Capex and Opex Benchmarking Study

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Aurora Energy

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Executive summary

This report outlines a benchmarking study undertaken for Aurora Energy (Aurora) in preparation for the upcoming regulatory review by the Australian Energy Regulator (AER). The purpose of this review is to benchmark Aurora's proposed capex and opex against its historical requirements and wider industry experience. The findings of this review also identify areas where additional analysis may be required to demonstrate the efficiency of the proposed expenditure.

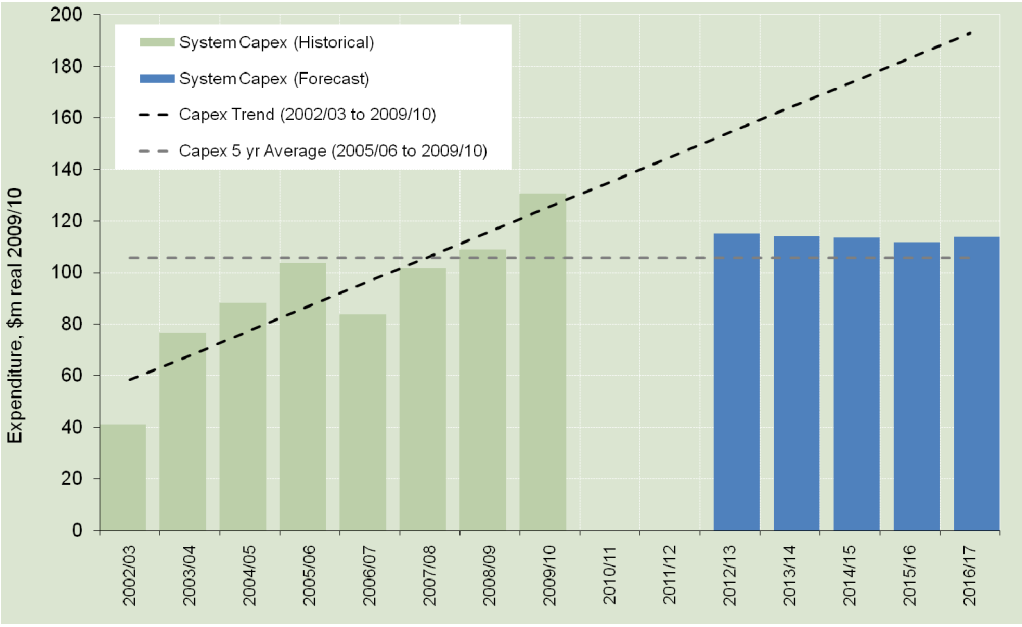
PB's approach to this work involves identifying and focusing on the most material items affecting Aurora's proposed Capex and Opex for the next regulatory control period. Essentially this involves:

- a comparison of Aurora's total historical capex and opex against the forecast expenditure to identify material step changes and historical trends
- a comparison of Aurora's historical capex and opex against the forecast expenditure in the major regulatory reporting categories (e.g. capacity augmentation, asset replacement etc.) to identify any material discontinuities
- a comparison of Aurora's proposed capital and operating expenditure against other Australian distribution networks, normalised by a range of typical comparators (e.g. $/km, $/customer, $/RAB, $/MW, $/employee etc.)
- an investigation of Aurora's unit costs to identify the most material cost items including a comparison of unit costs against the costs typically incurred by other distribution businesses.

Where significant deviation from benchmarking expectations is evident, PB has provided commentary on the extent to which the differences are attributable to differences in scope assumptions, categorisation, equipment specifications or environmental factors.

Capex findings

Aurora's historical and forecast capex is summarised in the figure below.



Aurora historical and forecast capex

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

PB has benchmarked Aurora's forecast capex against historical performance and other NEM distribution businesses, and considered the unit costs underpinning the most material aspects of the forecast expenditure. In total, Aurora's capex forecast for the next regulatory control period is within 7% of the equivalent historical capex for the most recent five year period and is approximately $300m below expectations based on the longer term trend in Aurora's historical capital expenditure.

On the basis of our high level review, PB has concluded that the forecast capex, whilst generally aligned with historical capex, is significantly lower than would be expected based on the historical trend in network expenditure. While benchmarking of Aurora's Capex against the other NEM distribution businesses shows that Aurora's forecast system capex is generally aligned with, or below industry expectations when normalised using a range of comparators.

PB has also benchmarked Aurora's Capex unit costs against the other NEM distribution businesses and has concluded that:

- 90% of the costs underlying the ten most material programs were found to be within the range of unit costs experienced by other businesses and 78% of the unit costs were found to be aligned with, or below industry averages. A further 9% of the cost of these programs related to specific IT expenditure that was not well suited to benchmarking comparisons. Together the specific programs considered in the unit cost review comprise 59% of Aurora's capex and opex forecast
- typical pole replacement unit costs are below the average but are likely to be aligned with average pole replacement costs when Aurora's additional annual allowance for 'complex' pole replacements is considered.
- meter installation/replacement costs, OH transformer installation costs and conductor replacement costs are generally in line with industry expectations.

However, we note that there is a risk that the lower than average benchmarking results may indicate a potential underinvestment when compared to historical expenditure and other distribution networks. In particular, PB notes that the recent and forecast increases in asset replacement expenditure are consistent with an increasing number of network assets reaching the end of their economic life. In our opinion there is a risk that the proposed capex may materially underestimate the capex requirements of the business.

Capex recommendations

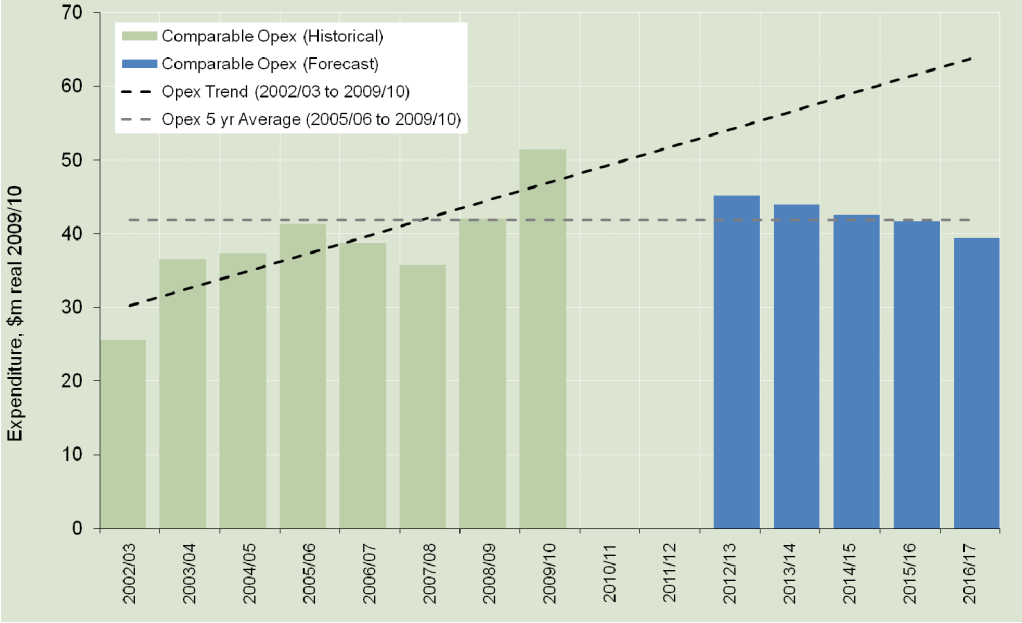
To address the issues identified above, PB recommends that Aurora review the following items prior to finalising its regulatory submission:

- the extent to which its replacement capex forecast and maintenance practices are sufficient to manage the known condition of assets in the medium to longer term. In particular where it is found that an asset replacement option is economically preferable to continued maintenance or emergency rectification, further increases to the replacement capex may be prudent to maintain the current levels of network performance and manage the risks associated with asset failure
- the supporting documentation for the asset replacement category to consider the implications of the AER's Repex model in recent regulatory determinations.
- the forecast reduction in augmentation capex and the underlying forecasting methodology to ensure that the reduction in augmentation capex in is well supported and is consistent with the business' customer and demand growth forecasts over the next regulatory control period
- the timing of its expenditure programs to ensure that any proposed capex deferral is economically justified with robust consideration of the risks, service quality implications, related increases in opex and stakeholder value implications
- given the inclusion of the program in the ten most material expenditure programs, the supporting documentation for the $30m network IT capex program identified as 'IT Systems' in the Program of

Works spreadsheet to ensure that the justification for the expenditure is sufficient to satisfy external regulatory scrutiny.

Opex findings

Aurora's historical and forecast opex is summarised in the figure below



Aurora historical and forecast opex

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

PB has benchmarked Aurora's forecast opex against historical performance and other NEM distribution businesses and considered the unit costs underpinning the most material aspects of the forecast expenditure. In total, Aurora's opex forecast for the next regulatory control period is 2% below the equivalent historical opex for the most recent five year period.

