

Guidance

RIIO-ED2 Cost Benefit Analysis (CBA) Guidance

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1. Where we expect a CBA submission

Introduction

1.1. This document sets out the framework to be used to produce a Cost Benefit Analysis (CBA). CBA is a decision-making tool and we expect DNOs to submit CBAs to justify a wide range of potential interventions.

1.2. The purpose of the CBA is to assist Ofgem in the understanding of a particular strategy or proposal in significant areas of investment. The CBA will provide information on other alternatives that have been considered and an understanding of the key assumptions that have been made which support a proposal.

1.3. Section 2 of this guidance sets out general requirements for identifying the range of options that are considered to meet the stated aim. Section 3 provides further information for valuing costs and benefits of options.

1.4. Section 4 of this guidance provides information to societal benefits and key assumptions in the CBA model. Section 5 and 6 provides information to the decision, uncertainty, and sensitivity analysis that DNOs should undertake.

1.5. Annex 1 in the guidance provides information regarding the Spackman approach to the CBA model. Appendix 1 provides an outline to the changes made to the CBA model parameters from RIIO-ED1 to RIIO-ED2. The benefit of submitting a CBA model for significant areas of investment are that it assists Ofgem in the understanding of a particular strategy or proposal, along with other alternative options that have been considered and an understanding of the key assumptions that have been made which support a proposal.

1.6. Examples of areas where it may be appropriate for DNOs to submit CBAs can be found in Appendix 2.

1.7. The use of CBAs should be proportionate to expenditure areas within RIIO-ED2 forecasts. We expect a DNO might chose to submit CBA where an approach is adopted that is either significantly higher cost than a previous strategy or likely to appear to be higher cost when compared to other companies because an alternative approach has been adopted.

Scope of CBA

1.8. DNOs may choose to carry out CBA at the following levels:

- Asset category/class
- Project level

1.9. At the asset category/class level it may be useful to group CBA analysis where the same/similar characteristics are displayed. Where projects within expenditure categories are homogenous in terms of the costs and benefits involved, we expect these projects to be considered as part of one CBA decision.

1.10. Schemes where costs and benefits are specific to the scheme or project being proposed may require consideration under a separate CBA model.

1.11. If the potential solution involves all Capital Expenditure (Capex) costs upfront (i.e. all costs in Year 2024) without any additional societal benefits, then producing a CBA will not provide additional value.

1.12. Where a programme or project options offer a blend of potential benefits, then a CBA is required. We expect there may be some large investment projects which require CBA to support investment justification and demonstrate value for money. Companies should submit CBA to support these decisions.

1.13. Further information is provided in Appendix 2 outlining cost activity areas and examples.

Interaction with the Business Plan Incentive

1.14. As detailed in the RIIO-ED2 Business Plan Guidance as a minimum requirement under Stage 1 of the Business Plan Incentive (BPI) DNOs must produce and submit CBAs in accordance with this document and the RIIO-ED2 CBA model.

1.15. In addition, as detailed in the RIIO-ED2 Engineering Justification Paper (EJP) Guidance; The licensee must explain, in a separate overarching document any links between the proposed CBA and the business plan outputs, supporting submissions, such as Business Plan Data Tables, EJPs, Network Asset Risk Metric (NARM) data and asset management plans.

2. Identification of Options

2.1. Consistent with the HM Treasury Green Book¹, DNOs should clearly identify the range of options that were considered to meet the stated aim. This list should, where feasible, include an option that requires a minimal initial investment (the “do minimum option”) against which other options can be compared.

2.2. The “do minimum option” or “reference scenario” may represent do nothing or business as usual e.g. ongoing maintenance. The minimum level of intervention that would be required to remain compliant with all relevant legislation must be clearly identified. This detail should be completed within the “Baseline” tab.

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.

2.4. This list should include an option that represents the status quo or business as usual option against which other options can be compared (discussed further below).

¹ http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

3. Valuing the cost and benefits of options

The Status Quo

3.1. The DNO should describe the status quo: that is the cost of business as usual in the absence of any investment intervention.

