SSEN DISTRIBUTION RIIO-ED2

COST BENEFIT ANALYSIS PROCESS

RIIO-ED2 Business Plan Annex 25

Scottish & Southern Electricity Networks

Contents

FINAL BUSINESS PLAN SUMMARY

RIIO-ED2 has many substantial challenges which has required increased use of Cost Benefit Analysis (CBA) to help support our business plan.

The RIIO-ED2 costs that have been modelled within our CBAs account for over £956m of our Business Plan, which is c.23% of the total baseline plan.

Below is a summary of expenditure in the main CBA areas that is modelled within our plan against our Business Plan:

Table 1 – CBA ED2 expenditure vs BPDT expenditure

£m	Load	Non Load - CAPEX	Environmental	IT/OT	Total
ED2 CBA Expenditure	226	412	87	231	**956**
ED2 BPDT Costs *before OE*	510	1,050	158	492	**4,135**
% of BPDTs	**44%**	**39%**	**55%**	**47%**	**23%**
Net positive NPV over 45yrs	**60**	**668**	**78**	**140**	**946**

The CBA is used to justify specific and bespoke areas of our projected spend that has materially changed compared to historic performance. As such, spend in areas such as CV7a - Asset Replacement do not need justification through a CBA for their primary driver, because there is already justification of volume through the NARMs methodology.

The CBAs demonstrate an **overall NPV positive figure compared to alternative options of £946m**, with a breakdown of this within the results section.

The benefit is through either

- Directly cashable savings, against our current RIIO-ED1 performance that will be recognised in RIIO-ED2;
- Avoided costs, those being costs that would have incurred if the alternative CBA approach was not adopted;
- Societal benefits, those such as reduced losses, improved network reliability or environmental;
- Time value of money – by delaying investment using suitable methods, we can add time for further analysis and engagement to projects to ensure we don't invest over need, generating value for customers.

Below sets out our approach to CBAs in ED2 and our results and outcomes through the process.

INTRODUCTION

Purpose of this Document

This document sets out the methodology we have applied to Cost Benefit Analysis (CBA) to support our RIIO-ED2 Business Plan along with our results.

The purpose of the methodology is to help decision makers within SSE Distribution make informed choices on investment decisions, and provides a framework for regulator and wider stakeholder assessment of the comparative societal, environmental and economic benefits and trade-offs associated with proposed investment options to enable the selection of the best value option for the end consumer. The approach outlined in this methodology can be applied to all investment types.

Our results are presented by Business Plan Data Table groupings to align with where they are reported within our submission.

Cost Benefit Analysis need

As SSEN Distribution is a provider of an essential public service in the North of Scotland and Southern England, standard appraisal methods based on projected profits and investment expenditures are not always readily applicable due to the intangible nature of public benefits associated with our investments.

The application of Cost Benefit Analysis (CBA) helps us identify the most cost-effective allocation of investments that will enable us to continue to provide a reliable, effective distribution network and facilitate the transition towards a clean energy economy.

Before making any decision on expenditure, we always ensure the need for that investment, and the preferred option is the one that realises the most overall benefit for energy consumers and wider local communities.

This appraisal can be further complicated by the long life and high cost of distribution infrastructure and in some cases, it can be of greatest benefit to build once rather than return to make a second upgrade. CBA improves the quality of such investment decisions by making explicit links between the inputs (i.e. the costs) and the outcomes (i.e. the benefits) of the investment. It attempts to express these in monetary terms which then enables the comparison across the alternative investment options.

It is worth noting that CBAs will not provide the definitive solutions in all cases, we use the outputs as a component in our decision making process, so results are typically used in conjunction with other analysis/qualitative considerations.

There is often the need for assumptions or reliance on secondary data, which can limit the ability to draw out conclusive evidence for investment from the CBA alone. Therefore, we acknowledge that the outputs from CBA modelling should be used with care, with a full understanding of the limitations that may exist with the data and the assumptions upon which the analysis is based.

Our CBA strategy

In our RIIO-ED1 investments for IT and Flexibility schemes, we have ensured CBA analysis is carried out to help clarify and understand the financial benefit such investments would bring to consumers.

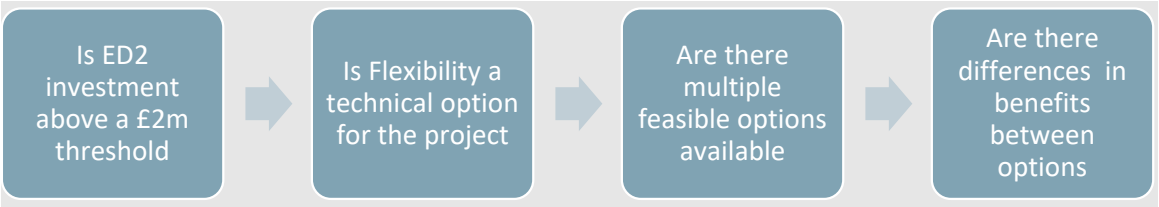
Furthermore, ongoing development of our Large Capital Projects (LCP) policies is embedding a culture of ensuring a CBA is considered in the early stages of LCP planning, again to ensure benefit is demonstrated.

The ongoing development of this has enabled us to utilise CBAs in the planning of our RIIO-ED2 expenditure, helping us to explain and justify these expenditure levels as part of our overall investment decisions.

CBA MODELLING

When we use CBA modelling

We have a developed a general approach with different criteria to determine when we will use CBA modelling:



These criteria have been determined utilising the Ofgem CBA guidance documents and from communication during CBA Working Group meetings with Ofgem and other DNOs.

Aligned with Ofgem's views, we believe that a CBA model is best utilised when a project contains optionality. Analysis carried out at the inception of a project should determine what optionality is available, and therefore whether a CBA is required.

Optioneering is developed by the project owners / engineers and has been explained within the corresponding Engineering Justification Papers (EJP) for the relevant project. Good quality optioneering ensures the primary investment driver is dealt with, to enable a positive outcome for consumers. We explain in detail the reasoning behind which options we deem to be feasible and non-feasible to ensure transparency in our approach.

Our CBA approach is also a useful tool to help model our approach to uncertainty. We can use the CBA to model different scenarios, then test the sensitivity of key parameters to ensure we mitigate risk to customers. For example, for LCT update we look at different outlook scenarios so we can ensure a least regret analysis is carried out, again to mitigate risk to customers.

Despite this, there will be instances where a CBA is not required as part of the decision-making process. This could be where there are no credible alternative options, i.e. a like-for-like asset replacement, or where there are technically no feasible alternatives.

A CBA approach is undertaken when a quantitative calculation can be carried out to determine different courses of action. When a quantitative assessment cannot be undertaken, the EJP will carry out an appropriate qualitative assessment through need and engineering justification.

Use of CBA alongside other tools

As well as EJPs to help explain the narrative of projects, we have also utilised a model developed via the ENA, by external consultants Baringa, to help determine the benefits of utilising flexibility to defer investment (Common Evaluation Methodology).

This model has been developed to better understand if deferring investment, even for a year or more, can engender savings due to the cost value of money of this deferment.

The use of this external model is carried out primarily within our Load CBAs, with further explanation in the results section.

Our CBA approach and Ofgem Guidance

Ofgem, with engagement from Distribution Network Operators (DNOs), have developed the RIIO-ED1 CBA model further, to include learnings during the RIIO-2 process from Electricity Transmission and Gas Distribution.

As in previous price controls, the model utilises a "Spackman" approach. This aims to closely follow the Regulatory model in which DNOs are paid for their services. This is to best ensure the costs of projects are aligned to when consumers are expected to pay for them.

The "Spackman" approach includes annualising capital costs using the weighted average cost of capital (WACC). This is then discounted utilising rates provided within the HM Treasury Green Book[1].

The model includes separate areas for DNO related costs, which have the "Spackman" approach applied and the inclusion of wider societal benefits (and costs) which do not have this approach applied.

Ofgem provided their original CBA guidance at 31st March 2021, with updates for final Business Plan submission provided on the 8th October 2021. Below are the main guidance points and how SSEN have applied them to our approach.