PB's high level review of Aurora's historical and forecast opex concludes that the forecast opex is lower than would be expected based on the historical trend in operating expenditure and lower than the average expenditure over the most recent 5 year period. While benchmarking of Aurora's opex against the other NEM distribution businesses, shows that Aurora's forecast opex is generally aligned with or below industry expectations when normalised using a range of comparators.

PB has also benchmarked Aurora's opex unit costs against the other NEM distribution businesses and concludes that:

- emergency management expenditure per km of line and metering expenditure per customer is well above average, but within the range experienced by other businesses.
- vegetation management costs per km of line are well below average and outside the range of values experience by other businesses. At $295/km, Aurora's historical costs represent approximately one third of the cost for the next peer business at $913/km.
- asset inspection costs are generally in line with industry expectations

Opex recommendations

To address the issues identified above, PB recommends that Aurora review the following items prior to finalising its regulatory submission:

- the drivers for the recent increases in operating expenditure and any scale or cost escalators used to develop the opex forecast to confirm that the opex forecast reflects the business' actual opex requirements over the next regulatory control period
- the drivers for the forecast increase in Network Asset Maintenance and the declining profile of the Emergency Response categories should be identified to ensure that the long term efficiency of the proposed mix of asset maintenance/replacement (opex/capex responses) can be demonstrated
- the drivers for the relatively high emergency response expenditure when compared to other businesses
- the relatively low vegetation management expenditure when compared to other businesses as Aurora's expenditure in this category appears to be considerably lower than other networks when normalised on both a per km and per customer basis.
- given the inclusion of the program in the ten most material expenditure programs, the supporting documentation for the $18.7m network IT opex items identified as 'Licenses and Maintenance Agreements' in the Program of Works spreadsheet should be reviewed to ensure that the justification for the expenditure is sufficient to satisfy external regulatory scrutiny.

1. Introduction

Aurora Energy (Aurora) has engaged Parsons Brinckerhoff Australia (PB) to conduct benchmarking of its capex and opex costs in preparation for the upcoming regulatory review by the Australian Energy Regulator (AER). This report presents the findings of PB's benchmarking analysis and makes recommendations regarding areas where additional analysis may be required to demonstrate the efficiency of the proposed expenditure.

In the following sections we set out the background to this review and summarise the scope and benchmarking approach.

1.1 Background

PB has undertaken benchmarking studies for a number of regulators and businesses within the energy industry. To support this work we maintain a cost database which includes a wide range of opex and capex costs relevant to electricity distribution activities. As Aurora is currently in the process of developing its regulatory submission, it is important to examine cost trends at a high level as well as the unit costs which underlie both capex and opex proposals.

The purpose of this review is to benchmark Aurora's proposed capex and opex against its historical requirements and against wider industry experience. The findings of this review can then be used to develop additional supporting analysis to support and demonstrate the efficiency of the proposed expenditure.

1.2 Scope of study

PB initially examined Aurora's capex and opex proposals and undertook a high level comparison of the forecast expenditure with the historical expenditure in order to identify significant variances in Aurora's capex and opex requirements. PB also compared the forecast expenditure against a cohort of Australian distribution businesses to assess the efficiency of Aurora's proposal when compared to wider industry experience.

Based on the most material expenditure items contained in Aurora's proposed program of works, PB has undertaken a more detailed benchmarking analysis of the unit costs underlying the opex and capex proposals. This analysis has identified potential areas where Aurora should focus efforts to best support its regulatory submission.

This report summarises our findings and makes recommendations to address the key issues indentified in the analysis.

1.3 Benchmarking approach

PB's approach to the work involved identifying and focusing on the most material items affecting Aurora's proposed Capex and Opex for the next regulatory control period. Essentially this involved:

- a comparison of Aurora's total historical capex and opex against the forecast expenditure to identify material step changes and historical trends
- a comparison of Aurora's historical capex and opex against the forecast expenditure in the major regulatory reporting categories (e.g. capacity augmentation, asset replacement etc.) to identify any material discontinuities
- a comparison of Aurora's proposed capital and operating expenditure against other Australian distribution networks, normalised by a range of typical comparators (e.g. $/km, $/customer, $/RAB, $/MW)
- an investigation of Aurora's unit costs to identify the most material cost items including a comparison of unit costs against the costs typically incurred by other distribution businesses.

Where significant deviation from benchmarking expectations was evident, PB has investigated the results to determine the extent to which the differences are attributable to differences in scope assumptions, categorisation, equipment specifications or environmental factors.

2. Benchmarking framework

In this section we describe the benchmarking framework that has been applied in the analysis, including the time periods, businesses data sources, and adjustments used for the comparative analysis.

2.1 Time period for comparison

The high level benchmarks have been based on the publically available information provided by the Australian distribution businesses in recent regulatory proposals, and the AER's final decision on capex and opex.

To reduce the effect of variations in expenditure between years, PB has used the average annual expenditure over the regulatory period covered by the most recent AER final determination for each business as the basis for the comparison to Aurora. The regulatory periods for each NEM distributor are summarised below:

- 2009/10 - 20013/14 - New South Wales (EnergyAustralia, Integral Energy, Country Energy) & Australian Capital Territory (ActewAGL)
- 2010/11 - 2014/15 - Queensland (Ergon Energy, Energex) & South Australia (ETSA Utilities)
- 2011 - 2015 - Victoria (CitiPower, Powercor, Jemena, United Energy, SPAusnet)
- 2012/13 - 2016/17 - Tasmania (Aurora)

The ABS national Consumer Price Index has been used to escalate figures reported on a prior year basis to the real 2010/11 basis used for Aurora's expenditure forecasts.

2.2 Sample businesses

For high level benchmarking Aurora's proposed capex and opex was compared to the NEM distribution businesses outlined above. These businesses cover a range of networks from a compact CBD based network (CitiPower) to widely dispersed rural networks such as Country Energy and Ergon Energy. Given the comparatively small and widely dispersed population of Tasmania, PB considers that Aurora's expenditure performance should primarily reflect aspects of the rural distributors and mixed networks than the predominantly urban networks.

To ensure consistency in the figures used for normalising the data PB has used the AER's State of the Energy Market 2009 report as a single reference for line length, customer numbers, maximum demand and RAB across all of the DNSP's

2.3 Unit costs

For low level unit cost benchmarks PB has compared Aurora's unit costs to recent costs covering Australian distribution businesses from PB's project experience, public documentation, and confidential sources. PB has also included the range of typical unit costs used for a comparable description of work and provided a view on the relative position of Aurora against industry expectations.

In establishing the most relevant unit costs, PB has considered the ten most material programs contained in Aurora's Unit Rates Model.

At a unit cost level, comparisons between Aurora's unit costs and industry experience are indicative only. Due to the fine level of detail required to ensure compatibility of costs between businesses and the wide variety of source documentation used, it is not always possible or appropriate to fully normalise unit costs between businesses. Due to these factors, an accuracy of +/-20% is typically considered reasonable in comparisons of this nature. Where Aurora's costs fall close to, or beyond the limits of our expectations, PB has investigated the underlying data to determine whether the variation can be explained by unusual factors affecting the Tasmanian distribution network.

3. Benchmark indicators

This section presents the results of the benchmarking analysis, provides commentary on the interpretation of results and identifies material issues that are likely to be subject to detailed review under regulatory scrutiny.

3.1 High level Capex benchmarks

The Aurora capital expenditure forecast has been benchmarked against historical expenditure in section 3.1.1 and compared against other Australian distribution businesses in section 3.1.2.

3.1.1 Comparison with historical expenditure

PB has compared the Capex forecast by Aurora with the business' historical expenditure. The forecast figures provided by Aurora have been broken down by the expenditure categories required by the AER's RIN Template which differs from the expenditure categories used in previous regulatory reporting to the Office of the Tasmanian Energy Regulator (OTTER). To enable a comparison between the historical and forecast figures, PB has aligned the forecast capex with the OTTER reporting categories based on the 'Thread' and 'Works Category Code' breakdown in the Aurora spreadsheets.

Significantly, PB notes that the forecast capex data provided by Aurora does not include a number of minor line items or the following major expenditure categories:

- Asset management capability
- Safety health & environment, and
- NEM & contestability related expenditure.

Therefore, PB has excluded these categories from the historical figures to allow a comparison based on the capex categories where comparable data exists. Our analysis indicates that the capex categories identified in the forecast data comprise between 76% and 87% of the total historical capex in each year from 2002/03 to 2009/10 and represents a majority proportion of the total capital expenditure. Aurora's Historical and Forecast Capex is shown below in Figure 3.1. For the purpose of this capex benchmarking analysis PB has excluded corporate overheads from the historical and forecast figures.

