

TASMAN ASIA PACIFIC
&
PACIFIC ECONOMICS GROUP

**ACHIEVING IDENTIFIED SAVINGS
IN OPERATIONS AND
MAINTENANCE EXPENDITURES —
BENCHMARK O&M COSTS FOR
ENERGEX**

**Paper prepared for
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1. INTRODUCTION

In a recent study undertaken for the Queensland Competition Authority (QCA), Tasman Asia Pacific (Tasman) in association with the Pacific Economics Group (PEG) benchmarked operations and maintenance expenditure for ENERGEX's distribution activities. Based on a comparison of operations and maintenance (O&M) costs of Australian distributors and United States distribution businesses it was concluded that:

- ENERGEX would need to cut unit O&M expenditure by 17 per cent to achieve performance levels within that attained by business in the top quartile of performance in the PEG database given similar operating environment conditions.

Achievement of such cost reductions would see the business make a substantial move towards best observed O&M practices.

As part of the process of setting benchmarks for the businesses, the QCA required the consultants to investigate how the DBs could achieve the identified O&M efficiencies. This report addresses this part of the terms of reference. The following section outlines a methodology to achieve this goal. The methodology expands and refines that proposed in our paper titled *Achieving Identified Savings in Operations and Maintenance Expenditures — Benchmark O&M Costs* circulated for comment in December 2000. Section 3 presents potential disaggregated O&M benchmarks for ENERGEX and draws conclusions.

2. METHODOLOGY

The strategy adopted is to provide the DBs with estimates of O&M expenditure for peer utilities from the PEG database of United States distributors at a reasonably disaggregated level. This will enable the DBs to assess their own O&M costs against the benchmark O&M performance from the US. This will provide the DBs with an indication of areas where performance improvements may be possible. Further work could then be undertaken to isolate the reasons for any indicated differences in O&M costs.

Disaggregated O&M costs differ significantly across utilities due, amongst other things, to the size of the distribution functions undertaken. We, therefore, normalise the disaggregated O&M costs by dividing the recorded costs by a comprehensive output index. This procedure effectively develops Partial Factor Productivity (PFP) benchmarks for the DBs¹. The steps involved in developing the PFP benchmarks are set out below.

2.1 OPERATIONS AND MAINTENANCE COST CATEGORIES

The first step in developing the PFP benchmarks is to decide on an appropriate disaggregation of costs. The FERC data utilised by PEG to estimate the distribution cost function is the most disaggregated publicly available cost data on electricity distribution available. It, thus, represents the best chance to develop reliable and reasonably disaggregated PFP benchmarks for the DBs.

PEG's database on electric utilities in the United States is based on data filed with the Federal Energy Regulatory Commission in the so-called FERC Form 1. This data provides a detailed breakdown of distribution O&M expenditure. O&M costs are broken down into five broad categories:

- Operating expenses;
- Maintenance expenses;
- Customer account expenses;
- Customer service information expenses; and
- Administrative and general expenses.

To be comparable with the definition of distribution expenses used by PEG in its cost function analysis, O&M costs were taken to be operating expenses, maintenance expenses, the meter reading expenses component of customer account expenses plus associated administrative and

¹ For ease of comparison, the PFPs are reported in their inverse form as unit costs in this report.

general (A&G) expenses. Adjustments were also made to make the split between transmission and distribution as comparable as possible. In terms of the cost categories in the FERC data, O&M costs were taken to exclude all retailing expenditure, customer account expenses and customer service information expenses, with the exception of meter reading. The remaining O&M cost breakdowns are provided in Table 1.

