504_SHEPD_HSM_24_SKYE-UIST-HARRIS

OUTER HEBRIDES - 2050 WHOLE SYSTEM PROPOSALS

ENGINEERING JUSTIFICATION PAPER

JULY 2024 UPDATE

Scottish & Southern Electricity Networks

504_SHEPD_HSM_24_SKYE-UIST-HARRIS	Outer Hebrides Whole System Project Hebrides and Orkney Whole System RIIO-ED2 Re-opener ENGINEERING JUSTIFICATION PAPER		Applies to	
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	Name	Title	Signature
Author	Andrew Harvey	Strategic Network Development Engineer	A.Harvey
Checked by	Andrew Wainwright Brad Doswell	Whole System Manager DSO System Planning Engineer (SHEPD)	A.Wainwright B Doswel
Approved by	Andrew Roper	Distribution Systems Operation Director	A.Roper

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Preface

SHEPD submitted the original version of this EJP under the HOWSUM window in January 2024,[1] identifying preferred options to replace the existing Ardmore to Loch Carnan subsea cable with a larger one, installing a new cable between Harris and Clachan substations, and laying a second subsea cable alongside the existing Ardmore to Harris route, at a total capital cost of £[redacted] million, spread across the current and subsequent price control periods.

This version of the EJP is an addendum to the Outer Hebrides – 2050 Whole System Proposals EJP submitted in January 2024, providing the update on Skye-Uist costs which was agreed by Ofgem to be submitted by the end of July 2024. This EJP provides narrative and supporting information on our long term strategy and high level delivery programme for the Outer Hebrides. This addendum is limited to refinements to costs further to procurement processes, and other essential associated updates, building on our January 2024 HOWSUM submission. Information pertaining to options to optimise delivery of the Dunvegan - Loch Carnan element of our strategy can be found in Appendix 8A.

This addendum is limited to refinements to costs further to procurement processes, and other essential associated updates, building on our January 2024 HOWSUM submission.

In addition to the original January 2024 submission, this addendum should be read in conjunction with the following supporting documents:

- HOWSUM July 2024 Core Narrative Addendum
- Appendix 3B – Outer Hebrides 2050 Whole System Proposals EJP (Skye-Uist-Harris) – July 2024 Addendum ('Appendix 3B Addendum')
- Appendix 8A – Outer Hebrides 2050 Whole System Proposals EJP (Ardmore – Loch Pooltiel Optimisation) ('Appendix 8A')

  Appendix 8B – Outer Hebrides 2050 Whole System Proposals CBA (Ardmore – Loch Pooltiel Optimisation) ('Appendix 8B')

The July 2024 application structure is noted in Figure 0.1.

[1] Document reference 501_SHEPD_HSM_24_SKYE-UIST-HARRIS, redacted version published here. Whole system energy solutions for the Scottish Islands - SSEN.

