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MEMO

TO: ScottishPower Energy Networks (Jim McOmish)
DATE: 25 September 2014
FROM: NERA Project Team (Richard Druce and Thomas Ash)
SUBJECT: Ofgem's Slow Track (Draft Determination) Benchmarking

This memo summarises our high-level views on the Ofgem benchmarking published in the RIIO-ED1 Slow Track Draft Determinations document.

1. Ofgem's Approach to Benchmarking

Ofgem's expenditure assessment uses the following procedure.

First, Ofgem develops three different benchmarking models. Using the results from each model, it measures the "gap" between cost forecasts submitted by each DNO for ED1 and the costs predicted by the benchmarking model for each DNO:

- Ofgem's activity-level benchmarking entails a detailed analysis to benchmark each category of costs separately. Depending on the cost category, Ofgem employs a range of benchmarking approaches based on regression analysis, engineering expert judgment and/or comparison to the mean/median of DNO's submitted costs; and
- Ofgem's totex benchmarking analysis uses two regression models to explain DNOs' totex (opex+capex) over the DR5 and ED1 periods using regression equations, in which totex is assumed to be a function of scale indices – these indices are formed from a combination of scale variables such as MEAV, customers connected , etc.

Ofgem then combines the results from these analyses, placing a 50% weight on the activity-level benchmarking, and a 25% weight on each of the two totex models to form a view of DNOs' relative efficiency. It then adjusts its modelled costs, such that the notional "efficient frontier" defining Ofgem's view of efficient costs is set by the "upper quartile" company. In other words, the DNO with an efficiency rank at the 25th percentile will receive an allowance identical to its submitted costs. DNOs with better/worse efficiency rank receive an assessment of costs that is above/below their submitted costs.

Under the IQI mechanism, Ofgem's assessed costs are weighted together with the DNO's own submitted costs to define allowances, with a greater 75% weight on the Ofgem assessment. The final step is an adjustment for real price effects (RPEs) and expected smart grid savings, which systematically disallow some expenditure from all slow track DNOs' business plan submissions.

2. Limitations to Ofgem's Approach

2.1. The Impact of Unobserved Heterogeneity

At the core of Ofgem's approach to setting allowances, described above, is the premise that it can robustly estimate the degree to which a DNO's cost forecasts are "inefficient" by (1) comparing that DNO's costs with those of all other DNOs, and (2) in making this comparison, controlling for *observable* differences between those companies, such as differences in the size of their operations or networks.

In practice, however, DNOs' costs differ for many reasons unrelated to inefficiency, and that cannot be controlled for using observable data on DNOs' characteristics. These unobserved differences between companies can bias the estimation of efficiency scores, and thus unduly influence the allowances emerging from the cost assessment. In statistical terms, this problem is known as *unobserved heterogeneity bias.*[1]

To limit the effect of this potential bias, Ofgem, like other regulators that conduct similar exercises, has sought to control for differences between companies using data on the characteristics of each DNO, and where it cannot do so, it has offered DNOs the opportunity to submit "special factor cases", but they have a limited scope, and have been accepted in only a very small number of cases in the RIIO-ED1 cost assessment. These special factor claims are also evidence-intensive, in that Ofgem have required a very high burden of proof to accept the claims. This approach is necessarily punitive for companies since the reason these cases are special factor claims in the first place, rather than controlled for in Ofgem's models, is that limited data exists on them; certainly cross-industry comparative data, the likes of which Ofgem seems to require, is impossible to obtain. There is therefore a risk that the models Ofgem has employed fail to control for differences between DNOs costs that arise for reasons besides differences in their relative efficiency.

A compounding factor, further increasing the risk of unobserved heterogeneity bias, is the use of a small dataset. To adequately control for all relevant high level characteristics affecting DNO costs, Ofgem would need to model a large and diverse range of companies to sufficiently control for different operating models and characteristics. Ofgem's dataset only includes the 14 UK DNOs, which themselves fall into five groups. By contrast, rigorous academic studies routinely include dozens of companies.[2] Ofgem must therefore accept the limitations of its approach. A practical means for doing this would be to place more emphasis on detailed engineering assessments in the bottom-up benchmarking, and thus less emphasis on the totex benchmarking.

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1 For further detail on unobserved heterogeneity bias see, for example, Greene, *"Econometric Analysis"*, 7th edition, chapter 14: Models for Panel Data.

2 For example Farsi and Filippini (2004) include 52 electricity distribution companies. Farsi, M and Filippini, M: *"A Benchmarking analysis of electricity distribution utilities in Switzerland"*, Centre for Energy Policy and Economics, Swiss Fedral Institute of Technology, 2005.

2.2. The Effect of Asset Condition and Investment Cycles

If the effect of some unobserved heterogeneity is essentially random, with some factors exerting a positive influence on costs, and some a negative influence, there may be no good reason to believe that, in the round, the results of Ofgem's benchmarking are biased by unobserved heterogeneity to the benefit or detriment of any company or licensee in particular. However, as we have commented on a number of occasions through the RIIO-ED1 process,[3] the Ofgem benchmarking systematically disadvantages those companies that are at a point in their investment cycles that requires high levels of replacement and refurbishment expenditure.