Table 1: FERC operations and maintenance expenses categories associated with electricity distribution

Distribution Operation Expenses	Distribution Maintenance Expenses
Supervision and engineering	Supervision and engineering
Load dispatching	Structures
Station expenses	Station equipment
Overhead line expenses	Overhead lines
Underground line expenses	Underground lines
Street lighting and signal system expenses	Line transformers
Meter expenses	Street lighting and signal systems
Customer installations expenses	Meters
Miscellaneous distribution	Miscellaneous distribution plant
Expenses	Other Distribution Expenses
Rents	Meter reading expenses

While there is not a perfect way to allocate A&G expenses across the detailed categories, a fairly accurate estimate can be obtained by allocating A&G expenses across the totals by using a rule based on the distribution of salaries that correspond to the totals. Using this approach we include two additional components to those listed in Table 1:

- A&G expenses for distribution operations and maintenance activities; and
- A&G expenses associated with meter reading activities.

This approach gives us 23 disaggregated O&M cost categories. This number of cost categories provides a reasonable level of disaggregation to begin the process of identifying where the DBs could improve performance.

2.2 SELECTION OF PEER UTILITIES

The PFPs are calculated for selected peer utilities so that the DBs have several utilities to benchmark their O&M operations against. PEG's analysis of O&M expenditure for United States electric utilities indicates that observed O&M costs are significantly influenced by the operating

environments faced by the utilities. It is therefore important to adjust measured O&M costs for the operating environment faced by electric utilities.

There are three possible ways that such adjustments can be accomplished:

- estimating detailed econometric models;
- setting benchmarks based on a selection of like utilities; and
- developing a comprehensive output measure — an output index that incorporates outputs that have a significant impact on O&M costs.

Estimation of a cost function with very disaggregated share equations is beyond the scope of this project. Thus, we adopt the last two options outlined above to provide some adjustment of the PFPs for operating environments.

The selection of peer utilities builds on PEG's previous work in Stage 1 of the project. In its analysis of the reliability performance of the DBs, PEG selected utilities that had similar operating environments to the DBs and which also had reliability data. A number of these utilities for which sufficient data are available are used as benchmark partners for the DBs in the current exercise.

An alternative to the selection of similar utilities is to select several utilities from the top quartile of performances in the PEG database. O&M costs for these utilities could be compared to the O&M costs for the DBs. However, the utilities in the top quartile of the PEG database may have significantly different operating environments to the Australian DBs. The impact of operating environment differences on the O&M PFPs can be minimised by normalising the O&M costs by a comprehensive output measure, as Tasman did in its analysis of the Australian utilities. While such a normalisation does not fully adjust for operating environment differences, Tasman's experience with the analysis of the Australian DBs suggests that such a normalisation does provide a good adjustment for operating environment differences.

The suggested performance targets for the DBs were set relative to the performance of DBs in the top quartile of the PEG analysis (see *Operations and maintenance cost benchmarks for Queensland electricity distributors – overview of findings*). Thus, the normalisation of PFPs for utilities from the top quartile would enable a direct comparison of the O&M PFPs against the identified O&M efficiency gap. It would, therefore, be possible to provide some insights into which O&M cost categories contribute most to the calculated efficiency gaps.

Based on these considerations, we have included in the benchmark partner utilities, utilities from the top quartile of performances in the PEG database, as well as utilities assessed as being similar to the DBs. The data for all peers are normalised by a comprehensive output index to ensure as like with

like comparisons as possible. The benchmark peers for both ENERGEX and Ergon are presented in Table 2 below.

Table 2: **Peer utilities**

Utility	Suggested Peer	Utility	Suggested Peer
ENERGEX	Consumers Energy	Ergon Energy	Sierra Pacific
	Pennsylvania Power and Light		West Texas Utilities
	San Diego Gas and Electric		
	Tampa Electric		

Key characteristics for these 6 peer utilities are presented in Table 3 below. The 'rank' column refers to the utility's rank in the PEG cost function analysis.

