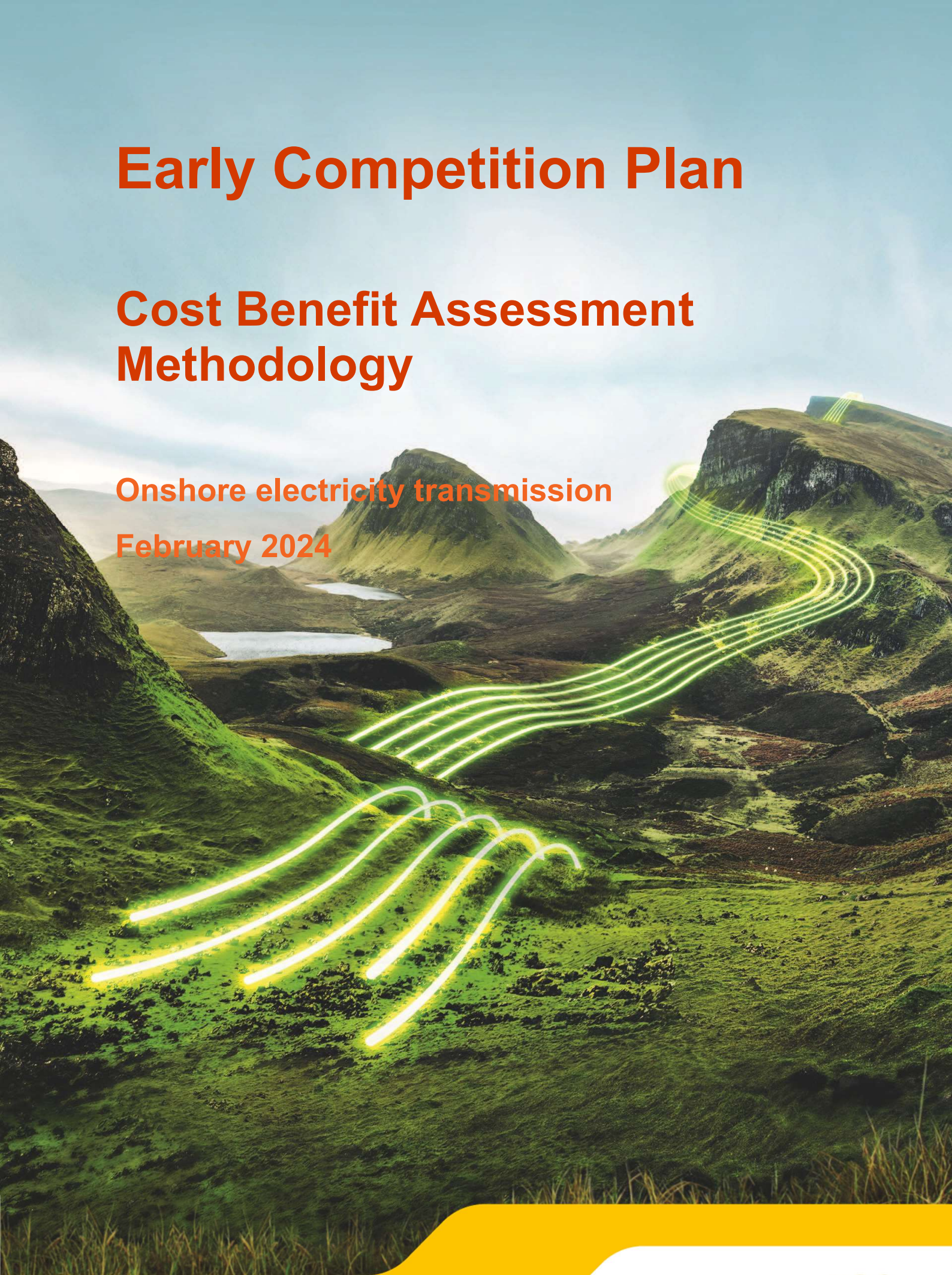
Early Competition Plan

Cost Benefit Assessment Methodology



Onshore electricity transmission

February 2024

ESO

Contents

Introduction

This document sets out the methodology for assessing which needs and associated reference electricity transmission projects are potentially suitable to be delivered via early competition. It builds on the recommendations set out under the Early Competition Plan (ECP) in terms of the overall commercial and legal framework for early competition but also the end-to-end process (from pre-tender project identification to post-tender). The following document has been updated through the early competition implementation phase, following a public consultation on the CBA methodology and engagement with stakeholders.

This CBA methodology document is structured as below:

- **Introduction** – Sets out the purpose of the document, the components of the analysis and how the methodology was developed.
- **List of costs and benefits –** A list of all the known or hypothetical costs and benefits of delivering solutions which address transmission needs under an early competition framework versus a regulated framework (i.e. the difference between the early competition and the regulatory framework).
- **Analysis of costs and benefits –** An assessment to determine suitability of costs and benefits for quantitative or qualitative assessment.
- **Quantitative assessment –** An explanation of the quantitative assessment, the relevant factors to be considered, the revenue build-up mechanism, the flow of revenues/cashflows, the calculation logic and sensitivities.
- **Qualitative assessment –** A description of the qualitative factors to be considered when assessing the suitability of each project to be delivered, how the qualitative factors may impact consumer value and a proposed framework for assessment.
- **Result interpretation –** A framework for how the results of the quantitative and qualitative assessment can be interpreted – how to weigh up and value different forms of information into a single recommendation to Ofgem as to whether a project is ultimately suitable for delivery via early competition and is likely to, on the balance of probabilities, deliver value for consumers.

Purpose of this document

The CBA methodology addresses one of the criteria for identifying projects for early competition, allowing cost benefit assessment on a project-by-project basis so that recommendations can be made to Ofgem.

The CBA aims to calculate the net cost to consumers to deliver the need through early competition and this is referred as the factual case. Additionally, the methodology and model would also calculate the net cost of a hypothetical delivery of the need in-house by the TOs under RIIO arrangements, this is referred as the counterfactual case.

Forecasting the likelihood of whether a solution will provide value for consumers if delivered under two theoretical models is an inherently uncertain and challenging assessment to undertake. The CBA framework will provide the ESO with a range of evidence based on the information available at the point of assessment to make a robust and well evidenced recommendation to Ofgem.

The methodology will be used by the ESO for quantitative and qualitative assessment of projects identified through the NOA process or other routes. The analysis that will need to be undertaken in order to arrive at a quantitative outcome will involve a projection of cost and benefits to consumers, which includes:

- Projection of project revenues for the Competitively Appointed Transmission Owner (CATO) or TO; and
- Any additional costs and/or benefits associated with delivery under an early competition framework or the regulatory framework.

The outcome of the quantitative assessment will be a range of Net Present Value (NPV) deltas of the total cost to consumers for delivery of the need under the factual case and counterfactual case.

This CBA differs from a typical investment appraisal process used to determine projects likely to deliver most value (such as the selection of options in the NOA process). Instead, it aims to assess which delivery route is more likely to deliver value for consumers, assuming a reference solution has already been selected.

How the methodology was developed

The CBA methodology was developed by the 'Regulation and Strategy' and 'Network' teams in ESO and our advisors through a series of workshops from September to November 2021. The methodology was also consulted with Ofgem in the context of its overall assessment on whether to introduce early competition and how it envisages the identification of projects for early competition to be undertaken.

The methodology provides a framework to assess project suitability for delivery through early competition rather than the overall societal cost as electricity investment is funded by the consumers rather than the public. This distinguishment is important as the Government undertakes CBA's when determine whether policies, programmes or projects present value for money for the public. Whereas this CBA (and the NOA and comparable ones undertaken by Ofgem) are on the basis of consumers. This has important implications in terms of what the scope and scale of benefits are.

This methodology was originally developed ahead of a formal decision by BEIS[1] and Ofgem[2] on early competition, the role of Future Systems Operator (FSO)[3] and the future role of the ESO. While the details of some of these decisions are still being made formal, ESO has progressed with EC implementation and has consulted on the CBA in November 2022. This document is an update to the December 2021 methodology document and reflects alignment with policy decisions, changes to the framework for early competition and the amendments based on the consultation responses received.

This document has been developed based on the assumption that the ECP proposals are implemented as written. It also assumes the reader understands the principles set out in the ECP and the potential range of proposals.

The calculations under the counterfactual are based on the basic building blocks[4] which are part of RIIO-T2. The underlying assumptions and calculations may need updating as the ECP evolves and as each subsequent price control methodology and final determination is published. We will likely need to engage with Ofgem periodically to determine which elements of the CBA methodology and model require updating.

We consulted on the CBA methodology, have published our responses to the consultation in Appendix B1 of the ESO's early competition implementation update published alongside this document, and have subsequently updated parts of the methodology. This document was developed as an internal methodology for the ESO to use during the assessment of individual needs in the process of making a recommendation to Ofgem and, although we have shared this document as part of our stakeholder engagement, its primary purpose is as an internal reference for assessment.

Costs and benefits of early competition

In this section we have set out a list of costs and benefits along with an assessment of how they are proposed to be assessed as part of the CBA.

List of costs and benefits

The objective of this CBA is to perform a comparative analysis of the net cost to consumers to deliver a solution under the counterfactual case and factual case.

Table 1 sets out all of the accepted or hypothetical costs and benefits of delivering solutions which address transmission needs under an early competition framework versus a regulated framework (i.e. the difference or delta between the factual case and counterfactual case). For the avoidance of doubt all costs and benefits which are equally applicable to the factual case and counterfactual case are not included, i.e. the table only includes cost/benefits that are exclusive to the factual case (e.g. pre-tender

[1] BEIS consultation on Onshore Electricity Networks
[2] Ofgem's consultation on early competition in onshore electricity transmission
[3] BEIS' consultation on the role of an FSO
[4] Return on RAB, Depreciation and Fast Money (Opex)

costs) as well as the impact of the delta of costs/benefits that are common for both factual case and counterfactual case (e.g. project costs).

The table sets out the long list of costs and benefits identified as part of the development of this methodology which may be realised in the factual case versus the counterfactual case. The table also provides a brief description of these costs and benefits.

Table 1: Long-list of material costs and benefits

Costs	Difference between factual (ECP) and counterfactual (in-house) cases
Pre-tender costs	Costs incurred by the procurement body associated with preparing for a tender under the factual case (e.g., staff time/hire, tender design/calibration).
Tender costs	Costs incurred by the procurement body for running the tender under the factual case (e.g. bid assessment, due diligence, external support fees, commercial negotiation and Post Preliminary Works Cost Assessment (PPWCA)).
Bidder costs	Costs associated with developing bids (e.g. initial design, building bid teams, supplier engagement, surveys) for the successful bidder under the factual case.[5]
Large consortium costs	Costs incurred by the bidder for assembly of large consortium which do not apply to sole or small consortia under the factual case.
Project cost estimate	Under the factual case these are bidder's initial design costs following the PPWCA. These costs are in comparison to the counterfactual cost allowance under RIIO-T2 regime.
Constraint costs	Additional costs incurred by the ESO under the factual case due to the timescales of delivery of the scheme relative to the counterfactual (e.g. these can be driven by varying construction time periods, potential for delay, time to tender, etc.).
Additional system costs	Additional costs incurred by the system operator under the factual case in relation to implementation (e.g. outage requirements), operation (e.g. availability) or existing system reinforcements. This is effectively netted off against any system costs associated with counterfactual delivery.
Financing costs	Under the factual case this is benchmarked cost of debt (i.e. base rate plus margins and any reserve costs (e.g. Lifecycle Reserve Accounts (LRA) or Lifecycle Reserve Facilities (LRF)), cost of equity incurred by the bidder and levels of gearing. Under the counterfactual case this will be the WACC for the relevant regulatory period. The difference in financing costs is driven by the overall WACC achieved.

[5] If early competition has a large pipeline of projects then bidders may try to recover their bid costs from multiple bids (if they have been unsuccessful on other early competition tender processes) by increasing the expected equity return from the project.

Costs	Difference between factual (ECP) and counterfactual (in-house) cases
Contract/License management	Costs incurred by the procurement body under the factual case, associated with preliminary works stage, PPWCA, performance monitoring, payments, conflict resolution, etc.
Difference in terminal value	These costs are incurred under both cases to operate assets beyond the revenue period. For example, the counterfactual case may have a RAB at the end of the revenue period when there is no residual value in the factual case. The additional return on the WACC and depreciation in the counterfactual would be post-revenue period cost to consumers which would exist under the counterfactual case and not under the factual case.
Incentives	These are potential additional costs incurred by the procuring body due higher incentives. How incentives are set for the factual case is described in the ECP. Under the counterfactual this would be RIIO incentives mechanisms and rates.
Planning cost	Visual impact of early competition design may involve additional costs for stakeholder management, time in planning process and changes to design under factual case in relation to the counterfactual case.
TO portfolio effect	Under the counterfactual case, incumbents may have lower costs due to economies of scale and scope (e.g. having local operations teams and in-house expertise, avoidance of interface costs). Whereas under factual these could be additional construction or operational costs to meet obligations.
Additional regulatory costs	Additional costs associated with award of network solutions under the factual case including licencing, oversight, monitoring, engagement, reporting etc.
First of a Kind premium	This is applicable to the first few tender rounds as they may not be fully efficient due to lack of precedents, knowledge and higher risks from adopting new delivery route. As the process is repeated bidders and the procuring authority would gain more experience and knowledge and be able to more accurately price and manage risks leading to reductions to the FOAK premium.

Benefits	Difference between factual and counterfactual
Innovative technology, process or system	Benefits from more efficient / innovative technology, processes or systems that could be introduced by bidders under the factual case that is typically not used by the incumbent. This could result in capex or opex efficiency adjustments to the counterfactual project cost estimate.
Access to a wider pool of expertise and capital	Bidders could bring in a wider pool of experience (including international) and capital (including financial instruments) which TOs do not typically use. This could result in a lower cost of equity under the factual case.