3.2. For consistency we have included a separate worksheet labelled *Baseline scenario* within the CBA model where DNOs should outline the business as usual position. This scenario sets the baseline for the analysis of all other options being considered. In most cases we would expect the baseline to represent the current strategy employed by the DNO and the associated level of expenditure currently being invested.

3.3. Where business as usual is not an option i.e. an investment intervention of some kind is required, DNOs should choose the option which best reflects business as usual to represent the baseline scenario. In most cases we would expect this to be the option with the lowest investment.

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.

Cost and Benefits

3.5. Costs and benefits to be considered in the CBA are those that would occur over and above the baseline scenario. These additional costs and benefits represent the marginal or incremental costs or benefits of the option being considered.

3.6. DNOs should classify all negative impacts of an option as costs and all positive impacts as benefits.

3.7. DNOs should consider and include where appropriate whole system costs associated with any proposed options (i.e. those costs incurred by other electricity network companies). DNOs should include these costs under the relevant investment categories, 'Whole Systems Cost – Other Electricity Distribution Licensees' or 'Whole Systems Cost – Electricity

Transmission Licensees'. DNOs should explain in 'Workings' worksheets how they have estimated these costs.

3.8. DNOs should assume zero benefits are realised in first year of investment, 100 per cent benefits are realised from year two of investment and beyond.

3.9. The financial costs and benefits should correspond to the financial/market values set out in the DNO's business plan (where applicable). For example, the expected reduction in any cost of repairs and maintenance (a financial benefit) arising from an investment should be consistent with the assumptions on unit repair and maintenance costs set out in the plan. If for some reason, there is any deviation from the values set out in the business plan, these should be explained within the CBA.

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.

3.11. The financial cost and benefits should be in 2020/21 prices, exclude real price effects (RPEs) and should be net of expected productivity improvements i.e. consistent with the data set out in the DNOs BPDT. Where CBA outcomes are marginal, the DNO should run sensitivities on productivity improvements beyond RIIO-ED2.

3.12. Where one or more of the options that have been considered by the DNO are flexible solutions/ services then these may be evaluated using the common evaluation methodology (CEM tool) where this has been amended to reflect the parameters used in the ED2 CBA model. Additionally, where of value, DNOs can also use their own proprietary models (such as the Real options CBA, ROCBA) to evaluate flexible solutions/ services. Where this is undertaken the DNO should consider providing copies of assessment as supporting evidence to the business plan and include the output in the ED2 CBA where the full options considered have been set out. The workings tabs in the ED2 CBA and/or supporting narrative set out in engineering justification papers should clearly set out the assumptions used, and the approach taken to evaluation that has been undertaken in models outside of the core ED2 CBA such as the CEM tool.

4. Society benefits and the treatment of non-marketed goods

4.1. DNOs should consider societal benefits (i.e. avoided costs) associated with each option.

4.2. The societal costs section of the CBA template is to value the key environmental, safety and other drivers that support many investment decisions. For consistency we have standardised some the assumptions and calculations for the valuation of society benefits and non-marketed goods within the core CBA model for RIIO-ED2.

4.3. Where we have entered default parameters/assumptions in the CBA model for most non-marketed items, if DNOs amend or add to these default parameters and assumptions full justification should be supplied to support the move from the default parameters. For the benefits associated with preventing fatalities and injuries, we require DNOs to draw on guidance set out in HM Treasury Green Book and the HSE. Further information is provided in following sections and Appendix 1.

4.4. We have included a Monetised Risk memo line in the RIIO-ED2 CBA Model. This line records the total monetised risk of the modelled scenario. It acts as a cross-reference between the CBA and NARM BPDTs and should not directly link to any formulas.

4.5. A brief outline of some of the key assumptions is provided below.

- Losses: Where expenditures are justified using the reduction of electrical energy lost, we have provided a standard value for £/MWh lost based on average wholesale electricity prices less the EU Emissions Trading Scheme (ETS) cost of carbon (which is factored into the wholesale price). This has been updated using the RIIO-ED1 value and rebasing to 2020/2021 prices.
- CO₂e associated with losses: Carbon emissions associated with losses have been estimated using the BEIS CO₂e conversion factor for electricity². To account for the RIIO ED2 process timeline and expected changes to the BEIS published values: the published figures from 23rd December 2020 have been used for the CBA. To take account of Government carbon targets and energy policy and modelling by the Committee on Climate Change and others, it is necessary to reflect the fact that power sector carbon intensity is likely to decline over time to

² <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>

almost zero. We have accounted for this in the CBA model through a linear reduction of power sector carbon intensity towards a final power sector carbon intensity of 10g/kWH in 2050. Should the DNO chose to use an updated version of the published carbon figures, this must be clearly recorded on the CBA and values consistently used across the interlinking suite of documents.