Table 3: **Key characteristics of peer utilities**

Utility	State	Rank	GWh	Customers	Kms of Line	SAIDI
Consumers Energy	Michigan	14	34,451	1,603,469	89,350	144
Pennsylvania Power and Light	Pennsylvania	22	32,047	1,240,227	107,360	119
San Diego Gas and Electric	California	11	16,747	1,168,404	21,046	79
Tampa Electric	Florida	10	15,090	518,368	15,230	55
Sierra Pacific	California	38	7,756	282,689	19,803	157
West Texas Utilities	Texas	52	4,838	187,003	13,027	77

The O&M data for the benchmark partners are converted from United States dollars in 1999 prices into Australian dollars in 1999 prices by using the OECD's purchasing power parity (PPP) exchange rate between the two countries. The data are then normalised by dividing by a comprehensive output index for each utility. The calculation of the output index is detailed in the following section.

2.3 A MEASURE OF UTILITY OUTPUT

Following the procedures used by Tasman to benchmark the DBs against other Australian electricity distributors, an output index has been formed for each utility. Four outputs are specified for the output quantity index: throughput (measured by gigawatt hours of energy delivered), network length

(measured by network kilometres – MVA kilometres are unavailable for the US utilities), the number of customers served and reliability (measured by SAIDI).

The four outputs are aggregated into a comprehensive output index in the following manner. The reliability output measure is treated as a negative output because a higher number of minutes off supply equates to a less reliable system. Minutes off supply are allocated a value based on the retail price of forgone energy multiplied by a penalty value of 100. The remaining three outputs are weighted together using a system of weights derived from econometric work. In the case of the United States utilities, the weights are derived from PEG's estimated cost function. The weights for the US utilities are around 47 per cent for throughput, 20 per cent for network length and 33 per cent for the number of customers. For the Australian DBs the weights needed to calculate the output index are derived from the simple cost function estimated by Tasman. The weight applied to the given outputs equals its coefficient in the cost function divided by the sum of the coefficients for all three outputs in the cost function. The weights for the Australian DBs are around 50 per cent for throughput, 23 per cent for network length and 27 per cent for the number of customers. The technical indexing method used to construct the output index was outlined in Tasman's Stage 1 reports.

For each of the DBs the output index is calculated such that output for ENERGEX equals one. Thus, the procedure outlined in sections 2.2 and 2.3 generates:

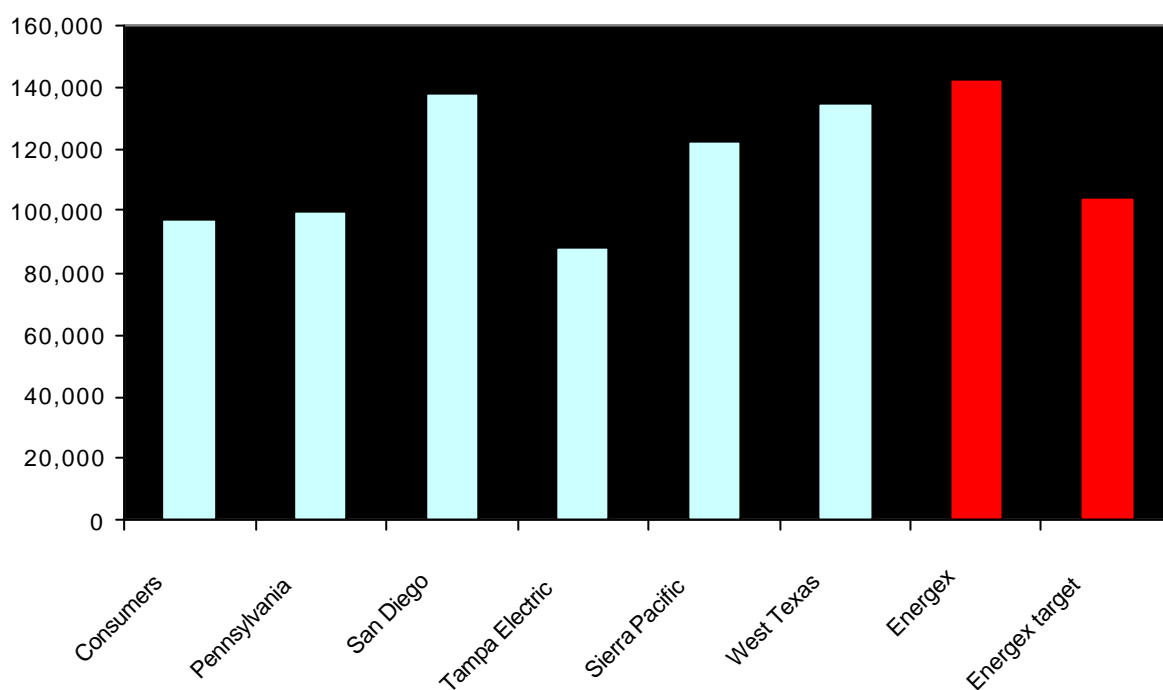
- Disaggregated O&M costs for the United States benchmark partners expressed in 1999 Australian dollars;
- An output index for each benchmark partner; and
- Disaggregated unit costs for the benchmark partners.