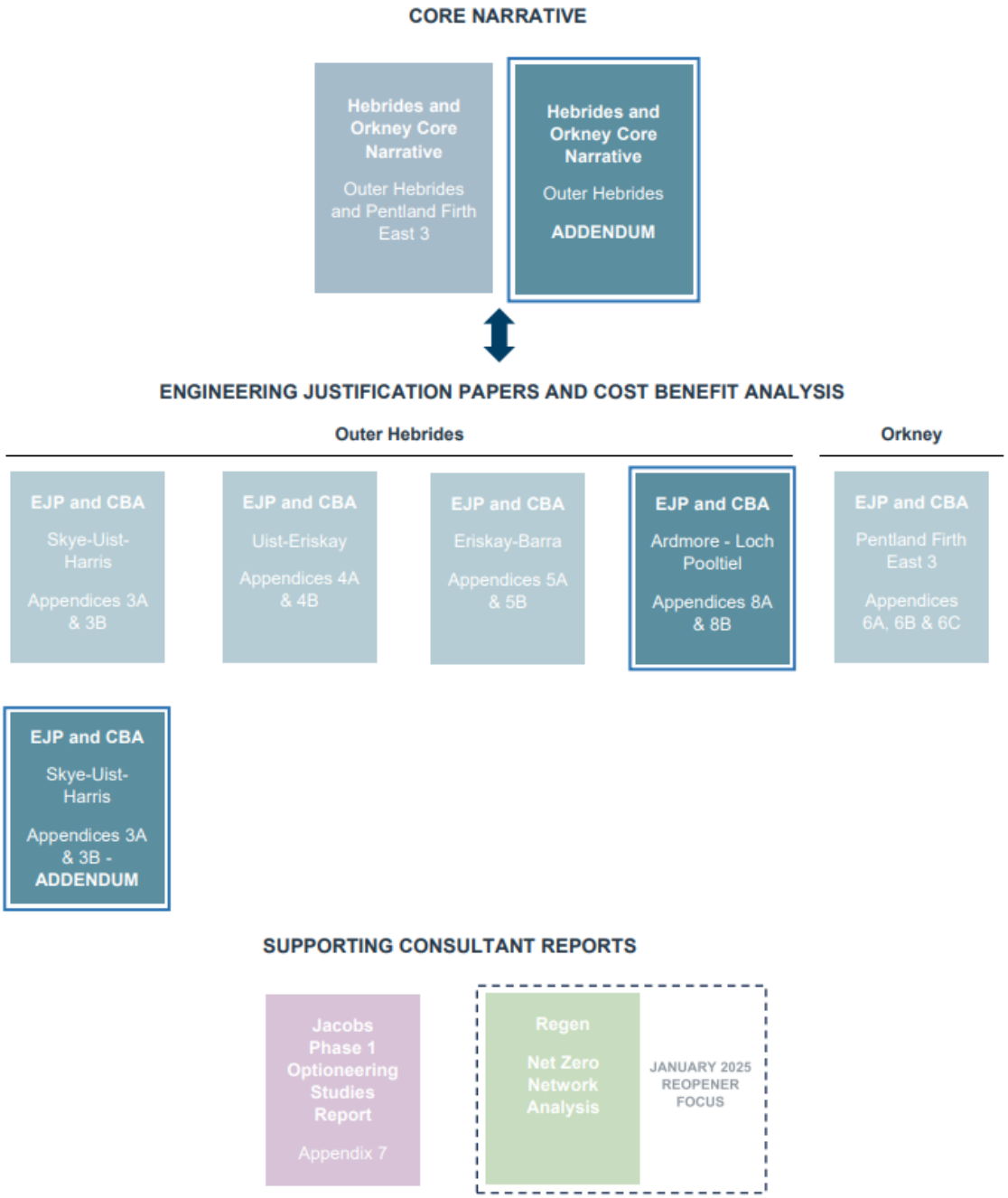

Figure 0.1: HOWSUM 2024 re-opener – July 2024 submission structure

1 Executive Summary

The purpose of this Engineering Justification Paper (EJP) Addendum is to detail changes to our original EJP for the Outer Hebrides submitted in January 2024, which set out the long-term solution for the Western Isles network, to ensure it remains resilient and meets the projected demands of the island communities out to 2050.

In that EJP, SHEPD identified Option 18[2] as the preferred long-term strategy to meet the region's electricity demands whilst ensuring a resilient network, sufficient capacity, and low carbon footprint. This option involves replacing the existing Ardmore to Loch Carnan subsea cable with a larger one, installing a new cable between Harris and Clachan substations and laying a second subsea cable alongside the existing Ardmore to Harris route. Onshore connections to substations will support each route. This option has been chosen because it:

1) Is the most cost-effective option with the highest Net Present Value (NPV).
2) Ensures future resilience on the Outer Hebrides.
3) Meets future demand and generation requirements.
4) Provides a credible route to facilitate decarbonisation of our embedded diesel generation fleet.

The investment timeline for this option spans 2025-2035, with the first circuit commissioning in 2027/28 and the last cable being completed in 2035, aligning with the forecasted Distribution Future Energy Scenarios (DFES) demand profile. The total capital cost of this option was estimated for the purpose of our January 2024 submission as £[redacted] million, spread across the current and subsequent price control periods. Based on the tender process we are running; we have revised this estimate to £[redacted] million.

This paper outlines the intention to defer elements of the preferred solution until future price reviews, with the proposed new 33kV subsea cable from Dunvegan GSP on Skye to Loch Carnan 33kV Sw/STN on South Uist being taken forward for consideration in this Hebrides and Orkney Whole System (HOWSUM) reopener window.

The current 33kV cable running between Skye and South Uist has been in service for 34 years. The average End of Life (EoL) for this cable type is 30 years, therefore the cable has reached its EoL within the current price control period. The asset has been given a Health Index (HI) score 5/5 and a Criticality Index (CI) of 2/5, which means that it has a high probability of failure and needs to be replaced. The risk of asset failure will only increase as the asset is being used passed its EoL and the load on the cable continues to increase.

Although flexibility services were considered, they were discounted due to the large amount required (~30 MVA) and the lack of response from flexibility providers to SHEPD's global tender in 2023.

[2]New Dunvegan – Loch Carnan subsea cable (plus supporting onshore), additional Harris – Clachan subsea cable (plus supporting onshore) and new secondary Ardmore – Harris subsea cable (plus supporting onshore)

This recommendation is based on a detailed analysis of 32 options (long list) of which 14 options (short list) were deemed to be technically feasible. The short-listed options underwent further Cost Benefit Analysis (CBA) to provide a commercial comparison. The analysis considered a whole system approach as part of our options development. The detailed options analysis as mentioned above concluded that Option 18 was the most suitable option.

The majority of the changes in this addendum relate to revised cost information following a competitive tender process and CBA has been updated accordingly. Given the current market position and price volatility, we have only updated the cost information for the options relating to the routes that have been included as part of this tender process (i.e. where updated costs are available). Other subsea cable costs remain unchanged, consistent with the limited differences experienced where updated costs have been available.