[1] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent/the-green-book-2020

Table 2 – Ofgem Guidance and SSE Approach

Ofgem Guidance	SSE Approach
2.3. We have included a section in the CBA spreadsheet model for DNOs to clearly identify the list of options they have considered for each investment decision. It should include those that have been considered and rejected before full costing, and the short list of those options that have been considered and costed, with a clear rationale for including/excluding them.	We have demonstrated our optioneering analysis within the corresponding EJP, to determine which options should be carried forward to a CBA.
2.4. The DNO should describe the status quo: that is the cost of business as usual in the absence of any investment intervention.	CBAs completed for RIIO-2 are based on an opportunity type cost / benefit approach. This being, we determine our expected start point for the beginning of RIIO-2 and this becomes our baseline. All costs and benefits are against this baseline, showing the positive/negative opportunity to be incurred by carrying out the option. We believe this approach ensures simple understanding of overall societal benefit delivered by a particular option.
3.4. In both cases described above, it is important that the baseline provides a scenario that is technically feasible and consistent with the DNO's regulatory requirements. It should represent a scenario that is a realistic option for the DNO; i.e. it should not reflect for instance a 'do nothing' or 'run to failure' approach if this is not a practical option for the DNO to employ as a business strategy.	Details on optioneering is explained within the corresponding EJP, but in all cases a 'Do-Nothing' approach is only considered when it is a practical and feasible solution.
3.10. DNOs should also include replacement costs for the particular assets specified which may need to be replaced during the 45-year horizon. DNOs should include assumed failure rates of assets and must set out their view and explain their assumptions.	Replacement costs have been included during the 45-year horizon if options compare different types of asset interaction, i.e. refurb then replace. This is to ensure that options are comparable for deliverability of outputs.

Due to the number of CBAs completed, we have developed an internal database in order to collate the CBA information and cross check to other documents within our Business Plan.

We can summarise all CBA costs in order to reconcile to Business Plan Data Tables (BPDT) and ensure that there is alignment between what we have submitted in the individual CBA files and the final BPDT.

INPUT METHODOLOGIES

CBA requires the input of both project costs and benefits in order to determine a Net Present Value (NPV) figure. This is the value that the project is worth to society based on today's monetary value.

As within the CBA guidance[2], where applicable we have utilised the NARMs methodologies in order to calculate benefits. This is to best align our CBA to any Monetised Risk calculated figures.

Costs

Costs for projects are well defined across all areas, based on our delivered rates for RIIO-ED1, less an efficiency challenge where applicable. These input costs have been further explained our in our ***Cost Confidence Assessment, (Annex 15.3)***.

With construction type CBAs covering specific asset types, SSEN have utilised these historic unit rates with efficiency to ensure our cost base is efficient.

CBAs that include more bespoke types of expenditure, such as IT or Environmental projects have costs based on a mix of externally benchmarked rates and RIIO-ED1 delivered unit rates.

DNO Benefits

DNO specific benefits are those that the DNO will incur directly, and as such are part of our efficiency story (see our ***Cost Efficiency (Annex, 15.1)*** for further details). These benefits can be classified in two ways, and are treated differently accordingly.

Cashable DNO benefits are those that will directly reduce our current cost base. These are sometimes referred to as cashable savings in narrative due to the direct reduction in our existing cost base.

Such examples include a reduction in committed Inspection and Maintenance costs due to the installation of a new, more efficient type of asset. It could also be due to a reduction in headcount caused by the option chosen. These benefits are captured within our reduced unit rates in the BPDTs.

We have also captured **Avoided DNO costs** within certain CBAs. These area costs that would have been incurred in a counterfactual situation, but the delivery of the specific project means these costs are avoided, causing a benefit when compared to the adopted option.

Avoided DNO costs are a change in cost related to the baseline scenario. If the cost is not one that would be incurred without the specific project, then it is not included as an avoided DNO cost.

The distinction between the two benefits type is important, as cashable benefits will be visible directly in efficiency between our RIIO-ED1 performance and RIIO-ED2 performance, while avoided DNO costs need to be specifically called out in optionality comparisons. For each investment category and where applicable, we have called out both types of benefits across our Business Plan chapters and annexes.

[2] https://www.ofgem.gov.uk/system/files/docs/2021/04/riio-ed2_cba_guidance.pdf

Losses (*and subsequent CO_2 impact*)

Losses within distribution networks are related to the energy that is lost while it passes through our assets. In many cases we can propose to replace our assets with a lower loss type intervention, in order to generate environmental benefits.

This could be through increasing cable sizing, using different conductor types or focussing on replacement of assets with "low loss" types, as further detailed in our ***Losses Strategy (Annex 13.1.1.)***

Reduced losses are calculated based on the manufacturer verified improvement in asset efficiency, which is used to determine the MWh improvement annually.

We have developed an internal calculator that is used to determine the loss reduction benefit through different intervention types to ensure a common approach through all CBAs.

This figure within the CBA includes a standard calculation to monetise these reduced losses, along with the subsequent CO_2 impact.

Within the results area, we have listed out our total Losses benefit along with the CBAs that contribute to this improvement. For further information please refer to our ***Environmental Action Plan, (Annex 13.1).***

Customer Interruption & Customer Minutes Lost Benefit

SSEN have utilised two separate approaches to determine, key network benefits, Customer Interruption (CI) and Customer Minutes Lost (CML), depending upon the data available.

CNAIM – Probability of Failure approach

We utilise the Ofgem agreed Common Network Asset Indices Methodology (CNAIM) approach to best align the calculation of societal benefits to a wider alignment in outcomes (*i.e. with Monetised Risk calculation*).

For these and Network Asset Risk Methodology Assets (NARM) assets, we can identify the Probability of Failure (PoF) of the asset population, and use the movement of Health Index due to intervention to calculate the change in CI and CML.

To do this, our Condition Based Risk Management (CBRM) system provides the Consequence of Failure (CoF), which includes the impact on CI and CML. Once the movement in PoF is identified, this is then multiplied by the CoF to determine the CI and CML opportunity benefit due to intervention.

Historic data approach

For non-NARM type assets (Overhead Lines, Underground Cables) the industry does not have the same level of Asset information in order to determine a PoF, i.e. underground cables, etc.

Instead, actual fault data is utilised as reported and verified by Ofgem via Regulatory Reporting submissions systems in order to determine existing performance.

We then determine what movement would be caused in CI and CML based on the intervention utilising expert judgement.

When historic data approaches are utilised, full explanation of the rational is included within the corresponding EJP.

Environmental and Safety

Similar to CI and CML benefits, utilising assumptions within our CBRM system and CNAIM we can determine the benefits identified for Environmental (*Oil leakage and CO^2 emissions*) and Safety areas.

The increased/decreased PoF is used to determine the number of times an environmental or safety event occurs. The consequence of this failure as determined per CNAIM is then utilised to determine the relative metric.

Monetised Risk - memo

The input of monetised risk is used to help reconcile between the CBA and NARM BPDTs, as per Ofgem CBA guidance[3] paragraph 4.4.

The CBA calculates the Monetised Risk by multiplying the number of assets interventions multiplied by the expected Monetised Risk for the particular asset, as calculated within the CNAIM.

As mentioned within the Ofgem guidance, the Monetised Risk figure is a memo item and does not impact on the NPV calculations.

Discounting Benefits - Flexibility

A key focus in RIIO-ED2 is investment to support net zero, though due to forecast uncertainties there is a risk that investment in our networks could exceed need.

One way to counter this is to utilise flexibility in order to delay investment to ensure it is required. Whilst procuring this flexibility can incur a cost, there is a benefit within the CBA due to delay of the initial investment to future years. The logic being that money not being spent through cashflow on investment, is instead earning "interest", and therefore generating different value.

The time period to when we delay investment results in a different type of benefit to capture within our Business Plan:

> *Within Price Control* deferment will cause a financial benefit that will be displayed within the NPV calculation of the CBA. The benefit is not directly cashable, but is still key as it helps with our delivery expectation
>
> *Outside Price Control* deferment will cause a benefit that can be clearly displayed within our BPDT as a counterfactual type benefit – we would have invested in an activity if it wasn't for a certain intervention. This type of flexibility helps to reduce our Totex ask within the ED2 price control period.

Utilising flexibility requires the setting of assumptions regarding the cost of flexibility. Our assumption is shown within the Table 12 in the appendix of this annex and further details can be found in our ***(DSO Strategy Annex, 11.1)***.

[3] https://www.ofgem.gov.uk/system/files/docs/2021/04/riio-ed2_cba_guidance.pdf

CBA APPRAISAL

Once CBAs are completed they need to be interpreted in a common way in order to determine the preferred option to take forward.