Calculating the disaggregated unit costs in this manner allows the DB to directly compare its unit costs with the reported benchmarks. Thus, all the DB would need to do is calculate its cost for a particular O&M category and this can be compared directly to the benchmark unit costs reported in the following section.

3. DISAGGREGATED O&M BENCHMARKS

Before proceeding to look at the disaggregated O&M unit costs, it is useful to compare the total O&M unit costs of ENERGEX and its peer utilities². From Figure 1 we see that the 6 US utilities have unit O&M costs lying in the range \$A88.4 million to \$A138.2 million. This compares with ENERGEX’s current equivalent O&M cost of \$A142.5 million. Achieving the target of a 17 per cent O&M cost reduction would bring ENERGEX’s O&M cost down to \$A104.0 million. Thus, ENERGEX’s target O&M cost lies well within the bounds of the peer utilities’ total O&M unit costs.

Figure 1: Total unit O&M costs (\$A’000, 1999 prices)



The disaggregated unit O&M costs for the US utilities are presented in Table 4 below in thousands of Australian dollars at 1999 prices. For ease of comparison, the data is reproduced in Table 5 in terms of shares of total unit O&M costs.

² We also present information on the 2 peer utilities for Ergon Energy.

Table 4: **Benchmark disaggregated unit O&M costs (\$A'000, 1999 prices)**

O&M Category	CE	PPL	SDGE	TE	SP	WTU
Dist Oper Supervision/engineering	6,002	5,448	6,300	2,857	3,280	3,973
Dist Load Dispatching	0	2,662	1,916	0	0	427
Dist Station Expenses	1,527	901	4,116	1,576	3,564	362
Dist Overhead Line Expenses	2,865	1,751	2,768	1,043	1,422	3,724
Dist Underground Line Expenses	1,695	1,253	2,650	548	2,161	934
Dist Street Lighting Expenses	4	737	595	1,160	-1	1,783
Dist Meter Expenses	2,192	5,724	5,539	3,055	2,704	7,557
Dist Customer Installations Exp	3,572	3,068	3,508	2,487	577	2,418
Dist Misc Expenses	5,787	4,673	3,604	8,175	19,315	14,013
Dist Rents	1,394	3,696	402	31	2,195	66
Total Distribution Operations	25,038	29,914	31,399	20,932	35,216	35,259
Dist Maint Supervision/engineering	1,900	2,197	551	1,164	-5	1,209
Dist Maint Of Structures	191	-10	50	868	0	0
Dist Maint Of Station Equipment	1,947	4,522	3,597	2,365	3,070	3,168
Dist Maint Of Overhead Lines	31,001	20,539	27,370	17,964	15,963	13,625
Dist Maint Of Underground Lines	1,068	1,936	6,560	2,438	3,888	598
Dist Maint Of Line Transformers	337	1,861	876	841	-1	2,298
Dist Maint Of Street Lighting	704	921	163	3,620	551	1,678
Dist Maint Meters	659	229	684	543	1,365	974
Dist Maint Misc Plant	26	157	16	0	504	1
Total Distribution Maintenance	37,832	32,352	39,868	29,804	25,335	23,550
Cust Accts Meter Reading Expenses	5,386	7,158	8,982	4,586	7,837	12,073
Distribution A&G	26,381	27,887	51,610	30,457	47,621	53,047
Cust Accts Meter Reading A&G	2,179	2,552	6,337	2,602	6,196	10,876
Total Distribution O&M Costs	96,816	99,863	138,196	88,379	122,204	134,805