On the basis of the updated estimated costs and CBA, SHEPD maintains its recommendation to pursue Option 18, ensuring a cost-effective engineering solution with the highest NPV.

The only other notable change is the decision to progress with a [redacted] 33kV subsea cable between Loch Pooltiel and Loch Carnan instead of the previously proposed [redacted] 33kV cable, given that the market has confirmed the cost difference to do so is minimal (circa £[redacted]m over the value of the whole project.)

We have assessed delivery optimisation for Option 18, which is set out in Appendix 8A - Outer Hebrides 2050 Whole System Proposals EJP (Ardmore – Loch Pooltiel Optimisation) and Appendix 8B – Outer Hebrides 2050 Whole System Proposals CBA (Ardmore – Loch Pooltiel Optimisation).

Procurement, delivery and regulatory activities have advanced since our January 2024 application. This EJP and Appendix 8A capture some of these updates, with most of the detail included in our Core Narrative Addendum in Sections 2.4, 2.5 and 2.7.

Given that the majority of the information provided in our original EJP for this project has not changed since our January 2024 application, we have taken the approach within this EJP Addendum of preserving key relevant headings but noting “no change” where there are no further updates to make.

3 Investment Summary Table

Name of Scheme/Programme	Outer Hebrides Strategic Investment	
Primary Investment Driver	Asset replacement of Ardmore – Loch Carnan 33kV subsea cable Future resilience on the Outer Hebrides Future demand and generation requirements Decarbonisation of our diesel generation fleet.	
Scheme reference/ mechanism or category	501_SHEPD_HSM_24_SKYE-UIST-HARRIS 504_SHEPD_HSM_24_SKYE-UIST-HARRIS	
Output reference/type	[redacted] subsea cable Onshore 33kV Overhead Line cables Onshore substation upgrades	
Cost	£[redacted]m	
Delivery Year	Between [redacted] and [redacted]	
Reporting Table(s)	R3 – Re-openers (subject to specific activities, costs may fall under other reporting tables)	
Outputs in RIIO ED2 Business Plan	HOWSUM development funding has been provided as part of SHEPD's RIIO-ED2 settlement for HOWSUM project development costs. For Skye-Uist, development costs in RIIO-ED2 are currently estimated at £[redacted]m (see also Hebrides and Orkney Whole System Core Narrative Addendum for more detail). We have deducted development costs from the 'Cost' and 'Spend Apportionment' values in this table to take account of this funding. A refined view of costs is provided in this EJP, building on SHEPD's submission made in January 2024.	
Spend Apportionment	**RIIO-ED2**	**RIIO-ED3+**
	£[redacted]m	£[redacted]
MVA released	30.9 MVA	

Table 3.1: Investment summary table

4 Introduction

No change to original submission

4.1 Geographical Context

No change to original submission

4.2 Uncertainty Mechanism

No change to original submission

4.3 Primary Investment Drivers

No change to original submission

4.4 Needs Case

No change to original submission

4.4.1 Subsea cable asset condition

No change to original submission

4.4.2 Future demand and generation requirements

No change to original submission

4.4.3 Summary

No change to original submission

5 Background Information

5.1 Intervention Priorities

No change to original submission

5.2 Existing Asset Conditions

No change to original submission

5.2.1 Health Index

No change to original submission

5.2.2 Criticality Index

No change to original submission

5.2.3 Monetised Risk Assessment

No change to original submission

5.3 Existing Network Arrangements

5.3.1 Uist archipelago

No change to original submission

5.3.1.1 Security of Supply (Uist Archipelago)

No change to original submission

5.3.2 Lewis and Harris

No change to original submission

5.3.3 Security of supply (Lewis and Harris)

No change to original submission

5.4 Load Forecast

No change to original submission

5.5 Regional Stakeholder Engagement and Whole Systems Analysis Summary

No change to original submission

5.5.1 Local Authority and Government

No change to original submission

5.5.2 Community Energy Groups and interest groups

No change to original submission

5.5.3 Whole system approach

No change to original submission

5.5.4 Summary

No change to original submission

5.6 Flexible Market Viability

No change to original submission

5.7 Confidence Table

No change to original submission

7 Optioneering

7.1 Long List of Options

No change to original submission

7.2 Short List of Options

No change to original submission

8 Detailed Option Analysis

Costs have been updated for all options that contain a Dunvegan – Loch Carnan circuit, for which updated information is available.

8.1 Baseline: Do Minimum (Replace on Failure)

Option Description

No change to original submission

Limitations

No change to original submission

8.2 Option 11: Replace Ardmore – Loch Carnan Subsea cable with Larger Cable and Add New Larger Size Cable / OHL Ardmore – Clachan and New Ardmore – Harris Subsea Cables

No change to original submission

Benefits

No change to original submission

Limitations

No change to original submission

8.3 Option 14: Remove Ardmore – Loch Carnan Subsea Cable and Replace with Dunvegan – Loch Carnan OHL/Subsea Cable and Ardmore – Clachan Subsea Cable / OHL and new Ardmore – Harris Subsea Cables

The only change we have made to the original option is to progress with a [redacted] 33kV cable instead of the [redacted] 33kV cable originally proposed. While the DFES does not currently confirm the requirement for a [redacted] cable, we have assessed its cost as part our tender process and consider that the additional 'future-proofing' it offers is worth the marginal increase in cost (circa £[redacted]M over the whole project value).