Benefits	Difference between factual and counterfactual
	Cost of equity would be an input to the model as a cost under the factual and the counterfactual. The benefit would be captured as the delta between these two inputs
Detailed allocation of risk	The use of project finance structures under the factual case will enable detailed allocation of risk which can allow for higher levels of gearing but with potentially higher cost of senior debt compared to notional in counterfactual. This is still likely to mean a net benefit driven by the delta in overall cost of debt and gearing between the factual and counterfactual.
Bidder portfolio effect (economies of scale)	This could appear when the bidders have economies of scale (e.g. a large transmission company with expertise in a particular geography or skills which is new or not accessible by the incumbent TO).
Revenue start point[6]	Under the counterfactual case, consumers bear the cost as expenditure for development of the need begins whereas under the factual revenues for bidders start post commissioning of the asset. This timing difference in cash flow results in a benefit under the factual.
Reduced overrun exposure	Under the factual case, the costs are fixed following a PPWCA so consumers do not pay for additional costs incurred post that stage. Under the counterfactual there is a cost sharing mechanism. This could result in a potential benefit to consumers.[7]
Ecological impact	Consumers could benefit from increased biological and ecological diversity from construction and operation of the asset compared with the solution proposed by the incumbent under the counterfactual case.
Carbon emissions	Consumers could benefit from potentially reduced carbon emissions from construction of the asset proposed under the factual case compared to the counterfactual case.
Social benefits	Consumers could receive social benefits such as job creation or some form of diversity benefit from the factual solution compared to the counterfactual.

Treatment of costs and benefits

In this section, we have analysed the following aspects of the cost and benefit elements listed above to determine their treatment in the methodology and the model:

- Relevance of each of the element for the CBA methodology
- Quantifiability of the relevant elements
- Robustness of the quantifiable elements and their significance in the outcome of the CBA model.

The analysis of these elements has been performed as a three-step process:

Step 1 – Is the cost/benefit element necessary for the methodology/model?

The ESO and its advisors determined the relevance of each element to the methodology through a series of workshops. This was based on the significance of the delta between factual and counterfactual delivery and whether there was a logical economic argument for this cost or benefit. The detailed outcome of these workshops is summarised in Appendix 2.

[6] For large projects the ECP allows for some decommissioning revenue which would lessen the impact of this benefit.
[7] The inverse of this is also true. If market prices significantly drop after the PPWCA consumers would not benefit under an early competition fixed price contract.

Step 2 – Is the element quantifiable?

This step considered the ability to quantify each relevant cost and benefit element that was shortlisted. To assess this aspect, we considered the ability to measure accurately the impact of each element on project delivery without the need for complex assumptions; as well as the availability of relevant data to quantify each element. Elements that were considered relevant but with limited or no publicly available information to support quantification have been included under the qualitative assessment factors.

Step 3 a – Is the data robust and certain?

For the robustness assessment of the quantifiable elements in step three, we first determined the relevant benchmarks to source the underlying data. This information is set out in Appendices 1 and 3. We then asked the following questions to assess the quality and robustness of data from the benchmarking exercise and determine the treatment of each element in the CBA:

- Is there a material number of data points available?
- How wide is the spread of the data points?
- Are the data points from comparable legislative and political regimes?
- Are the data points used for drawing assumptions from a sector with a comparable regulatory regime such as Offshore Transmission Owners (OFTO), Ofgem's price controls, Direct Procurement for Customers (DPC), and UK Private Finance Initiatives (PFI)?
- Are the data points from comparable industries and sectors?
- Are the data points from a recent or comparable time period so that it reflects market expectations and macroeconomic factors?
- Can the benchmarking exercise cover projects across a range of size and characteristics that are comparable to the needs that are envisaged to be evaluated in the NOA process?

Step 3 b – Does the element have a significant impact on the outcome?

This final step in the assessment process is to identify whether the data which is sufficiently robust and certain has a material impact on the results. We are trying to determine whether this is a key value driver of the overall result. If it is then this this input should be subjected to sensitivity testing based on the range of benchmarked data.

A visual representation of the three steps is set out in Figure *1* below:

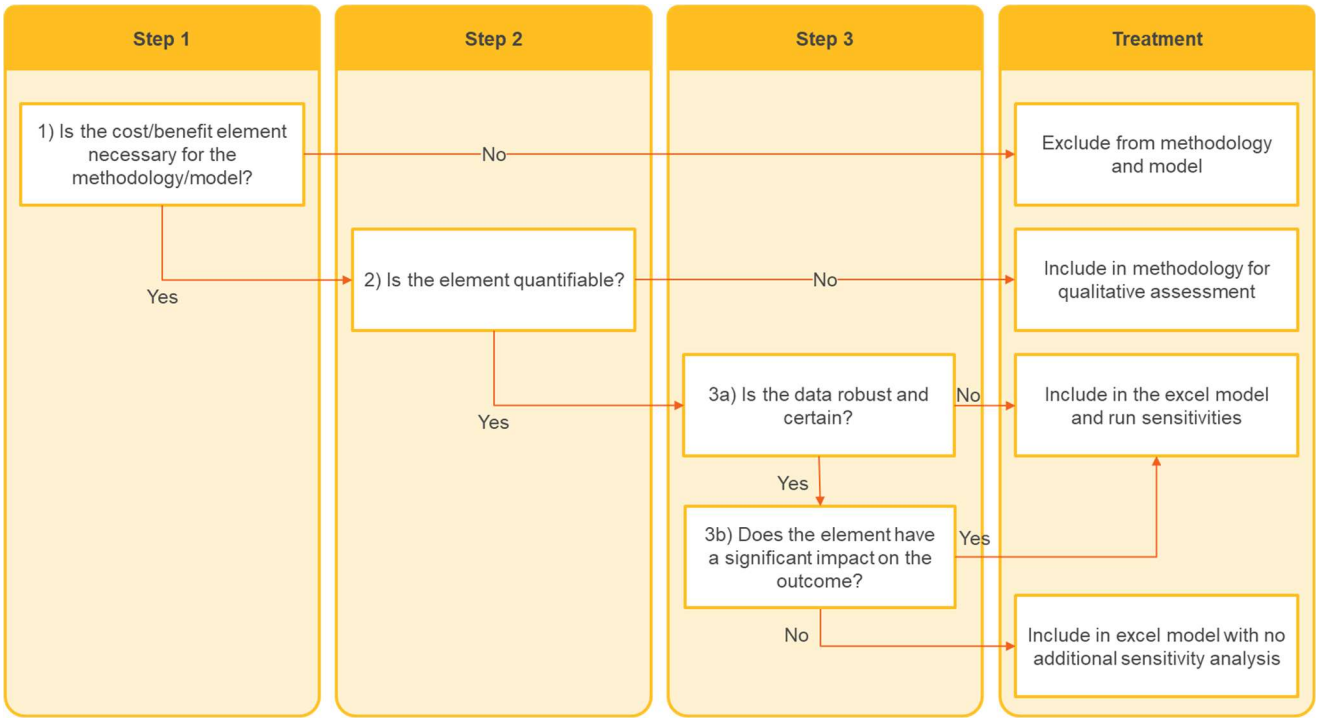


Figure 1: Process for determining treatment of costs and benefits in the methodology

A summary of the conclusions from the above analysis is captured in Table 2 below with more detailed information provided in Appendix 2.

Table 2: Classification of the costs and benefits in the CBA framework

Classification	Costs	Benefits
Elements that are excluded from the methodology and model. These are not considered relevant for the methodology	• Difference in terminal value • Incentives • Planning costs	• Innovation in social benefits • Reduced overrun exposure
Elements that are included in methodology but not the model. Impact of these factors on total value for consumers will be assessed qualitatively	• Large consortium costs • Additional system costs • TO portfolio effect	• Innovation in ecological impact • Reduced carbon emissions • Bidder portfolio effect
Elements that are quantifiable and included in the CBA model subject to additional sensitivity analysis.	• Project costs • Constraint costs • Financing costs	• Innovation in technology, process and system • Access to wider pool of debt and equity capital • Detailed allocation of risks
Elements that are included in the CBA model without additional sensitivity analysis.	• Pre-tender costs • Tender costs • Bidder costs • First-of-a-kind premium • Contract/License management costs • Additional regulatory costs	• Revenue starting point

The 3-step process set out in Figure *1* (supported by the detail in Appendix 4) has excluded certain costs and benefits from the methodology and the rest have been shortlisted to be included in the methodology and model of the CBA.

Elements that are a direct cost to consumers with reliable data sources have been assessed as robustly quantifiable and these costs have been included in the CBA model. The quantitative assessment of these elements is set out the next section.

Other costs and benefits that are excluded from the model will be qualitatively assessed to enable an informed decision-making process. The qualitative assessment is also set out below the quantitative section.

Quantitative Assessment

This section explains the scope of the CBA model, key assumptions for the purpose of the quantitative assessment, build-up of revenues and costs under both the factual and counterfactual calculations, NPV comparison, and sensitivities.

All quantifiable costs and benefits relevant for development, procurement and delivery of needs will be compared on an NPV basis calculated by an Excel-based financial model (referred to as the CBA model). The model determines the total cost to consumers for delivery via both factual and counterfactual cases. A visual representation of the model structure is set out in Figure 2:

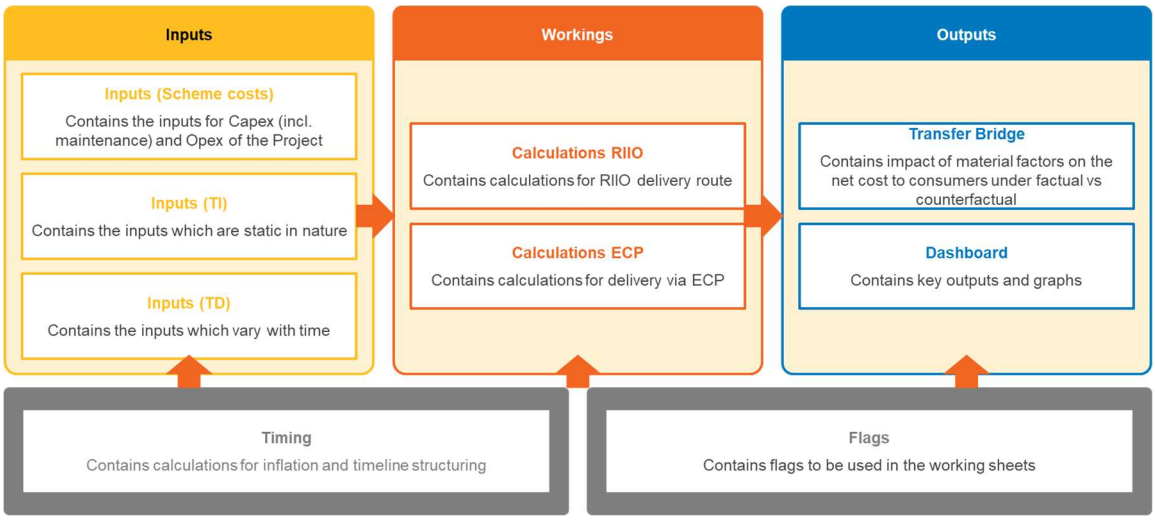


Figure 2: Illustration of the CBA model structure

The model has been designed to accommodate changes to the underlying inputs, incorporate additional features for bespoke projects as well as future regulatory changes. The model is supplemented by a step-by-step user guide that describes the features and functionalities of the model in detail.

Scope of model and interface between costs and benefits

The model includes two sets of calculations:

- Counterfactual case – Costs and revenues for delivery under a regulatory building block approach based on the RIIO-T2 arrangements.
- Factual case – Costs and revenues for delivery through a project finance structure based on the commercial model proposed in the ECP.

The key value drivers between the factual and counterfactual cases are expected to be driven by the benefits of early competition (i.e. cost and financing efficiencies) and the costs of early competition (i.e. tender and contract/license management costs). An illustrative visual representation of this is show in Figure 3 below:

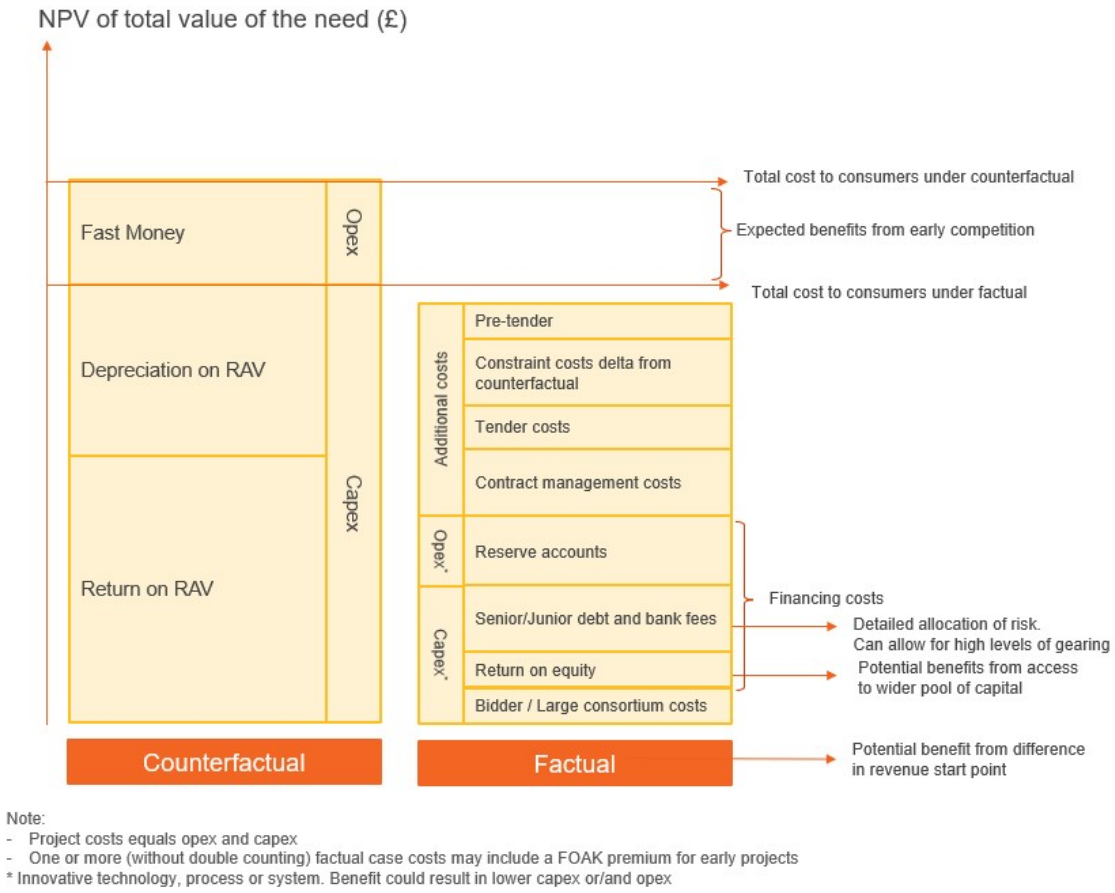


Figure 3: Illustrative value comparison between factual and counterfactual schemes

Both the calculations are subject to certain assumptions to simplify and align the results. These are set out in the following section.

