

**Cross Submission for the Commerce
Commission's Inquiry into the New Zealand
Gas Transmission and Distribution Sectors**



Pacific Economics Group
Economic and Litigation Consulting

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Larry Kaufmann, Ph.D.
Partner

PACIFIC ECONOMICS GROUP

22 East Mifflin, Suite 302
Madison, Wisconsin USA 53705
608.257.1522 608.257.1540 Fax

This cross submission will address the issues raised during questioning of my July 28 presentation to the Commerce Commission as part of the Commission's Inquiry into New Zealand's Gas Transmission and Distribution Sectors. The following issues were raised that required further clarification:

- The relative size of New Zealand (NZ) and US gas distributors and whether PEG's regression methods place a "disproportionate" weight on larger firms (Transcript pp. 22 and 57)
- The exchange rate used in the Mercer Study (Transcript p. 41).
- The plausibility of the variation of the NZ results relative to the mean (Transcript p. 49).
- Additional sensitivity analyses that could have been performed in PEG's benchmarking study if more time was available (Transcript p. 52).
- The differences in capital stock measures in NZ and the US (Transcript pp. 67 and 70).
- The implications of not having a system capacity measure in the PEG or Meyrick studies (Transcript p. 68).
- The validity of using Melbourne construction costs as a proxy for NZ construction costs (Transcript p. 68).
- Copies of PEG's Australian benchmarking studies (Transcript p. 71).

- General question on the weight the Commission should place on benchmarking results in the current Gas Inquiry (Transcript p. 73).

I address each of these issues in turn.

Relative size of NZ and US Gas Distributors and Whether a “Disproportionate” Weight is Placed on Larger Firms

A concern was raised about PEG’s regression techniques and whether they placed a “disproportionate” weight on the observations of larger firms. It was suggested that the parameter estimates resulting from these regressions would not be appropriate for New Zealand’s smaller gas distributors. I believe these concerns are unfounded, since PEG’s econometric methods effectively address this issue.

In either cross sectional or panel (combined cross section and time series) analyses, larger sample values will tend to have more of an impact than smaller sample values on the parameters estimated in econometric regressions. This will typically be the case unless sample observations are weighted in a way that reduces the influence of the larger sample values.¹

PEG’s econometric methods do effectively re-weight sample values in such a way although this was probably not clear from our report, which was intended for a lay audience and therefore suppressed some technical details. As I discussed in the presentation, PEG’s regression techniques employ corrections for heteroskedasticity. Heteroskedasticity refers to error term (or residual) variances that are not constant

¹ Some other econometric methods, such as “median regression,” are also designed to place less weight on outlier values, but this is an uncommon technique in cost function analysis and difficult to implement when estimating a system of equations, as we have done in our benchmarking study.

across sample observations. In a cost study, this will typically be because there is greater variance in residuals for larger sample firms or, more generally, that the variance of residuals is positively related to the size of the firm. Non-constant variance in residuals violates the assumptions of the classical regression model. The presence of heteroskedasticity will bias the computation of standard errors and, accordingly, can lead to incorrect inferences regarding the statistical significance of regression results.

PEG corrects for this problem through a group-wise heteroskedasticity correction, where each “group” refers to the time series observations for an individual sample firm. Our heteroskedasticity correction procedure effectively transforms sample data by weighting each data point by the *inverse* of the associated group’s standard error of the residual; this standard error is equal to the square root of that group’s residual variance. This procedure reduces the weight on larger sample firms, because larger firms are likely to have greater residual variance. Therefore, as discussed in the presentation, I believe that PEG’s heteroskedasticity correction effectively mitigates concerns regarding the disproportionate impact of large sample observations on the regression results. It should also be recalled that PEG included the smaller, NZ distributors in our sample when estimating the regression parameters, so data for these companies is directly affecting the “cost driver” estimates.

Exchange Rate Used in Mercer Study

We contacted Mercer directly, and they report that they essentially use current exchange rates when developing cost of living indexes for different cities. PEG used the March 2004 cost of living indexes from Mercer in our study. In March 2004, the average US-NZ exchange rate was 1.48NZ\$ for each US\$. This compared to a purchasing power parity exchange rate of 1.46 in this month. Since these measures are almost identical, I believe that Mercer’s exchange rate assumption did not undermine the suitability of this index for our benchmarking work.