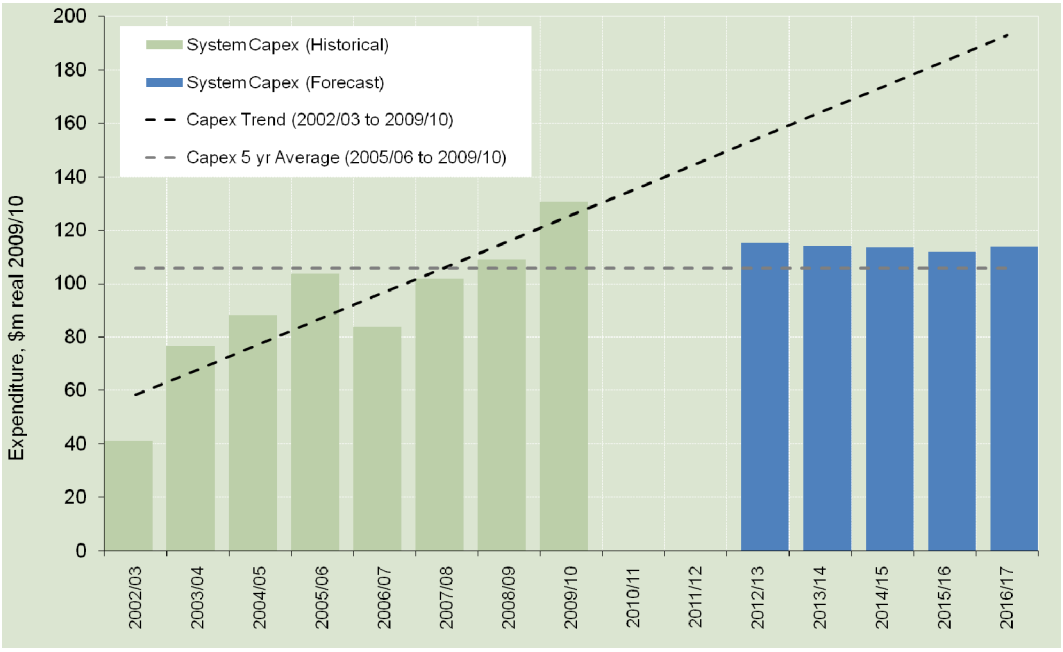


Figure 3.1 Aurora historical and forecast capex

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

PB notes that no forecast data has been provided for the 2010/11 and 2011/12 years as these fall outside the next regulatory control period. Therefore the most recent five year period from 2005/06 to 2009/10 has been used for benchmarking purposes where comparisons based on 5 year (regulatory period) averages have been made.

The average forecast expenditure of approximately $114m p.a. (real 2010) represents a moderate increase in capex of 7% ($7.9m) against the comparable capex for the five year period from 2005/06 to 2009/10. The increase is driven by a $15.0m (76%) increase in replacement capex and a $5.5m (71%) increase in metering expenditure. These increases are partially offset by an $8.3m (13%) reduction in augmentation expenditure, a $3.9m (46%) decrease in reliability expenditure, and a $0.4m (22%) decrease in public lighting capex. The historical trends by expenditure category are shown in Figure 3.2

Recent regulatory reviews have focused on the veracity of the forecast methodology and supporting documentation for categories where a significant increase in expenditure against historical levels has been proposed. For the Asset Replacement category, the AER's 'Repex' model that was used during the recent Victorian review is likely to be employed in the review of Aurora's replacement capex. Given the significant increase in Non-Demand Replacement expenditure, PB considers that it would be prudent to review the implications of the application of the AER's Repex model to Aurora's proposed Asset Replacement expenditure.

Similarly, PB notes that the significant reduction in Reliability Improvement expenditure implies that the reliability performance of the network is adequately managed through Aurora's forecast replacement programs and the historical investment in reliability improvement projects throughout the current regulatory control period. In preparation for regulatory scrutiny PB recommends that Aurora ensures that it can demonstrate how it has accounted for the reliability benefits arising from the increased replacement program. This may include the objective of the replacement program to maintain reliability at current levels or identifying and any significant improvements expected from specific projects.

Aurora's forecast represents a significant deviation from the longer term historical trend which suggests that the historical increases in system capex were driven largely by one-off augmentation work. As illustrated below, the augmentation capex in the next regulatory control period is forecast to decrease significantly from historical levels while the increases in asset replacement and metering capex result in a level of overall system capital expenditure that represents a modest (7%) increase above the average capex over the past 5 years. At a high level, the reduction in augmentation expenditure could be due to recent major augmentation work providing sufficient additional capacity to accommodate the forecast demand growth over the next regulatory control period and/or the forecast demand and customer growth rates may be significantly reduced in comparison to recent years (possibly due to a reduction in the number of major projects).

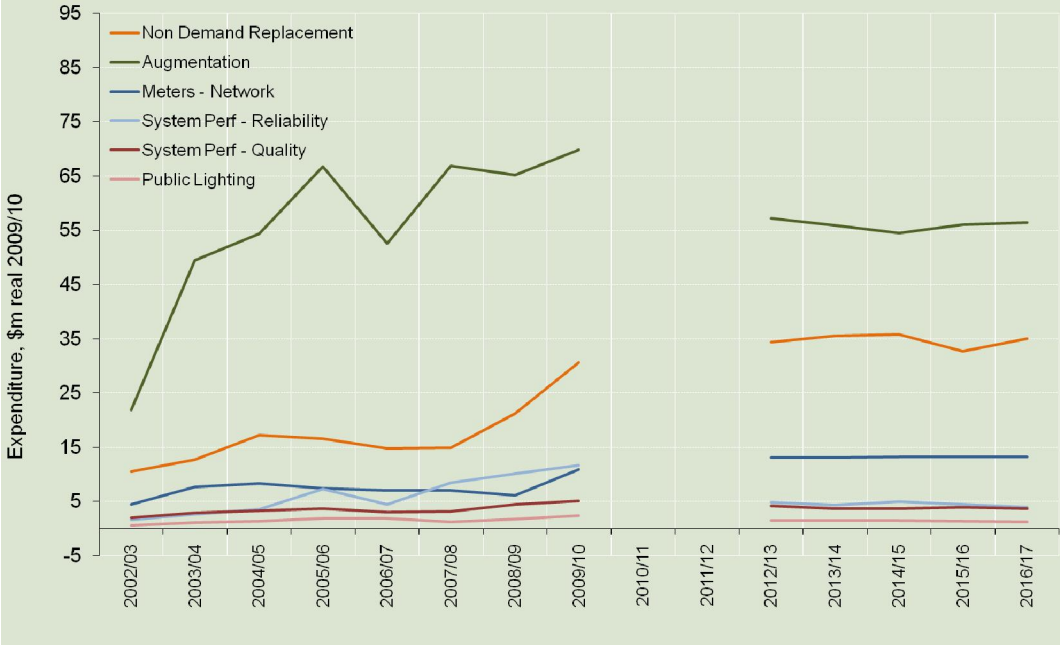


Figure 3.2 Aurora historical and forecast capex by expenditure category

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

In the absence of evidence of a slowing demand and customer growth rate, PB would be concerned that the capital expenditure forecast over the next regulatory control period is well below the long term trend since 2002/03. Should the historical trend continue, Aurora's forecast would fall significantly below the required level of capital investment. Therefore, PB is concerned that there is a risk that the proposed expenditure program understates the business' actual funding requirements.

PB notes that the historical increases in system capex are principally related to the increases in asset replacement, augmentation and reliability improvement expenditure categories which increase by $14.9m, $4.4m and $4.6m respectively over the five years from 2005/06 to 2009/10.

The historical increase in the asset replacement and reliability improvement categories is consistent with the behaviour of an aging asset base that is beginning to reach the end of its economic life. Combined with coincident increases in the 'network asset maintenance' and 'emergency response' opex categories, it is clear that the management of the assets reaching the end of their economic life will be a key driver of expenditure over the next regulatory control period.

To address this issue Aurora will need to demonstrate that the forecast increase in asset replacement expenditure is efficient and the volume of forecast asset replacement is appropriate. PB also notes that demonstration of economic efficiency requires the timing of investment to be shown to optimal. Hence, while investment earlier than required is inefficient, deferral may also be inefficient where the deferral results in a greater need for investment at a later date, results in increased risks, or has implications for service quality at a later time. Consequently, PB also recommends that Aurora ensures that any proposed capex deferral is economically justified with robust consideration of the risks, service quality implications and stakeholder value implications.

On the basis of our high level review of Aurora's historical and forecast capex, PB recommends that Aurora:

- considers the extent to which its replacement capex forecast and maintenance practices are sufficient to manage the known condition of assets in the medium and longer term. In particular where it is found that an asset replacement option is economically preferable to continued maintenance, further increases to the replacement capex may be prudent to maintain the current levels of network performance and manage the risks associated with asset failure
- undertakes a review of the recent augmentation capex and forecasting methodology to ensure that the reduction in augmentation capex in is well supported and is consistent with the business' customer and demand growth forecasts over the next regulatory control period.
- undertakes a review of the supporting documentation for asset replacement and reliability improvement categories to consider the implications of the treatment of these expenditure categories in recent regulatory determinations. Specifically the use of the AER's Repex model and the treatment of Reliability Improvement expenditure should be addressed.
- considers the timing of its expenditure programs to ensure that any proposed capex deferral is economically justified with robust consideration of the risks, service quality implications, related increases in opex and stakeholder value implications

3.1.2 Comparison with other businesses

Aurora's forecast system capex has been compared against other businesses using a range of normalisers such as line length, RAB, customer numbers and network capacity (MW). As noted in section 3.1.1, the figures provided by Aurora do not include forecast figures for all expenditure categories. To ensure that the Aurora capex figures were comparable, PB has made an allowance for the system capex categories that are not represented in the input data. This adjustment was based on the historical proportion of these costs over the period 2005/06 to 2009/10 and results in an average system capex of $150m pa.