Key assumptions

The CBA model calculates the total cost to consumers under the counterfactual as per the RIIO-T2 building blocks as well as under factual as per project finance principles. Several simplifying assumptions have been made to enable this analysis to be undertaken. Key assumptions have been listed in Table 3 below. The model also includes other non-material assumptions based on the benchmarks set out in Appendix 3.

Table 3: Key assumptions

Assumption	Relevant cost/benefit	Description
Solutions under factual case and counterfactual case	Project costs	Solutions proposed under the factual and counterfactual are assumed to be functionally the same e.g. have the same required system reinforcements, planning costs..
Additional system costs	Additional system costs	Additional costs incurred for implementation, operation or reinforcement of existing system requirements under the factual case is effectively netted off against any system costs associated with counterfactual delivery.
Capex phasing	Project costs	The capex phasing (over the pre-construction and construction period) is assumed to come either from the TO reference design in the NOA process, or in the future from the ESO or a third party. The ESO will have to consider, depending on the approach to those cost estimates, what adjustment may be required for the purpose of the CBA.

Assumption	Relevant cost/benefit	Description
Opex and lifecycle costs	Project costs	Opex and lifecycle costs are not currently part of the NOA process. The model will include functionality for opex and lifecycle costs as these could in future be a requirement for TO submissions to the CSNP, may be estimated by the ESO as part of an expanded role and/or responsibility or it may be provided through the Interested Persons process. Bidders are assumed to price in opex under the factual case.
Economic life of assets	Difference in terminal value	The useful economic life of the solutions under both the factual and counterfactual case is assumed to be equal at 45 years and there will be no RAB under the counterfactual case or any residual value in the factual case. Updates to factual case revenue period will be reviewed at the time of running the CBA.
Pre-tender and tender costs	Pre-tender and tender costs	These are pass-through costs under the ESO regulatory framework and therefore recovered at the time they are incurred.
PPWCA	Tender costs	Costs associated with the PPWCA are assumed to be equal to the additional costs incurred by Ofgem during the Large Onshore Transmission Investments (LOTI) assessment process, Medium Sized Investment Projects process (MSIP) or the price control under the counterfactual.[8] Therefore, these net off in the CBA and are not included in the analysis.
Pre-commissioning revenues	Revenue start point	Pre-commissioning revenue is catered for in the model and will be dependent on the specific project that is assessed. This allowance can begin at a designated time through the pre-commissioning period.
Commissioning of solutions	Revenue start point	The commissioning of solutions is expected to start in the same year under the factual and counterfactual. If delays are expected in the commissioning of the factual case a commensurate Constraint Cost will be accounted for.
Cash flow timing	Revenue start point	Delivery dates under factual and counterfactual are assumed to be the same in the base case and delays may be captured through commensurate Constraint Costs. However, under the factual revenues don't start until commissioning (subject to pre-commissioning revenues) whereas under counterfactual capex is added to the TO's Regulatory Asset Value (RAV) as it is incurred and recovered from consumers on an ongoing basis through the regulatory regime.
Future regulatory decisions	Financing costs and project costs	The ESO will engage with Ofgem for input on what assumptions should be included in the model regarding future WACC and if relevant cost efficiency challenge for the counterfactual case.
Tax	Overarching assumption	Tax expense under factual and counterfactual is expected to be similar as the main difference over the life of the asset is one of timing due to differing revenue start periods. This assumption has been made on the basis that the tax treatment in early competition is not yet known and difference due to changes in future tax regimes may not be relevant in the future. Further, the decision between the factual and counterfactual should also not be driven by the potentially arbitrary different tax treatment of alternative approaches
Indexation	Overarching assumption	All revenues across the life of the project will be indexed under the factual. Under the counterfactual all revenues from fast money and return on RAV will be indexed across the life of the project
Discount rate	Overarching assumption	The Spackman approach will be used to determine the discount rate for the calculations in line with other regulatory regimes. This reflects that this analysis is quantifying a public good as a result of private investment[9].
Project Finance	Financing costs	We assume the factual case (i.e. the preferred bidder) uses a project finance approach as opposed to a corporate finance solution as this is typical for Public Private Partnership (PPP) type tender and commercial arrangements.
Timing of constraint costs	Constraint Costs	Constraint costs are only added into the factual case as they are the delta between the factual and counterfactual case. This is in terms of the length of delay the ESO estimates early competition may create. This could relate to a

[8] https://www.ofgem.gov.uk/sites/default/files/docs/2021/01/large_onshore_transmission_investements_loti_reopener_guidance_1.pdf
[9] https://www.ofgem.gov.uk/sites/default/files/docs/2011/10/discounting-for-cost-benefit-analysis-involving-private-investment-but-public-benefit.pdf

Assumption	Relevant cost/benefit	Description
		delay in pre-tender, tender or construction. As the cause of the delay is unknown the model does not delay cashflows under the factual. The timing of the constraint cost delta is assumed to be following commissioning of the counterfactual case so this is when it is also applied in the factual case.

Key assumptions will require updates at regular intervals to accurately reflect market conditions, the evolution of the RIIO framework and outcomes of other relevant competitive tender regimes. Key milestones such as Ofgem regulatory settlements, or specific triggers in the infrastructure procurement lifecycle, may provide a natural opportunity to update the CBA model in preparation for future procurement rounds.

Revenue and cost build-up

This section describes the structure and logic of the CBA model used to calculate the net value to consumers under both the factual case and counterfactual case. A visual representation of the model calculation logic is shown in Figure 4 followed by a detailed description of the process. Table 4 presents a mapping of the model calculation logic to the list of costs and benefits.

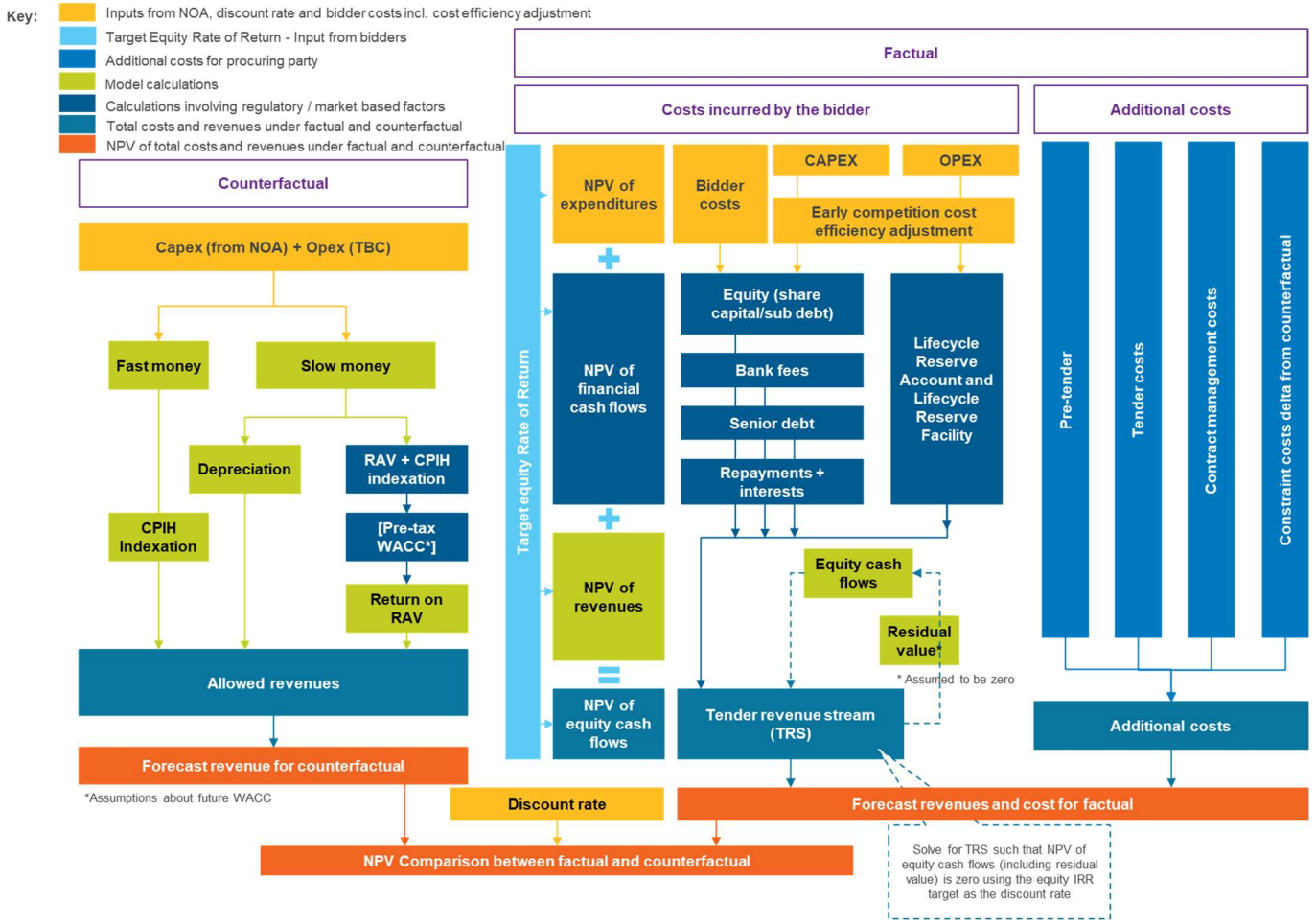


Figure 4: CBA model calculation logic

Table 4: Mapping of costs and benefits to model schematic

Model element	Cost	Benefit	Factual / counterfactual	Comment
Pre-tender cost	Pre-tender cost		Factual	
Tender cost	Tender cost		Factual	
Bidder costs	Bidder costs		Factual	Successful bidder prices its costs into bid (unsuccessful bidders do not recover bid costs)
Contract/License management costs	Contract/License management costs		Factual	
Constraint costs	Constraint costs		Factual	
Capex	Project costs		Factual	
Opex	Project costs		Factual	
NPV of expenditure	Project costs		Factual	Profiled for the purpose of calculating revenue requirement
Capex + opex	Project costs		Counterfactual	
Fast money	Opex		Counterfactual	
Capex and Opex efficiency adjustment		Innovative technology, process or system	Factual	Innovation is assumed to lead to cost reductions
Equity, equity cashflows and Target Equity Internal Rate of Return (TEIRR)	Financing cost (equity including FOAK premium) and Project costs (size of equity)	Access to a wider pool of expertise and capital	Factual	Cost of equity under the factual FOAK premium applied to the high cost of equity scenario to account for the uncertainty about how EC mechanism and its institutions will work in practice.
Bank fees, senior debt, repayments, Lifecycle Reserve Account (LRA) and Lifecycle Reserve Facility (LRF)	Financing cost (debt) and project costs (size of debt i.e. gearing)	Detailed allocation of risk	Factual	Cost of debt and gearing under the factual to fund the project costs (capex and opex)
Depreciation	Financing cost		Counterfactual	Effectively the repayment of debt/equity
Return on RAV	Financing cost		Counterfactual	Effectively the interest/returns on debt/equity
Tender Revenue Stream (TRS)	All	All	Factual	TRS is sized based on the project costs, any assumed efficiencies, cost and size of debt (gearing) and the TEIRR (i.e. what return bidders expect)
Discount rate/ NPV	All	Revenue start point	Factual	Later start of revenue and time value of money is benefit to consumers in NPV terms

Factual (early competition)

The factual uses a project finance (delivered through a limited recourse special purpose vehicle or similar) approach to calculate the revenue build-up which would be the new cost to consumers. There are two sources of cashflows under the factual case:

1. Costs incurred by the bidder for development and delivery of the project.
2. Additional costs including those incurred by the procurement body to set up and oversee the tender process and manage delivery through early competition, and any difference in constraint costs against the counterfactual.

The cashflows follow a typical waterfall structure in the model. The Tender Revenue Stream (TRS) is derived by (1) calculating the cash outflows from the project and (2) setting the TRS to a level where the Equity Internal Rate of Return (EIRR) (i.e. the return that equity receives for investing in the project) as an output of the model is equal to the Target Equity Internal Rate of Return (TEIRR) i.e. the return that bidders expect to receive. The TRS is the cost to consumers from the first source mentioned above.

The TRS is set at a level which allows all project cashflows to be met in line with the actual project costs (opex, debt and various accounts) and the expected returns for equity.