- Other GHG emissions (CO₂e) i.e. not associated with losses: All Carbon emissions have been valued based on the BEIS traded (central) carbon values³. To account for the RIIO ED2 process timeline and expected changes to the BEIS published values: the published figures from 23rd December 2020 have been used for the CBA. Should the DNO chose to use an updated version of the published carbon figures, this must be clearly recorded on the CBA and values consistently used across the interlinking suite of documents.
- Fatality and major injuries: For the benefits associated with preventing fatalities and injuries, we require DNOs to draw on guidance set out in HM Treasury Green Book⁴ and the HSE⁴. A 'default' disproportion factor of 6.25 has been set to reflect the Common Network Asset Indices Methodology (CNAIM). The HSE states that "*for a measure to be deemed not reasonably practicable, the cost has to be grossly disproportionate to the benefits. This is taken into account by the disproportion factor (DF). A DF more than 10 is unlikely.*"⁵ DNOs should consider what safety disproportion factor is appropriate in the CBA submission with the factor ranging between 1 to 10.
- Others included and standardised: Customer interruptions (CI), Customer minutes lost (CML), and Oil leakage.

4.6. DNOs should consider including further non-marketed items (i.e. benefits that accrue beyond a customer's meter), where a fixed parameter or calculation methodology has not been provided in the CBA model. Where a societal benefit or non-marketed item is not provided in the CBA as a fixed parameter, DNOs can include by using the 'other X (specify)' field to include these values and impacts in its CBA.

³ <https://www.gov.uk/carbon-valuation>

⁴

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf

⁴ <https://www.hse.gov.uk/economics/eauappraisal.htm>

⁵ <https://www.hse.gov.uk/managing/theory/alarpcheck.htm>

4.7 Where this is used, DNOs should justify why the additional societal benefit or nonmarketed item has been included as well as the method by which it has calculated the impact on this value of the investment being assessed. This should clearly set out the assumptions and valuation methodology used, in the workings section of the model, and how double counting or interactions with other fixed parameters has been considered and avoided. The calculation of impact can be both based on DNO data and/or a common data basis where the best approach is used.

4.8 In the first instance DNOs should use societal benefit or non-marketed item values from the DNO common approach to Social Return on Investment (SROI) - data proxy bank as the source for additional values. DNOs can also utilise other values not included in this data bank where sufficient justification can be provided as to why it has been used.

4.9 It may be appropriate to use a different assumption (e.g. location specific assumption) to measure benefits where this can apply to both fixed parameters and additional parameters included in the analysis. DNOs can include these benefits in the rows provided but should clearly set out the assumptions and valuation methodology used in the *workings* section of the model.

4.10 DNOs should also set out any non-marketed impacts or factors that cannot be monetised within the engineering justification paper (EJP) or in the investment decision developed.

4.11. In all instances DNOs should present the results of any CBA both including and excluding additional societal benefit or non-marketed items so that comparisons can be easily drawn between the results from a core CBA and those enhanced by the inclusion of additional societal benefit or non-marketed items.

4.12. The common approach to SROI should not be used instead of the RIIO-ED2 CBA model, but may need to be used for other aspects of companies RIIO-ED2 business plans (i.e. CVPs).

4.13. The CBA should signpost where societal benefits are contributing to a CVP and where applicable this should reveal any additional allowance that is being requested to deliver the CVP as per the Business Plan Guidance.

5. Decision Rule

5.1. The purpose of CBA is to enable companies to demonstrate the proposals included in their business plan provide the optimum solution and best value for customers.