Net Present Value

The CBA calculates a Net Present Value (NPV) in order to represent the value of the options to society as a whole.

Net Present Value takes into account the cash flow expected of the project options, and discounts the outcomes to be reflective of a consistent time value of money, in the case of the RIIO-2 CBA the time value of money at the start of the ED2 period.

So, to determine the financially preferred option, the most positive, or least negative, NPV is the best choice to make.

It should be noted that due to the nature of investment in electricity networks, the NPVs calculated may be negative. This is expected and as explained below analysis should be carried out to look at the delta between options to best demonstrate value for customers. As in all cases of modelling, the benefit of keeping the electricity network running is not specifically costed, as we only assess viable options which meet our licence obligations within our CBA approach.

Option Comparisons

Within the Ofgem CBA template on the Option Comparisons tab, SSEN have added some visuals to help portray the flow of NPV across the standard 45 year horizon that is assumed within the "Spackman" modelling.

The trend charts show both the trend of NPVs for all options, as well as a view against the option deemed "Do Minimum", which is that of the lowest spend within ED2.

The views help to present to the audience which option generates the best outcome for society as a whole.

Choosing the "Adopted" Option

Ofgem have highlighted within the CBA guidance[4] that CBAs should not be used mechanistically, and therefore may include an element of judgement as part of the submission.

As such, an explanation of CBA options and reasoning behind the "Adopted" option is provided within the corresponding EJPs.

[4] https://www.ofgem.gov.uk/system/files/docs/2021/04/riio-ed2_cba_guidance.pdf - paragraph 5.2

RESULTS

For our final Business Plan submission, we are presenting the results of our CBAs as well as the approach we have taken in related subject areas.

Our CBAs are listed in 6 separate areas:

Load (*incl 1 HVP CBA*)

Non Load

North of Scotland Resilience

Subsea Replacement (*incl 1 HVP CBA*)

IT/OT

Environmental

Below we list out the specific CBA approach and results used with each of our CBA areas.

Load

OUR LOAD EXPENDITURE WITHIN ED2 ACCOUNTS FOR £510M OF OUR BUSINESS PLAN, WHICH IS 13% OF OUR TOTAL BASELINE ASK.

WE HAVE CARRIED OUT 29 CBAS TO HELP IMPROVE THE JUSTIFICATION OF OUR BUSINESS PLAN, WITH A TOTAL ED2 EXPENDITURE OF £226M, MEANING 44% OF OUR LOAD SPEND IS COVERED THROUGH CBA JUSTIFICATIONS.

Our Load CBAs are particularly important as they help to demonstrate the benefits of flexibility, which is postponing investment beyond when reinforcement is triggered in the demand scenario, and utilising flexibility contracts to ensure assets remain within their utilisation thresholds.

Methodology – Optioneering

Our Load CBAs were carried out using a common approach as described earlier in the CBA. The specific project EJP determined the appropriate optioneering, taking into consideration engineering judgement, to come to feasible options that could then be modelled in a CBA.

One of the considerations in this optioneering was deliverability. We have significant volumes of work to deliver within RIIO-ED2 as part of our transition to net zero, and as such we need to ensure our workforce capacity is aligned to our investment requirements. This is further detailed in our ***Deliverability Strategy (Annex 16.1)*** and our ***Workforce Resilience Strategy (Annex 16.3).***

14 Load projects were considered for testing of deliverability in the EJP, and we have took 4 projects in SEPD and 5 projects in SHEPD forward to further CBA analysis. To do this we have considered the use of premium pricing to ensure we are able to deliver the projects when demand scenarios require.

This involves comparing an option of

1) Normal delivery timetable, but at a premium price to ensure it can be delivered; against
2) A delayed investment, utilising flexibility contracts (with a higher threshold price) but due to the extra time afforded to us, the asset unit rates being as standard.

A detailed example of this is covered within our ***Cost Confidence Assessment (Annex 15.3).***

Methodology – Costs & Benefits

Within the Load CBAs we have followed the standard approach as detailed earlier within the annex for calculation of costs and benefits.

In particular, within the Load CBAs we use the Baringa Common Evaluation Model (CEM) to help calculate the benefit of utilising flexibility to defer investment, where applicable. We have also carried out further sensitivity analysis on our flexibility cost assumptions to test the potential impact of market liquidity. Further details on the methodology behind our load investment plan and flexibility procurement approaches can be found in **Annexes 10.1 and 11.1** respectively.

One societal benefit that can occur within Load investment is reduced Customer Interruptions (CI) and Customer Minutes Lost (CML). For our CBAs we have we have considered the impact of CI/CML in two ways.

> *Overload with Do Nothing* when the network demand exceeds capacity there is potential for CI/CMLs to occur. We discuss this within the EJP as a potential option but in most cases a Do Nothing scenario is discounted as it does not comply with our licence conditions, so there is no CI/CML benefit modelled within CBAs due to exceeding capacity
>
> *Health Based Improvement* occurs as a secondary driver when we uprate our network for a primary load related driver. As this benefit is caused through a secondary driver the CI/CML improvement is likely to be lower than the benefits called out within any CBAs that have health based improvement as the primary driver.

As such, while there is a strong CI/CML benefit through load reinforcement activities, due to a Do Nothing scenario being un-feasible, the benefit of this is not displayed within the CBA directly, and called out instead with narrative in the EJP.

This approach aligns with guidance from Ofgem in the CBA Guidance documentation[5].

There are also broader benefits not quantified in our load CBAs, such as "option value" through our application of flexibility. However, we detail a qualitative assessment of these benefits in our ***DSO Strategy (Annex 11.1).***

[5] https://www.ofgem.gov.uk/system/files/docs/2021/04/riio-ed2_cba_guidance.pdf - paragraph 3.4

Results

Tables 4 and 5 show a summary of the ED2 cost and 45yr NPV of our Load CBAs, highlighting the adopted approach:

Table 4 – Load SEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
44_SEPD_LRE_SCO_CBA	Fleet and Bramley Split 1	-45.3	-56.8	Rejected
	Fleet and Bramley Split 2	-42.8	-54.2	Adopted
47_SEPD_LRE_BEAC_CBA	Asset Replacement	-6.5	-8.4	Rejected
	Add in New Asset	-1.0	-5.0	Adopted
48_SEPD_LRE_ASHR_CBA_BAU - V2	Asset Replacement and Add New Assets	-1.6	-5.8	Rejected
	Flexible Solution with Standard Unit Rate	-1.6	-6.0	Adopted
50_SEPD_LRE_HARL_CBA_Final	Replacement	-1.2	-3.7	Rejected
	Flexibility	-1.1	-3.7	Adopted
51-SEPD-LRE-STOK_CBA - V2	Asset Replacement with Premium Cost	-2.6	-4.1	Rejected
	Add New Assets	-4.3	-4.5	Rejected
	Flexble solution Standard Costs	-1.5	-3.1	Adopted
	Flexible solution with premium cost	-2.6	-4.2	Rejected
53_SEPD_LRE_EGHA_CBA	Asset Replacement	-3.3	-4.5	Rejected
	Add New Assets	-2.7	-3.7	Rejected
	Flexible Solution	-2.5	-3.8	Adopted
54_SEPD_LRE_ASHP_CBA_Final - V2	Asset Replacement	-1.8	-2.5	Rejected
	Add New Assets	-2.5	-3.8	Rejected
	Flexible Solution with standard cost	-1.8	-2.6	Adopted
55_SEPD_LRE_MILT_CBA	Asset Replacement	-1.4	-2.7	Rejected
	Add New Assets	-4.9	-4.3	Rejected
	Flexible Solution with Standard Cost	-1.2	-2.6	Adopted
56_SEPD_LRE_NETLEY_CBA	Add in New Asset	-2.2	-2.8	Rejected
	Flexible Solution	-2.1	-2.8	Adopted
57-SEPD-LRE-AMESBURY_CBA - V2	Asset Replacement	-3.7	-9.4	Rejected
	Add New Assets	-1.8	-1.9	Rejected
	Flexibile Solution	-1.7	-1.9	Adopted
58-SEPD-LRE-ALTON_CBA - V2	Add New Asset - Switching Station	-10.2	-13.8	Adopted
	Add New Asset - New 132kV circuit	-11.2	-20.2	Rejected
59-SEPD-LRE-BRAMLEY_THATCHAM_Final - V2	Network Reconfiguration	-3.4	-5.5	Adopted
	New 132 kV Circuit	-10.7	-14.8	Rejected
61-SEPD-LRE-FAWLEY_Final-V2	Network Reconfiguration	-1.1	-1.2	Adopted
	Add New Assets	-3.9	-4.6	Rejected
62-SEPD-LRE-MANNINGTON_BAU	Asset Replacement	-0.2	-0.2	Adopted
	Add New Assets	-1.3	-2.6	Rejected
65_SEPD_LRE_EBED_CBA_R1 - V2	Flexible Solution	-2.4	-4.1	Adopted
	Add New Asset	-3.8	-7.4	Rejected
	Asset Replacement	-2.6	-4.0	Rejected
66_SEPD_LRE_Upton_CBA	New assets - 132 kV switching station & 3rd circuit	-8.6	-10.4	Rejected
	Flexible Solution	-8.3	-10.4	Adopted
127_SEPD_LRE_CHAR-WOOD_CBA_Final	New Assets & Uprating (Premium Unit Rate)	-4.3	-6.1	Rejected
	Demand Transfer & Uprating (Premium Unit Rate)	-2.9	-5.3	Adopted
356-SEPD-LRE-POLE OFGEM CBA	Rutter Pole Lines Reinforcement	-10.3	-10.9	Adopted
	Cable Replacement	-14.0	-15.0	Rejected
SEPD_HV LV Feeders	Reinforcement without flexibility services	-55.6	-62.7	Rejected
	Deploy flexibility services - Central Price	-49.6	-56.2	Adopted
	Deploy flexibility services - Low Price [SENSITIVITY]	-48.5	-54.9	Rejected
	Deploy flexibility services - Lowest Price [SENSITIVITY]	-47.3	-53.5	Rejected