The simplified cashflows under the factual model are set out in Figure 5:

- **Operating costs** – These are recurring costs incurred for day-to-day business activities throughout the life of the project.
- **Reserve account funding** – This is the cost of cash being withheld in the business to ensure liquidity ratios stipulated by the debt providers and other stakeholders are met. This was grouped into the financing costs in sections above.
- **Financing costs –** This is made up of two components:
    a. Cost of debt financing (including repayments and bank fees), and;
    b. Equity cashflows which are set based on the TEIRR.

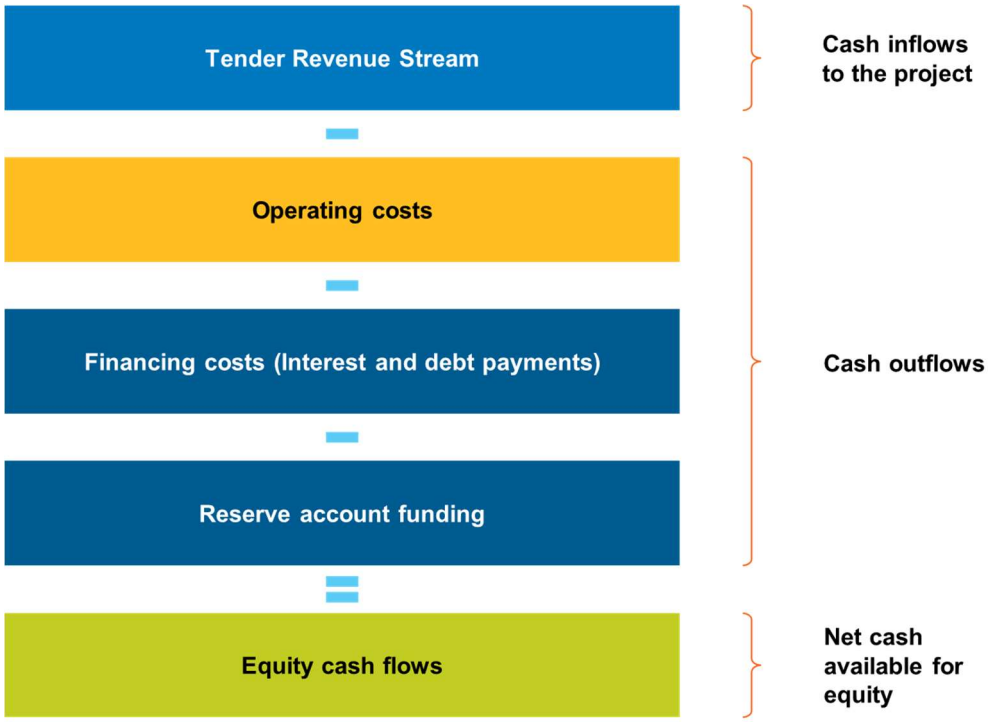


Figure 5: Simplified representation of the factual cashflow waterfall

The project cost estimates for the factual are expected to be the same as the counterfactual and subject to a 'cost efficient adjustment'. This adjustment is to reflect the benefit of innovative technology, process or system. Bidder costs are also included in the cost estimates as bidders will seek to recover these through their project funding.

Typically, the capital structure under the factual includes commercial debt and equity by the project sponsor(s). Return on the equity capital would be an assumed input value based on benchmarking exercises to calculate the necessary cashflows to the equity holder(s), this will be the TEIRR for the project.

Debt costs are based on a combination of arrangement fees, commitment fees, agency costs, interest rates, lifecycle reserve accounts, debt service reserve accounts and other project finance debt requirements which impose either a direct cost on the operator or constitute an opportunity cost arising from funds being tied-up for a period of time. The funding of Debt Service Reserve Account (DSRA) and debt service in the project would be optimised to reduce the TRS under project finance principles. However, for the purpose of the CBA the model Lifecycle Reserve Account (LRA) and Debt Service Reserve Account (DSRA) are funded by project cashflows and are based on basic project finance principles.

The project finance debt may be in the form of one or more of bank, bond, private placement, etc. Depending on the solution the individual debt cost items may vary. For the purpose of the CBA model a bank debt solution has been assumed.

The CBA model uses a macro-functionality to back-solve the TRS so that the cash flows for equity (revenue minus the debt and operational costs) result in the EIRR being exactly equal to the TEIRR, i.e. the total cash inflows would equal the cash outflows. The model also ensures that the TRS enables the project to meet standard borrowing covenants such as minimum cash reserves and Debt Service Cover Ratios (DSCR). Note that the difference between the TEIRR and the EIRR is that the former is the level of return that bidders require, and the latter is what level of return the successful bidder receives.

The additional costs to consumers under the factual case which would be additional to the TRS include pre-tender, tender costs, contract/license management cost and constraint costs (where there is an assumed delay between the factual and counterfactual) as shown in Figure 4.

Counterfactual (RIIO-2)

Revenues under the counterfactual are built up using the basic regulatory building blocks shown in Figure 6, subject to the simplifying assumptions set out in Table 3. Project costs estimated by the TOs are split between additions to the RAV (also referred to as slow money) and fast money. Slow money and fast money are analogous (for the purpose of this analysis) to capital cost and operating cost. Note that as part of RIIO arrangements the split of totex between fast and slow money has several levers to support bill smoothing and financeability. In addition, the rate at which total costs are allocated between slow and fast is set by the regulator in order prevent sub-optimal investment decisions being made on the basis of differing treatment of capital and operating costs.

Revenues from fast money are based on a percentage of total expenditure that can be recovered within a one-year period. All other costs are capitalised into the Regulatory Asset Value (RAV). The RAV is depreciated on a straight-line basis and returns are earnt on the RAV based on the Weighted Average Cost of Capital (WACC) set by Ofgem. Returns on RAV and fast money are indexed using the CPIH rates over the life of the project.

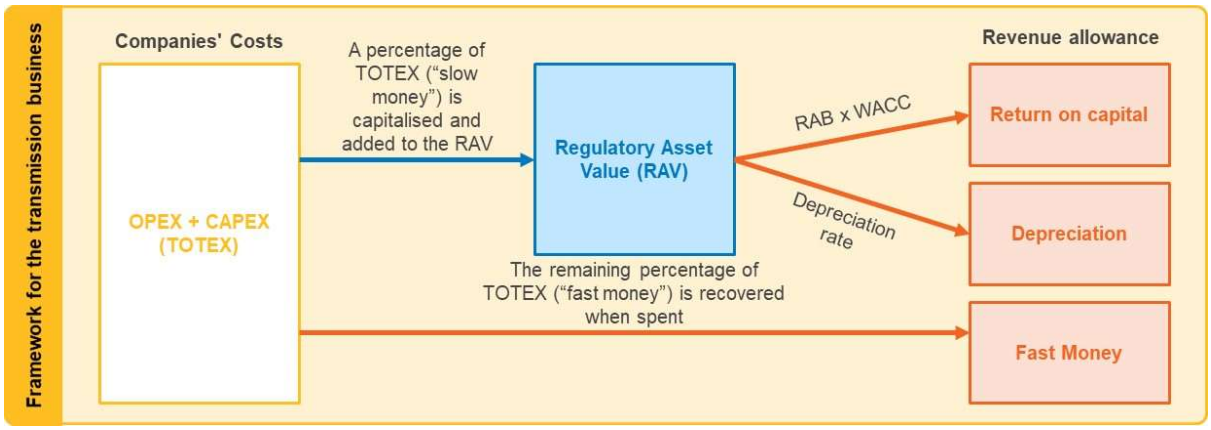


Figure 6: Simplified illustration of RIIO-T2 conceptual framework to calculate allowed revenues

The regulatory framework for RIIO-T2 includes several additional measures for financeability, cashflow management, incentives etc. However, for the purpose of this CBA a simplistic building block approach has been adopted.

The three sources of revenue to the incumbent – fast money, depreciation on RAV and the return on RAV – in aggregate will form the total cost to consumers under the counterfactual. Unlike the factual there are no additional costs associated with the counterfactual which need to be added to the cost to consumers.

Net present value comparison

The forecast revenues and costs from the factual and counterfactual will be discounted using a common discount rate (set as described in the assumptions above using the Spackman approach) to arrive at a NPV of the cost to consumers. Sensitivities will be run on various uncertain or material inputs to result in an overall range of NPV differences between the factual and counterfactual.

Sensitivities

In this section we have set out a range of sensitivities for the quantifiable cost and benefit elements in the model that have a potential significant impact on cost to consumers. The objective of this sensitivity analysis is to analyse the magnitude of impact of each element on the model outcome. Further details on relevant benchmarks and input factors for these elements have been listed in Appendices 1 and 3.

The sensitivities included in Table 5 are based on the current benchmark data available but will be updated based on the outcomes from DPC, OFTO, late CATO and other similar relevant competitive tendering regimes when available.

Table 5: Range for sensitivity analysis

Item	Range from benchmarking exercise	Initial proposed sensitivities	Assessment of benchmarks
Cost of equity	6.5% - 16%. (Nominal)	8-12% (midpoint 10%) 12% +25bps FOAK premium high case for first procurement rounds	UK PFI (schools, hospitals, housing and transport) and waste-to-energy over the past 5-6 years have a range of 8.5-15%. ESO notes that a consultation response highlights evidence from the Department of Energy & Climate Change (DECC)[10] on applying a novelty premium in instances where there are 'uncertainties about how the mechanism and its institutions will work in practice'. In response to the evidence, to enhance the robustness of the CBA and further stress the high cost of equity scenario, a 25bps first of a kind (FOAK) premium is included.
Cost of debt	**Construction** LIBOR + 150bps to 275bps	Forward swap base rate + 210 to 230bps (midpoint 220bps)	Margins on construction debt costs range from 150-190bps for a range of UK tunnelling and interconnector projects. Early competition projects will vary in terms of risk profile and margins and may be priced more favourably to benchmarks with more ground risk.

[10] DECC Novelty Premium (FOAK)

Item	Range from benchmarking exercise	Initial proposed sensitivities	Assessment of benchmarks
	Operations LIBOR + 150bps to 240bps	Forward swap base rate + 125 to 145bps (midpoint 135bps)	OFTO margins on operations are most appropriate benchmark where there is a large number of recent benchmarks. As the OFTO market has matured margins have broadly decreased from the upper end of the range.
Gearing	Average gearing: 85.67%. Range: 57% - 92.8%	80 to 90% (midpoint 85%)	Range of Public Private Partnership (PPP) and PFI projects show a wide range of gearing. Projects which include demand risk are typically at the lower end of the range whereas the upper end of the range for infrastructure, hospitals and schools are more akin to the revenue build up and risk allocation proposed in the ECP.
Capex efficiency	0% - 30.8% for PPP and traditional public procurement projects.	5-20% (midpoint 10%)	Studies estimating capex efficiencies realised through competitive processes range widely. Most benchmarks are typically at the 'late' tender point but some examples are prior to planning/consenting (where there is most risk)
Opex efficiency	Overall range of 0% - 27%.	5-20% (midpoint 10)	Studies estimated opex efficiencies for OFTO projects vs RIIO delivery lead to savings of up to 27% on opex. The OFTO regime transfers the asset following construction which may allow for more accurate and competitive pricing of opex costs.
Procurement costs (pre-tender and tender)	0.48% - <3% of total project costs.	0.5-2% (midpoint 1% plus £2m fixed[11])	In PPP and PFI studies procurement costs range from 0.5 to 3% of total project costs. Studies noted that many of these are likely to be understated (e.g. negotiation) and that PPP/PFI costs are typically much higher than D&B tenders.
Bidder costs	0.8% - 3% of total project costs.	0.8-2% (midpoint 1%)	PPP in other jurisdictions and OFTOs demonstrate bidder costs in the range of 0.8-3% of total project costs. Costs are driven by deal complexity, bid requirements, length of tender process and procuring authority experience.
Constraint costs	(see below)		

[11] Based on the estimate from the ECP page 161

For the constraint costs we will apply appropriate costs where a delay to commissioning is likely due to the additional time required to run a competition. A typical delivery process for network build options shows that the network competition process replicates several activities in the traditional project lifecycle process, namely route option identification and selection, some front-end engineering and design (FEED), and supply chain engagement. These activities forming part of the network competition process does not cause a delay in the project delivery. The government's transmission acceleration action plan[12] may result in changes to the typical delivery processes and consequently the assumption on the lack of delay may need to be reviewed periodically, dependant on the implementation of these recommendations. For projects in the latter stages of development it is more likely that development activities undertaken during the competition process may be a duplication of effort, which can be considered as a delay. For projects in the latter stages of development, constraint costs can be calculated by the ESO's internal technical economic assessment teams based on resetting the delivery process through early competition and applying delivery timescales.

For both CBA recommendations (both prior to and following the pre-tender period) the ESO will use the constraint costs from the network planning scenarios with the earliest required delivery date as the base case. Further constraint cost sensitivities based on the latest required delivery date scenario will provide the lower banding for constraint cost sensitivities, with the higher band the same as the base case. This is consistent with the certainty criteria as determined by Ofgem in their decision on early competition in onshore electricity transmission networks[13]. It is likely that future CSNP process may move away from multiple scenarios to more defined pathways and therefore the most appropriate scenario for that pathway will be utilised in any constraint cost calculation.

Analysis of the sensitivities concludes the quantitative assessment in the CBA. The result from the quantitative assessment will provide a comprehensive view on the net present value of delivery via counterfactual and factual. The CBA model will also help analyse the key elements that are driving the differences between these delivery routes. The result from the quantitative assessment must be considered in conjunction with the results of qualitative assessment set out in the following section to determine the total impact on consumer value.

Qualitative assessment

A number of factors were identified as likely to have an impact on consumer value but the benchmarks and data sources for the factors were not of sufficient certainty to quantify robustly as part of the CBA model. These factors have therefore been included in the methodology as part of the qualitative assessment for us to consider alongside the quantitative outcomes of the model.

