershader in addition to the existing subsea cable link to further back up the remote end of feeder 011.

Laxay feeder 011 will still have 63 customers on Keose Spur experiencing more than 12 number interruptions based on the fault data. To address this part of the network, it is proposed to install 2km of 11kV overhead line to create interconnection between feeder 012 and Keose Spur as shown on the map below.

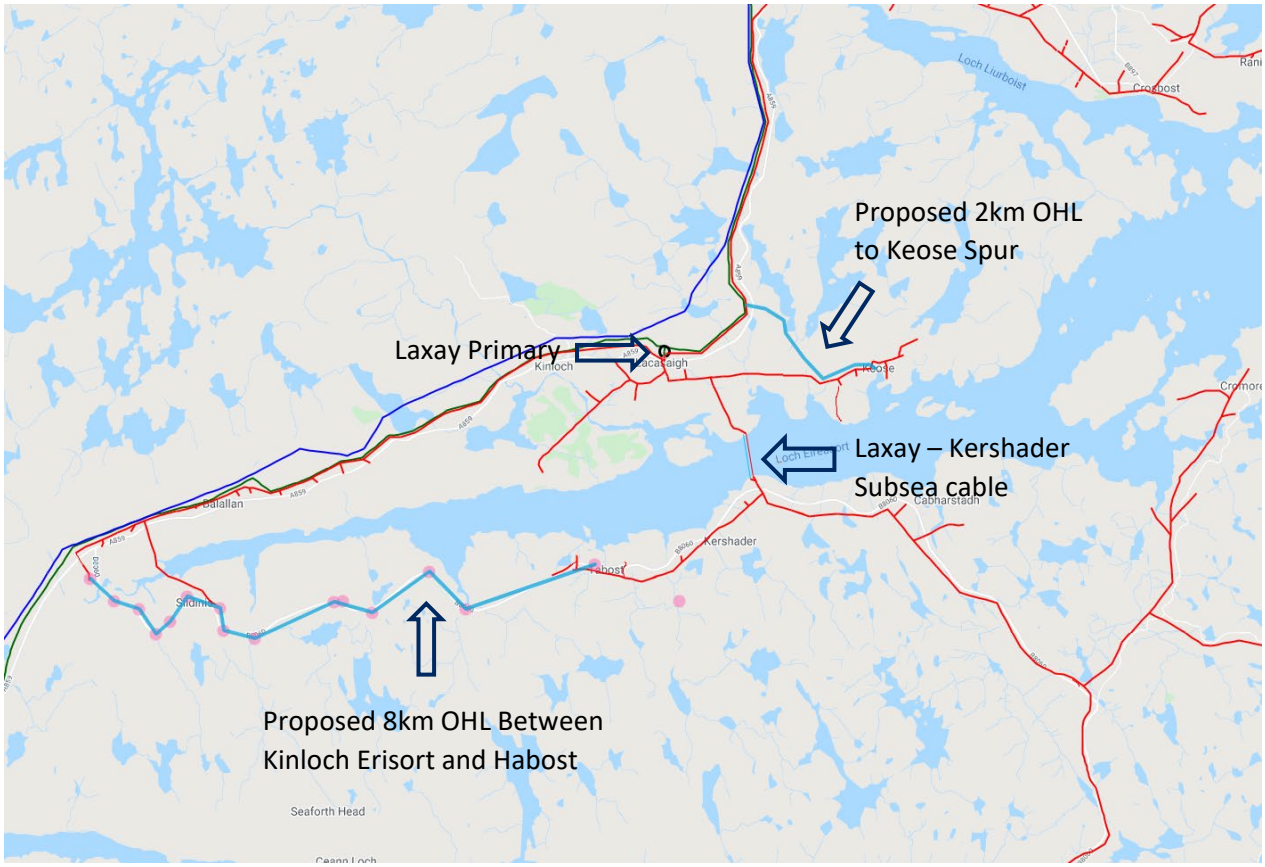


Figure 3: Proposed 11kV OHL Installation

6.5 Option 5: Flexible Solution

Estimated Cost: £715k

Flexibility services could be used to support Laxay substation in the 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. The technology is still unproven for a solution that can support the network of this size for this duration. Without having a separate service, it will not benefit Maaruig.