The results of the capex benchmarking is summarised in Table 1.

Table 1 – Annual system capex benchmarks

Description	Aurora	Benchmark Average (Range)	% Variation (Position)
Capex ($m)	150	496 (75 to 1221)	-70% (2 of 12)
Capex $/Customer	564	577 (245 to 577)	-2% (8 of 12)

Description	Aurora	Benchmark Average (Range)	% Variation (Position)
Capex$ /km	6,082	11,722 (2,768 to 24,642)	-48% (5 of 12)
Capex/RAB	14.0%	14.9% (8.6% to 21.8%)	-6% (6 of 12)
Capex $k/MW	140	178 (83 to 388)	-21% (6 of 12)

Source: PD-Line-items(1) 15 Feb.xls & PB Analysis

Table 1 indicates that Aurora's system capex is below the industry average when normalised on the basis of customer numbers, line length, RAB and maximum demand. These results support the concern expressed in section 3.1.1 that Aurora's proposed capex may understate the business' actual requirements. The figures in Table 1 are based on a single figure for industry averages only and do not provide a complete view of the relative position of the business. For this reason, the full results are shown graphically below.

Figure 3.3 shows that the annual system capex plotted against the number of customers. This measure provides a comparison based on the size of the customer base. At approximately 265,000 customers, Aurora has the smallest customer base in the cohort and is of a similar scale to Jemena and Citipower. Given Aurora's line length of approximately 24,000km is significantly larger than the approximately 6,000km networks of Citipower and Jemena, PB considers that expenditure levels for Aurora at the upper end of expectations for businesses with a similar number of customers are reasonable.

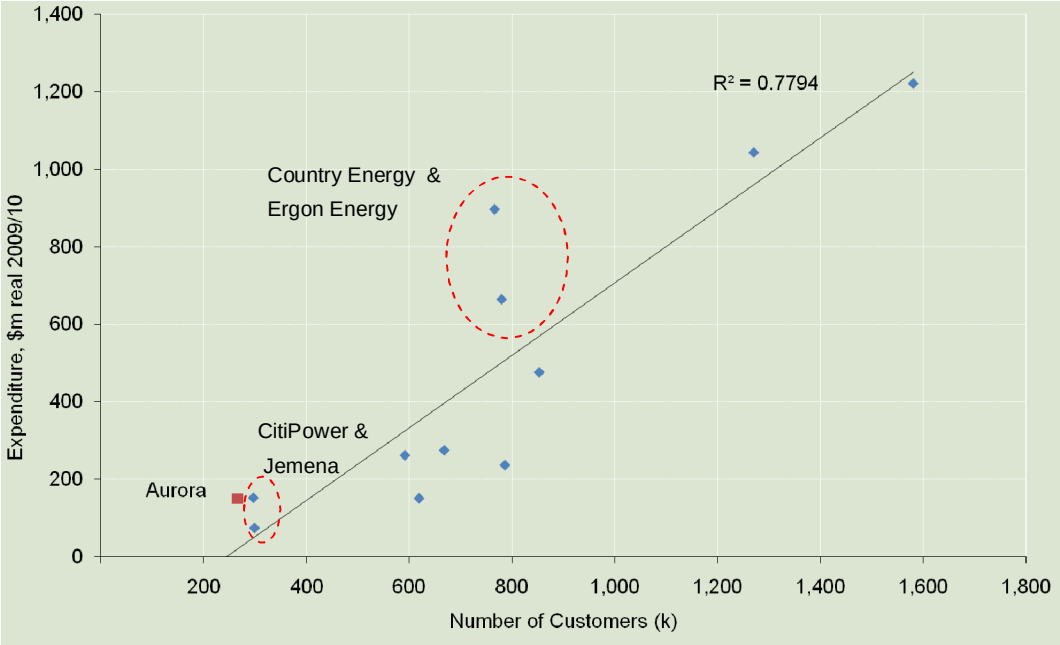


Figure 3.3 Annual System Capex v Number of Customers

Source: PB Analysis

Figure 3.4 shows the annual system capex plotted against line length. This measure provides a comparison based on the physical size of the asset base. The weak correlation indicated by the low R^2 value is due to the differing nature of distribution areas. The clear difference between rural and major city networks is due to the large length of low capacity assets (e.g. SWER lines) in rural areas and small length of high capacity assets in CBD

areas. Despite the weak correlation, Aurora benchmarks at the lower end of the cohort in this comparison

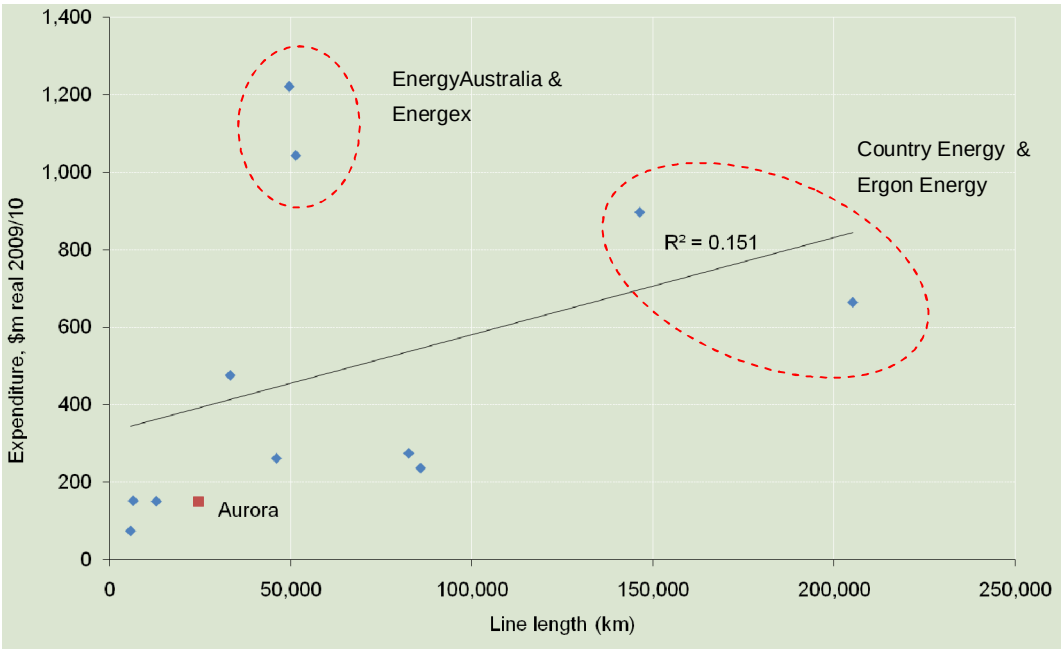


Figure 3.4 Annual System Capex v line length

Source: PB Analysis

Figure 3.5 plots the annual capex against the Regulated Asset Base for each business. This measure provides a comparison based on the value-weighted size of the asset base. In this comparison, Aurora benchmarks on the trend line which indicates that the proposed capex is aligned with industry expectations