Table 5 – Load SHEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
72-SHEPD-LRE-KEITH-1-303 (CBA)	Smart Solution	-0.4	-3.2	Adopted
	Reinforcement (Premium Pricing)	-0.5	-3.4	Rejected
	Reinforcement (Deferred)	-4.0	-7.2	Rejected
72-SHEPD-LRE-KEITH-2-304 (CBA)	Smart Solution	0.4	-2.1	Adopted
	Reinforcement (Premium Pricing)	-0.2	-2.9	Rejected
	Reinforcement (Deferred)	-0.6	-3.2	Rejected
72-SHEPD-LRE-KEITH-3-307 (CBA)	Smart Solution	-0.2	-0.2	Adopted
	Reinforcement (Premium Pricing)	-3.9	-7.9	Rejected
	Reinforcement (Deferred)	-3.2	-7.5	Rejected
77-SHEPD-LRE-STMARYS (CBA) - V4	Additional Transformer & 33kV OHL line	-2.6	-3.0	Adopted
	Establish new South Ronaldsay substation & Subsea Cable	-4.5	-5.2	Rejected
78-SHEPD-LRE-KILNIVER (CBA) - V4	Additional Transformer & 33kV OHL line & 11kV Cable	-2.0	-3.4	Adopted
	Additional Transformer & 33kV OHL line & 11kV Subsea	-3.6	-5.3	Rejected
79-SHEPD-LRE-SKULAMUS (CBA) - V4	Establish New Lussa Primary Substation & 11kV OHL	-1.9	-2.2	Adopted
	Additional Transformer & New 11kV OHL	-2.1	-2.4	Rejected
82-SHEPD-LRE-PORTANN-1-306 (CBA) -V4	Reinforcement	-1.5	-2.7	Rejected
	Flexible Solution	-0.9	-2.0	Adopted
82-SHEPD-LRE-Portann-2-307 (CBA) -V4	SMART Solution	-0.9	-1.0	Rejected
	Reinforcement (Premium Pricing)	-0.8	-2.6	Adopted
	Reinforcement (BAU Timescale)	-1.1	-3.0	Rejected
82-SHEPD-LRE-Portann-3-302 (CBA) - V4	SMART Solution	0.0	-0.3	Adopted
	Reinforcement (Premium Pricing)	-0.2	-1.2	Rejected
	Reinforcement (BAU Timescale)	-0.6	-0.9	Rejected
SHEPD_HV LV Feeders	Reinforcement without flexibility services	-15.4	-17.1	Rejected
	Deploy flexibility services - Central Price	-12.2	-13.6	Adopted
	Deploy flexibility services - Low Price [SENSITIVITY]	-12.2	-13.6	Rejected
	Deploy flexibility services - Lowest Price [SENSITIVITY]	-12.1	-13.5	Rejected

In all cases, our chosen option is the most beneficial to consumers, demonstrating value.

As discussed within our CBA Appraisal section, we have carried out our CBA analysis showing incremental costs / benefits to a baseline start point of ED2. As such, and due to the nature of investment in electricity networks the NPVs may be negative, even in the adopted option.

We are demonstrating value calculated from the CBAs by comparing the adopted option against the alternative, rejected option. This allows us to calculate a net benefit for the option chosen.

OUR DEMONSTRATED 45YR NPV BENEFIT AGAINST ALTERNATIVE OPTIONS IS £43M POSITIVE IN SEPD AND £17M POSITIVE IN SHEPD.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference.

Non Load

OUR NON LOAD RELATED EXPENDITURE WITHIN ED2 ACCOUNTS FOR £843M OF OUR BUSINESS PLAN, WHICH IS 20% OF OUR TOTAL BASELINE ASK.

WE HAVE CARRIED OUT 16 CBAS TO HELP IMPROVE THE JUSTIFICATION OF OUR BUSINESS PLAN, WITH A TOTAL ED2 EXPENDITURE OF £254M, MEANING 30% OF OUR NON LOAD SPEND IS COVERED THROUGH CBA JUSTIFICATIONS.

The above covers where specific CBAs have been used to justify sections of our expenditure. Other types of CBA are carried out through different mechanisms to help justify spend, such as in CV7a – Asset Replacement NARMs utilising the NARMs approach, further details can be found in our ***Safety and Resilience (Annex 7.1.)***

Methodology – Optioneering

We have carried out the standard approach to optioneering for the Non Load CBAs as detailed earlier in the annex with some exceptions, to help better demonstrate value.

Automation CBAs – only have one option, in this specific case we chose to deviate from our standard CBA criteria (as this goes against point 3 and 4 of our approach). In this case, we believe it is important to demonstrate the value of our Automation program through a CBA, as it sits within our Quality of Service activity type. Further information can be found in our EJP (*397_SSEPD_NLR_Automation*).

Methodology – Costs & Benefits

Within the Non Load CBAs we have followed the standard approach as detailed earlier within the annex for calculation of costs and benefits.

Bespoke CBA Approach – Underground Cable CBA

Our underground cable network is aging and will require significant investment over the next price controls.

In order to ensure our planned activity for RIIO-ED2 is cost effective to consumers, we carried out the CBA slightly different, using the model as a sensitivity tool to help determine what is the maximum fault rate compared to a standard overlay in yr1 of RIIO-ED2.

Further details of this methodology is explained within the workings tabs in the appropriate CBA.