The qualitative assessment process is flexible to adapt as more information about costs and benefits of early competition are understood. Any policy direction by DESNZ (or Ofgem should be taken into account in how this qualitative assessment is undertaken. The approach set out in this document provides a comparative assessment framework for qualitative costs and benefits of delivering solutions which address transmission needs under an early competition framework versus a regulated framework.

The first section describes the list of qualitative factors and their relevance for the CBA. Each of these unique factors have varying drivers and characteristics and so may require adjusted approaches and consideration of different qualitative factors especially as early competition develops.

The subsequent section provides a suggested framework for how the qualitative factors could be considered, alongside the model, to come to a final decision.

Qualitative factors

Table 6: List of qualitative assessment factors

[12] Electricity networks: transmission acceleration action plan - GOV.UK (www.gov.uk)
[13] Decision on early competition in onshore electricity transmission networks | Ofgem

Title	Description
Large consortium costs	Costs involved in assembling and managing large consortia. For very large projects (in excess of £1bn) there is limited market precedent of delivery by sole bidders or small consortia. Lenders typically prefer to lend to projects of this nature in syndicates which typically leads to longer negotiation, more contracts (e.g. intercreditor agreements, ISDAs[14] etc.), increased due diligence etc which would not necessarily exist if there were only a single lender.
Additional system costs	These additional costs range depending on the solution and could include varying system reinforcement costs. The key point for consideration for early competition is whether a different solution would likely drive materially different outcome for additional system costs given the underpinning assumption that the counterfactual and factual solutions are functionally the same.
Bidder portfolio effect	The need being tendered may have characteristics which make it more efficient for the incumbent TO to develop compared with a third party due to economies of scale. The ESO will need to consider feedback from the pre-tender process to assess this factor. If the market is of the view that it is not able to be more efficient that the TO then that need may be less suitable for competition.
Innovation – ecological impact	This factor would depend on whether a bidder is likely to propose a solution which could deliver ecological benefits which the TO's reference design would not. Similar to the portfolio effect factor the ESO will need to rely on feedback from the market in the pre-tender process to inform the assessment for this factor. Additionally, the ESO will need to consider the policy steer from government and Ofgem on what level of weighting ecological impact should have in the tender process.
Innovation – systems, processes and technology	This is a benefit expected to be realised from the introduction of early competition. Whilst some of the benefits from improved systems, process and technology are captured as part of the cost efficiency adjustment, the ESO will need to consider other qualitative benefits such as improved adaptability to future changes, smoother operability etc compared to the solutions proposed by the incumbent. As this benefit is captured under both the qualitative and quantitative analysis caution is needed to ensure that this benefit is not overstated. The ESO should consider the scope for potential innovation versus the benchmarks.

[14] Swaps and derivatives contracts

Assessment framework

Elements from the section above could be considered as part of a qualitative assessment by the ESO as factors not captured in the CBA model and which may materially drive the value of competition.

Further details on the effect of these qualitative factors and the approach towards their assessment will become clearer as the legislative and regulatory framework for early competition develops. Furthermore, Ofgem or DESNZ may issue policy direction or aims which the qualitative assessment may need to take into account. This will evolve further as the roles and responsibilities of the different parties are more clearly defined and the 'pathfinder' early competition projects are tendered. The ESO will then need to consider how to reflect those changes, including addition of any other qualitative factor, in its assessment.

Elements set out in the above section have varying effects on the CBA. Some qualitative factors may prove to be negligible in terms of consumer benefit while there could be additional factors that may be relevant for certain specific needs.

In absence of need-specific information this section presents a suggested approach to assessing the qualitative factors alongside the quantitative outputs from the model.

Each qualitative factor will be assigned a score between -2 to 2 based on the following scale:

- -2 – factual case likely to deliver net cost for consumers
- -1 – factual case may deliver net cost for consumers
- 0 – on balance the net effect is negligible
- 1 – factual case may deliver net benefit for consumers
- 2 – factual case likely to deliver net benefit for consumers

These scores are assigned by assessing the impact of each factor on delivery comparing factual with counterfactual delivery. An illustrative list of questions for each factor is set out in Table 7 below:

Table 7: Illustrative questions for qualitative assessment

Qualitative factor	Example questions
Large consortium costs	Is the reference design capex in excess of £1bn? Are there any characteristics of the need which suggest a large or complex consortium would be likely?
Additional system costs	Do any of the alternative solutions suggested by potential bidders through the pre-tender engagement (or similar) have materially different additional system costs?
Portfolio effect	Are there any characteristics of the need, reference solution or other solutions proposed under the pre-tender engagement (or similar) which suggest that either a CATO or TO would benefit from a portfolio effect?
Innovation – ecological impact	Do any of the alternative solutions suggested by potential bidders through the pre-tender engagement (or similar) have materially different ecological impacts?
Innovation – systems, processes and technology	Do any of the alternative solutions suggested by potential bidders through the pre-tender engagement (or similar) have materially different systems, processes or technology which could deliver consumer value?

At the end of the scoring process a total score is calculated. The interpretation of the total score is as follows:

- -10 to -5 = factual case likely to deliver net cost for consumers
- -5 to 5 = factual case may deliver net benefit or cost for consumers
- 5 to 10 = factual case likely to deliver net benefit for consumers

The qualitative assessment process is the final step in the CBA. The factors set out in this section and the total score from the framework described above will supplement the results from the quantitative assessment and help determine the delivery route that provides best value to consumers.

The following section describes how the results of both the quantitative and qualitative assessments have to be interpreted while making the final recommendation to Ofgem.

Result interpretation

Following the analysis of the project the ESO will have a series of quantitative and qualitative outputs to consider when making a recommendation as to which delivery route is likely to deliver value for consumers. The overall conclusion in some cases may not be binary and the ESO will have to make a holistic assessment based on the range of evidence resulting from the methodological assessment.

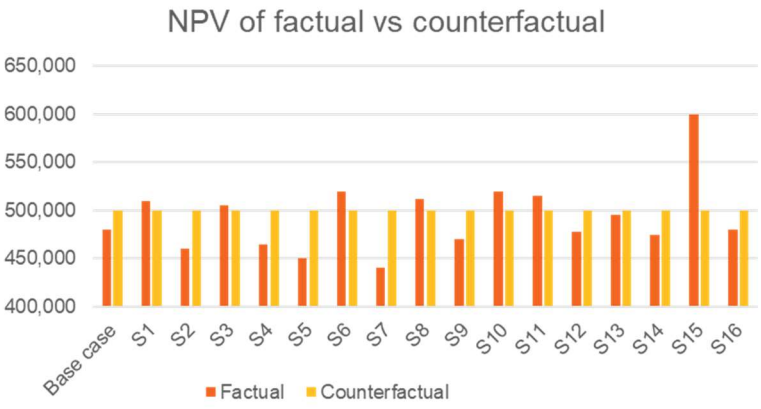
The CBA will have the following outputs that the ESO will want to consider in making a final decision:

1. The CBA model will provide an NPV range of the cost of delivery under the factual and counterfactual cases. The midpoint of this range will be a key factor in assessing impact on consumer value.
2. The sensitivity analysis in the CBA model will provide comprehensive insights into specific elements around magnitude of impact, resilience to downside scenarios, potential gains in upside scenarios under both the factual and counterfactual cases.
3. While assessing the robustness and accuracy of the benefits from factual delivery as well as the likelihood of value for consumers, the ESO could consider:
    i. The number of model runs where the factual case was determined to be better value for money compared to the counterfactual case (the higher the number where the factual case delivers benefit the higher confidence that the factual case will be the preferred delivery route);
    ii. The range of distribution of outputs from model runs would be a key indicator in the level of certainty of each element in the calculations (the spread of data from the mean should get indication of confidence in the base case or mean i.e. a very wide spread of data suggests a wide distribution of possible outcomes limiting our confidence in the base case); and
    iii. The key value drivers. If for example all benefit is driven by a single value driver then the ESO may want to place more weight on the sensitivities which relate to that.
4. The results of the qualitative assessment and the relative strength of answers to the qualitative factors between counterfactual and factual provide an additional perspective on the solutions presented for each need. The outcome from this assessment when compared with the results of the CBA model is an important part of the decision-making process.

    If for example the quantitative modelling shows an even balance between the factual and counterfactual cases (i.e. just as likely to deliver value for money as not) and the qualitative analysis shows a high likelihood for early competition to deliver net benefit for consumers the ESO may conclude that early competition is likely to deliver best value.

Illustrative example

The range of outputs described in the previous section has been illustrated below based on a simulated CBA of an investment need. Outputs from the quantitative assessment will be the first step in the analysis; this result will be an NPV range of the net cost to consumers under (a) base case assumptions as described in this methodology and (b) other scenarios that incorporate a sensitivity analysis on key factors. Figure 7 below is a visual representation of this output in the CBA model.



Label	Sensitivity factor
S1	Cost of equity (high)
S2	Cost of equity (low)
S3	Cost of debt (high)
S4	Cost of debt (low)
S5	Gearing (high)
S6	Gearing (low)
S7	Capex efficiency (high)
S8	Capex efficiency (low)
S9	Opex efficiency (high)
S10	Opex efficiency (low)
S11	Procurement costs (high)
S12	Procurement costs (low)
S13	Bidder costs (high)
S14	Bidder costs (low)
S15	Constraint costs (high)
S16	Constraint costs (low)

Figure 7: illustrative sensitivity analysis from quantitative assessment

Following the above analysis, the qualitative factors will be assessed for the solution under the factual case and a score will be allocated as set out in Table 8 below. In the current example, the solution under the factual case has a qualitative score of 6. This indicates the factual case is likely to deliver value to consumers.

Table 8: Illustrative qualitative assessment

Qualitative factor	Score	Description
Large consortium costs	0	Mid-sized project – effect not likely to be material
Additional system costs	1	Limited scope for more additional system costs under factual
Portfolio effect	0	Minimal impact of portfolio effect
Innovation – ecological impact	2	Large potential scope for factual to deliver innovation benefits through systems, processes and technology
Innovation – systems, processes and technology	2	Large potential scope for factual to deliver innovation benefits through systems, processes and technology
Total Score	**5**	**Overall likely to deliver benefits**

Score Key

Individual Score

-2 – factual likely to deliver net cost for consumers

-1 – factual may deliver net cost for consumers

0 – on balance the net effect is negligible

1 – factual may deliver net benefit for consumers

2 – factual likely to deliver net benefit for consumers

Total Score

-10 to -5 = likely to deliver nett cost for consumers

-5 to 5 = may deliver net benefit or cost for consumers

5 to 10 = likely to deliver net benefit for consumers

As a final step, the results from the qualitative and quantitative analysis will be considered in two steps (1) Delta of the TRS NPV from factual and counterfactual. In the current example this would be largely positive as majority of scenarios resulted in a positive delta (as represented in figure 8 above) and (2) the scoring of the qualitative assessment. This would be compared against the NPV delta to determine the likelihood of the solution under the factual case to deliver value to consumers. An illustrative representation of this assessment is in Figure 8 below.

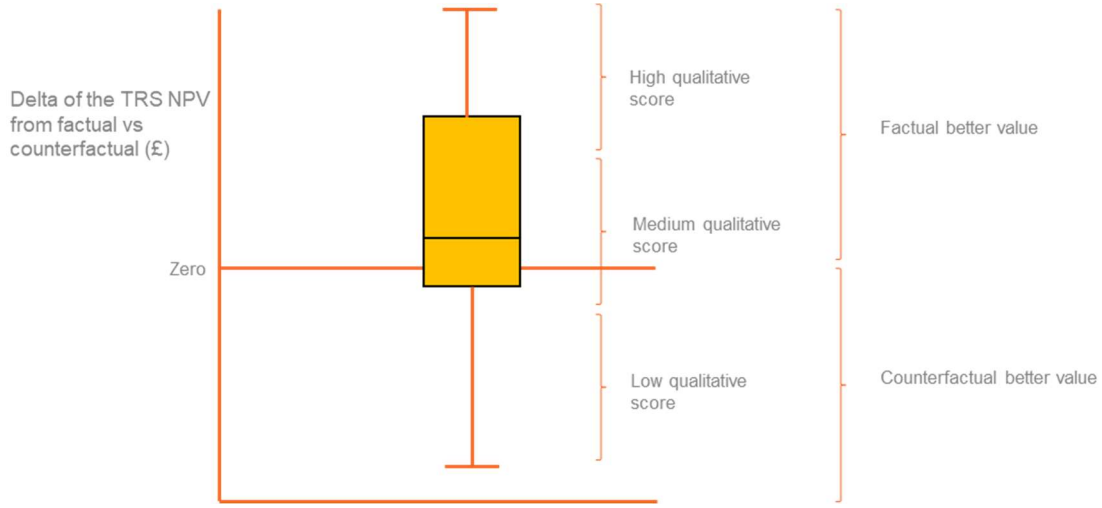


Figure 8: Illustrative result interpretation from quantitative and qualitative assessments

In the example under discussion, both the qualitative and quantitative assessments indicate the solution under the factual case to be overall better value for consumers.

Conclusion

This document sets out the methodology to be used by the ESO when undertaking the CBA as part of its assessment as to whether individual needs are potentially suitable to be delivered via early competition. This assessment will inform the recommendation alongside the other criteria (being new, separable, whether the need is sufficiently certain, whether there is sufficient market appetite and other Ofgem considerations).

This methodology sets out all the significant understood or hypothetical costs and benefits of delivering solutions which address transmission needs under an early competition framework versus a regulated framework. It then considers which of these are sufficiently relevant to be included in the methodology

and which of these have sufficiently robust data to be included in the model. This sets the boundaries of the quantitative and qualitative elements of the methodology.

The quantitative assessment is a CBA model which assesses the cost to consumers of delivering the reference solution through the commercial model set out in the ECP (factual case) versus a regulatory building block framework based on RIIO-T2 (counterfactual case). It compares the NPV of the cost to consumers of the factual case versus the counterfactual case. This also includes a series of sensitivities to produce a range of likely NPV differences.