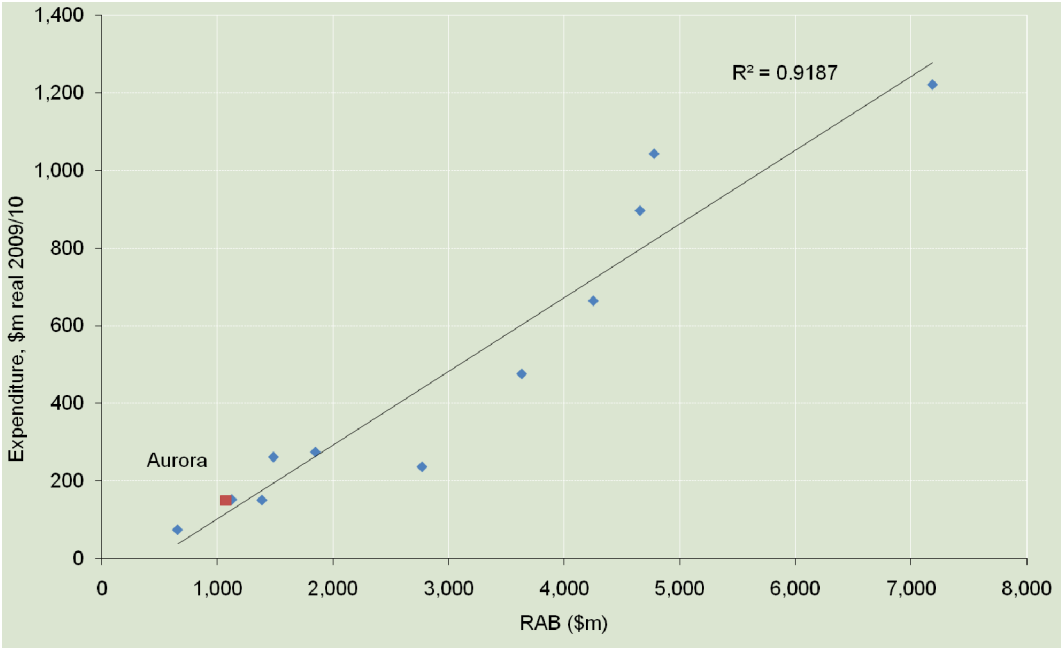


Figure 3.5 Annual System Capex v RAB

Source: PB Analysis

Figure 3.5 plots the annual capex against the system maximum demand for each business. This measure provides a comparison based on the capacity of the network. In this comparison, Aurora benchmarks on the trend line which indicates that the proposed capex is aligned with industry expectations. As illustrated by Country Energy and Ergon Energy's position, the effect of a geographically dispersed customer base and demand typically results in a higher than trend result for the rural distribution businesses across most comparators.

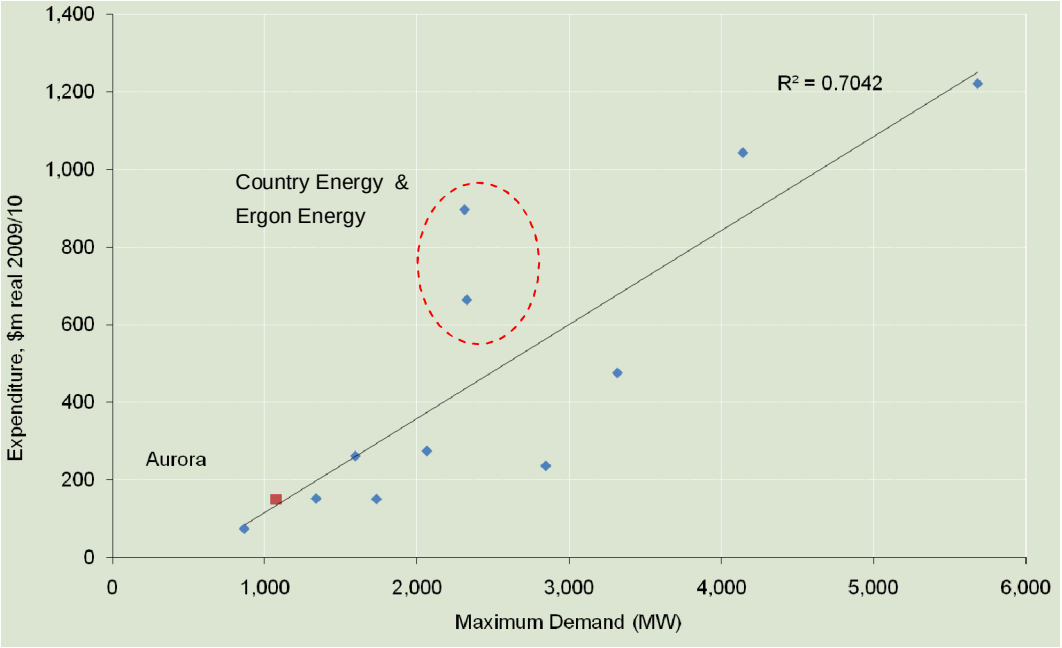


Figure 3.6 Annual System Capex v demand

Source: PB Analysis

On the basis of our benchmarking of Aurora's Capex against the other NEM distribution businesses, PB concludes that:

- Aurora's forecast system capex is generally aligned with, or below industry expectations when normalised using a range of comparators.
- however, we note that the lower than average benchmarking results compared to other distribution networks may indicate potential underinvestment in the capex forecast.

3.2 High level Opex benchmarks

The Aurora operating expenditure forecast has been benchmarked against historical expenditure in section 3.2.1 and compared against other Australian distribution businesses in section 3.2.2.

3.2.1 Comparison with historical expenditure

PB has compared the Opex forecast by Aurora with the business' historical expenditure. The forecast figures provided by Aurora have been broken down by the expenditure categories required by the AER's RIN Template, which differs from the expenditure categories used in the previous regulatory reporting to the Office of the Tasmanian Energy Regulator (OTTER).

To enable a comparison between the historical and forecast figures, PB has aligned the forecast opex with the OTTER reporting categories based on the 'Thread' and 'Works Category Code' breakdown in the Aurora spreadsheets.

Significantly PB notes that the forecast data provided by Aurora does not include a number of minor line items or the following major expenditure categories:

- corporate overheads
- network divisional management.

Therefore, PB has excluded these categories from the historical figures to allow a comparison based on the opex categories where comparable data exists. Our analysis indicates that the opex categories identified in the forecast data comprise between 51% and 62% of the total historical opex in each year from 2002/03 to 2009/10 and therefore represents a material proportion of the total operating expenditure. Aurora's Historical and Forecast Opex is shown below in Figure 3.7

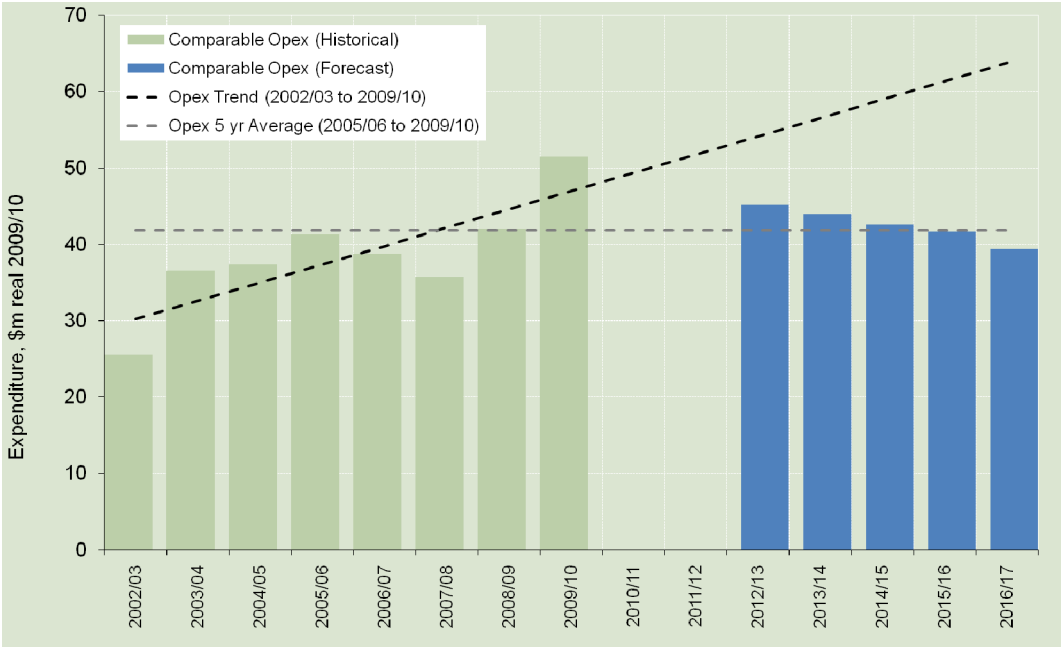


Figure 3.7 Aurora historical and forecast opex

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

PB notes that no forecast data has been provided for the 2010/11 and 2011/12 years as these fall outside the next regulatory control period. Therefore the most recent five year period from 2005/06 to 2009/10 has been used for benchmarking purposes where comparisons based on 5 year (regulatory period) averages are made.

The average forecast expenditure of approximately $43m p.a. (real 2010) represents a small increase of 2% ($3.5m) in the comparable opex for the five year period from 2005/06 to 2009/10. The increase is primarily associated with modest increases in Network Asset Maintenance ($5.3m, 9%) and metering ($2.4m, 8%) categories which are partially offset by reductions in Public Lighting ($1.6m, 12%) and System Operations ($4.5m, 78%) categories. The historical trends by expenditure category are shown in Figure 3.8

PB notes that the increases are likely to be considered in detail when subjected to regulatory scrutiny. In particular, the drivers for the increase in Network Asset Maintenance category should be identified in the supporting documentation. Where the drivers relate to an ageing or poor condition asset base, the long term efficiency of the proposed mix of asset maintenance/replacement (opex/capex responses) should also be demonstrated, with consideration given to any link between the declining profile of the emergency response expenditure and the increasing asset replacement forecast.

