A Commentary on NERA's Cost Benefit Analysis of Transmission Losses Proposal prepared for Powergen

by

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1 Summary

Using a cost benefit analysis is one of a number of methods to appraise an investment. In the case of Modifications to the BSC it is normally limited to assessing the effect on Elexon's systems. In the present case, the TLMG agreed that it may be useful to apply a cost benefit analysis more generally.

However, criticism of the paper falls into two main areas: the appropriateness of the approach used when applied to the BSC Objectives, and the assumptions used in the analysis.

The BSC Objectives, NGC's licence conditions and the Utilities Act already incorporate the consideration of welfare benefits to society. To rely on these elements in a cost-benefit analysis of the Modifications is therefore not appropriate. The BSC Objectives validly imply cost-benefit analysis in terms of central systems but consumer benefit is otherwise delivered through competition in generation and supply. Implicit in this is that risk resides with such parties who will not pass on gains and losses to consumers except through the route of competition.

Like any forecasting method, cost benefit analysis is sensitive to the assumptions used. In the main, reasonable assumptions have been used in the analysis and, other than the specific points made in this critique, it is probably not wise to challenge those assumptions. However, the approach is fundamentally driven by the net national welfare objective, which increases the number of assumptions that must be made because it is so much broader than the BSC objectives.

The assumptions used in this cost benefit analysis do not always take account of the present conditions in the electricity supply industry. In other cases the assumptions may understate the effects of elements. A crucial element in this is the ignored load growth, which impacts on the costs of avoided generation and the costs of systems.

Using the different assumptions suggested in this commentary would give a different result for the cost benefit analysis. Accepting the net national welfare approach on adjusted assumptions would lead, probably to a negligible net effect, whereas restricting the analysis to those appropriate to the BSC Objectives could well lead to a positive effect of the approach.

Finally, a fundamental drawback to the approach is its static nature. It does not model the complex behaviours that result from the response to competition. Given the length of the period modelled, the model does not take into account the cumulative effects of innovation and competitive response.

Overall, the cost benefit analysis provides one view of what may happen if a losses scheme were to be introduced. It is by no means the only view, and the approach has limitations. This suggests that the TLMG should take account of the study but should be aware that it does not represent a definitive study of the effects of the introduction of a losses scheme.

2 Introduction

The report on the cost benefit analysis was prepared by NERA and tabled at the meeting of the Transmission Losses Modification Group held on 23 October 2002. This work was the result of an action placed by the Modification Group on NERA, but the Group did not have time after the end of the consultation process to consider it in detail.

Campbell Carr has prepared this report for the proposer of the P75 Modification, Powergen, to assist in the assessment of the analysis and for the Modification Group's report to the BSC Panel. Given the short time available the commentary makes observations and, where appropriate, proposes alternatives to the inputs used by NERA in its modelling approach, it does not attempt to replicate the analysis.

There are several techniques that may be used to consider the efficacy of a development. In the case of appraising Modifications P75 and P82 the TLMG agreed that a cost benefit analysis may help the Group in its work. NERA has used the approach of cost benefit analysis that assesses economic efficiency as a measure for the net benefit to society as a whole.

Economic modelling of this nature uses assumptions and data that will be subject to interpretation. In some cases such inputs will provide a reasonable forecast of the effects of actions; in other cases they may give results that vary from the systems being modelled. The correlation between modelling and the modelled system will to a large extent depend on the assumptions used in the modelling.

Now that that the report is available it is clear that this approach is less appropriate for use to assess BSC Modifications than the TLMG originally thought.

There are points of principle about the methodology that bring into question the appropriateness of the approach in these circumstances. Also, using different assumptions and input data will give different results. The following sections consider the application of cost benefit analysis as an appropriate methodology, the assumptions used and how different ones may give different results and comments on the inputs into the modelling.

3 Principles

There are three points of principle concerning the use of cost benefit analysis in the consideration of the Modifications. First, is that the BSC Objectives already take account of the efficiencies that the cost benefit analysis seeks to quantify; second the assessment of benefit to society as a whole is out of scope of the BSC and third, cost benefit analysis is a static analysis.