Results

Tables 6 and 7 show a summary of the ED2 cost and 45yr NPV of our Non Load CBAs, highlighting the adopted approach:

Table 6 – Non Load SEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
308_SEPD_NLR_HV_TRANSF	Tier 2 Compliant Replacement	-4.5	-7.2	Rejected
	LV OLTC Equipped Replacement	153.3	-15.1	Adopted
309_SEPD_NLR_EHV_REFURB	Tier 2 compliant Replacement	-4.1	-5.1	Rejected
	Refurbishment	-2.8	-0.6	Adopted
309_SEPD_NLR_EHV_REPLACE	Tier 2 compliant Replacement	-16.6	-20.8	Adopted
	Refurbishment	-17.0	-10.8	Rejected
310_SEPD_NLR_132kV_TRANSF_REFURB	Tier 2 Complaint Transformer Replacement	-6.7	-8.6	Rejected
	Transformer Refurbishment	-5.4	-1.9	Adopted
310_SEPD_NLR_132kV_TRANSF_REPLACE	Tier 2 Compliant Transformer Replacement	-17.5	-22.5	Adopted
	Transformer Replacement	-18.8	-4.9	Rejected
324_SSEPD_NLR_TREES	Do Nothing	-44.1	-10.3	Rejected
	ABC Replacement	-42.2	-35.1	Rejected
	Insuline and ABC 5/5 split	-32.6	-23.7	Adopted
397_SEPD_NPR_Automation	Install Automation	89.7	-17.3	Adopted
305_SSEPD_NLR_11kV_SWGR	Switchboard Replacement	-4.0	-4.6	Rejected
	CB Retrofit	-2.3	-0.1	Adopted
311_SEPD_NLR_LV_UG_CBA	*Sensitivity* - Investment in yr1	*-36.4*	*-37.4*	Adopted
	Sensitivity - Delay investment for 1 price control	*-36.4*	*-3.4*	Rejected
	Sensitivity - Delay investment for 2 price control	*-36.4*	*-3.2*	Rejected
	Sensitivity - Delay investment for 3 price control	*-36.4*	*-3.1*	Rejected
	Actual chosen approach	-18.8	-55.6	Adopted
312_SEPD_NLR_HV_UG_CBA	*Sensitivity* - Investment in yr1	*-891.7*	*-917.0*	Adopted
	Sensitivity - Delay investment for 1 price control	*-891.7*	*-35.8*	Rejected
	Sensitivity - Delay investment for 2 price control	*-891.7*	*-33.8*	Rejected
	Sensitivity - Delay investment for 3 price control	*-891.7*	*-32.5*	Rejected
	Actual chosen approach	-14.1	-34.7	Adopted

*for 311 LV UG cable and 312 HV UG cable, options 1 – 4 are displayed in £000s due to the small nature of the values.

Table 7 – Non Load SEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
308_SHEPD_NLR_HV_TRANSF	Tier 2 Compliant Replacement	-3.0	-5.0	Rejected
	LV OLTC Equipped Replacement	110.2	-10.8	Adopted
309_SHEPD_NLR_EHV_REFURB	Tier 2 compliant Replacement	-1.7	-2.2	Rejected
	Refurbishment	-1.3	-0.4	Adopted
309_SHEPD_NLR_EHV_REPLACE	Tier 2 Compliant Replacement	-8.4	-11.2	Adopted
	Refurbishment	-8.6	-1.9	Rejected
397_SHEPD_NPR_Automation	Install Automation	16.0	-5.5	Adopted
311_SHEPD_NLR_LV_UG_CBA	*Sensitivity* - Investment in yr1	*-19.7*	*-20.1*	Adopted
	Sensitivity - Delay investment for 1 price control	*-19.7*	*-2.5*	Rejected
	Sensitivity - Delay investment for 2 price control	*-19.7*	*-2.4*	Rejected
	Sensitivity - Delay investment for 3 price control	*-19.7*	*-2.3*	Rejected
	Actual chosen approach	-7.6	-23.3	Adopted
312_SHEPD_NLR_HV_UG_CBA	*Sensitivity* - Investment in yr1	*-335.3*	*-341.1*	Adopted
	Sensitivity - Delay investment for 1 price control	*-335.3*	*-9.8*	Rejected
	Sensitivity - Delay investment for 2 price control	*-335.3*	*-9.2*	Rejected
	Sensitivity - Delay investment for 3 price control	*-335.3*	*-8.9*	Rejected
	Actual chosen approach	-3.9	-10.3	Adopted

*for 311 LV UG cable and 312 HV UG cable, options 1 – 4 are displayed in £000s due to the small nature of the values.

In all cases, our chosen option is the most beneficial to consumers, demonstrating value.

As discussed within our CBA Appraisal section, we have carried out our CBA analysis showing incremental costs / benefits to a baseline start point of ED2. As such, and due to the nature of investment in electricity networks the NPVs may be negative, even in the adopted option.

We are demonstrating value calculated from the CBAs by comparing the adopted option against the alternative, rejected option. This allows us to calculate a net benefit for the option chosen.

OUR DEMONSTRATED 45YR NPV BENEFIT AGAINST ALTERNATIVE OPTIONS IS £265M POSITIVE IN SEPD AND £130M POSITIVE IN SHEPD.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference.

North of Scotland Resilience (NoSR)

OUR NORTH OF SCOTLAND RESILIENCE EXPENDITURE WITHIN ED2 ACCOUNTS FOR £22M OF OUR BUSINESS PLAN, WHICH IS <1% OF OUR TOTAL ASK.

WE HAVE CARRIED OUT 3 CBAS TO HELP IMPROVE THE JUSTIFICATION OF OUR BUSINESS PLAN, WITH A TOTAL ED2 EXPENDITURE OF £13M, 59% OF OUR NOSR SPEND IS COVERED THROUGH CBA JUSTIFICATIONS.

While NoSR related spend may be small, the potential benefit to customers can be relatively large due to the societal benefits that can be delivered through projects.

Methodology – Optioneering

We have carried out the standard approach to optioneering for the NoSR CBAs as detailed earlier in the annex. Details of optioneering can be found in the corresponding EJPs.

Methodology – Costs & Benefits

Within the Non Load CBAs we have followed the standard approach as detailed earlier within the annex for calculation of costs and benefits.

Results

Table 8 shows a summary of the ED2 cost and 45yr NPV of our NoSR CBAs, highlighting the adopted approach:

Table 8 – NoSR SHEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
342_SHEPD_Regional_WSC_Barvas Dec	Refurbishment then Reinforcement in ED3	0.8	-0.2	Rejected
	Replacement	-1.0	-2.3	Rejected
	Reinforcement	1.3	-7.3	Adopted
343_SHEPD_Regional_WSC_Lochinver Dec	Refurbishment	-0.8	-0.1	Rejected
	Reinforcement	-2.3	-2.2	Rejected
	Re-build	-0.6	-3.5	Adopted
344_SHEPD_Regional_WSC_Clachan Dec	Refurbishment	0.3	-0.3	Rejected
	Re-build	-1.9	-2.8	Rejected
	Reinforcement	0.5	-1.9	Adopted

In all cases, our chosen option is the most beneficial to consumers, demonstrating value.

As discussed within our CBA Appraisal section, we have carried out our CBA analysis showing incremental costs / benefits to a baseline start point of ED2. As such, and due to the nature of investment in electricity networks the NPVs may be negative, even in the adopted option.

We are demonstrating value calculated from the CBAs by comparing the adopted option against the alternative, rejected option. This allows us to calculate a net benefit for the option chosen.

OUR DEMONSTRATED 45YR NPV BENEFIT AGAINST ALTERNATIVE OPTIONS IS £7M POSITIVE IN SHEPD.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference.

Subsea Replacement

OUR SUBSEA RELATED EXPENDITURE WITHIN ED2 ACCOUNTS FOR £185M OF OUR BUSINESS PLAN, WHICH IS 5% OF OUR TOTAL ASK.

WE HAVE CARRIED OUT 17 CBAS TO HELP IMPROVE THE JUSTIFICATION OF OUR BUSINESS PLAN, WITH A TOTAL ED2 EXPENDITURE OF £147M, MEANING 78% OF OUR SUBSEA SPEND IS COVERED THROUGH CBA JUSTIFICATIONS.

As Subsea cables are largely unique to SHEPD, it is imperative that we fully justify our investment in this area.

We are confident our robust approach to CBAs within the Subsea asset type justifies our proposed investment.

Methodology – Optioneering

Due to the unique nature of Subsea cables, a four-step funnel approach was developed to analyse all of our Subsea assets to determine which should be proposed for intervention.

More details on this approach can be found in ***Scottish Island Strategy (Annex 8.1).***

Due to this approach, we put forward 6 standard options which were all deemed feasible, with 1 bespoke option dependent upon engineering judgement (where applicable), explained within the corresponding EJP.

The standard approaches were:

Fix on Failure – to be used as part of the four-step funnel approach to determine which Subsea cable assets are not to be intervened upon;

Replace – Similar Sized Cable – the default option for a straight lift and replace of the existing asset

Replace – Larger Cable – an option to help take into account future load growth and potentially reduce losses on the network

Augment – Similar Sized Cable – as per the replace option but to leave the existing cable in situ to help improve network reliability

Augment – Larger Cable – as per the replace option but to leave the existing cable in situ to help improve network reliability

Reinforcement – two new cables – to reinforce with the extra resilience of a supporting cable.