Aurora's forecast suggests that the increase in 2009/10 was essentially a step change and no further growth in opex is envisaged in subsequent years. PB is concerned that the declining profile of the operating expenditure forecast over the next regulatory control period is in contrast to the increasing opex requirements observed since 2007/08. Should the historical trend continue to 2011/12, this forecast is well below the long term trend line. Hence there is a risk that the proposed expenditure understates the business' actual funding requirements.

PB notes that the recent increases in opex are related to the 'network asset maintenance' and 'emergency response' categories, and that this is consistent with the increasing maintenance requirements associated with an aging asset base. Combined with the recent increases in asset replacement and reliability improvement capex, Aurora's historical expenditure indicates that the management of assets reaching the end of their economic life through maintenance or replacement is a key driver of expenditure in the next regulatory control period.

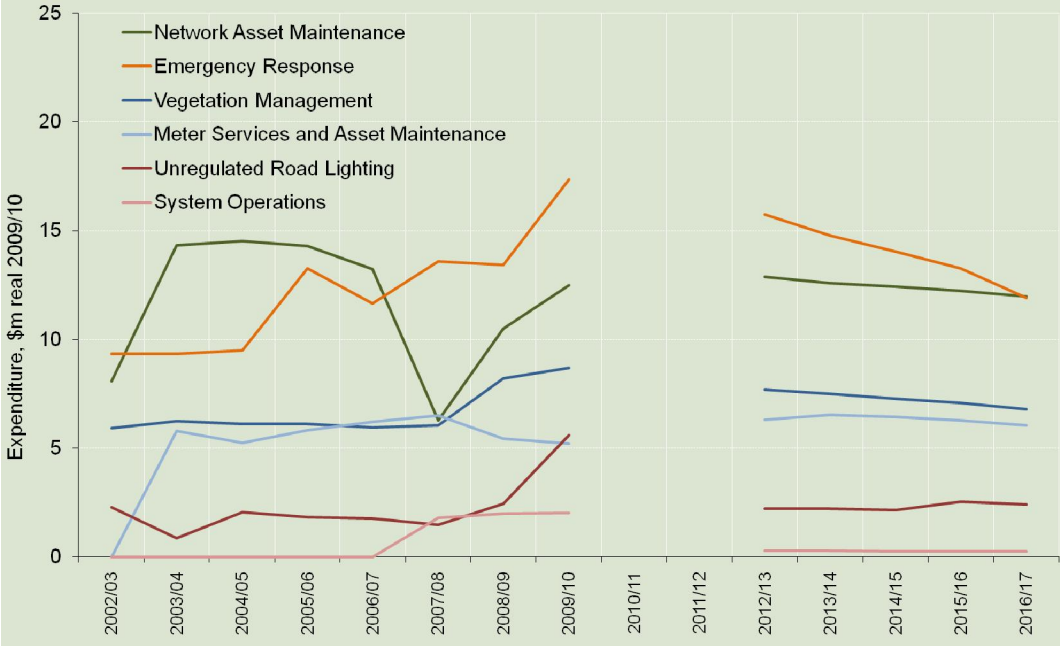


Figure 3.8 Aurora historical and forecast opex by expenditure category

Source: PD-Line-Items(1) 15 Feb.xls, PB Capex and Opex historical Data.xls & PB Analysis

On the basis of our high level review of Aurora's historical and forecast Opex, PB recommends that Aurora:

- undertakes a review of the drivers for the recent increases in operating expenditure and any scale or cost escalators used to develop the opex forecast to confirm that the opex

forecast reflects the businesses actual opex requirements over the next regulatory control period

- depending on the actual asset condition and the maintenance practices adopted by Aurora, further increases to the opex may be prudent to maintain the current levels of network performance.

3.2.2 Comparison with other businesses

Aurora's forecast opex has been compared against other businesses using a range of normalisers such as line length, RAB, customer numbers and network capacity (MW). As noted in section 3.2.1, the figures provided by Aurora do not include forecast figures for all expenditure categories. To ensure that the Aurora opex figures were comparable, PB has made an allowance for the opex categories that are not represented in the input data. This adjustment is based on the average historical proportion of these costs over the period 2005/06 to 2009/10 and results in an average controllable opex of $64m pa.

A summary of the benchmark results is shown in Table 2.

Table 2 – Annual controllable opex benchmarks

Description	Aurora	Benchmark Average (Range)	% Variation (Position)
Opex ($m)	62	236 (45 to 515)	-74% (3 of 12)
Opex $/Customer	232	288 (150 to 518)	-19% (4 of 12)
Opex $/km	2,505	5,679 (1,895 to 10,402)	-56% (5 of 12)
Opex/RAB	5.8%	7.8% (4.0% to 11.1%)	-26% (2 of 12)
Opex $/MW	57,532	89,823 (33,280 to 173,559)	-36% (2 of 12)

Source: PD-Line-items(1) 15 Feb.xls & PB Analysis

Table 2 indicates that Aurora's controllable opex is below the industry average when normalised on the basis of line length, maximum demand and RAB and ranks toward the middle of the cohort when normalised on the basis of customer numbers. This is likely to reflect the reduced economies of scale available to networks with a smaller customer base and large distribution area. The results are shown graphically in Figure 3.9 to Figure 3.12.

Figure 3.9 shows that the annual controllable opex plotted against the number of customers. This measure provides a comparison based on the size of the customer base. Aurora's system capex is marginally above the regression line indicating that it is in general aligned with industry expectations.

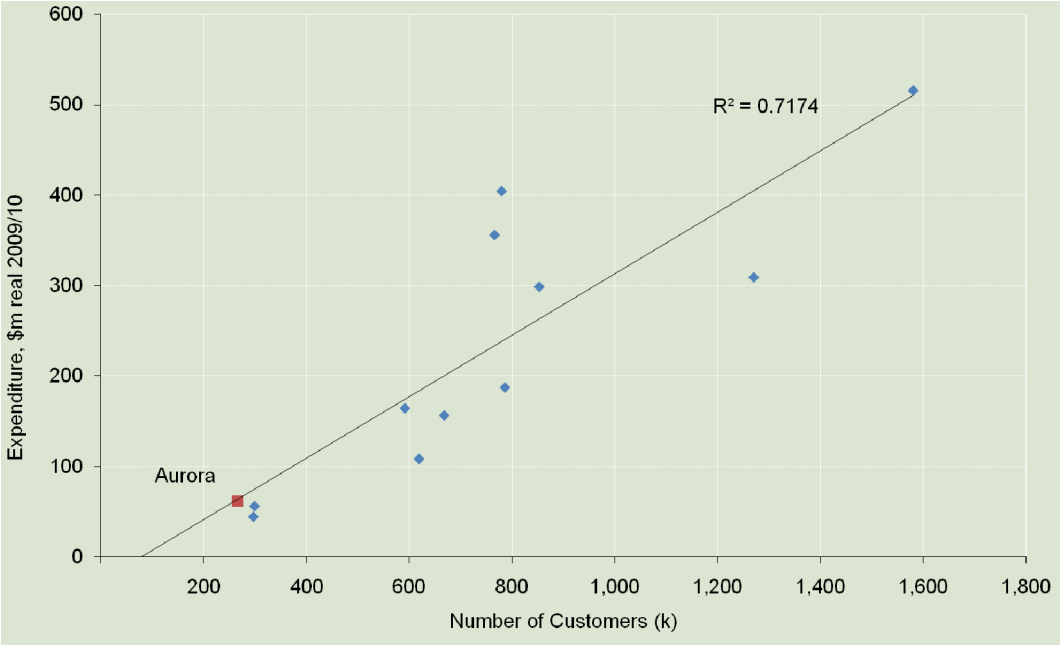


Figure 3.9 Opex vs Number of Customers

Source: PB Analysis

Figure 3.10 shows the annual controllable opex plotted against line length. This measure provides a comparison based on the physical size of the asset base. The weak correlation indicated by the low R^2 value is due to the differing nature of distribution areas. Despite the weak correlation, Aurora benchmarks at the lower end of the cohort in this comparison.