3.1 BSC Objectives

The TLMG concluded that, in the case of these two Modifications BSC Objectives (b), (c) and (d) were relevant. These are

> (b) The efficient discharge by the Transmission Company of the obligations imposed under the Transmission Licence;

(c) Promoting effective competition in the generation and supply of electricity and (so far as is consistent therewith) promoting such competition in the sale and purchase of electricity and

(d) Promoting efficiency in the implementation and administration of the balancing and settlement arrangements.

Cost benefit analysis can only ever take limited account of competition issues and only to the extent that they may impact on elasticities of supply or demand. It cannot address the central BSC Objective of competition in generation and supply.

Cost benefit analysis is better at addressing efficiency. However, in terms of the BSC, it is efficiency in network operation and BSC administration that are relevant rather than the more general economic efficiency of UK plc on which the NERA analysis is based.

As a more general principle, it was the implied intent of the BSC objectives that consumer benefit should be directed, under the BSC, by efficient use of the network – lowering transmission costs – and competition between generators and suppliers to ensure that there was no monopoly rent being earned in these activities.

In the case of transmission losses, consumer benefits are taken into account in terms of the allocation of costs more accurately to remove cross subsidies. In turn that would give more efficient outcomes as parties develop their approaches to competition.

The effects on consumers' behaviour and the welfare benefit to society may be of interest, but the Panel will have to consider whether removing cross subsidies and a better allocation of costs gives rise to more efficient outcomes than the present arrangements. At its most basic, the implementation of either modification would promote competition. In which case, the panel has to assess whether this statement is true, it cannot analyse the impact on society as a whole.

3.2 The static nature of CBA analyses

Cost benefit analysis is one of a range of methods that may be used to analyse an investment in wide terms. In the present case it can give an indication of the effects, but the limitations of the approach suggests that caution should be used when using it to assess the Modifications. It is a static approach does not take account of interactions between elements that arise as a result of changes in behaviour.

The promotion of competition will give rise to innovation that will in turn develop further efficiency. Unless the modelling takes account of these iterations it cannot forecast accurately the effect of innovation and parties' responses to competition. In practice, their behaviour will be more complex and would require more complex systems to model such changes.

The approach also assumes that classes of customers will operate in a uniform manner, largely as rational economic entities. However, parties will react differently to the implementation of a transmission losses scheme. For some a losses scheme may be a major influence on their behaviour. Some parties may gain from the implementation; others may lose from it. On the other hand some parties may be

indifferent, or less affected by such costs. In other cases the change in behaviour may be counter intuitive.

4 Assumptions

The results of modelling are dependent on the assumptions and the data used in the modelling. For example, fuel and energy prices will change; over the long term the new entry cost will alter as plant efficiency changes and the costs of technology changes. Demand growth and changes in economic behaviour that may affect that growth will also differ from the assumptions made by the model.

Using alternative assumptions to those used in this modelling and which are suggested below would give a different result in a cost benefit analysis.

4.1 Discount rate

Using the government's 6% consumer welfare discount rate may be appropriate to consider social benefits, but investments in the electricity supply industry typically use a different rate of at least 10%. This higher rate would be more appropriate in this case because it is the way generators (in particular) and suppliers respond to a change to the losses regime that will, in practice, determine the net costs and benefits (even when measured on a total society basis).

4.2 Demand growth

Demand for electricity in the country will grow during the decade. NGC's Seven Year Statement forecasts a growth in annual electricity requirement of 0.8% a year[1]. More demand growth will take place in the south of the country than the north, with a consequent effect on losses. Furthermore, the Seven Year Statement also forecasts much greater transfers of electricity from the northern to the midlands zones during the same period.

4.3 Forecasts of losses

Losses are in the region of 1.5% presently. The Seven Year Statement forecasts that they will grow to 1.9% during its forecast period.

4.4 Costs of generation

The average efficiency of CCGT in the UK is 49%[2], and the efficiency degrades about 3 - 4 % over ten years. Coal and oil fired generation will have a lower efficiency of around 42%. NERA uses a higher efficiency to calculate the avoided cost of generation. This avoided generation will not be newly built CCGT but older types with lower efficiencies.

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[1] Base case, SYS 2002

[2] CoGen Europe, Ecocert Project

The new entrant cost of £23.50/MWh may be reasonable, but the justification for using fuel costs as a short-term avoided cost is only appropriate in terms of net social benefit and is not appropriate to NGC's or generators efficient price signals . The use of £23.50/MWh throughout appears to be more reasonable.