The qualitative analytical framework enables the ESO to assess systematically whether any of the other key costs or benefits identified affect the overall conclusions from the quantitative assessment. The framework assesses whether any of the qualitative characteristics of the need, market or reference solution impact the likelihood of an early competition delivery route to deliver more or less value for consumers.

The overall results from the qualitative assessment enable the ESO to assess whether the upper, middle or lower end of the quantitative range is most likely. This combination of evidence will allow the ESO to make a more holistic, rounded assessment of the likelihood of early competition to deliver value for consumers.

The commercial, regulatory and legislative arrangements for early competition is in the implementation phase. The ESO will continue to work with internal stakeholders, Ofgem, DESNZ (previously BEIS) and others to refine its approach and integrate it into the network planning processes. Early competition will be a transformative delivery model in the sector. As was found with the most comparable competitive models OFTOs and DPC in the water sector there are many “unknown unknowns” in terms of potential costs and benefits which may be discovered as solutions are progressed. When discovered or realised these factors would be considered in future analysis.

This methodology aims to be as simple and streamlined as possible but also sufficiently robust and defensible. Once implemented the ESO will review the efficiency, effort and quality of output and adjusts the methodology and assessment process as required. The methodology needs to enable the ESO to make a rational and reasonable recommendation to Ofgem based on the information available to it at the time.

Appendix 1 – Treatment of costs and benefits

Note: Suggested treatment Key - A = Not included in the model, B = Qualitative assessment, C = Quantitative assessment with sensitivities, D = Quantitative assessment

Table 9: Treatment of costs

Cost Name	1) Needed for the model or methodology?	2) Is it quantifiable?			3) Is the data sufficiently robust?			Initial suggested treatment
		Can it be quantified?	Approach towards quantification	Potential sources?	How robust?	Are market prices available?	Surrogate market prices	
Pre-tender costs	Yes	Yes	Benchmarks from comparable tender processes	DPC, OFTOs, PFI, Pathfinders, Global PPP studies	High / medium	Yes	n/a	D – small scale
Tender costs	Yes	Yes	Benchmarks from comparable tender processes	OFTOs, PFI, Pathfinders and global PPP studies	High / medium	Yes	n/a	D – small scale
Bidder costs	Yes	Yes	Benchmarks from comparable tender processes	OFTOs and PPP benchmarks from social, rail and road tenders	High	Yes	n/a	D – small scale
Large consortium costs	Yes / maybe	Maybe	Premium based on benchmarks	Factual: Bidder estimates	Low	No	Bidder cost premium for large projects (risk of double count)	B – insignificant size and could be discussed qualitatively
Project costs (Totex profile over need)	Yes	Yes	Budget estimates	Counterfactual: NOA costs Factual: NOA costs (plus/minus any efficiencies or adjustments)	High / medium	Yes	n/a	C – sufficiently certain but very large size means sensitivities are sensible
Constraint costs	Yes	Yes	Single year least worst regret	NOA / ESO	High / medium	Yes	n/a	C / D – fairly certain (based on available info) but large scale
FOAK Premium	Yes / maybe	Yes	Simplifying assumption based on evidence	Factual: BEIS and Department of Energy & Climate Change (DECC) Counterfactual: Expert opinion	Medium	No	Pre-tender, tender and bidder cost premium based on timescales	D –provision for premium in high equity return scenario
Additional system costs	No	Maybe	Simplifying assumption	Factual and counterfactual: TO estimates / additional research by ESO	Low	Yes	n/a	A or B – very difficult to forecast and will vary materially by project
Financing costs	Yes	Yes	Factual: Benchmarks Counterfactual: RIIO-2 WACC	Factual: Comparable deals using PPP data sources and Eikon/Bloomberg and other financial terminals for debt costs Counterfactual: Regulatory WACC	High / medium	Yes (factual)	Yes (WACC)	C – fairly certain but high importance. Need to consider assumption long-term WACC for counterfactual

Cost Name	1) Needed for the model or methodology?	2) Is it quantifiable?			3) Is the data sufficiently robust?			Initial suggested treatment
		Can it be quantified?	Approach towards quantification	Potential sources?	How robust?	Are market prices available?	Surrogate market prices	
Contract/license management	Yes	Yes	Benchmarks from comparable tender processes	OFTOs and PPP benchmarks from social, rail and road tenders	High / medium	Yes	n/a	D – small scale
Difference in terminal value	Yes / No	Assumption	Simplifying assumption that there is no difference	Factual and counterfactual: Asset life as determined under the NOA process	Low	n/a	n/a	n/a
Incentives	Yes / No	Assumption	Probability adjusted financial incentives (Monte Carlo)	RIIO-2 arrangements and statistical models	Medium / low	No	Regulatory	A – assumption that incentives are set equal and on balance of probabilities there is no difference
Planning cost	No	No	Revealed and stated preferences of consumers	Planning studies	Low – as difference of factual solution is unknown	No	WTB studies in GB and impact studies commissioned for consenting	A – very difficult to forecast or even take into account qualitatively
Additional regulatory costs	Yes	Yes	Assumed the same as the contract management costs					
TO portfolio effect	Yes	Maybe	Analysis of TO efficiency vs standalone projects	Regulatory submissions	Low	No	Yes – aforementioned analysis but likely to be disputed	B – worth discussing but too challenging to quantify (future tenders)

Table 10: Treatment of benefits

Benefit Name	1) Needed for the model or methodology?	2) Is it quantifiable?			3) Is the data sufficiently robust?			Initial suggested treatment
		Can it be quantified?	Approach towards quantification	Potential sources?	How robust?	Are market prices available?	Surrogate market prices	
Innovation – Technology, processes and systems (cost efficiencies)	Yes	Yes	Assumed efficiency saving which could be based on	Literature review of comparable early competitions e.g. PPP studies, PFIs, NAO, World Bank Australia, OFTOs	Medium/low	No	Yes – hypothetical difference between BAU and competitive delivery	C – Low certainty but high impact so sensitivities are important
Innovation - Ecological impact	Yes	Maybe	Assumption on ecological impact and costing approach	Literature review of early competition and changes in design/ecological impact	Low	No	Yes – natural capital approach (NCC)	B – worth discussing but too challenging to quantify *

Benefit Name	1) Needed for the model or methodology?	2) Is it quantifiable?			3) Is the data sufficiently robust?			Initial suggested treatment
		Can it be quantified?	Approach towards quantification	Potential sources?	How robust?	Are market prices available?	Surrogate market prices	
Innovation - Carbon emissions	Yes	Maybe	Assumption on carbon emissions	Literature review of early competition and carbon impact	Low	Yes	Market carbon price	B – worth discussing but too challenging to quantify *
Innovation - Social benefits	No (focus on consumers)	No	Assumption about local societal impact	Economic impacts easier to source – 'softer' (e.g. diversity) is more challenging	Very low	Yes and no	Job creation, local economic benefits	B – worth discussing but too challenging to quantify *
Equity - Access to a wider pool of expertise and capital	Yes	Yes / maybe	Difference between costs of equity set by Ofgem and market deals	See costs	High / medium	See costs	n/a	C – fairly certain but high importance. Need to consider assumption long-term WACC for counterfactual
Debt - Detailed allocation of risk	Yes	Yes / maybe	Difference between costs of debt set by Ofgem and market rates (base) and deals (margins)	See costs	High / medium	See costs	n/a	C - As above
Bidder portfolio effect	Yes	Maybe	Analysis of TO efficiency vs standalone projects	Regulatory submissions	Low	No	Yes – aforementioned analysis but likely to be disputed	B – worth discussing but too challenging to quantify (future tenders)
Revenue start point	Yes	Yes	Difference in timing of cashflows	Dependent on discount rate (tbc – likely Greenbook STDR)	High	Yes	n/a	D – fairly robust based on understanding of discounting but effect also relatively negligible
Reduced overrun exposure	Maybe	Yes	Sharing rates under RIIO-2 are known – would need to sensitivity test the potential variability of TO outturn costs and cost to consumers	RIIO-2 and probabilistic sensitivity analysis	Medium	No	Regulatory framework	A or B –Too challenged to quantify and may not be relevant

Appendix 2 – Analysis of costs and benefits

Note: Suggested treatment Key - A = Not included in the mode, B = Qualitative assessment,

C = Quantitative assessment with sensitivities, D = Quantitative assessment

Costs

Title	Analysis
Pre-tender, tender and bidder costs	These costs are specific to early competition, relevant for the methodology and quantifiable. These could be quantified through benchmarking of similar tender processes, with potentially robust data sources. Pre-tender and tender costs may be grouped together in sensitivity analysis. These elements could therefore be classified under category D.
Large consortium costs	These are specific to very large capex projects, whilst they could be potentially relevant for the methodology, there are limited data sources available and rely heavily on estimates by bidders., these are most suited to be classified under category B.
Project costs	These make up the largest portion of costs and are therefore relevant for the methodology. Due to their nature and significance the input sources are typically driven by budget estimates and require some sensitivity analysis to ensure they are accurate. This element is potentially more suitable to be classified under category C
Constraint Costs	The approach for constraint costs is slightly unique as only the delta between counterfactual and factual would be relevant for the CBA. The inputs for this element will flow in from the NOA process. At this stage it is more appropriate to classify these under category C as some sensitivity analysis needed based on the different potential lengths of delay
FOAK Premium	This is a relevant element for the model given market feedback and evidence provided, there remains a potential risk of double count when included in the model. This element has a clearly suggested BEIS data source. These costs are relatively smaller in scale and potentially low value in NPV terms. To enhance the robustness of the CBA, the FOAK premium will be included in the high equity return scenario.
Additional system costs	These costs are not required for the CBA methodology and are difficult to quantify. These may be worth considering as part of the qualitative assessment in category B assuming there is sufficient information available to the ESO to make this assessment
Financing Costs	These are potentially significant costs and could be a key differentiating factor between factual and counterfactual. This element has robust data sources for both factual and counterfactual elements; However, it will potentially require an assumption for long-term WACC under the counterfactual. Due to the significance of this element on the outcome of the model, some sensitivity analysis will be required (Category C). The range of sensitivity and type scenarios for the sensitivity analysis will have to be decided carefully as it can have a significant impact on the results
Contract/License Management	These costs are relatively smaller in scale and potentially low value in NPV terms. However, as these costs are quantifiable with robust data sources, they could be included in the model and grouped with pre-tender and tender costs (category D).
Difference in terminal value	A simplifying assumption that there is no difference between factual and counterfactual would be most efficient. This will also ensure there is alignment between the underlying requirement / need and the life of the solution (category A)
Incentives	As discussed in the previous workshop on long list of costs, the assumption for this element is that incentives are set equal under both factual and counterfactual

	(category A). This element could be used as an ongoing check if the incentives are aligned between factual and counterfactual throughout the process
TO Portfolio effect	Although this element is potentially relevant for the model, it is too complex to quantify with limited robust sources of data. Therefore, this element is not relevant for the methodology (category A)
Planning cost	This element is too difficult to quantify and therefore not relevant for the methodology (category A).

Benefits

Title	Analysis
Innovation in technology, process and system	This is one of the main benefits from early competition. However, due to the nature of benefit, there are limited data sources for quantification or easily observable market prices. As a result, these are most suited to be assessed under two parts 1) as a qualitative assessment under category B and 2) as a quantitative cost efficiency assessment under category C, requiring some sensitivity analysis.
Innovation in ecological impact and carbon emissions	These benefits are potentially relevant for the methodology, however there are limited sources of accurate data and quantifying these benefits could be complex. These could be incorporated in the model at a later stage once a number of projects have been run as successful bid submissions could be used as benchmarks. Therefore, they are most suited to be classified under category B
Innovation in social benefits	This element is not relevant for the methodology as social benefits from a consumer point of view may not directly be linked to the underlying solution being proposed. Therefore, they can be excluded from the methodology (category A).
Access to wider pool of debt and equity capital	These elements are one of the key drivers of benefits between factual and counterfactual. Both elements have potentially robust data sources from reliable market sources. However, due to the magnitude of impact on the outcome and results of the model, some sensitivity analysis will be required. Therefore, they are most suited to be classified under category C.
Portfolio effect	This is the flip side of the portfolio effect discussed as part of the costs. This benefit arises when there are efficiencies from developing solutions within their preferred geography or expertise. As this element is potentially quite difficult to define and quantify, they are most suited as a qualitative assessment factor (category B).
Revenue start point	This is mainly driven by the difference in timing of cashflows, with robust data sources. Therefore, they can be classified under category D. These costs could be relatively insignificant when discounted.
Reduced overrun exposure	This element could be relevant for the methodology; However, it is largely reliant on robustness of TO estimates. This stage to retain this element as a qualitative factor (category B) in the methodology and assess at a later stage if it can be moved to category C

Appendix 3 – Benchmarks

Cost of equity - Equity IRR benchmarks

Equity returns have been benchmarked using various sources, including target equity IRRs of bidders in competitive tenders and of investors in transactions and estimates of allowed equity returns by regulators. The table below summarises nominal whole life post-tax return benchmarks.