Option 14 includes the removal of the existing Ardmore to Loch Carnan (South Uist) subsea cable (95mm^2) with a 16.5km OHL between Dunvegan and Loch Pooltiel and a 38.5km larger subsea cable ([redacted]) between Loch Pooltiel and Loch Carnan (South Uist). Additionally, we would lay a 33km subsea cable between Ardmore and Lochmaddy and a 16km OHL between Lochmaddy and Clachan (North Uist). Furthermore, this option would retain the existing 32.3km (500mm^2) subsea cable between Ardmore and Harris and commission a second ([redacted]) subsea cable between Ardmore and Harris.

The new circuits are 33 kV and are shown with a dashed green line. The green solid line is the existing subsea cable from Skye to Harris. Each route will be supported with onshore connections to the substations. The routes are further depicted in Figure 8.1. This will provide N-1 capacity and cater for demand growth until at least 2050.

Figure 8.1: Option 14 route map

Cost

The estimated capital cost components of this option are the three cable routes (subsea and onshore) and upgrades to the Ardmore, Harris and Clachan substations. This totals to £[redacted]m; which occurs through the current and subsequent price control periods. Table 8.1 provides a breakdown of cost.

Line Items	Route	Cost (£m)
Subsea cable (Dunvegan - Loch Carnan)	(Dunvegan - Loch Carnan)	[redacted]
Onshore - OHL	(Dunvegan - Loch Carnan)	[redacted]
Onshore - Poles	(Dunvegan - Loch Carnan)	[redacted]
Onshore - 33kV U/G Cable	(Dunvegan - Loch Carnan)	[redacted]
Subsea cable (Ardmore - Lochmaddy)	(Ardmore - Clachan)	[redacted]
Onshore - OHL	(Ardmore - Clachan)	[redacted]
Onshore - Poles	(Ardmore - Clachan)	[redacted]
Onshore - 33kV U/G Cable	(Ardmore - Clachan)	[redacted]
Subsea cable (Ardmore - Harris)	(Ardmore - Harris)	[redacted]
Onshore - OHL	(Ardmore - Harris)	[redacted]
Onshore - Poles	(Ardmore - Harris)	[redacted]
Onshore - 33kV U/G Cable	(Ardmore - Harris)	[redacted]
Substation upgrade - Ardmore	[redacted]	[redacted]
Substation upgrade - Harris		[redacted]
Substation upgrade - Clachan		[redacted]

Table 8.1: Option 14 cost breakdown (2021 prices)

Benefits

No change to original submission

Limitations

No change to original submission

8.4 Option 18: New Dunvegan – Loch Carnan Subsea Cable (Plus Supporting Onshore), Additional Harris – Clachan Subsea Cable (Plus Supporting Onshore) and New Secondary Ardmore – Harris Subsea Cable (Plus Supporting Onshore)

The only change we have made to the original recommendation is to determine to progress with a [redacted] 33kV cable instead of the [redacted] 33kV cable originally proposed. While the DFES does not currently confirm the requirement for a [redacted] cable, we have assessed its cost as part our tender process and consider that the additional 'future-proofing' it offers is worth the marginal increase in cost (circa £[redacted]M over the whole project value).

Option 18 entails replacing the existing Ardmore to Loch Carnan subsea cable (95mm^2) with a larger cable ([redacted]) from Dunvegan to Loch Carnan. It also involves a new cable from the Harris to Clachan substations, via Lochmaddy, and a secondary subsea cable alongside the existing Ardmore to Harris route. Each route will be supported with onshore connections to the substations. The routes are further depicted in Figure 8.2. This will provide N-1 capacity and cater for demand growth until at least 2050.

Figure 8.2: Option 18 route map

Cost

The estimated capital cost components of this option are the three cable routes (subsea and onshore) and upgrades to the Dunvegan, Clachan and Harris substations. This totals to £[redacted]m; which occurs through the current and subsequent price control periods. Table 8.2 provides a breakdown of cost.