All CBAs followed the same basic assumptions for these 6 options to ensure they were appraised against each other appropriately.

Methodology – Costs & Benefits

Due to the unique nature of Subsea cable assets, the costs and benefits utilised, required further calculation to ensure a suitable cost was used for the CBAs. Further information on this calculation can be found in our ***Cost Confidence Assessment (Annex 15.3).***and ***Scottish Island Strategy (Annex 8.1).***

As Subsea Cables are regularly inspected, benefits were calculated primarily using the NARM approach of Probability of Failure and Consequence of Failure, utilising our own internal data. Further information on this can also be found in the ***Scottish Island Strategy (Annex 8.1).***

Some options include an increase in cable size to support future load growth, with the secondary benefit that it can have a positive impact on cable losses. For our final business plan, we have not included these specific losses benefit calculation due to a lack of suitable information to be able to confidently value benefit of this impact. However, it should be noted that for projects where we deem a larger cable to be suitable, there would be additional benefit as a result of reduced losses. Further information on our overarching Losses Strategy can be found in our ***Environmental Action Plan (Annex 13.1).***

Results

Table 9 shows a summary of the ED2 cost and 45yr NPV of our Subsea – Asset Replacement CBAs, highlighting the adopted approach:

Table 9 – Subsea SHEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
328_SHEPD_Subsea_Sky_S_UIST	Fix on Failure	1,144.6	-41.8	Rejected
	Replace - Similar Sized Cable	1,282.8	-33.1	Rejected
	Replace - Larger Cable	1,279.7	-36.3	Rejected
	Augment - Similar Sized Cable	1,229.9	-33.3	Rejected
	Augment - Larger Cable	1,226.8	-36.6	Rejected
	Reinforcement - two new cables	1,301.5	-67.1	Rejected
	Two New Cables Shorter Subsea Route	1,310.5	-57.7	Adopted
329_SHEPD_Subsea_PFW	Fix on Failure	56.6	-29.6	Rejected
	Replace - Similar Sized Cable	75.6	-25.8	Rejected
	Replace - Larger Cable	74.4	-27.0	Rejected
	Augment - Similar Sized Cable	77.3	-26.2	Adopted
	Augment - Larger Cable	76.1	-27.4	Rejected
	Reinforcement - two new cables	82.6	-48.9	Rejected
331_SHEPD_Subsea_Hoy_Flotta	Fix on Failure	-4.9	-4.4	Rejected
	Replace - Similar Sized Cable	-1.2	-3.9	Rejected
	Replace - Larger Cable	-1.4	-4.1	Rejected
	Augment - Similar Sized Cable	-1.1	-4.0	Adopted
	Augment - Larger Cable	-1.2	-4.1	Rejected
	Reinforcement - two new cables	-2.4	-7.1	Rejected
333_SHEPD_Subsea_Loch_Achoire_South	Fix on Failure	-1.8	-4.5	Rejected
	Replace - Similar Sized Cable	-1.3	-4.0	Adopted
	Replace - Larger Cable	-1.4	-4.1	Rejected
	Augment - Similar Sized Cable	-1.3	-4.0	Rejected
	Augment - Larger Cable	-1.5	-4.2	Rejected
	Reinforcement - two new cables	-4.2	-7.1	Rejected
335_SHEPD_Subsea_Loch_Long	Fix on Failure	-3.4	-2.3	Rejected
	Replace with higher rated cable	-0.1	-2.0	Adopted
	Augment with higher rated cable	-0.3	-2.3	Rejected
	Replace with HDD higher rated cable	-0.8	-2.9	Rejected
	Replace with HDD 2 x higher rated cables	-2.4	-4.5	Rejected
	Replace with higher rated cable using alternative land route	2.1	-0.1	Rejected
338_SHEPD_Subsea_Mull_Iona	Fix on Failure	-1.6	-3.9	Rejected
	Replace - Similar Sized Cable	-0.1	-3.4	Rejected
	Replace - Larger Cable	-0.2	-3.6	Rejected
	Augment - Similar Sized Cable	-0.1	-3.5	Adopted
	Augment - Larger Cable	-0.2	-3.7	Rejected
	Reinforcement - two new cables	-2.1	-6.2	Rejected
	Replace - similar sized cable using HDD	-0.5	-4.5	Rejected
388_SHEPD_Subsea_Orkney_Hoy South	Fix on Failure	137.4	-5.4	Rejected
	Replace - Similar Sized Cable	166.8	-4.7	Rejected
	Replace - Larger Cable	166.6	-4.9	Rejected
	Augment - Similar Sized Cable	166.7	-4.9	Adopted
	Augment - Larger Cable	166.5	-5.2	Rejected
	Reinforcement - two new cables	167.2	-8.9	Rejected
390_SHEPD_Subsea_Eriskay_Barra_2	Do Minimum - Fix on Failure	12.8	-10.2	Rejected
	Replace - Similar Sized Cable	16.4	-8.8	Rejected
	Replace - Larger Cable	16.0	-9.2	Rejected
	Augment - Similar Sized Cable	16.4	-8.9	Adopted
	Augment - Larger Cable	16.0	-9.3	Rejected
	Reinforcement - two new cables	10.9	-16.0	Rejected

CBA	Option	45yr NPV	ED2 Cost	Adopted
394_SHEPD_Subsea_Orkney_Shapinsay	Fix on Failure	1.4	-5.6	Rejected
	Replace - Similar Sized Cable	3.4	-4.9	Rejected
	Replace - Larger Cable	3.2	-5.1	Adopted
	Augment - Similar Sized Cable	3.2	-5.1	Rejected
	Augment - Larger Cable	3.0	-5.3	Rejected
	Reinforcement - two new cables	0.3	-8.9	Rejected
395_SHEPD_Subsea_Coll_Tiree	Fix on Failure	16.0	-4.8	Rejected
	Replace - Similar Sized Cable	16.8	-7.6	Rejected
	Replace - Larger Cable	16.5	-8.0	Rejected
	Augment - Similar Sized Cable	16.9	-7.6	Adopted
	Augment - Larger Cable	16.6	-8.0	Rejected
	Reinforcement - two new cables	12.0	-14.1	Rejected
401_SHEPD_Subsea_South Uist_Eriskay	Fix on Failure	-4.3	-5.3	Rejected
	Replace - Similar Sized Cable	-4.2	-4.6	Adopted
	Replace - Larger Cable	-4.4	-4.8	Rejected
	Augment - Similar Sized Cable	-4.2	-4.7	Rejected
	Augment - Larger Cable	-4.4	-4.9	Rejected
	Reinforcement - two new cables	-7.8	-8.4	Rejected
403_SHEPD_Subsea_Mainland_Kerrera 2	Fix on Failure	-2.6	-3.1	Rejected
	Replace - Similar Sized Cable	-2.6	-2.7	Adopted
	Replace - Larger Cable	-2.7	-2.8	Rejected
	Augment - Similar Sized Cable	-2.7	-2.8	Rejected
	Augment - Larger Cable	-2.8	-2.9	Rejected
	Reinforcement - two new cables	-5.1	-5.2	Rejected
404_SHEPD_Subsea_Mainland_Kerrera	Fix on Failure	-2.1	-2.3	Rejected
	Replace - Similar Sized Cable	-1.9	-2.0	Adopted
	Replace - Larger Cable	-1.9	-2.1	Rejected
	Augment - Similar Sized Cable	-1.9	-2.1	Rejected
	Augment - Larger Cable	-2.0	-2.1	Rejected
	Reinforcement - two new cables	-3.2	-3.4	Rejected
405_SHEPD_Subsea_Laxay_Kershader 2	Fix on Failure	-1.3	-2.3	Rejected
	Replace - Similar Sized Cable	1.0	-2.0	Rejected
	Replace - Larger Cable	0.9	-2.1	Rejected
	Augment - Similar Sized Cable	1.0	-2.0	Adopted
	Augment - Larger Cable	1.0	-2.1	Rejected
	Replace HDD - similar sized cable	0.2	-2.9	Rejected
414_SHEPD_Subsea_Kintyre_Gigha	Fix on Failure	-3.0	-4.2	Rejected
	Replace - Similar Sized Cable	-2.4	-3.6	Adopted
	Replace - Larger Cable	-2.6	-3.8	Rejected
	Augment - Similar Sized Cable	-2.4	-3.7	Rejected
	Augment - Larger Cable	-2.6	-3.9	Rejected
	Reinforcement - two new cables	-4.9	-6.6	Rejected
441_SHEPD_SUBSEA_JURA_ISLAY	Fix on Failure	43.9	-4.0	Rejected
	Replace - Similar Sized Cable	54.7	-3.5	Rejected
	Replace - Larger Cable	54.6	-3.6	Rejected
	Augment - Similar Sized Cable	54.6	-3.8	Rejected
	Augment - Larger Cable	54.4	-3.9	Rejected
	Reinforcement - two new cables	53.6	-6.7	Rejected
	Replace Cable with Horizontal Directional Drill (HDD)	53.7	-4.5	Adopted
457_SHEPD_Subsea_Loch A''Choire North	Fix on Failure	-3.4	-4.5	Rejected
	Replace - Similar Sized Cable	-3.3	-4.0	Adopted
	Replace - Larger Cable	-3.5	-4.1	Rejected
	Augment - Similar Sized Cable	-3.4	-4.0	Rejected
	Augment - Larger Cable	-3.5	-4.2	Rejected
	Reinforcement - two new cables	-6.4	-7.1	Rejected