Project	Cost of Equity	Comparability to early competition	Date
Equity IRRs from transactions or bids for regulated utilities[15]	6.5% - 7.5%		2018
Heathrow Terminal 5 CoE regulatory settlement (mid-point)[16]	9.0%		2009
Required equity returns on Heathrow expansion project[17]	8.5% - 11.0%		2018
Target equity IRR for HPC underpinning negotiated CfD[18]	9.0%		2016
Target equity IRRs for OFTOs (competitive bids)	7% - 11% [19]		2017-18
Offshore wind target/assumed equity IRRs required by investors	8.0% - 12.0%		2014-18
IPPs target/assumed equity IRRs required by investors[20]	11.0% - 13.0%		2014 (latest)
School PFIs bid implied equity IRRs or bid assumptions[21]	10.5% - 12.0%	Projects follow a more typical project finance structure and so are more comparable to early competition. **Equity IRR range: 8.5 – 16%**	2015-16
Hospital PFIs bid implied equity IRRs or bid assumptions[22]	10.0% - 13.0%		2015
Housing PFIs bid implied equity IRRs or bid assumptions[23]	12.5% - 13.5%		2013-14

[15] This estimate is based on aggregated confidential market information on returns implied by selected recent transactions or bids for minority stakes in regulated utilities over the lifetime of these investments.
[16] This is estimated based on the midpoint of the real, post-tax cost of equity range set out in Competition Commission (2002), 'BAA plc: A report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd)', October, together with an inflation assumption of 2.8%.
[17] This estimate is based on the 'as-is' estimate of the cost of capital for the H7 price control period for Heathrow Airport Limited as set out in PwC (2019)
[18] National Audit Office (2017), 'Hinkley Point C'.
[19] The NAO found that 10-11% IRR requirements were seen in early deals (round 1), while subsequent tender rounds have seen in many cases equity returns falling closer to reported secondary market rates of return in PFI projects (around 7-9%).
[20] NERA (2013), 'Changes in Hurdle Rates for Low Carbon Generation Technologies due to the Shift from the UK Renewables Obligation to a Contracts for Difference Regime'.
[21] HM Treasury (2018), 'Private Finance Initiative and Private Finance 2 projects', March; and National Audit Office (2018), 'PFI and PF2'. Paragraph 3.10
[22] National Audit Office (2018), 'PFI and PF2', paragraph 3.13.
[23] This range is based on aggregated confidential market information on individual investors' target equity returns from transactions and/or bids for Housing PFI deals over the project lifetime.

Project	Cost of Equity	Comparability to early competition	Date
Transport PFIs bid implied equity IRRs or bid assumptions[24]	8.5% - 10.0%		2014
Private waste bid implied equity IRRs or bid assumptions[25]	13.0% - 16.0%		2017-2020

Cost of debt – Construction

Funding terms for construction offered by debt providers will vary, depending not only on the asset characteristics but also on the type of funding package offered. The tables below show indicative debt financing costs from major players in the infrastructure sector, and publicly available information on actual margins.

Market engagement feedback on the likely cost of debt for recent infrastructure projects

Project type	Facility	Average ticket size (£m)	Weighted average cost of debt	Notes
Tunnelling[26]	Long term bank (29 years)	108	LIBOR + 150bps to 210bps	Swap credit margins 15bps and 30bps not included
	Medium term bank (15 years)	106	LIBOR + 130bps to 260bps	Swap credit margins 7bps and 22bps not included
	Medium term bank (10 years)	106	LIBOR + 120bps to 250bps	Swap credit margins 5bps and 20bps not included
	Fixed rate bond	186	LIBOR + 160bps to 275bps	Assuming a BBB rating
	Fixed rate bond (delayed amortisation)	200	LIBOR + 175bps to 240bps	Assuming a BBB rating
	Indexed-linked bond	150	LIBOR + 200bps to 275bps	Assuming a BBB rating

Publicly available information on the cost of debt for recent infrastructure projects

Project	Facility	Average ticket size (£m)	Weighted average cost of debt	Notes
Silvertown Tunnel PPP	Term loan (18-29 years)	103	150-170 bps (floating rate)	Actual margins

Source: InfraNews

[24] This range is based on aggregated confidential market information on individual investors' target equity returns from transactions and/or bids for PFI deals over the project lifetime.
[25] This range is based on aggregated confidential market information on individual investors' target equity returns from transactions and/or bids for Private Waste deals over the project lifetime.
[26] KPMG analysis based on the feedback from more than 25 banks and institutions for a large infrastructure asset in 2017

Cost of debt – Operations

The Offshore Transmission Owner (OFTO) regime involves the procurement of operation and maintenance of a constructed asset.

The table below sets out the financing costs from OFTO tender rounds 1 to 6.

Project	Tender Round	FC Date	Transfer Value	Security type	Gearing	Maturity	Margin
Barrow	1	28 Sep 2011	£34m	Term loan	81%	17.5 years	Libor + 220bps
Gunfleet Sands 1&2		20 Jul 2011	£50m	Term loan	84%	19 years	Libor + 195 bps
Robin Rigg		1 Mar 2011	£66m	Term loan	84%	20 years	Libor + 200 bps
Walney 1		21 Oct 2011	£105m	Term loan	85%	19 years	N/A
Walney 2		26 Sep 2012	£110m	Term loan + £5m liquidity facility	87%	19 years	Libor + 240 bps
Sheringham Shoal		27 Jun 2013	£193m	Term loan + £6m liquidity facility	91%	19 years	Libor + 220 bps
Greater Gabbard		27 Nov 2013	£317m	Bond issuance + EIB credit enhancement	87%	19 years	4.137% coupon (gilts + 125 bps)
West of Duddon	2	21 Aug 2015	£300m	Bond issuance	85%	19 years	3.446% coupon (2027 gilts +145bps)
Lincs		4 Nov 2014	£308m	Term loan	50%	19 years	Libor + 150bps
Gwynt y Mor		18 Feb 2015	£352m	Bond issuance	87%	19 years	2.778% coupon (2025 gilts +110bps)
London Array		10 Sep 2013	£459m	Term loan + £3m liquidity facility	N/A	19 years	Libor + 220 bps
Westermost Rough	3	4 Feb 2016	£172m	Term loan	83%	19 years	Undisclosed (index linked)
Humber Gateway		7 Sep 2016	£142m	Term loan + EIB facility	87%	19 years	N/a
Burbo Bank	4	26 Apr 2018	£194m	Term loan	80%	19 years	N/a
Dudgeon	5	7 Nov 2018	£402m	Bond issuance	86%	13 years	3.158% coupon (2030 gilts + 155 bps)
Race Bank		10 Oct 2019	£472m	Term loan + £3m liquidity facility	91%	20 years	RPI + 130 bps

Galloper	6	25 Feb 2020	£282m	Term loan + £2m liquidity facility	92%	20 years	RPI + 157 bps; RPI + 125 bps
Walney Extension		8 Jun 2020	£447m	Term loan + £2m liquidity facility	92%	20 years	RPI + 125 bps
Hornsea One		3 Mar 2021	£1,200m	Term loan + IL institutional debt	92%	25 years	N/a
Beatrice		29 Jul 2021	£438m	Term loan + IL institutional debt	89%	23 years	N/a

Source: InfraNews, IJ Global, Ofgem and KPMG Offshore Transmission: An Investor Perspective, February 2014

Analysis of the financing trends across OFTO tender rounds provides insight into how the continuing development and increasing maturity of an asset class can impact the type of financing package and margins that can be achieved.

Trends observed over the 5 tender rounds

- The overall cost of financing has fallen between the tender rounds driven mainly by (i) improved terms of debt providers (EIB finance), (ii) lower borrowing costs, and (iii) lower required equity returns from investors, as the asset class has become more mature.
- From tender rounds 1 to 3, this asset class saw an increasing interest in offering a larger equity portion. This deleveraged , “thick SPV” structure may better support pension funds and other long term investors who typically accept lower returns. Although the effect of cheaper equity is offset by having lower leverage, the overall cost of capital could be lower, particularly since the lower leverage may also allow banks to offer better terms e.g. EIB.
- In tender rounds 4 and 5, a higher leverage is observed for the projects coupled with longer maturity; Bank loan terms become more favourable, contributing to an overall lower cost of capital. Even margin on bond issuance has decreased in tender round 5 compared to bond issuance in previous tender rounds, showing improved financing costs.
- Margins on debt have been falling reflecting improvements in debt market conditions and the benefits of inflation linked financing arrangements.
- The earlier deals were financed on a c.98% availability assumption. In practice, projects have delivered a higher level of availability – close to 100%.

Base rates

Updates to the base rates and given contracting periods will be considered at the time of running the CBA. Based rates are taken from a forward curve calculator for base rates calculated based on the forward markets. This is based on an assumed construction period of five years and a revenue period of 45 years. This assumes construction starts in two years and operations in 7 from now. The tenor was calculated based on the Weighted Average Life (WAL) of the loan for a 50-year period. Base rates may fluctuate between different lengths of tenor or forward periods but for the high-level purpose of this analysis the below base rates are assumed to be applicable to all projects.

Debt period	Instrument	Tenor (years)	Forward (years)	Base rate[27]
Construction	Libor 6m	5	2	0.396
Operations	Libor 6m	25	7	0.461

Gearing – PPP projects by sector

The project's gearing will affect both the cost of debt and the cost of equity. Gearing ratios have been looked at for over 80 Public-Private-Partnership projects to derive a comparator average.

For Public-Private-Partnership (PPP) and Private Finance Initiative (PFI) projects gearing is typically high, however, this varies by asset class and reflects the project risk profile of each.

- Higher-risk projects, such as airports, healthcare and waste require a greater equity investment which results in a lower gearing.
- Lower-risk projects such as education, social housing and other social infrastructure projects achieve a higher level of gearing.

Sub-Sector	No. projects in data set	Duration (years)	Transaction size (£m)	Min-max gearing range	Average gearing
Accommodation	8	8 - 52	17 – 225	80 - 97%	89.63%
Bridges & tunnels	3	16 - 30	847 – 2,750	72 – 92%	84.67%
Courthouses	1	30	275	96%	
Defence	2	17	500 – 600	84 – 92%	88%
District heating and cooling	1	25	58	70%	
Education	15	24 - 30	23 - 242	90 – 97%	92.80%
Energy from waste	9	25 - 35	47-400	55 - 87%	75.11%
Healthcare	20	19 – 28	29 - 1,308	68 – 90%	80.15%
Police facilities	1	25	112	90%	
Ports	1	10	43	90%	
Roads	14	12 - 39	123 – 2,023	60 – 95%	83.86%
Social housing	2	25	102 – 124	90 – 93%	91.5%

[27] Source: Thompson Reuters Eikon FWDC calculator

Social infra other	1	30	56	93%	
Street lighting	2	20 – 30	51 - 330	72 – 92%	82%
Urban rail transit	1	31	418	93%	
Waste	3	25 – 28	38 – 1,100	40 – 81%	70%
Water	1	25	708	92.2%	
				Average	85.67%

Source: KPMG analysis based on aggregated confidential market information on individual transactions and/or bids

1 – HM Treasury (2017) Private Finance Initiative and Private Finance 2 projects: 2017 summary data

Capex efficiency – Literature Review

This section sets out the results of a literature review into capex efficiency. The review covers evidence from the delivery of a range of asset classes in different sectors. This literature review is an indicative overview and not expected to be a comprehensive list of all potential literature sources available.

Study	Methodology and key comments on PPP/PFI efficiency gains	Efficiency range of total capex
Infrastructure Partnerships Australia (2007) Performance of PPPs and Traditional Procurement in Australia	• The Infrastructure Partnerships Australia (IPA) 2007 study considered efficiency of PPP relative to traditional procurement approaches in the provision of public infrastructure. • Study separated project into four periods and examined the project management and construction phases of projects recording costs incurred compared with cost anticipated. • It considered 206 projects (50 PPP and 156 traditional public procurement) undertaken since 2000, larger than $20m and matched the complexity of PPP to traditional delivery projects. • Traditional procurement is associated with optimism bias which is defined as the differential between capex cost between the project inception and completion of work. A Mott Macdonald study of large public procurement in UK showed that non-standard projects have greater levels of optimism bias. • The study compared reported cost overruns between traditional delivery and PPP delivery. The difference between the cost overrun is the assumed capital expenditure efficiency under PPP delivery. • PPP projects, from contract to completion, had a cost overrun of 1.2% whereas traditional procurement overran by 14.8%. • The upper end of the range of efficiency covers the full period from inception to work completion whereas 11.4 runs from contract commitment to work competition. 11.4% capex efficiency covers a more analogous period to early competition than the other 3 periods considered in the study.	11.4 – 30.8%
NAO (2009) Performance of PFI construction	• 2009 study focused on the performance of PFI construction projects against contracted timetable and price. • Evidence comes from two surveys undertaken by NAO in 2008 of public sector construction projects with capex greater than £20m and completed between 2003 and 2008. A total of 151 projects have been assessed as part of the study.	n/a