5.2. We do not expect DNOs to use CBAs mechanistically i.e. including all schemes with positive NPV and excluding all those with negative NPV. Where a scheme has a marginally positive or negative NPV the DNOs should consider the inclusion/exclusion of such a scheme drawing on sensitivity analysis and the identification of any non-monetised benefits or costs. As an example, such non-monetised costs/benefits might include (non-monetised) engineering judgement on what constitutes an efficient project. We envisage that DNOs would clearly set out such judgements as part of their submission

5.3. For all NARM categories, the CNAIM methodology has a future risk calculation embedded. For 'pure' asset replacement scheme and programmes, if the NARM outputs for different options are presented this achieves the purpose of a CBA. Therefore, a CBA will not be required in this case.

5.4. A CBA would be required if the chosen option provides other societal benefits in addition to those included in the CNAIM as this will provide information and justify additional expenditure.

6. Uncertainty and Sensitivity Analysis

6.1. We expect DNOs to undertake sensitivity analysis consistent with the HM Treasury Green Book guidance⁶.

"Sensitivity analysis explores the sensitivity of the expected outcomes of an intervention to potential variations in key input variables. It can demonstrate, for example, the changes in key assumptions required to change the preferred option on an NPSV or BCR basis or to turn the NPSV of an option positive. A switching value refers to the value a key input variable would need to take for a proposed intervention to switch from a recommended option to another option or for a proposal not to receive funding approval

At a minimum sensitivity analysis and the identification of switching values should be carried out on the preferred option from the shortlist appraisal. These results must form part of the presentation of results. If the costs and benefits of the preferred option are highly sensitive to certain values or input variables, sensitivity analysis will probably be required for other options in the shortlist."

6.2. We expect DNOs to consider sensitivity analysis for key assumptions used in their CBA for example:

- Asset performance / health deterioration rates
- Ongoing efficiency assumptions
- Future demand growth / reduction
- Future energy scenarios
- Future utilisation of assets

6.3. Sensitivity analysis should primarily focus on the preferred option, demonstrating that it is a viable under a range of different potential scenarios. However, companies may also need to undertake sensitivities on other options, to provide comparators under different assumptions. For example, when testing the sensitivity of a key input assumption (e.g. capacity utilisation) it is appropriate to only consider the impact on the preferred option,

⁶

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf

however, when evaluating the impact of higher carbon prices it is important to consider this impact on each of the options identified in the CBA.

Where a DNO provides a CBA for smart grids using our template, we expect the DNO to incorporate a run of the model without RPEs applied as part of the sensitivity analysis on RPEs that should be considered. Any CBAs provided should align with the DNO “best view” scenario.

Annex

Annex 1: Applying the Spackman approach to Electricity Distribution Network Investment

The Spackman approach involves the following two-step approach⁷:

- Convert capital costs into annual costs using the company's cost of capital.
- Use the Social Time Preference Rate (STPR) of 3.5% (less than & equal to 30 years); 3% (greater than 30 years) to discount all costs and benefits, except safety where the Health Discount Rate (HDR) of 1.5% (less than/equal to 30 years); 1.2857 (greater than 30 years) should be used.

The capital costs should be converted to equivalent annual costs that are recovered through customers' bills. The CBA spreadsheet model assumes straight line depreciation in line with our RIIO-ED2 regulatory depreciation policies. The annual capital costs should also be calculated over the assumed economic life of the asset.

To convert capital costs into annual cost recovered through customers' bills, we require companies to use a pre-tax weighted average cost of capital (WACC) figure which is consistent with their own individual business plan submissions.

Costs and benefits should be extended to cover a 45-year period, from the start of investment, which represents the useful economic life of the asset and is consistent with asset life assumptions used in the RIIO-ED2 finance model. This is a working assumption subject to any decision on regulatory depreciation we take for RIIO-ED2. Due to future uncertainties, we have limited the CBA model to 55 years this will give clear visibility of any assets that are expected to have a 45-year economic life. This is from the final year of investment during the RIIO-ED2 period. For certain investments (e.g. CBA focused on IT benefits), a 45-year economic life might not be appropriate, and a shorter discount period may be warranted. We expect DNOs to explain their rationale to the change under the 'Workings' worksheet in the RIIO-ED2 CBA Template.