Line Items	Route	Cost (£m)
Subsea cable	(Dunvegan - Loch Carnan)	[redacted]
Onshore - OHL	(Dunvegan - Loch Carnan)	[redacted]
Onshore - Poles	(Dunvegan - Loch Carnan)	[redacted]

Line Items	Route	Cost (£m)
Onshore - 33kV U/G Cable	(Dunvegan - Loch Carnan)	[redacted]
Subsea cable	(Harris- Clachan)	[redacted]
Onshore - OHL	(Harris- Clachan)	[redacted]
Onshore - Poles	(Harris- Clachan)	[redacted]
Onshore - 33kV U/G Cable	(Harris- Clachan)	[redacted]
Subsea cable	(Ardmore - Harris)	[redacted]
Onshore - OHL	(Ardmore - Harris)	[redacted]
Onshore - Poles	(Ardmore - Harris)	[redacted]
Onshore - 33kV U/G Cable	(Ardmore - Harris)	[redacted]
Substation upgrade - Dunvegan	[redacted]	[redacted]
Substation upgrade - Harris		[redacted]
Substation upgrade - Clachan		[redacted]

Table 8.2: Option 18 cost breakdown (2021 prices)

Benefits

No change to original submission

Limitations

No change to original submission

8.5 Option 19: New Dunvegan – Loch Carnan subsea cable (plus supporting underground onshore), additional Harris – Clachan subsea cable (plus supporting onshore) & new secondary Ardmore – Harris subsea cable (plus supporting onshore)

The only change we have made to the original recommendation is to determine to progress with a [redacted] *33kV cable instead of the* [redacted] *33kV cable originally proposed. While the DFES does not*

currently confirm the requirement for a [redacted] cable, we have assessed its cost as part our tender process and consider that the additional 'future-proofing' it offers is worth the marginal increase in cost (circa £[redacted]M over the whole project value).

Option 19 is sensitivity analysis of Option 18, in which the 16.5km Dunvegan to Loch Caran onshore cable is all underground. The subsea section of the Dunvegan to Loch Carnan route is the same, as is the entirety of the Harris to Clachan and Ardmore to Harris routes. The routes are further depicted in Figure 8.3. This will provide N-1 capacity and cater for demand growth until at least 2050.

Figure 8.3: Option 19 route map

Cost

The estimated capital cost components of this option are the three cable routes (subsea and onshore) and upgrades to the Dunvegan, Clachan and Harris substations. This totals to £[redacted]m; which occurs through the current and subsequent price control periods. Figure 8.3 provides a breakdown of cost.

Line Items	Route	Cost (£m)
Subsea cable	(Dunvegan - Loch Carnan)	[redacted]
Onshore - 33kV U/G Cable	(Dunvegan - Loch Carnan)	[redacted]
Subsea cable	(Harris- Clachan)	[redacted]
Onshore - OHL	(Harris- Clachan)	[redacted]
Onshore - Poles	(Harris- Clachan)	[redacted]
Onshore - 33kV U/G Cable	(Harris- Clachan)	[redacted]
Subsea cable	(Ardmore - Harris)	[redacted]
Onshore - OHL	(Ardmore - Harris)	[redacted]
Onshore - Poles	(Ardmore - Harris)	[redacted]
Onshore - 33kV U/G Cable	(Ardmore - Harris)	[redacted]
Substation upgrade - Dunvegan	[redacted]	[redacted]
Substation upgrade - Harris		[redacted]
Substation upgrade - Clachan		[redacted]

Table 8.3: Option 19 cost breakdown (2021 prices)

Benefits

No change to original submission

Limitations

No change to original submission

8.6 Option 26: Replace Ardmore – Loch Carnan Subsea Cable (Plus Supporting Onshore), Additional Harris – Clachan Subsea Cable (Plus Supporting Onshore) and New Secondary Ardmore – Harris Subsea Cable (Plus Supporting Onshore)

No change to original submission

Benefits

No change to original submission

Limitations

No change to original submission

9 Optioneering Summary Table

No change to original submission

10 Cost Benefit Analysis

Costs have been updated for all options that contain a Dunvegan – Loch Carnan circuit for which updated information is available. All other elements of CBA remain unchanged.

10.1 CBA of Investment Options

Displayed in Table 10.1 is the expenditure components, split by Capex and Opex, for the next three price control periods. The vast majority of costs is made up of capital costs, with operating costs accounting for a smaller fraction of total expenditure. The bulk of the operating expenditure for the short-listed options is a consequence of operating the DEG on standby, which is treated as an operating cost in this table.

	RIIO-ED2			RIIO-ED3			RIIO-ED4		
Option	**Capex**	**Opex**	**Totex**	**Capex**	**Opex**	**Totex**	**Capex**	**Opex**	**Totex**
Baseline	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 10.1: Cost summary - 2021 Prices (£m)

The cost summary shows that Option 18 is the least costly of all the options which meet the investment needs. The reasoning for this is discussed in detail in Section 8.4. The most expensive option is Option 26.

The three forthcoming price control periods are the only ones displayed here, as all capital expenditure (outside of asset renewals at EoL) is concluded in 2034 (RIIO-ED4) for all options.

10.2 CBA Results

The output of the CBA is displayed below in Table 10.2.

Option	10 years	20 years	30 years	45 years	Whole life (55 years)
Option 11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option 26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 10.2: Net Present Value at different intervals (£m, 2021 prices)

The NPV is heavily driven by capital expenditure, which therefore logically leads to Option 18 producing the most positive result and Option 11 displaying the least positive NPV.