These revised assumptions would have the effect of increasing the benefits forecast in the modelling.

4.5 Costs of systems

The data for the costs of systems to manage the effects of a losses scheme comes from one source. Developers of systems suggest that this cost is very high. In some cases systems for losses may be part of other software developments and thus the costs attributable to managing losses may be marginal.

The cost benefit analysis assumes an ex-post calculation of TLFs, but a losses scheme could well be ex-ante. In either case, parties could deal with the net uncertainty of losses by managing their output and using the net effect of the variation of their errors. Systems costs used in this approach would be much lower than those used in the cost benefit analysis.

5 Detailed comments

5.1 Despatch

The section on short-term net benefits is too brief to be certain about the assumptions used. The following points may be made:

- The use of gas cost to assess net savings is not appropriate – extra gas may be used in the south but replaced northern generation is as likely to be coal. However, as the BSC cannot take account of lost return on capital to such generators, the value of reduced generation is the price of electricity and not the price of fuel to electricity. This renders the NERA short-term analysis redundant.
- NERA may be on safer ground in reducing the losses rate to average rather than marginal.
- The calculation uses a TLM adjuster for generation, which appears to give a losses figure for just generation. Losses reduction will come from demand as well as generation and the report gives no reason why NGC's analysis should have ignored this.

5.2 Demand location

Table 3.1 suggests that there would be lost demand of 24 GWh as a result of lower losses due to relocation. This depends on a uniform national elasticity of demand of 0.25, with an assumed energy cost as 50% of all electricity sold. Given that the make-up of demand in the south differs from that in the north (with far more commercial and domestic as opposed to industrial), it is reasonable to assume that

demand elasticity in the south will be much lower. Therefore, the 24 GWh net reduction in demand is overstated.

In addition, this loss of demand is not relevant to BSC objectives except that removal of a cross-subsidy from one group of consumers to another may be regarded as an increase in economic efficiency.

The loss in demand has to be matched by a reduction in generation. As such it should represent a consumer gain.

5.3 Generation relocation hypotheses

The comments set out in the section on assumptions above are valid here. The net benefits figures ignore demand growth and any network savings should apply immediately, not just after 5 years. The relevance of non-network costs is questionable and should not apply in an analysis of this kind.

NGC's base forecast for demand growth would require an additional 2GW of plant to meet the demand. If this new generation were to be sited in areas with favourable TLFs the effect would be to reduce the volume and cost of losses.

5.4 Windfall gains

The cost to new entrants as an increased cost of capital of 1% is not a reasonable figure. This relates to a premium on the cost of capital to accommodate increased risk from losses. However, the effect of losses will depend to an extent on the location of a generator. They will be less advantageous in zones that have negative TLFs and more in other zones. A simple application of a higher cost of capital does not take account of the differences between generators.

There are other ways to avoid any imbalance due to losses. In the case of ex post TLFs this would be to spill slightly more output and so the extra cost is fixed by the differential between market price and SSP. This differential can be estimated as £10/MWh. If the increase in spill is by 0.5% of a party's total forecast metered position then this works out as an extra cost of 0.5p per MWh. Even by increasing spill by 2% it is still only 5[3]p/MWh extra.

This places a cap on the increase on the new entrant increase from risk. A figure of no more than 0.5% is a more reasonable figure.

This also caps the cost of new systems required to forecast losses because historic outturns will be sufficient to estimate losses without expensive new systems with a little bit of extra spill to cover the risk. Therefore, use of LE's estimate of costs seems excessive as an estimate of party costs.

6 Conclusions

Several conclusions may be drawn from this commentary:

[3] We have revised this figure from 20p in the original report following comments from NERA

- the benefits of Modifications are taken account of in the BSC Objectives;
- cost benefit analysis has limited effect in appraising developments of this kind;
- cost benefit analysis is static and does not take account of complex behaviours in response to competition or the impact of innovation;
- some of the assumptions made in the analysis are questionable;
- different assumptions would significantly alter the results of the analysis;
- some data inputs could be altered, in general the data does not take full account of reasonable changes to them;
- the result is that the costs are overstated and the benefits are understated and
- consequently, the cost benefit analysis needs to be treated with caution.

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