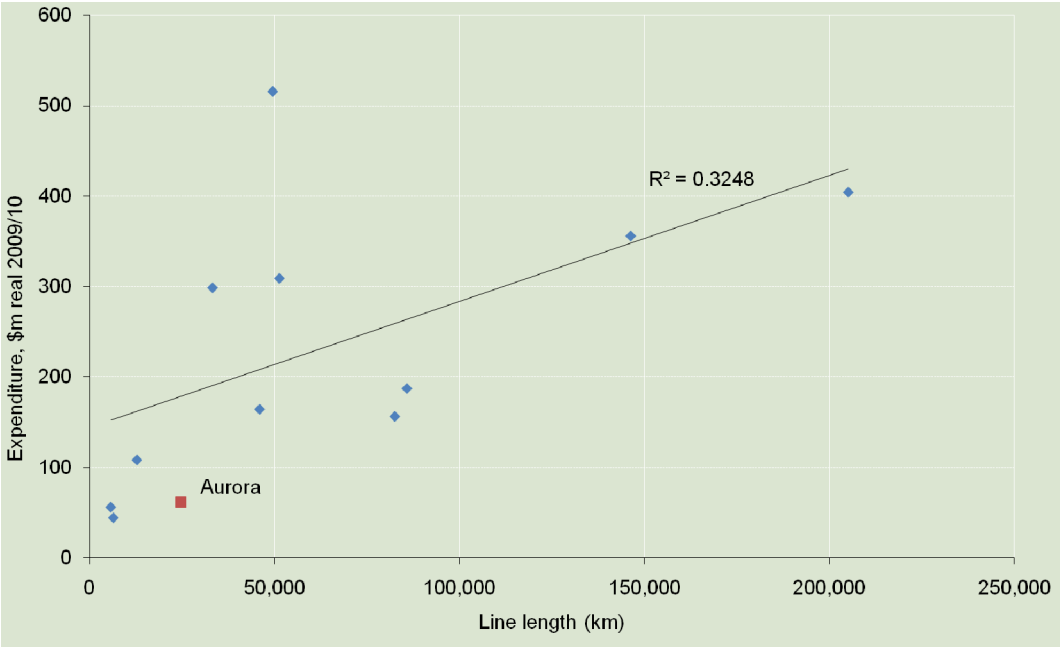


Figure 3.10 Opex vs line length

Source: PB Analysis

Figure 3.11 plots the annual opex against the Regulated Asset Base for each business. This measure provides a comparison based on the value-weighted size of the asset base. In this

comparison, Aurora benchmarks on the trend line which indicates that the proposed opex is aligned with industry expectations.

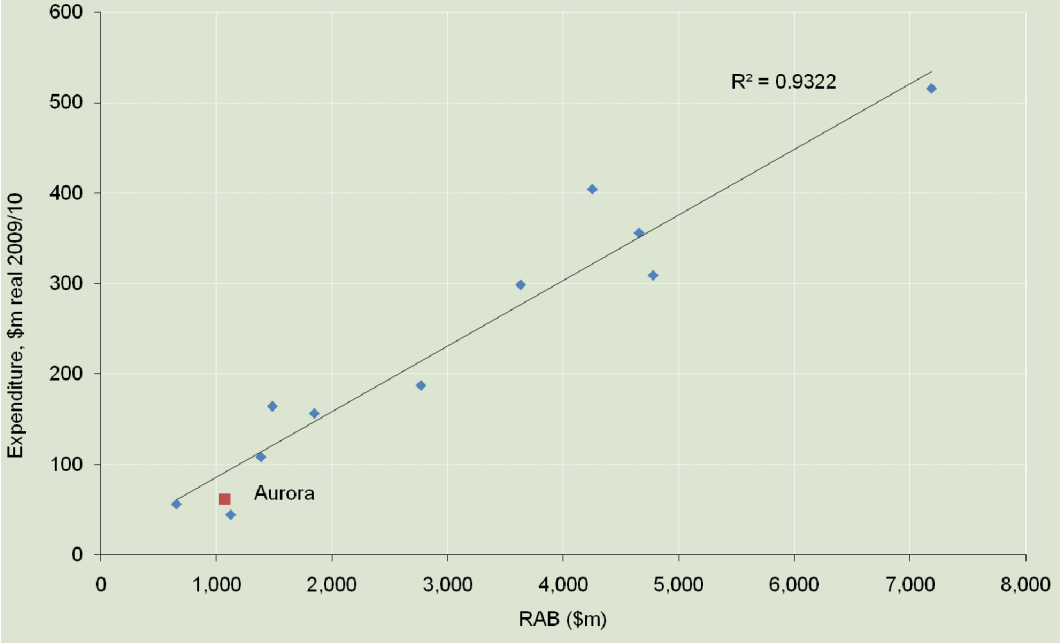


Figure 3.11 Opex v RAB

Source: PB Analysis

Figure 3.12 plots the annual opex against the system maximum demand for each business. This measure is provides a comparison based on the capacity of the network. In this comparison, Aurora benchmarks marginally below the trend line which indicates that the proposed capex is broadly aligned with industry expectations.

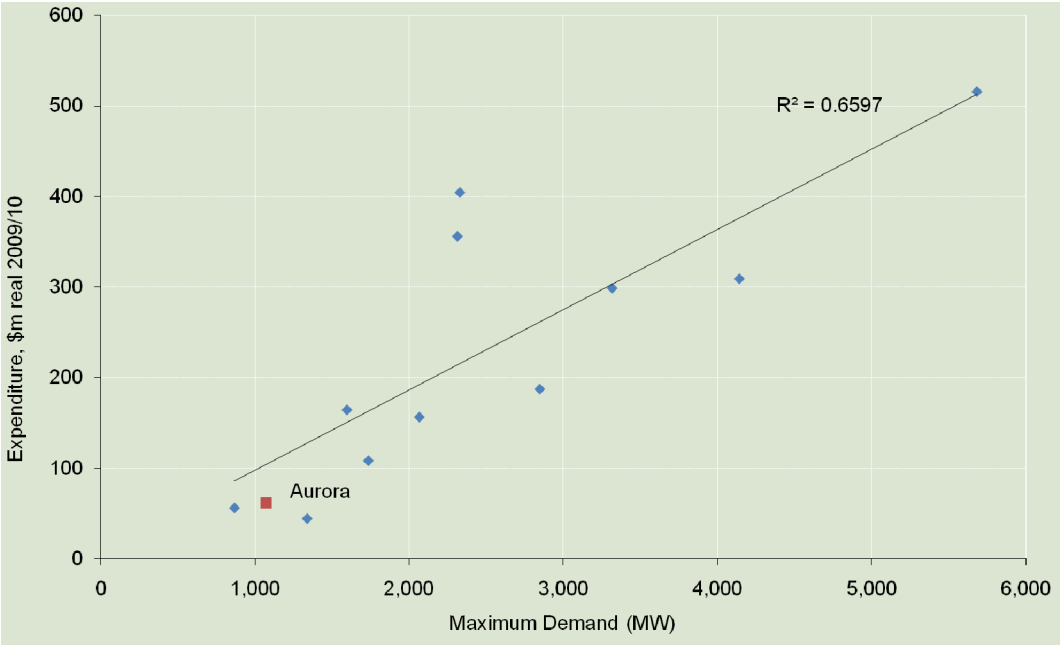


Figure 3.12 Opex v demand

Source: PB Analysis

On the basis of our benchmarking of Aurora's Opex against the other NEM distribution businesses, PB concludes that:

- Aurora's forecast opex is aligned with industry expectations when normalised using a range of comparators.

3.3 Unit cost benchmarks

To identify the most material unit costs within the proposed expenditure program, PB identified the ten most material programs in the portfolio, these are summarised in Table 3 below. In total these programs comprise $447.6m (52%) of Aurora's $869m total network expenditure identified in the *PD-Line-items(1) 15 Feb.xls* model.

PB notes that the 'IT Systems' capex program and the 'Licences and Maintenance Agreements' opex program relate to network IT expenditure that does not lend itself to benchmarking comparisons of this nature. As limited descriptions have been provided for much of this expenditure in the Program of Works model, PB recommends that Aurora undertake a separate review the supporting documentation for these major network IT capital and operating expenditure programs prior to submission of its regulatory proposal.

Table 3 – Top ten proposed projects/programs

Program	$(m)	Typical Unit Cost Comparator	Description
Customer Connections and Demand Based Expenditure	279.9	Connection Cost	Average supply connection cost per customer
Emergency Management	66.0	Proportion of Opex	Relative performance against other businesses normalised for line length
Meter Replacement	39.1	Meters	Average meter replacement cost per customer
Vegetation – Maintenance Management Program	35.4	Vegetation Management	Relative performance against other businesses normalised for line length
IT Systems[1]	30.0	N/A	-
Replace Condemned Pole	26.9	Pole Replacement	Average cost to replace a pole
Install Metering Equipment (New Installations)	25.7	Meters	Average meter installation cost per customer
Licenses and Maintenance Agreements[2]	18.7	N/A	-
Inspection OH and treatment Structures	16.5	Proportion of Opex	Relative performance against other businesses normalised for line length

1 This item is comprised of $6m p.a. under the 'Asset Management Capability' capex work program (items 20294 to 20299 in PD Line Items(1) 15 feb.xls)

2 This item is comprised of $3.7m p.a. under the 'Direct Work' opex work program (items 16693, 16944, 20111, 20115 to 20121 in PD Line Items(1) 15 feb.xls)

Program	$(m)	Typical Unit Cost Comparator	Description
Install Substation – New OH transformer for Voltage Improvement	10.7	Pole mounted substations	Average cost to install a new pole mounted substation
Scheduled Meter Reading 3 Day Window	9.0	Meter Reading	Average cost of metering per customer

Source: PD-Line-items(1) 15 Feb.xls & PB Analysis

The supply program is the largest component of the Aurora expenditure forecast. Aurora has itemised this amount into a number of subcategories to differentiate between customer types, as well as overhead and underground connections. Notwithstanding the above, limited conclusions can be drawn regarding the efficiency of supply costs for individual customer types in the absence of similar detailed information for each of the networks, which is not typically available in the public domain. Therefore, as shown in Table 4, to provide a comparison between networks, PB has compared the total customer connection costs for Aurora with the comparable costs approved for other businesses in the most recent AER determinations.