Table 10.3 and Table 10.4 display the whole life cost and benefit of each option. As we have used a 55-year appraisal period (as per Ofgem's CBA guidance), this does include a portion of renewals, as the asset life of a subsea cable is modelled at 45 years. Note also that these costs are not discounted to present values. The societal benefits are net negative due to the increased cable volume and associated losses.

Option	Capex	Opex	DEG	Totex
Option 11	[redacted]	[redacted]	[redacted]	[redacted]
Option 14	[redacted]	[redacted]	[redacted]	[redacted]
Option 18	[redacted]	[redacted]	[redacted]	[redacted]
Option 19	[redacted]	[redacted]	[redacted]	[redacted]
Option 26	[redacted]	[redacted]	[redacted]	[redacted]

Table 10.3: Option whole life costs (£m, 2021 prices)

In Table 10.3, Option 14 has the lowest expected capital costs over the whole life of the assessment period (55 years). Option 18 has marginally higher expected capital costs. Option 19 is the costliest option.

Option	Total Societal Net Benefits	Avoided Baseline Costs	Total Benefits
Option 11	[redacted]	[redacted]	[redacted]
Option 14	[redacted]	[redacted]	[redacted]
Option 18	[redacted]	[redacted]	[redacted]
Option 19	[redacted]	[redacted]	[redacted]
Option 26	[redacted]	[redacted]	[redacted]

Table 10.4: Option whole life benefits (£m, 2021 prices)

Option 11's societal benefits are the most negative of all options considered. This is driven by the relative increase in losses of the Ardmore to Loch Carnan subsea cable, compared to the shorter Dunvegan to Loch Carnan route. The benefits for Options 18 and 19 are modelled as identical, as they share the same cable routes. Whole life benefits are illustrated in Figure 10.1.

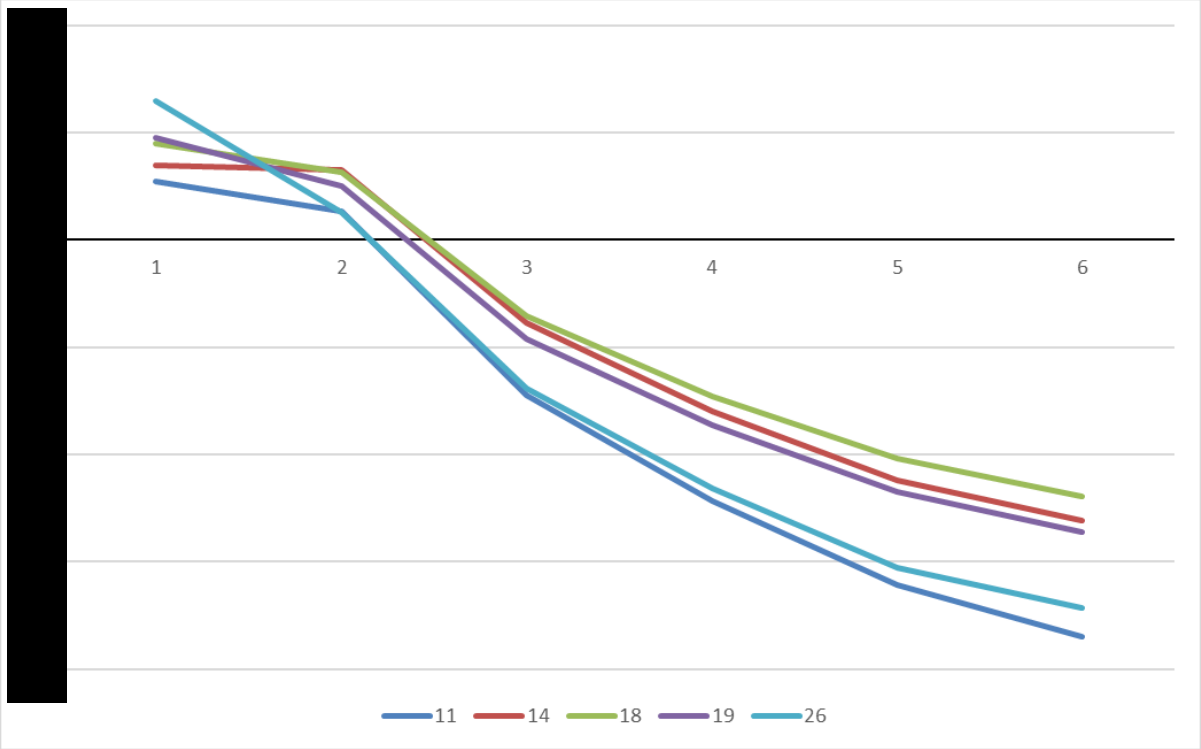

Figure 10.1: Option whole life benefits (£m, 2021 prices)

11 Preferred Option

The preferred option for this EJP is Option 18. This option is successful in providing a solution to the needs case, delivers the best value to customers and is the economical of all the short-listed options. Taken forward, we are confident that it will put SHEPD in the best place to achieve targets and contribute towards providing a resilient network for current and future customers.