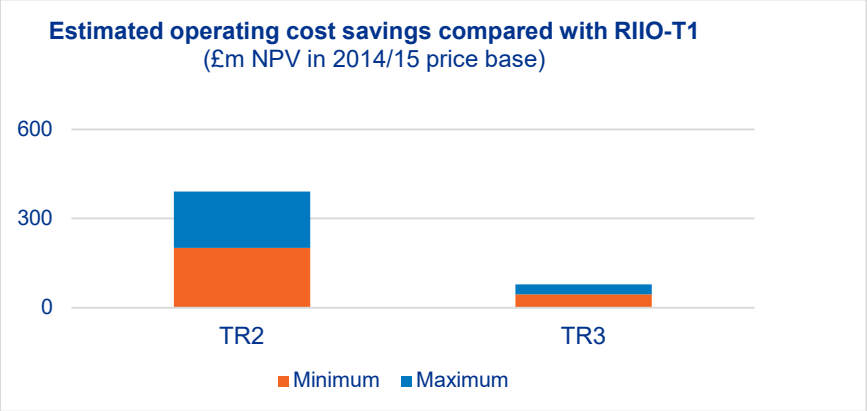
	• 94% of the projects reported to deliver on or less than 5% over price and the remaining reported that price increased of 5% and over. One project reported delivery below the contracted price. • This analysis does not compare expenditure under a PFI model to traditional procurement but examines whether PPP/PFI models deliver on budget or are characterised by cost overruns.	
Blanc-Brude, F. et al. (2009) A Comparison of Construction Contract Prices for Traditionally Procured Roads and Public–Private Partnerships	• 2009 journal article published in the Journal of Industrial Organisation looks at road construction PPP contracts in the EU over the past 15 years in Europe. Data for the analysis was sourced from project appraisal files of the EIB. • Analysis suggest that the ex-ante price under a PPP contract is 24% more expensive than the ex-ante price under traditional public procurement. • The difference in ex ante price between PPP and traditional procurement is of a similar magnitude as the cost overruns that are typically observed in traditional public procurement in the European road sector. • The largest part of the difference between PPP and public procurement reflects the price that the public sector pays in order to avoid cost and time overruns as well as specification changes. • In addition to the risk transfer around cost overruns PPP construction costs could be higher due to the bundling of construction and operation into one contract that may generate additional upfront investment and even the recouping of higher transaction costs as the article argues. • The study does not look at outturn prices and life-cycle costs under the PPP contract.	n/a
RICS (2011) The Future of PFI and PPP	• 2011 report issued by the Royal Institute of chartered Surveyors (RICS). • There is a lack of robust and objective data on PPP contract efficiency in comparison with conventional procurement. This is compounded by the opaqueness and complexity of PPP contracts. • Comparative assessments fail to take into account 'fixed price, fixed-term, turn key constructions contracts' which are integral to PPP agreements.	n/a
NAO (2018) PFI and PF2	• NAO briefing on the rationale, costs and benefits of the PFI 1 and 2 and the introduction of PFI 2. • Treasury Committee found that some PFI projects charge higher prices for construction to cover unforeseen costs. NAO report on PFI housing stated significant capital cost increases compared to initial estimates. • Department of Education has focused on the impact of private finance procurement on construction costs and has found that the financing route offers little to no effect on construction costs of schools as part of Priority School Building Programme. • The report concluded that fixed price benefits can be achieved without the use of long-term private finance contract.	Limited evidence for any efficiency
World bank blogs (2018) Using guarantees to drive efficiency gains in road PPPs by reducing costs	• According to the 2018 report, construction risk in Infrastructure Project Finance from EDHEC show that for a large number of transport infrastructure PPP projects, (including roads), construction overruns are significantly lower at 3.3% on average compared to public procurement projects, with a 26.7% overrun average. • This means that on average efficiency gains from overruns between public procurement and PPPs are around 23.3%.	23.3%

	• The efficiency gains accrue from allocating to the private sector certain risks that are better managed by the private sector, such as those associated with construction costs. • However, efficiency gains may be limited by a country's minimum risk rating of at least BBB which can lead to costs of financing to be higher than the potential gains.	
New South Wales Treasury Value For Money in PPP Procurement	• Based on a study carried out by Alan Consulting in Australia, PPPs exhibit cost efficiency over traditional projects ranging from 30.8 % when measured from project inception, to 11.4% when measured from contractual commitment to the final outcome. • PPPs were found to be completed 3.4% ahead of time on average, while traditional projects were completed 23.5% behind time. • On a contracted $4.9 billion of PPP projects the net cost over-run was only $58 million, whereas the net cost overrun for $4.5 billion of traditional procurement was $673 million. • The National PPP Forum Benchmarking Study by the University Melbourne suggests that in meeting budgets, PPPs were 35.1% better than traditional procurement. • Post contractual close, PPPs had an average cost escalation of 4.3%, compared to 18% for traditional projects. • During construction, the average PPP delay was 2.6%, while the average for traditional was 25.9%.	11.4% - 30.8%
AESO Alberta Powerline Limited Partnerships – 500kV Transmission Project	• Competitive contract for the Fort McMurray West 500-Kilovolt Transmission Project awarded by the Alberta Electric System Operator (AESO). • Five bidders were shortlisted and submitted a technical proposal and one for price and bid evaluation was done on a balanced basis between technical assessment and price. • The successful bidder 'the Alberta PowerLine Limited Partnership submitted a bid of $1.433bn for the right to design, build, finance, operate and maintain the asset for a period of 35 years. • Prior to competition AESO's planning cost estimate had been $1.6bn for the construction portion alone suggesting savings of 11%.	11%
Ofgem (2016) Extending competition in electricity transmission: impact assessment	• 2016 report by Ofgem assessing impact of their decision to extend the use of competitive tendering to onshore electricity transmission assets that are new, separable and high value. • The assessment compares the preferred option to extend competition to onshore electricity transmission under an early and later model against a counterfactual which assumes the continuation of current arrangements for the delivery of the assets. • Analysis uses broadly comparative examples from GB and other countries when assessing potential benefits and cost assumptions. • Ofgem expect competitive tendering to put downward pressure on capital and operational expenditure. • True costs likely to be faced by monopoly companies creates problems of information asymmetry which is particularly problematic because new, high-value projects have not come forward historically. • Ofgem expect bidders to put forward lower costs than incumbents estimating the cost of construction. • Early tender models which include construction internationally came in between 20 – 60% below project cost/incumbent bid.	Evidence suggest some opex savings within total savings at bid stage between 20% – 60% versus incumbent

Opex efficiency - OFTO model

Ofgem commissioned a report by CEPA to look into the benefits of the OFTO tender rounds suggests that competition has driven down operating costs.

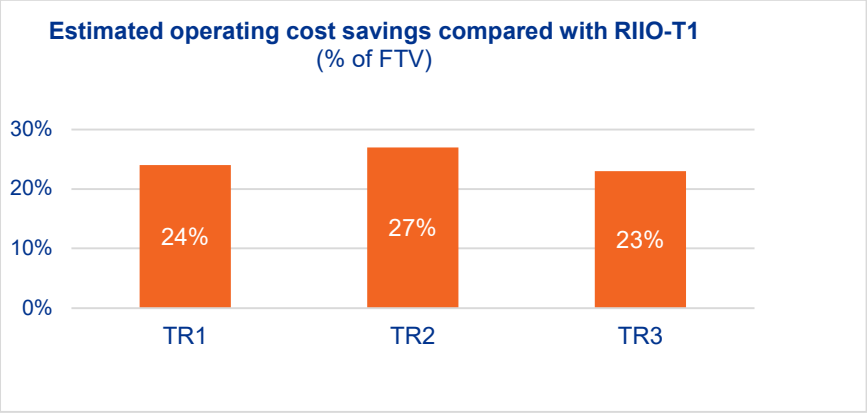
- Ofgem's evaluation indicates that tender rounds TR 2 and TR3 realised operating costs savings when compared to delivery by the incumbent.
- Operating costs as a percentage of Final Transfer Value (FTV) were lower in TR2 than TR1 but higher in monetary (£m) terms (due to the higher overall value of the projects tendered in round 2. Also, in TR2, the incumbent's opex was closer to the preferred bidder's costs than in TR1.



Source: CEPA (2016) Evaluation of OFTO Tender Round 2 and 3 Benefits;

The Net Present Value (NPV) delivered via operating cost savings in TR2 ranges between £201m and £391m, while in TR3 it is between £45m and £79m compared to a delivery under the RIIO T1 framework.

The higher savings for TR2 than for TR3 are likely to be driven by differences in project sizes.



Source: CEPA (2016) Evaluation of OFTO Tender Round 2 and 3 Benefits;

All three tender rounds allowed for a cost saving of above 20% when compared to a counterfactual based on NGET's RIIO T1 price control.

The increase in savings between TR1 and TR2 shows that a market maturity can drive costs down. The trend from TR2 to TR3 reflects a change in the basis of the counterfactual to reflect the savings achieved by the preferred bidder rather than the average bidder level (as was the case at TR1).

Opex efficiency – Literature Review

This slide sets out the results of a literature review into opex efficiency. The review covers evidence from the delivery of a range of asset classes in different sectors. This literature review is an indicative overview and not expected to be a comprehensive list of all potential literature sources available.

Study	Methodology and key comments on efficiency gains	Efficiency range of total opex
CEPA (2016) Evaluation of OFTO Tender Round 2 and 3 Benefits	• Ofgem commissioned CEPA to undertake a study of the benefits of the OFTO TR2 and TR3 benefits. • Comparative study compared operating expenditure of OFTOs against a series of counterfactual scenarios. • The percentage range based on the savings of the OFTOs tender revenue stream against the counterfactual scenarios. • The merchant counterfactual is less applicable to early competition as it takes cost assumptions from a similar industry whereas the regulated counterfactual extends the current regime. • Figures apply across 20 years of OFTO licence and are projected real costs	19-23% for the regulated counterfactuals and 22-31% for the merchant counterfactuals
Frontier Economics (2016) CBA of the potential introduction of competitively appointed transmission operators	• National Grid commissioned Frontier Economics to undertake CBA of competitive onshore transmission projects. • The report criticises the use of OFTOs as a precedent as it involves the transfer of assets which have already been built and therefore do not hold construction risk. • The report notes that OFTOs largely subcontracts O&M activities with the associated risks passed through to the contractor. • Criticism of the precedent highlights that the procurement or contract management of subcontractors could be replicated and similar cost reductions could be made under achieved by an incumbent transmission operator.	Evidence suggests limited cost efficiency
NAO (2018) PFI and PF2	• NAO briefing on the rationale, costs and benefits of the PFI 1 and 2 and the introduction of PFI 2. • NAO work on PFI hospitals found no evidence of operational efficiency over 10 years. More recent data from NHS London Procurement Partnership shows costs of services are higher under PFI contracts. • Respondents to 2017 survey considered that operational costs were either similar or higher under PFI contracts.	Evidence suggests limited cost efficiency

Procurement costs – Literature Review

This slide sets out the findings of a literature review into precedent for procurement costs under other competitive procurement models. This literature review is an indicative overview and not expected to be a comprehensive list of all potential literature sources available.

Study	Methodology and key comments on PPP/PFI procurement cost	Procurement cost (as a % to total project costs)
Allen, G. (2003) The Private Finance Initiative (PFI)	• The research paper from 2003 sets out considerations on tender costs using examples of specific PFI projects where possible. • PFI tendering costs are far greater than the average tender costs of other procurement methods; And this remains true no matter what the project size. • These tendering costs are likely to be underestimated, since many of the contractors approached revealed only the cost of achieving preferred tenderer status. The full costs, including the contract negotiation stage, are greater – perhaps not 0.5%, but 1% more. • Unlike other procurement methods, where tender costs diminish as a percentage of the total, there are no economies of scale with PFI tendering. There is instead a tendency for costs to increase as a percentage of the total. • The report finds the total cost of tendering for a PFI project to all potential contractors to be just under 3% of expected total costs while for traditional procurement the total costs accounted for just under 1%	< 3%
Saidan Khaderi, S. et al. (2019) Public Infrastructure Project Tendering Through Public Private Partnerships (PPP) – A Literature Review	• The report provides a literature review focusing on tendering procedures of PPP/PFI projects. • PPP/PFI tendering procedure is more complicated and costlier compared to traditional process. • Example, in UK's PFI project tender costs, Design and Build and traditional method reveal high total project cost as compared to PPP/PFI (higher range between 0.48% to 0.62%).	0.48% - 0.62%
Ofgem (2017) Decision on Shetland New Energy Solution Ofgem (2017) SHEPD Reopener decision letter Ofgem (2017) Consultation on the cost of the new energy solution for Shetland	• Three documents published by Ofgem related to a proposed alternative energy solution for an isolated Scottish Island – Shetland. • The project value is given at £581.7m and the procurement costs at £2.91m. • Notably this project has since been cancelled due to the difference between the solution costs and alternative measures.	0.5%
Ofgem (2016) Extending competition in electricity transmission: impact assessment	• Ofgem provides an updated assessment of the impact of extending competition to onshore electricity transmission assets. • Analysis includes an assessment of bid costs based on Ofgem's experience in OFTO rounds 1, 2 and 3.	1-3%

Bid costs – Literature Review

Bid costs will reflect the nature of the project and the context of the procurement, including familiarity of the procuring parties with the process. A literature review has considered precedent projects in the social, rail, road and energy sectors.

Key drivers of bid cost

- **Deal complexity:** Resulting in longer and more intense procurement phases causing detailed clarifications after bid submission.
- **Level of certainty required by procuring authority before it appoints a Preferred Bidder:** Extensive bid requirements, in particular on design and operational elements. requires bidders to incur significant expenses.
- **Length of the procurement process from market announcement to Financial Close.**
- **Experience and expertise of the procuring authority in driving the bid process:** Ensuring timely and effective communication and generally managing an efficient procurement process.

Bid costs	Social accommodation sector	Rail sector		Road sector	Energy (OFTO TR1-3)	% breakdown of total bid costs (avg)
Project Size	Circa $3bn	Example Project 1 (circa $6bn)	Example Project 2 (circa $2bn)	circa $2bn	£34m – £459m	-
Planning	Not actively tracked	Not actively tracked	Not actively tracked	Minimal		Minimal
Market sounding	Not actively tracked	Not actively tracked	Not actively tracked	Minimal		Minimal
Expression of Interest	$200K	$600K	$1M	Minimal		0.5 – 3.5%
RFP preparation, interactive tender process and responding to clarifications	$20M	$34M	$17.5M	$25M - $30M		60 – 75%
Post RFP Q&A / negotiations	$1.5M	$4.5M	$1.6M	$10M - $12M		5 – 25%
Contract close / Financial Close	$7.5M (forecast)	$10M	$7.5M (forecast)			20 – 30%
Total (approx.)	**$30M**	**$50M**	**$28M (forecast)**	**$35M - $42M (forecast)**		**100%**
Total bid costs (% of total project costs)	**1.0%[28]**	**0.8%1**	**1.4%**	**1.8%-2.1%**	**1-3%[29]**	

[28] *NSW Treasury, December 2015, Reducing procurement bid costs (https://www.treasury.nsw.gov.au/sites/default/files/2017-03/Bid%20costs%20-%20Report%20-%20Reducing%20Private%20Sector%20Bid%20Costs%20_%20Final%20Draft.pdf), KPMG analysis*

[29] *Ofgem (2016) Extending competition in electricity transmission: impact assessment*