

RIIO-T1 reopener consultation: One-off Asset Health Costs (Feeder 9)

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Please find the Business Modelling Associates UK LTD response to Ofgem's RIIO-T1 reopener consultation: One-off Asset Health Costs (Feeder 9). Business Modelling Associates (BMA) is a leading business analytics and solutions development firm operating in the UK, Europe and Africa. We design solutions that help clients systemically and holistically model their end-to-end operations, analyse what-if scenarios and explore how potential changes affect service, costs, investor returns, sustainability and risk. BMA have been active in the UK since 2013 and their services and solutions are widely used in the UK Utility sector, particularly water, wastewater and bioresources.

Overall, BMA were pleased that our Extreme Value Analysis (EVA) approach in support of the Feeder 9 CBA was validated by the independent peer reviews by Cranfield University (commission by NGGT) and Cambridge University (commission by Ofgem). However, we were disappointed with several comments and concerns on the EVA approach in the RIIO-T1 reopener consultation published on the 8th August 2018. Here are our responses to the concerns raised in the consultation.

Business Modelling Associates UK LTD response to Ofgem comments:

Ofgem concerns in summary: There was a general Ofgem concern regarding the use of proprietary software and lack of transparency of that software which ultimately drove Ofgem to develop their own simplified MS Excel model.

BMA response: The EVA approach was fundamentally developed to be able to include tail end risk within a single CBA analysis. This required modelling large numbers of uncertain variables and their interdependencies. This required the use of the proprietary software and **would not be possible in** more widely available spreadsheet-based software such as **MS Excel**. Specifically:

- Ability to model large numbers of stochastic functions in a time series model.
- Ability to model both the divergence of decisions or events into multiple possible impacts, and the convergence of multiple possible causes to common impacts.
- Ability to comprehensively model the range of risk (probabilities and impacts) including tail end risk using Monte Carlo analysis.
- The ability to model and manage the large scale and complexity of the decision tree capturing the knowledge of multiple domain experts across NGGT.

The Monte Carlo approach was the critical functionality provided by the proprietary software allowing the CBA to capture tail end risk. To illustrate, the Ofgem MS Excel model only takes two probability values (low and high) to represent the full range of uncertainty. These two values are within the wider and more granular range of values run through the EVA model Monte Carlo for each scenario. The consequence being that that the EVA model quantified 1000's of values for each uncertain variable (probability or impact) rather than the snapshot of only two values achieved in

Excel. It also allowed 1000's of combination of variables to be tested rather than the two combinations (scenarios 1 and 2) achieved in Excel. This ability significantly reduced the need to use averages and snapshots that invariably downplay or ignore tail end risk.

We note that Ofgem raise transparency as an issue, which clearly in itself should not be a reason for seeking to simplify and dumb down a model in Excel. Given the sheer scale of the EVA model and volume of results there is a lot of data to understand. However, through provision of further detailed results and face to face meetings with Ofgem, much additional detail on assumptions and values were provided. This included tabular results in excel providing the probability and costs associated with every link and node in the decision tree, and high-resolution diagrams of the decision tree.

Response to specific Ofgem concern 4.10:

"4.10. However, the additional engagement with NGGT on the model allowed us an opportunity to critically review some of NGGT's assumptions. Following this review, we raised a number of supplementary questions, one of which resulted in NGGT identifying a serious error in model logic and assumptions. NGGT then issued a short update to the CBA report. However, a number of our concerns with the assumptions remain unresolved. We consider that these errors, coupled with the overall lack of transparency, cast considerable doubt on the reliability of the EVA model and its results."

BMA Response:

There were two changes made to the model following provision of the core report, detailed results in Excel format, and the in-depth, 4-hour, review of the EVA model (in person) with Ofgem. One was a change in assumption as to how NGGT would respond to a small but growing free span, the other was a single minor error regarding the impact of gas ignition. The change and corrections were quickly made to the model, and neither had a substantial or fundamental effect on the results. Therefore, we challenge whether this can be classified as a "serious error", and most certainly not "a number of" errors as Ofgem seem to have wrongly concluded.