11.1 Phasing of Preferred Option

No change to original submission

12 Deliverability and Risk

12.1 Delivery Strategy

Updates are provided in the Core Narrative Addendum.

12.1.1 Project plan

No change to original submission– updates are provided in the Core Narrative Addendum.

12.2 Procurement and Contracting Strategy

We referenced in our January 2024 application that the contracting structure for the Skye – Uist subsea cable replacement project is an [redacted].

In order to progress the project, [redacted]. These activities are covered by HOWSUM development funding.

[redacted]

Given the significance of fair offshore weather for subsea activities, delays to the programme risk us not being able to complete all required works in a given summer, which risks extensive delays during less favourable times of the year, and / or potentially delaying offshore works to the following summer. We have asked for a decision before the end of calendar year 2024 to allow us to [redacted] We have already progressed works to maintain momentum of the project to facilitate the programme, covered primarily by HOWSUM development funding. [redacted].

Market response

[redacted]

- [redacted]

[redacted]

Under the RIIO-ED2 regulatory framework we are able to manage general inflation effects, but this will play a very limited role in addressing these uncertainties. We therefore need further mechanisms to ensure a balanced approach to cost risk and a fair distribution hereof for all parties involved. These areas are also discussed in the Core Narrative Addendum.

12.2.1 Work undertaken in RIIO-ED1 and RIIO-ED2

No change to original submission - updates are provided in Appendix C of this document, and the Core Narrative Addendum.

12.2.2 Managing and monitoring delivery

No change to original submission - updates are provided in the Core Narrative Addendum.

12.3 Estimated Cost of Preferred Option

To manage cost there will be procurement, insurance and legal reviews held at each key stage of the project. This will define the contract strategy and ensure that SHEPD agree well defined contracts that both protect SHEPD and manage risks appropriately. Costs will be estimated at each stage of the project and will include tendered costs to achieve accurate estimates. Regular review of expenditure and forecast will be done throughout the project to monitor this and deliver the project within budget. More information on current estimated costs, the procurement and delivery processes, and managing cost risk is included in the Core Narrative Addendum at Sections 2.4, 2.5 and 2.7.

Figure 12.1 provides a breakdown of the costs for the preferred option. The estimated to cost £[redacted]m in capex.

Line Items	Route	Cost (£m)
Subsea cable	(Dunvegan - Loch Carnan)	[redacted]
Onshore - OHL	(Dunvegan - Loch Carnan)	[redacted]
Onshore - Poles	(Dunvegan - Loch Carnan)	[redacted]
Onshore - 33kV U/G Cable	(Dunvegan - Loch Carnan)	[redacted]
Subsea cable	(Harris- Clachan)	[redacted]
Onshore - OHL	(Harris- Clachan)	[redacted]
Onshore - Poles	(Harris- Clachan)	[redacted]
Onshore - 33kV U/G Cable	(Harris- Clachan)	[redacted]
Subsea cable	(Ardmore - Harris)	[redacted]
Onshore - OHL	(Ardmore - Harris)	[redacted]
Onshore - Poles	(Ardmore - Harris)	[redacted]
Onshore - 33kV U/G Cable	(Ardmore - Harris)	[redacted]
Substation upgrade - Dunvegan	[redacted]	[redacted]
Substation upgrade - Harris		[redacted]
Substation upgrade - Clachan		[redacted]

Figure 12.1: Cost breakdown

12.3.1 Regional variations in cost

No change to original submission

12.3.2 Ensuring cost robustness of preferred option

No change to original submission

12.4 Risks and Mitigations

Risk will be managed in accordance with the Large Capital Governance framework to ensure risks are identified, assessed, mitigated and monitored. This is done using a risk management system that the project team uses to capture this process and to review the risks regularly. An estimated risk allowance of £[redacted]m has been determined at this stage using Quantitative Cost Risk Analysis to provide a realistic appraisal of the potential value. This is discussed further in the Core Narrative Addendum.

12.4.1 Specific risks and mitigations

The risks and mitigations set out in our original EJP remain relevant. We include more information on current risks in the procurement and delivery processes in the Core Narrative Addendum, specifically Section 2.5.

13 Conclusion and Recommendation

The preferred option is Option 18, which is to remove the existing Ardmore to Loch Carnan subsea cable (95mm^2) with a larger cable ([redacted]) from Dunvegan to Loch Carnan. It also involves a new cable (33kV OHL) from the Harris to Clachan substations, via Lochmaddy, and a secondary subsea cable (33kV OHL) alongside the existing Ardmore to Harris route. Each route will be supported with onshore connections to substations.

Option 18 meets all our primary drivers, is the most cost-effective option and provides the region with N-1 capacity in addition to providing sufficient capacity for demand growth until at least 2050 according to our DFES projections. Our analysis to reflect tendered costs from the market confirms this option.