Costs and benefits should be discounted over this period and DNOs should use a common base year of 2023/24.

⁷Joint Regulators Group (4 October 2011) op. cit., para 3.10

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Appendix 1: Summary of updates to CBA Guidance

Parameter	RIIO-ED1	RIIO-ED2 Updated Thinking
CBA period	No update – 45 years.	No update – 55 years. (This incorporates all ED periods to be a 5-year duration from ED2 to ED13 inclusive)
Price base	2012/13	2020/2021
Base year	No update – 2015/16.	2023/2024
Depreciation calculation	Use straight line depreciation consistent with ED1 financial models.	Use straight line depreciation consistent with ED1 financial models.
	Assume depreciation starts 1 year after investment, consistent with ED1 financial model.	Assume depreciation starts 1 year after investment, consistent with ED1 financial model.
Conversion of capital costs to annual cost recovered through customers' bills	Use the pre-tax WACC figure which is consistent with DNO individual business plan submissions.	Use the pre-tax WACC figure which is consistent with DNO individual business plan submissions.
Inflation	RPI	RPI/CPIH split. Consistent with RIIO-ED2 Business Plan Data Template and ED2 Financial Model inflation methodology. Using the up to date published and forecast figures.
Capitalisation assumptions	Applied to all financial costs (investment costs and benefits); the capitalisation rates assumptions in CBA models should be consistent with those stated in DNOs individual business plan	Applied to all financial costs (investment costs and benefits); the capitalisation rates assumptions in CBA models should be consistent with those stated in DNOs individual business plan. We have set a capitalisation rate of 85% as a default assumption.
RPEs	For clarity costs should be entered consistent with BPDT submissions i.e. assume RPEs = zero, net of ongoing productivity.	For clarity costs should be entered consistent with BPDT submissions
Financial benefits in year 1	Assume zero benefits are realised in first year of investment, 100% benefits are realised from year 2 of investment and beyond.	Assume zero benefits are Realised in first year of investment, 100% benefits are realised from year 2 of investment and beyond.

Discount rate	<p>No update.</p> <p>For safety costs and benefits assume 1.5% PTPR.</p>	<ul style="list-style-type: none"> - Discount Rate <= 30 years = 3.50% - Discount Rate > 30 years = 3.00% - Discount Rate for safety <= 30 years = 1.50% - Discount Rate for safety > 30 years = 1.286%
Carbon abatement values	DECC traded carbon values for electricity distribution.	BEIS traded carbon values ⁸ for electricity distribution.
Reduction of electricity lost	No update.	Updated figures.

⁸ <https://www.gov.uk/carbon-valuation>

Appendix 2: Cost activity areas

As highlighted in the main document we expect DNOs to include CBA where there are options on how to management intervention on the network, particularly where there is a step change between RIIO-ED1 and RIIO-ED2. This is principally where there is a capex/opex trade off and where the DNO has the option to continue to incur opex in a particular area but identifies a solution that requires network investment that will deliver longer term benefits. Hence the CBA will support the assessment of any capex/opex trade-offs to demonstrate the benefits of the decision that has been proposed in the plan.

DNOs may find it appropriate to provide CBA to justify expenditure for the following investment areas/decisions:

- Asset replacement decisions e.g. refurbishment versus replacement
 - Including whether to purely replace faulted section of cable/line or to carry out additional works where an opportunity arises.
 - Replacement/refurbishment of entire asset or elements of.
 - Carrying out multiple activities at a site or those most critical.
- Deferred replacement
- Increased utilisation of the network
- Interventions to reduce faults or extend asset lives
- Planning of intervention
 - Demonstrating where it is more efficient for example to replace old equipment with newer equipment requiring less opex costs or whether replacement can be deferred but with increased opex expenditure.
- Reinforcement schemes
 - Where a small investment or contracted customer flexibility may enable deferment of a major reinforcement
- Large scheme or programme of work
 - CBA can be used to demonstrate why low loss transformers are cost effective and be adopted as the new policy standard for all transformers.
- Black Start and Network Resilience
- Distribution System Operator (DSO) Activities
- Data and Digitalisation
- QoS