While in some projects, the adopted option may not be the most NPV positive, the chosen option represents the most realistic approach as determined by our engineering justifications. Further information can be found in the corresponding EJP.

As discussed within our CBA Appraisal section, we have carried out our CBA analysis showing incremental costs / benefits to a baseline start point of ED2. As such, and due to the nature of investment in electricity networks the NPVs may be negative, even in the adopted option.

We are demonstrating value calculated from the CBAs by comparing the adopted option against the alternative, rejected option. This allows us to calculate a net benefit for the option chosen.

OUR DEMONSTRATED 45YR NPV BENEFIT AGAINST ALTERNATIVE OPTIONS IS £266M POSITIVE IN SHEPD.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference.

IT/OT

OUR IT/OT EXPENDITURE WITHIN ED2 ACCOUNTS FOR £492M OF OUR BUSINESS PLAN (INCL BUSINESS SUPPORT COSTS), WHICH IS C.12% OF OUR TOTAL ASK.

WE HAVE CARRIED OUT 22 CBAS TO HELP IMPROVE THE JUSTIFICATION OF OUR BUSINESS PLAN, WITH A TOTAL ED2 EXPENDITURE OF £231M, 47% OF OUR IT/OT SPEND IS COVERED THROUGH CBA JUSTIFICATIONS.

Utilising CBAs for our IT and OT investments allows us to compare options and assess the value the most valuable option for our customers.

As we detail above (in terms of our load and non-load investment CBAs), IT/OT CBAs are carried out for individual projects. This means that the inter-dependencies between projects are not clear through a CBA alone, and benefits from the synergies of delivering a "portfolio of IT/OT projects" are not captured through our project specific CBAs. We provide further detail in *our* ***Digitalisation Investment Plan (Annex 5.1)*** on the dependencies between projects, their links back to our strategic outcomes and how they enable us to meet minimum requirements and stakeholder requested outputs. In addition to how our IT/OT investments support our ongoing efficiency ambitions, which also cannot be captured through a specific project CBA.

The societal benefits of individual IT/OT projects are also not captured in the specific CBAs. This is because our IT/OT projects enable the delivery of stakeholder requested outputs and minimum requirements which are captured elsewhere in our Business Plan. For example, at least 7 of our IT/OT investments are enablers for our DSO capabilities. The customer and societal benefits delivered by our package of DSO services and outputs are captured in detail in ***Whole Systems (Annex 12.1)***, rather than in the individual component IT/OT project CBAs.

Methodology – Optioneering

We have carried out a comparison of viable options, including do nothing within our IT/OT CBAs. Details of optioneering can be found in the corresponding EJPs.

Methodology – Costs & Benefits

Within the IT/OT CBAs we have followed the standard approach as detailed earlier within the annex for calculation of costs and benefits.

Due to the bespoke nature of IT related costs, further justification of costs has been sought through a third party expert, Gartner, to ensure our costs have been checked against industry standard.

Further information on our cost confidence can be found in our ***Cost Confidence Assessment (Annex 15.3).*** We capture 3 key categories of benefit to support our investment decision making:

- Cashable benefits, whereby IT/OT investments allow for savings (such as headcount reduction) which are then captured within the BPDTs
- Productivity benefits, whereby IT/OT investments allow us to carry out more work with the same amount of people, the savings of which are then captured within the BPDTs
- Cost avoidance benefits, whereby IT/OT investments allow us to avoid costs that would have occurred in a counterfactual situation (if we carried on delivering in the same way we do today). For example, this allows us to capture avoided increases in headcount that would have been required without a specific IT/OT investment.

In general, the financial benefits from the solution have been calculated from the year of implementation and the following years of the RIIO-ED2 period. However, for the calculation of Net Present Value (NPV) 5 years of both OPEX and Benefits after the implementation of the new technology have been included, although in many cases that OPEX and Benefit will run into the RIIO-ED3 (ED3) period. This method has been used to ensure all projects are assessed on an equal basis with regard to value over time.

Results

Table 10 shows a summary of the ED2 cost and 45yr NPV of our IT/OT CBAs, highlighting the adopted approach:

Table 10 – IT/OT SSEN CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
1_SSEPD_IT-DSO_FLEX_CBA	Do Nothing	-2.4	-1.2	Rejected
	Prime Option	-8.7	-8.8	Adopted
17_SSEPD_IT_OT_ADMS+_CBA	Do Nothing	0.0	0.0	Rejected
	Prime Option	-7.2	-17.3	Adopted
21_SSEPD_IT-ASSET_CONNECTIVITY++_CBA	Do Nothing	-3.5	-2.8	Rejected
	Prime Option	-8.9	-9.9	Adopted
23_SSEPD_OT_DIGITAL_WORKPLACE_CBA	Do Nothing	0.0	0.0	Rejected
	Prime Option	-3.1	-3.5	Adopted
25_SSEPD_IT-ASSET_ENVIROTRACK	Do Nothing	-1.1	-0.3	Rejected
	Prime Option	-1.9	-1.9	Adopted
27_SSEPD_IT_OPTIMISATION_CBA	Do Nothing	-5.5	-4.0	Rejected
	Prime Option	-4.0	-4.5	Adopted
29_SSEPD_IT-DSO_DSO_MANAGEMENT_CBA	Do Nothing	-11.3	-1.4	Rejected
	Prime Option	-11.3	-11.1	Adopted
32_SSEPD_IT_OT_LINEAR_ASSETS	Do Nothing	-0.9	-0.4	Rejected
	Prime Option	-1.0	-5.5	Adopted
33_SSEPD_IT-ASSET_DATALAKE_CBA	Do Nothing	-9.0	-8.4	Rejected
	Prime Option	-13.0	-14.5	Adopted
36_SSEPD_IT-CONNS_CONNECTIONS+_CBA	Do Nothing	-13.2	-8.6	Rejected
	Prime Option	-10.7	-10.8	Adopted
37_SSEPD_IT-CUST_IVR_CBA	Do Nothing	-2.3	-1.3	Rejected
	Prime Option	-10.3	-10.0	Adopted
38_SSEPD_IT-CUST_OUTAGE_CBA	Do Nothing	0.0	0.0	Rejected
	Prime Option	-1.7	-1.7	Adopted
39_SSEPD_IT-DSO_PSA	Do Nothing	-12.9	-3.9	Rejected
	Prime Option	-1.7	-1.6	Adopted
40_SSEPD_IT-DSO_SYS_ECONOMICS_CBA	Do Nothing	-11.1	-1.4	Rejected
	Prime Option	-5.9	-6.5	Adopted
41_SSEPD_IT-DSO_DSO_ENABLEMENT_CBA	Do Nothing	-8.0	-0.8	Rejected
	Prime Option	-7.5	-7.5	Adopted
42_SSEPD_IT-NLR_WAM2_CBA	Do Nothing	0.0	0.0	Rejected
	Prime Option	1.2	-8.2	Adopted
444_SSEPD_IT_CAPITAL_INVESTMENT_CBA	Do Nothing	-7.4	-5.4	Rejected
	Prime Option	-5.6	-5.1	Adopted
35_SSEPD_IT_INSIGHTS_CBA	Do Nothing	-4.9	-1.3	Rejected
	Prime Option	-8.7	-10.0	Adopted
421_SSEPD_OT_LV_MONITORING offgem	Minimum Deployment	-16.0	-16.7	Rejected
	Prioritised Deployment	-25.5	-27.8	Adopted
	Complete Deployment	-126.7	-146.7	Rejected
422_SSEPD_OT_OT2_OTN_ROLLOUT offgem	Do Nothing	-13.2	-5.8	Rejected
	Minimum Deployment	-2.8	-23.2	Rejected
	Responsible Operator	-8.0	-51.9	Adopted
	Prog Network Enabler	-49.5	-116.0	Rejected
420_SSEPD_OT_SCADA_CBA offgem	Do Nothing	-17.6	0.0	Rejected
	Natural	-2.5	-5.9	Rejected
	Targetted	-4.2	-10.8	Adopted
	Widescale	-17.1	-28.7	Rejected

Our demonstrated 45yr NPV benefit against alternative options is £140m positive across SSEN.