The timeline for investment for the three cables begins with the building of the first cable in 2025 (RIIO-ED2) and with the completion of the last cable in 2035 (ED4). The cables are rolled out in line with the forecasted DFES demand profile. This option considers flexibility; however, flexibility services have been discounted due to the large amount (~5 MVA) required and the fact that no flexibility providers responded to SHEPD's tender in 2023.

This timeline and the solution will be kept under review through 2024, and any changes will be highlighted in the January 2025 HOWSUM submission.

Therefore, in conclusion, SHEPD concluded to pursue Option 18 ensuring that we continue to provide a resilient network, with sufficient capacity, and lower carbon footprint all whilst ensuring a cost-effective engineering solution, recognising that this option had the highest NPV.

14 References

The documents detailed in Table 14.1, Table 14.2and Table 14.3, should be used in conjunction with this document.

Table 14.1: Scottish and Southern Electricity Networks Document

Reference	Title
N/A	Hebrides and Orkney Whole System UM Core Narrative (Addendum) Appendix 8A – Outer Hebrides 2050 Whole System Proposals EJP (Ardmore – Loch Pooltiel Optimisation)

Table 14.2: External Documents

Reference	Title
Nil	

Table 14.3: Miscellaneous Documents

Title

15 Revision History

No	Overview of Amendments	Previous Document	Revision	Authorisation
01	Re-submission	n/a		
02				

Appendix A Definitions and Abbreviations

Acronym	Definition
BAU	Business As Usual
CBA	Cost Benefit Analysis
CBRM	Condition Based Risk Management
CDM	Construction Design Management
CEM	Common Evaluation Methodology
CEGS	Community Energy Groups
CI	Criticality Index
CMZ	Constrained Management Zone
CNAIM	Common Network Assets Indices Methodology
CPI	Cost Performance Index
CT	Consumer Transformation
DEG	Distributed Embedded Generation
DFES	Distribution Future Energy Scenarios
DNO	Distribution Network Operator
DTS	Desk Top Survey
EJP	Engineering Justification Paper
EoL	End of Life
EPCI	Engineering, Procurement, Construction, and Installation contract
EV	Earned Value
FES	Future Energy Scenarios
GB	Great Britain
GSP	Grid Supply Point
HI	Health Index
HND	Holistic Network Design
HOWSUM	Hebrides and Orkney Whole System Uncertainty Mechanism
HVDC	High Voltage Direct Current
IIS	Interruptions Incentive Scheme
LA	Local Authority
LW	Leading the Way
MVA	Mega Volt Ampere
MW	Megawatt

Acronym	Definition
NPV	Net Present Value
OHL	Overhead Line
PO	Purchase Order
PFE	Pentland Firth East
RFI	Request for Information
RIIO-ED1/2	RIIO Electricity Distribution Price Control periods 1 and 2
ROV	Remotely Operated Vehicle
SBT	Science Based Target
SHEPD	Scottish Hydro Electric Power Distribution
SEPD	Southern Energy Power Distribution
SPI	Schedule Performance Index
SSEN	Scottish and Southern Electricity Network
SW/STN	Switching Station
TO	Transmission Operator
UM	Uncertainty Mechanism
VfM	Value for Money

Appendix B Procurement Activities

Procurement activities completed to date for the Skye – Uist project:

Package	Package Description	Procurement Strategy	Comments	Required Completion / Delivery Date
1	Skye to Uist Route Desktop Study (DTS)	[redacted]	[redacted]	[redacted]
2	Fisheries Liaison and Scouting Surveys	[redacted]	[redacted]	
3	Offshore Route Surveys	[redacted]	[redacted]	[redacted]

Currently identified procurement activities remaining for the Skye – Uist project:

Package	Package Description	Procurement Strategy	Comments	Required Completion / Delivery Date
1	EPCI Contract for Skye to Uist 2 Cable Submarine Cable, Design, Manufacture, Survey & Installation.	[redacted]	[redacted]	[redacted]
2	Shunt Reactor – Plant	[redacted]	[redacted]	[redacted]

Package	Package Description	Procurement Strategy	Comments	Required Completion / Delivery Date
3	Shunt Reactor – Civils, M&E and Commissioning	[redacted]	[redacted]	[redacted]
4	Surplus cable load into storage	[redacted]	[redacted]	[redacted]
5	Professional Services – Cable design Assurance	[redacted]	[redacted]	[redacted]
6	Marine Warranty Surveyor	[redacted]	[redacted]	[redacted]
7	Goods and Equipment Importation	[redacted]	[redacted]	[redacted]
8	Onshore OHL Works/ Underground Cable Works	[redacted]	[redacted]	[redacted]
9	Onshore Environmental Surveys	[redacted]	[redacted]	[redacted]
10	Ground Condition Surveys/Trial Pits	[redacted]	[redacted]	[redacted]

Package	Package Description	Procurement Strategy	Comments	Required Completion / Delivery Date
11	Commissioning	[redacted]	[redacted]	[redacted]
12	Substation Upgrades (Supply and installation)	[redacted]	[redacted]	[redacted]