For the two core scenarios, the impact of the two minor changes combined was as follows:

Scenario	Original NPV	Updated NPV
Tunnel Replacement start in 2012	-£214m	-£210m
Stop Tunnel 2016 and Mitigate	-£292m	-£280m

As can be seen the results have tightened but not fundamentally changed. We also note that despite the challenges experienced in communicating the large and complex analysis and set of results, it is testament to the effort put into communicating and visualising the decision tree that such a nuanced discussion of the logic (reflected in the decision tree) around how a developing free span would be managed took place between NGGT and Ofgem.

Response to specific Ofgem concern 4.12:

“4.12. The independent review made a number of observations about the methodology and its implementation, and concluded that the model results are sensitive to a number of key assumptions, and “tiny differences in probabilities” drive the differences in the costs and benefits of different options. Under these circumstances, the review recommends that the investment case should not rely solely on the results of the EVA CBA, but should also consider other approaches such as a more traditional CBA.”

The fundamental premise for the approach taken here was to address the very issue of carrying out a CBA where there are a large number of uncertain and interdependent variables: where a tiny difference in probability may drive significant changes to costs and benefits. The decision tree approach (to capture interdependencies based on data and engineering judgement) and Monte Carlo approach (to capture the impact in variable uncertainty) were the core approaches used to address this. This is fundamental to the approach taken. The ability of the EVA methodology developed and applied to quantify the range of uncertainty around the NPV of each investment option as a box plot is testament to this. This functionality was then lost in the Ofgem MS Excel version of the model, where this concern raised in 4.12 would be more valid. Furthermore, in addition to the Monte Carlo, we carried out an extensive range of stress tests specifically targeting the tunnel replacement options, for example reducing the probability of free spanning by 90%. These results were included in full in the core report.

Response to specific Ofgem concern 4.13:

“4.13. We consider that the EVA methodology and its ability to inform investment decisions is severely compromised as a result of the lack of transparency and the extreme sensitivity of results to different subjective assumptions. Combined with the fact that the methodology is novel and untested, we do not consider it, on its own, to be developed enough to provide a sound basis for informing high-value investment decisions.”

The EVA model and results were never intended to be standalone, but rather contribute to the overall business case: specifically, through better inclusion of uncertainty and tail end risk. In this regard we are confident the EVA project does this, providing valuable insight and understanding to the overall business case. In particular, the very detailed EVA model directly informed and shaped the MS Excel CBA models produced by NGGT and Ofgem.

With regards being a novel and untested methodology. We refer to the peer review (commission by Ofgem) by Dr Robert Ritz, Assistant Director, Energy Policy Research Group (EPRG), Cambridge Judge Business School, University of Cambridge who clearly states the fundamental financial economical model approach is robust:

“The EVA methodology presented in the report is based on standard financial economics and is, in general terms, a suitable methodology for CBA of investment options involving low probability high impact events. The standard “highest NPV” criterion is used to choose between different investment options.”

Regarding the technology platform used. The proprietary software used, Enterprise Optimiser by River Logic, is used globally across a wide range of industries from Mining, to Oil & Gas, to Healthcare. It is widely and highly regarded by global IT analysts, most notably Gartner in terms of maturity and capability. It has been used globally since 1984 and in the UK Water Utility Sector since 2011. Therefore, the platform also cannot be described as novel and untested.

In summary, we would make the strong point that, fundamentally, the EVA approach constitutes a step forward in ability to model uncertainty and tail end risk within CBA to inform asset investment planning in the UK Gas Utility sector. While there are areas that we can all learn from, the response should not be to take a step back to existing, spreadsheet approaches, that fundamentally cannot account for tail end risk. Therefore, for example, where there are varying opinions on the probabilities of free spanning (which is to be expected given the paucity of data available) these should be run through the EVA model to understand the impact of that variance in the round, rather than for a few 'snapshots'.

Finally, we find it surprising to say the least that an economic regulator defaults to MS Excel as its preferred tool for assessing significant value based, multi-faceted and extremely complex decisions. We are not aware that Ofgem prescribe a mandatory MS Excel approach, there would be little business improvement and innovation if this were to be the case.

Yours sincerely,

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