In some instances, our adopted option may not be the most positive NPV. While in these cases the CBA may be suggesting our adopted approach is not cash beneficial to consumers, the corresponding EJPs look at the wider situation for adopting a particular option.

As previously mentioned, due to the way our CBAs have been produced for individual projects, in practice, investments would be combined into a "portfolio" which results in an overall positive NPV across the payback lifetime.

Furthermore, due to the difficult nature of quantifying some of the IT/OT benefits, and the fact that they enable our broader strategic outcomes, the investments presented have more intrinsic benefit then is being portrayed within the individual CBAs.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference, as well as in the ***Digitalisation Investment Plan (Annex 5.1)*.**

Environmental

Our Environmental expenditure within ED2 accounts for £158m of our Business Plan, which is 4% of our total ask.

We have carried out 7 CBAs to help improve the justification of our Business Plan, with a total modelled ED2 expenditure of £87m, meaning 55% of our Environmental spend is covered through CBA justifications. However, it should be noted that we have also captured environmental benefits through our CBAs across the plan as a whole.

Environmental projects can be difficult to prove through solely the Ofgem CBA tool, however where possible, we have assessed solutions through optioneering and CBAs.

Through our environmental CBAs we have justified the customer and societal benefit of our investments. For these types of investments the societal elements are particularly important to support our justification, in terms of CO_2 reduction, oil reduction and SF_6 reduction.

Our ***Environmental Action Plan (Annex 13.1)*** also describes how we have assessed the environmental benefits of our broader plan investments, whether through losses reduction technology selection, upsizing of cables to manage losses and connect LCTs. For example, our CBAs have supported our justification to the increase in sizing of certain cables to support capacity increases as well as losses benefits.

We have utilised other methods to assess societal benefits and looked to industry for guidance particularly with our biodiversity and natural capital investment proposals. Latest industry figures for the market value of biodiversity have been used for monetisation in our wider assessment beyond the ED2 CBA template.

In addition, the CBA tool uses 2018 BEIS prices, using more up to date carbon figures actually shows investment proposals more positively, like in the SF_6 case for example. We hope to continue to work with Ofgem to develop credible methods that recognise the wider benefits that these projects can deliver.

Methodology – Optioneering

We have carried out the standard approach to optioneering for the Environmental CBAs as detailed earlier in the annex. Details of optioneering can be found in the corresponding EJPs.

Methodology – Costs & Benefits

Within the Environmental CBAs we have followed the standard approach as detailed earlier within the annex for calculation of costs and benefits. Our environmental costs are also further justified in our ***Cost Confidence Assessment (Annex 15.3).***

We capture the following categories of environmental benefit through our plan:

- Oil leakage
- SF^6 emissions reduction
- CO^2 emissions not associated with losses
- CO^2 associated with losses

The cost related assumptions for these benefit categories are detailed in Table 12 in the Appendix.

Results

Table 11 shows a summary of the ED2 cost and 45yr NPV of our Environmental CBAs, highlighting the adopted approach:

Table 11 – Environmental SHEPD CBA Results and Adopted option

CBA	Option	45yr NPV	ED2 Cost	Adopted
5_SSEPD_ENV_LOSSES	TASS Option 1 over 12 years	0.2	-0.2	Rejected
	TASS Option 1 + 2 over 12 years	0.6	-0.8	Rejected
	TASS Option 1 + 2 + 3 over 12 years	0.3	-1.0	Rejected
	TASS Option 1 + 2 + 3 over 30 years	7.0	-2.3	Adopted
6_SSEPD_ENV_LOSSES	Upgrade substations with key measures	7.3	-3.5	Rejected
	Upgrade substations with key and additional measures	21.2	-3.6	Adopted
8_SSEPD_ENV_Cable_FFC	Risk score 33.3 to 100; include Portsmouth Water; cables section in H15	-30.3	-37.3	Adopted
	Risk score 22.2 to 100; include Portsmouth Water; cables section in H15	-37.6	-46.9	Rejected
	Risk score 27.8 to 100; include Portsmouth Water; cables section in H15	-18.8	-33.4	Rejected
	Risk score 27.8 to 100; include Portsmouth Water; cables section in H15, and FFC with age over 80 (6.5km)	-21.2	-41.0	Rejected
9_SSEPD_ENV_SF6	Do Nothing	0.0	0.0	Rejected
	Severe Leaker Replacement	0.2	-3.1	Rejected
	Poor and Severe Leaker Replacement	0.3	-5.6	Adopted
10_SSEPD_ENV_GENERATION	End of life replacement - like for like	-3.6	-2.0	Rejected
	Replace Diesel with Hybrid at end of life	-2.5	-2.9	Adopted
	Replace Diesel with Hybrid all at once	-2.1	-2.4	Rejected
	Replace Diesel with Hybrid evenly over years	-2.6	-3.0	Rejected
348_SHEPD_ENV_BATTERY	Do Minimum (Replace 2 oldest generators for 1 new)	-7.2	-4.8	Rejected
	Replace all 4 old generators for 2 new	-6.7	-9.0	Adopted
447_ENV_NATURAL_CAPITAL	Option 1 - purchase carbon units	3.9	-7.8	Rejected
	Option 2 - natrual capital approach	51.9	-26.4	Adopted

In most cases, our chosen option is the most beneficial to consumers, demonstrating value. For one of our CBAs, the adopted option is not the least negative – but it must be stressed that a CBA can't take into account all of the societal benefits that could occur through improved environmental impacts.

As discussed within our CBA Appraisal section, we have carried out our CBA analysis showing incremental costs / benefits to a baseline start point of ED2. As such, and due to the nature of investment in electricity networks the NPVs may be negative, even in the adopted option.

We are demonstrating value calculated from the CBAs by comparing the adopted option against the alternative, rejected option. This allows us to calculate a net benefit for the option chosen.

OUR DEMONSTRATED 45YR NPV BENEFIT AGAINST ALTERNATIVE OPTIONS IS £78M POSITIVE ACROSS SSEN.

You can find more information on the outcome of CBAs within the "Summary of Cost Benefit Analysis" section of each EJP of the same reference.

APPENDICES

The appendices provide additional detail around specific elements within the SSEN Distribution CBAs.

Table 12 – CBA Parameters

Parameter	Value	Comments
Price base	**20/21 financial year**	Ofgem guidance.
Pre-tax Weighted Average Cost of Capital	**3.01%**	Based upon latest Ofgem assumptions on financiability.
Discount rate	**<= 30 years – 3.5%** **>30 years – 3.0%**	Based on HMRC Green Book on advice from Ofgem Guidance.
Safety Discount rate	**<= 30 years – 1.5%** **>30 years – 1.286%**	Based on HMRC Green Book on advice from Ofgem guidance.
Assumed Asset Life	**45 years**	Ofgem guidance.
Capitalisation Rate	**65%**	Based upon latest internal financiability workings.
Cost of Flexibility	**Availability Price £150.00** **Utilisation Price £150.00**	Based upon analysis carried in in Load Annex 10.1
Carbon cost of Cable Overlay	**75 tCO_2e**	Based upon internal guidance.
Losses	**£58.22/MWh**	As per ED1 rates, updated for inflation to 20/21 monetary value.
CI / CML	**CI £18.57** **CML £0.45**	As per ED1 rates, updated for inflation to 20/21 monetary value.
Oil Leakage	**£43.38/litre**	As per ED1 rates, updated for inflation to 20/21 monetary value.