For instance, Ofgem's totex models seek to explain variation in DNOs' capex and opex over the DR5 and ED1 periods using data on the variation in companies' size, represented by metrics such as MEAV. These size variables bear no relation to asset condition, and so DNOs incurring a high level of capex because of poor asset condition will appear "inefficient". In reality, DNOs' asset condition can vary for many reasons:

- DNO assets are long-lived, and many date from the pre-privatisation era. If a large number of assets are approaching the end of their lives in a particular control period, it may well be efficient for the DNO(s) affected by this trend to seek additional funding for their replacement. The longevity of assets also means that decades may pass between individual DNOs' large replacement and refurbishment programmes.
- There may also be economies of scale and scope in replacement and refurbishment programmes, making "lumpy" investment profiles efficient.

This potential need for high levels of replacement and refurbishment expenditure can be identified and explained by variation in DNOs' asset condition, as measured, for instance, by their respective health indices. Our previous analysis of the link between health indices and DNOs' totex has suggested that including the health index in the regression materially reduces the modelled efficiency "gap" (i.e. the difference between business plan submissions and Ofgem allowances) for SPMW.[4]

Notwithstanding some problems with the quality of DNOs' submitted data on asset health, this finding supports the hypothesis that the modelled efficiency gap for SPMW is explicable by variation in asset condition, and thus high asset replacement and refurbishment costs relative to other DNOs. Moreover, as SPMW is affected materially more than other licensees by the inclusion

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[3] As examples, see "Totex Benchmarking Analysis" slide pack prepared for Scottish Power, NERA 11th October 2013, slides 27-36; "Review of Ofgem's RIIO-ED1 Fast Track Cost Assessment" NERA 24th January 2014, page i; and "Potential Improvements to Ofgem's Fast Track Cost Assessment Methodology" NERA 17th April 2014, page 9.

[4] See "Totex Benchmarking Analysis" slide pack prepared for Scottish Power, NERA 11th October 2013, slides 27-36; and "Review of Ofgem's RIIO-ED1 Fast Track Cost Assessment" NERA 24th January 2014, page 4.

of this variable, our analysis suggests that, in this respect, Ofgem's benchmarking models may be unduly discriminating against SPMW.

Moreover, the omission of this important factor will tend to simultaneously penalise those companies conducting especially large volumes of capex, as the modelled "efficient frontier" will be set with reference to the costs of the cheapest companies, who, all else equal, will tend to be those performing less capex. This factor will lead companies to expect that, over the investment cycle, they will earn a return on invested capital that is systematically less than the regulator's determination of the allowed WACC, and thus deter them from committing capital for investment in the industry in the first place.

2.3. Other Problems with Ofgem's Approach

The discussion in this memo focuses on the problems with Ofgem's benchmarking related to unobserved heterogeneity bias, but in addition, we have identified a number of other problems with the Ofgem benchmarking that we have explained in other submissions to Ofgem:

- Firstly, the modelling contains a number of arbitrary choices, for instance, regarding the weightings used to combined indices, and the process followed to select between alternative statistical models.[5] While this problem applies to some extent to both the slow and fast track modelling, Ofgem's benchmarking process has improved in this area since the fast track cost assessment, as Ofgem now seeks to justify some of the weightings used to combine variables, and has published more detail on its model selection process.[6]
- However, and more seriously, Ofgem continues to adopt an arbitrary, subjective and discriminatory approach to adjusting for regional variation in wages. It provides DNOs in the South East of England with an extra allowance for high wage costs, but assumes no regional wage variation in the rest of the country. In fact, published ONS data suggest that wages in professions relevant to the DNOs' activities are higher in Scotland than elsewhere in England and Wales outside the South East. Ofgem's failure to account for this factor unduely discriminates against Scottish licensees and in favour of those in England and Wales.[7]

3. Summary and Conclusion

Ofgem's benchmarking models control for a range of factors that influence DNOs' costs for reasons besides inefficiency. However, data limitations mean that, inevitably, it will not be

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[5] Review of Ofgem's RIIO-ED1 Fast Track Cost Assessment: Prepared for SP Energy Networks, NERA Economic Consulting, 24 January 2014.

[6] RIIO-ED1: Draft determinations for the slow - track electricity distribution companies Business plan expenditure assessment Supplementary annex to RIIO-ED1 overview paper, Ofgem, 30 July 2014, Appendices 2-4.

[7] Regional Wage Adjustments in Ofgem's Benchmarking Analysis, Memo from NERA Economic Consulting to SP Energy Networks, 14 August 2014.

possible for Ofgem to control for some differences between companies through high-level benchmarking. As discussed above, an important omission from the modelling is the need for high levels of refurbishment and replacement investment required by DNOs with particularly old assets, or those in relatively poor condition.

In these conditions, given the uncertainties that exist around DNOs' data on asset health, we would recommend that Ofgem rely on detailed engineering analysis to evaluate the efficiency of individual DNOs' replacement and refurbishment capex programmes instead of the high-level benchmarking that. Even when taken in the round, Ofgem's current approach will tend to systematically discriminate against those companies at the high point of lumpy capex cycles, and thus disallow efficient expenditure and deter investors from committing the capital required to undertake such upgrade programmes.