As with any disaggregated data, the disaggregated unit O&M costs show considerable variation between utilities. This variation could be due to:

- differences in reporting conventions and practices adopted; or
- different technologies being used by the utilities.

The FERC data are compiled with the benefit of detailed reporting instructions and definitions that should minimise the scope for utilities to adopt different reporting conventions. Nevertheless, there is always cope for different people to interpret instructions differently and allocate some costs to different categories and the utility's own information systems may constrain the detail it can provide in some instances. Consequently, more confidence can usually be placed in broad data categories rather than narrow ones.

Table 5: **Benchmark disaggregated unit O&M cost shares (per cent)**

O&M Category	CE	PPL	SDGE	TE	SP	WTU
Dist Oper Supervision/engineering	6.20	5.46	4.56	3.23	2.68	2.95
Dist Load Dispatching	0.00	2.67	1.39	0.00	0.00	0.32
Dist Station Expenses	1.58	0.90	2.98	1.78	2.92	0.27
Dist Overhead Line Expenses	2.96	1.75	2.00	1.18	1.16	2.76
Dist Underground Line Expenses	1.75	1.25	1.92	0.62	1.77	0.69
Dist Street Lighting Expenses	0.00	0.74	0.43	1.31	0.00	1.32
Dist Meter Expenses	2.26	5.73	4.01	3.46	2.21	5.61
Dist Customer Installations Exp	3.69	3.07	2.54	2.81	0.47	1.79
Dist Misc Expenses	5.98	4.68	2.61	9.25	15.81	10.40
Dist Rents	1.44	3.70	0.29	0.04	1.80	0.05
Total Distribution Operations	25.86	29.96	22.72	23.68	28.82	26.16
Dist Maint Supervision/engineering	1.96	2.20	0.40	1.32	0.00	0.90
Dist Maint Of Structures	0.20	-0.01	0.04	0.98	0.00	0.00
Dist Maint Of Station Equipment	2.01	4.53	2.60	2.68	2.51	2.35
Dist Maint Of Overhead Lines	32.02	20.57	19.81	20.33	13.06	10.11
Dist Maint Of Underground Lines	1.10	1.94	4.75	2.76	3.18	0.44
Dist Maint Of Line Transformers	0.35	1.86	0.63	0.95	0.00	1.70
Dist Maint Of Street Lighting	0.73	0.92	0.12	4.10	0.45	1.24
Dist Maint Meters	0.68	0.23	0.49	0.61	1.12	0.72
Dist Maint Misc Plant	0.03	0.16	0.01	0.00	0.41	0.00
Total Distribution Maintenance	39.08	32.40	28.85	33.72	20.73	17.47
Cust Accts Meter Reading Expenses	5.56	7.17	6.50	5.19	6.41	8.96
Distribution A&G	27.25	27.93	37.35	34.46	38.97	39.35
Cust Accts Meter Reading A&G	2.25	2.56	4.59	2.94	5.07	8.07
Total Distribution O&M Costs	100.00	100.00	100.00	100.00	100.00	100.00

However, it is also possible that some of the variation in the disaggregated unit O&M costs may be due to different technologies adopted by the utilities which have a different mix of costs.

Further work beyond the scope of this project would be required to determine the exact sources of variations in unit costs and cost shares across the peer utilities. However, the data presented in Tables 4 and 5 provide a useful starting point for ENERGEX to determine priority areas for attention in its efforts to reduce O&M costs and instigate detailed benchmarking studies with possible US peer utilities.