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 Analysis of Option 2

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Laxay	0.03 (207)	0.03 (23757)

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 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 Analysis of Option 3

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Laxay	0.047 (376)	0.033 (26673)

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 Laxay customers from WSC classification.

Table 9: CI/CML Analysis of Option 4

	CI Improvement % (Actual Volume)	CML Improvement % (Actual volume)
Laxay	0.235 (1881)	0.167 (133366)

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	2023/24	2024/25	2025/26	2026/27	2027/28	Total
Option 1 – Do Minimum	£m	0	0	0	0	0	0
Option 2 – Enhanced Maintenance and Inspection	£m	0	0.25	0	0	0	0.25
Option 3 – Asset Replacement	£m	0	1.12	0	0	0	1.12
Option 4 – Add New Asset	£m	0	1.80	0	0	0	1.80
Option 5 – Flexible Solution	£m	0	0.18	0.18	0.18	0.18	0.71

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

The analysis above demonstrates 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. Options 2 and 3 do not introduce any new fault resilience to Laxay. They only deliver marginal improvement in CI/CML and network performance which will deteriorate in future years and therefore 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 of Preferred Option

Asset Category	Unit	2023/24	2024/25	2025/26	2026/27	2027/28	Total
11kV OHL (Covered Conductor)	km	0	10.4	0	0	0	2
11kV Poles	#	0	138	0	0	0	29
11kV Voltage Regulator	#	0	1	0	0	0	1
11kV UG Cable	Km	0	0.1	0	0	0	0.1
11kV CB (GM) Primary	#	0	4	0	0	0	4
11kV CB (PM)	#	0	3	0	0	0	3
33kV CB (Gas Insulated Busbars)(ID)(GM)	#	0	3	0	0	0	3
33kV UG Cable (Non Pressurised)	km	0	0.2	0	0	0	0.2
33kV OHL (Pole Line) Conductor	km	0	0.5	0	0	0	0.5
33kV Pole	#	0	5	0	0	0	5
11kV Pole Refurbishment	#	0	103	0	0	0	103
33kV Pole Refurbishment	#	0	36	0	0	0	36

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 the 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 the 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 (see 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 OHL circuits or elements of them and request undergrounding of sections of the OHL proposed routes or impose various conditions related to archaeological or environmental or ecological requirements to carry out the works. There is also consent requirement for the new switchboard building. This is subject to landowner discussion and may impose delays of the project.

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 WSC related investment in Laxay substations.

Five investment options have been described which could be carried out as a solution to address the WSC issue at these sites. This EJP is supported by a Cost Benefit Analysis (CBA) which provide more detail on the investment option which are deemed most viable on an individual project basis.

As detailed within Section 8, 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 a Cost Benefit Analysis (CBA). This includes future network trend analysis and 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 and volumes are proposed for delivery during RIIO ED2. The preferred investment for Laxay substation in RIIO ED2 is Option 4: asset reinforcement.

Table 12: CV Table Summary

CV Table	Unit	2023	2024	2025	2026	2027	Total
CV15 Primary Reinforcement RIIO ED2 Spend	£m	0	1.80	0	0	0	1.80

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

Scottish & Southern Electricity Networks

13 Appendix 3. Assumptions for Flexible Solutions

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	[redacted]	2	365		[redacted]	1440			
Year 2	[redacted]	2	365	[redacted]	[redacted]	1440	[redacted]	[redacted]	
Year 3	[redacted]	2	365	[redacted]	[redacted]	1440	[redacted]	[redacted]	
Year 4	[redacted]	2	365	[redacted]	[redacted]	1440	[redacted]	[redacted]	[redacted]
Year 4	[redacted]	2	365	[redacted]	[redacted]	1440	[redacted]	[redacted]	