Table 4 – Customer supply benchmarks

Description	Aurora	Benchmark Average (Range)	% Variation (Position)
Customer Initiated Capital Works ($ per connection)	9,035	11,766 (6,512 to 22,571)	-23% (6 of 12)
Customer Initiated Capital Works ($ per existing customer)	211	145 (48 to 383)	45% (11 of 12)
Customer Initiated Capital Works (% total capex)	45%	24% (6% to 47%)	21% (11 of 12)

Source: PD-Line-items(1) 15 Feb.xls & PB Analysis

Aurora benchmarks in the middle of the cohort on a cost per connection basis and at the upper end of the cohort on the basis of both cost per existing customer and percentage of total capex. This indicates that the cost per connection is relatively consistent with industry expectations for a mixed rural/urban network and that at an average of 2.2% p.a., the rate of growth in customer connection expenditure is at the upper end of industry expectations given the size of the customer base and total proposed capex.

PB notes that major projects requiring a HV connection are frequently located outside or on the fringes of urban areas where more extensive network augmentation is required to serve these customers. In particular major resources and industrial connections often occur in rural areas and frequently require extensive augmentation work. Significantly, the three businesses that exhibit a cost per connection above $15k all contain a large proportion of rural network within their service area. However, when these businesses are excluded, the range of results is significantly reduced with Aurora's average cost per connection remaining within 10% of the industry average.

Given the materiality of customer connection costs in the total expenditure program and the limited supporting detail included in the Unit Cost and Program of Works model to support the annual estimates, PB recommends that a detailed review of the connection cost estimating process is undertaken prior to submission of Aurora's regulatory proposal. This is also discussed in section 3.1.1

Table 5 summarises the results of PB's analysis of the remaining key unit costs affecting the most material programs in Aurora's proposed expenditure program.

Table 5 – Opex & Capex unit cost benchmarks

Description	Aurora $/unit	Benchmark Average (Range)	% Variation (Position)
Opex programs			
Emergency Management - per km	535	395 (168 to 685)	36% (4 of 5)
Vegetation Management - per km	295	1,134 (913 to 1,468)	-74% (1 of 5)
Vegetation Management - per customer	27	105 (48 to 242)	-69% (1 of 5)
Asset Inspections - per km	230	325 (179 to 516)	-29% (3 of 5)
Metering – per customer	24.1	16.6 (6.9 to 27.9)	45% (7 of 8)
Asset replacement/augmentation			
Pole Replacement (Typical) - per pole	4,403	6,420 (4,459 to 8,043)	-31% (1 of 6)
Install OH Transformer (11kV & 22kV)	36,020	34,325 (32,139 to 36,860)	5% (4 of 5)
Replace HV Copper Conductor - per km	48,283	57,549 (34,700 to 80,200[3])	-16% (3 of 5)
Meter Installation/replacement - per meter	127 / 103	100-150[4]	-

Source: PD-Line-items(1) 15 Feb.xls & PB Analysis

The results indicate that Aurora's:

- emergency management expenditure per km of line and metering expenditure per customer is well above average, but within the range experienced by other businesses
- vegetation management costs per km of line are well below average and the outside the range of values experience by other businesses. At $295/km, Aurora's proposed vegetation management costs represent approximately one third of the cost for the next peer business at $913/km
- typical pole replacement unit costs are below the average. However, PB notes that Aurora also includes a separate allowance for 'complex' pole replacements but does not provide forecast quantities. This could have the effect of increasing the average pole replacement cost closer to those reported by the cohort businesses
- asset inspection, meter installation/replacement costs, OH transformer installation costs and conductor replacement costs are generally in line with industry expectations

3 The upper end of the range relates to complex urban environments.
4 Typical average meter installation cost

PB notes that the total cost of Aurora's expenditure program is dependent on both unit costs and the volume of activity undertaken. For many of the projects and programs identified in Aurora's program of works, only an annual amount or contract value has been included with no specific description of the volume of work covered by the allowance. In this case it is not possible to assess the underlying unit costs.

Following from our review of unit costs, PB recommends that Aurora review the following items prior to finalising its regulatory submission:

- the comparatively high emergency response expenditure, especially given the coincidental reduction in network maintenance expenditure in 2007/08
- the comparatively low vegetation management expenditure when considered against other distribution businesses.
- the supporting documentation for the major network IT capex and opex programs to ensure that the expenditure is justified to a level that satisfies external regulatory scrutiny.

4. Summary of findings

This section summarises the findings from our benchmarking review of Aurora's capex and opex costs.

4.1 Summary of Capex findings

PB has benchmarked Aurora's forecast capex against historical performance and other NEM distribution businesses and considered the unit costs underpinning the most material aspects of the forecast expenditure, and concluded that:

- the forecast capex represents a 7% increase on the average capital expenditure over the five year period between 2005/06 and 2009/10 and is significantly lower than would be expected based on the historical trend in network expenditure
- Aurora's forecast system capex is generally aligned with, or below industry expectations when normalised using a range of comparators
- unit cost benchmarking suggests that:
  - typical pole replacement unit costs are below the average but are likely to be aligned with average pole replacement costs when Aurora's additional annual allowance for 'complex' pole replacements is considered '
  - meter installation/replacement costs, OH transformer installation costs and conductor replacement costs are generally in line with industry expectations.
- however, we note that there is a risk that the lower than average benchmarking results may indicate a potential underinvestment when compared to the trend in historical expenditure and other distribution networks.

In particular, we note that the recent and forecast increases in asset replacement expenditure are consistent with an increasing number of network assets reaching the end of their economic life. In our opinion there is a risk that the proposed capex may materially underestimate the capex requirements of the business.

4.1.1 Capex recommendations

To address the issues identified above, PB recommends that Aurora review the following items prior to finalising its regulatory submission:

- the extent to which its replacement capex forecast and maintenance practices are sufficient to manage the known condition of assets in the medium to longer term. In particular where it is found that an asset replacement option is economically preferable to continued maintenance or emergency rectification, further increases to the replacement capex may be prudent to maintain the current levels of network performance and manage the risks associated with asset failure
- the supporting documentation for asset replacement category to consider the implications of the AER's Repex model in recent regulatory determinations.
- the forecast reduction in augmentation capex and the underlying forecasting methodology to ensure that the reduction in augmentation capex in is well supported

and is consistent with the business' customer and demand growth forecasts over the next regulatory control period

- the timing of its expenditure programs to ensure that any proposed capex deferral is economically justified with robust consideration of the risks, service quality implications, related increases in opex and stakeholder value implications
- given the inclusion of the program in the ten most material expenditure programs, the supporting documentation for the $30m network IT capex program identified as 'IT Systems' in the Program of Works spreadsheet to ensure that the justification for the expenditure is sufficient to satisfy external regulatory scrutiny.

4.2 Summary of Opex findings

PB has benchmarked Aurora's forecast opex against historical performance and other NEM distribution businesses and considered the unit costs underpinning the most material aspects of the forecast expenditure, and concluded that:

- the forecast opex represents a 2% decrease on the average operating expenditure over the five year period between 2005/06 and 2009/10 and is lower than would be expected based on the historical trend in operating expenditure
- Aurora's forecast opex is generally aligned with industry expectations when normalised using a range of comparators
- unit cost benchmarking shows that;
  - emergency management expenditure per km of line and metering expenditure per customer is well above average, but within the range experienced by other businesses.
  - vegetation management costs per km of line are well below average and the outside the range of values experience by other businesses. At $295/km, Aurora's proposed vegetation management costs represent approximately one third of the cost for the next peer business at $913/km
  - asset inspection costs are generally in line with industry expectations

4.2.1 Opex recommendations

To address the issues identified above, PB recommends that Aurora review the following items prior to finalising its regulatory submission:

- the drivers for the recent increases in operating expenditure and any scale or cost escalators used to develop the opex forecast to confirm that the opex forecast reflects the business' actual opex requirements over the next regulatory control period
- the drivers for the forecast increase in Network Asset Maintenance and the declining profile of the Emergency Response categories should be identified to ensure that the long term efficiency of the proposed mix of asset maintenance/replacement (opex/capex responses) can be demonstrated
- the relatively high emergency response expenditure when compared to other businesses

- the relatively low vegetation management expenditure when compared to other businesses as Aurora's expenditure in this category appears to be considerably lower than other networks when normalised on both a per km and per customer basis.
- given the inclusion of the program in the ten most material expenditure programs, the supporting documentation for the $18.7m network IT opex items identified as 'Licenses and Maintenance Agreements' in the Program of Works spreadsheet should be reviewed to ensure that the justification for the expenditure is sufficient to satisfy external regulatory scrutiny