Variation in Results

There was a request for further information on the variance in results from PEG's cost model. Our total sample included 40 US distributors plus NGC and Vector. The best performing company in the sample had costs that were 36.4% less than predicted (slightly better than NGC, which was second best); the worst performing company had costs that were 34.9% greater than predicted. Concavity conditions were satisfied at 100% of sample observations. Of the 42 companies, eighteen were superior cost performers (*e.g.* actual costs were lower than predicted costs and the difference was statistically significant), fifteen were inferior cost performers (*e.g.* actual costs were higher than predicted costs and the difference was statistically significant), and nine were average cost performers (no statistically significant difference between actual and predicted cost). These results are broadly consistent with how I described them from memory during my presentation.

Additional Sensitivity Analyses

As discussed in the presentation, PEG would have undertaken more sensitivity analyses and/or attempted to refine certain data series if more time was available for our study. I continue to believe that further refinement of input prices would have been most fruitful. In particular, PEG would have attempted to obtain more precise data on gas utility construction costs in NZ vis-à-vis the US; additional detail or more precise measures of labor costs for New Zealand's electric, gas and water sector vis-à-vis the US; and additional or more precise measures of prices for non-labor operations and maintenance inputs in NZ compared with the US.

While these data refinements and sensitivity analyses would improve the precision of our results, I would not expect them to affect our qualitative conclusions that NGC and Vector were significantly superior cost performers, for at least two

reasons. First, PEG has already performed some sensitivity analyses with different capital service price specifications, and our results for the companies' predicted costs did not change materially. Second, the differences between Vector's and NGC's actual and predicted costs were more than 20% (in absolute value terms). Operations and maintenance (O&M) costs account for less than 40% of NGC's and Vector's total cost of gas distribution operations. Therefore, for changes in labor and other O&M input prices to offset the difference between either company's actual and predicted costs, the actual prices for labor and other O&M inputs facing the NZ distributors would have to be 50% lower than what PEG measured or, alternatively, PEG would have had to overestimate the NZ companies' input prices by more than 100%. If this was the case, wages in New Zealand's electric, gas and water sectors and the cost of other O&M inputs in NZ would both be less than 50% of the respective US values. Given the generally comparable standards of living in the countries, I believe these are implausible figures.

NZ and US Capital Stock Measures

Issues were raised about the comparability of the US and NZ capital stock measures. While these measures were not constructed in identical ways, I do believe that PEG took all practical steps to make them as comparable as possible. Most importantly, both the NZ and U. S. capital stocks are revalued in each year to reflect the effects of inflation and straight-line depreciation. Depreciation using straight-line accounting was a departure from our past depreciation measures, so PEG changed our depreciation measures to be consistent with the New Zealand treatment. It is important to recognize that both the US and NZ capital stock measures are designed to reflect depreciated replacement costs for assets, although the methods used to construct the depreciated replacement cost measures clearly differ.

Lack of a System Capacity Measure

One concern noted for PEG's benchmarking study was the lack of a system capacity output. I do not believe that the lack of such a measure is a significant deficiency in our study for several reasons. First, "capacity" is much less relevant as a cost driver for gas distribution than for gas transmission. The capacity of gas transmission systems can vary dramatically. Gas transmission pipelines vary in diameter from four inches to as much as 60 inches; the capacity of a 60 inch diameter pipeline of a given length is more than 2000 times greater than that of a pipe with a four inch diameter. In contrast, the diameter of gas distribution main does not vary nearly as much. Data from the American Gas Association show that US gas distributors report gas distribution main from 1 inch to 12 inches, but 58% of all main is less than 2 inch diameter and 28% is between two and four inches. Only 14% of distribution main is therefore more than four inches in diameter, and nearly all of this is older and made from steel or iron. PEG's econometric model includes a variable for the percentage of main that is not cast iron and thus controls for the higher costs of using older, and larger diameter, pipe. Compression can also be used to increase the effective capacity of gas pipelines, but nearly all such compression is used for transmission rather than distribution systems. In addition, unlike electricity, natural gas can be stored. Gas distributors therefore are less constrained to size the capacity of their operations to meet maximum system demand. For all these reasons, I believe outputs that reflect peak demand/system capacity are much less essential for gas distribution benchmarking than for gas transmission or power distribution benchmarking.

Melbourne and NZ Construction Costs

Concerns were raised about the validity of using Melbourne construction costs as a proxy for New Zealand construction costs. These concerns are valid; Melbourne

construction costs are obviously an imperfect proxy for similar costs in New Zealand. As I discussed in my presentation, PEG was unable to locate information on construction cost levels in New Zealand relative to the US so we relied on the Richardson data for the next closest country – Australia. If we were able to locate NZ data we would have certainly used them.

However, as discussed in both the report and my presentation, PEG did test the sensitivity of our results to the construction cost assumption, and we found that the results were not highly sensitive to this assumption. I believe there is an intuitive explanation for this result. Construction cost data are used to develop the capital service price measure. Capital costs are equal to the product of the capital service price and the capital stock measure. All else equal, higher construction cost levels raise both the capital service price and capital costs. But since the capital service price is also used as a dependent variable in the cost model, a higher capital service price will raise the predicted cost of service. Therefore higher construction costs affect both measured and predicted costs in our model, so our results are less sensitive to changes in assumptions regarding construction costs.

PEG's Australian Benchmarking Studies

I have attached copies of the three PEG benchmarking studies in Australia that are in the public domain. The first is an assessment of the comprehensive costs of power distribution services in Victoria; the second is an assessment of operation and maintenance (O&M) costs of power distribution services in Queensland; the third is an assessment of the O&M costs of gas distribution services in Victoria. All of these were multi-client studies, and for simplicity I have attached only a single copy of our work in each instance; report formats and results for other clients in these studies were very similar.

In terms of approach, the first study in Victoria is most similar to PEG's work for the NZ gas distributors since both were examinations of the total cost of service rather than just O&M costs. As discussed in the attached reports, PEG's techniques for analyzing O&M costs are compatible with our comprehensive benchmarking techniques although somewhat more complex. Also, as I mentioned during the presentation, PEG continues to advance the data and techniques used in our benchmarking work. We made a significant investment in upgrading our benchmarking methods in 2002-2003 to address the heteroskedasticity issues discussed earlier. These methodological improvements occurred after the Australian studies were completed and are therefore not used in those studies, but they were employed in our work for the NZ gas distributors. Because of this, the results between NZ and Australia are not entirely comparable.

The Relative Weight Placed on Benchmarking Evidence in this Inquiry

A more general issue was raised regarding the value of benchmarking and the weight that should be placed on benchmarking evidence in the current Inquiry. As I briefly discussed, I am not an unabashed advocate of benchmarking in regulation. Benchmarking is only a tool, and like any tool it can be used either wisely or unwisely. However, I do believe that if benchmarking is done well, it can provide indicative measures of firms' relative performance. I believe this view is generally shared in the economics profession and the regulatory arena. Research on benchmarking techniques is a very active field, as indicated by the Asia-Pacific Productivity Conference in Brisbane last month that featured 118 invited papers on benchmarking topics from economists at leading universities and other institutions throughout the world. Regulators in Europe, Latin America, North America and the Asia-Pacific region are also increasingly using benchmarking in regulatory decisions, including in NZ's electricity regulatory thresholds

proceeding. These trends suggest that benchmarking is advancing as both a science and an instrument for public policy.

For this Inquiry, I would say that for benchmarking to be done “well” benchmarking methods must be sensitive to the particular conditions of NZ’s gas distributors. Two of the most important of these conditions are the relatively small size and the low customer densities of the NZ companies. Both of these factors reduce the potential for distributors to realize scale economies and other efficiencies that lead to lower unit costs. I have presented benchmarking evidence that was explicitly designed to control rigorously for these and similar conditions on the NZ firms’ cost performance. I believe that it is critical for the Commission to keep these issues in mind when it considers alternative benchmarking evidence and the potential for firms to realize productive efficiencies under control. Given the uncertainties in any benchmarking evaluation, I also believe it is prudent to err on the side of caution, since this increases the probability that firms will not be “penalized” for factors that are beyond their control.

At the same time, it must be acknowledged that there are real data challenges in NZ. While the quality of NZ’s utility data appear to be improving, available data series are not nearly as mature as those in some other jurisdictions. The quality of any benchmarking study naturally depends on the quality of the underlying data. More unreliable data reduce the reliability of the benchmarking conclusions and therefore the weight that policymakers should place on benchmarking relative to other evidence. Given NZ’s data issues, I believe the Commission should place less weight on benchmarking than policymakers in places like the UK where there are fewer (although still some) data concerns.

On balance, then, I would recommend that benchmarking play a role in this Inquiry. I also believe the Commission should be particularly cognizant of the small size and low customer densities of the NZ companies and ensure that benchmarking

techniques and evidence do not unfairly penalize firms for these conditions. However, I also believe that benchmarking should receive less weight than it has in gas distribution regulation proceedings *per se* since, in most of these proceedings, the underlying data are better.