The Impact of the AER's Draft Decision on ActewAGL's Service and Safety Performance

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Client: ActewAGL Distribution

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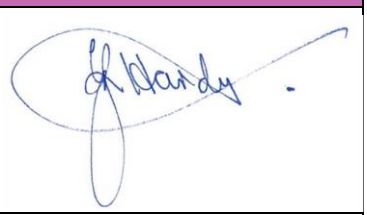
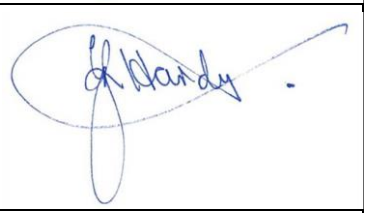
A	14-Jan-2015	Final Draft Report	Geoff Hardy Industry Director, Advisory	
B	15-Jan-2015	Final Report	Geoff Hardy Industry Director, Advisory	

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In November 2014 the AER provided a draft decision on the revenue ActewAGL may recover from its customers in the 2015-2019 regulatory control period. ActewAGL is preparing a further submission in response to this draft determination, and asked AECOM to contribute an assessment of the probable impact of the draft decision on its customers and its ability to maintain its levels of service.

This report reviews the impact that a substantial reduction in REPEX and OPEX could have on ActewAGL's customers and its ability to provide services, starting with a summary of how work management is prioritised and carried out by ActewAGL. It then addresses the impacts of underfunding REPEX and OPEX in turn, using examples drawn from other sectors and jurisdictions as well as ActewAGL's experience, and finally draws a number of conclusions:

- ActewAGL appears to be prudent in its approach to asset management and efficient in its use of resources, as would be expected from a DNSP that rates among the best in the country when judged by cost to consumer and level of service achieved, and is committed to further ongoing improvement.
- A forced reduction in REPEX and OPEX of the scale suggested by the AER would have a significant impact on the level of service ActewAGL is able to provide to its customers, potentially including an impact on safety levels associated with its assets. Various examples have been provided to indicate the type and scale of this possible impact on ActewAGL's customers.

  This strategy would run down asset value, benefiting current customers at the expense of future customers. We concluded that customers unable to accept a decline in level of service or an increased risk of service interruption will have to invest in contingency measures. The forced reduction in funding would therefore increase supply costs for some customers, and force the remainder to accept a lower level of service.
- The benchmarks used by the AER have little or no relevance to a DNSP, and in our opinion judgements made based on them are of limited value.

  ActewAGL has experienced engineers who use all the information available to them and sophisticated analysis tools to optimise total cost of ownership for critical assets and therefore determine the optimal timing for replacement (and therefore for REPEX). In contrast, the AER has relied on generic econometric models and distantly related data from other sources to over-rule ActewAGL's projections, in many cases using 'average' asset lives that are almost double ActewAGL's experience-based estimates.
- We suggest that the AER would arrive at a more reliable determination if it were able to rely on audited certification to current asset management standards (ISO 55001:2014), which require demonstrated application of systems and processes that achieve an optimised (least cost) management regime consistent with level of service obligations (and also require demonstrated continuous improvement processes).

  We acknowledge that this approach is not yet possible, because ActewAGL is not yet certified, but recommend that it be adopted for the next regulatory period.
- The AER has included REPEX and OPEX reductions in its determination that, if ActewAGL's own estimates are eventually proven more reliable, will cause a significantly higher rate of failures and a corresponding deterioration in levels of service provided to customers that would otherwise not have occurred.

We note that, in our opinion, the ultimate measure of prudence and efficiency for a DNSP should be:

1) its long-term average distribution network charge
2) its long-term ability to meet level of service obligations
3) its ability to preserve its assets in an appropriate state of good repair on behalf of future users.

Poor performance against any of these measures would be a valid reason for action by a regulator. In this case, ActewAGL is a leader among its peers on the first two points, and the AER has not required (or made) any assessment of the third point.

We have noted that the lack of a commonly accepted definition of 'state of good repair' by the regulator and the DNSPs means that an appropriate level of tolerance of risk to service delivery is not agreed by both parties, which makes it very difficult to reach agreement on future REPEX and OPEX funding for any DNSP.

1.0 Introduction

ActewAGL Distribution (ActewAGL), the electricity distribution network provider in the ACT, has its revenues subject to determinations made at intervals by the Australian Energy Regulator (AER) based on the National Electricity Rules and National Electricity Law.

In November 2014 the AER provided a draft decision on the revenue ActewAGL may recover from its customers in the 2015-2019 regulatory control period.[1] ActewAGL is preparing a further submission in response to this draft determination, and asked AECOM to contribute an assessment of the probable impact of the draft decision on its customers and its ability to maintain its levels of service.

This report reviews the impact that a substantial reduction in REPEX and OPEX could have on ActewAGL's customers and its ability to provide services, starting with a summary of how work management is prioritised and carried out by ActewAGL. It then addresses the impacts of underfunding REPEX and OPEX in turn, using examples drawn from other sectors and jurisdictions as well as ActewAGL's experience, and finally draws a number of conclusions.

The data and information used in this report has been provided by ActewAGL, sourced internally by AECOM or drawn from publically available documents. It is not possible to be definitive about future performance, so much of the discussion in this document is cast in terms of risk (to service delivery capability or levels of service).

This document has been prepared for the sole use of ActewAGL and specifically to review the possible impact of the AER's draft decision on ActewAGL's levels of service. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on ActewAGL's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM has relied on information provided by ActewAGL and other third parties, some of which may not have been verified.

1.1 Context

In its draft decision, the AER determined that ActewAGL's forecast REPEX for the 2014-19 regulatory period should be reduced by 25.4%. This determination was based on:

- benchmarking at the expenditure category level, and trend analysis of historical actual and expected REPEX
- a review of the major REPEX projects nominated by ActewAGL
- its own predictive modelling of replacement expenditure requirements.

The AER has also determined that ActewAGL's annual operational budget should be reduced by approximately 42%, a decision that relies heavily on econometric modelling and benchmarking. This determination includes a reduction required in ActewAGL's OPEX in the current financial year by 45% (the year will be 58% complete at the end of January 2015).

1.2 This Document

REPEX and OPEX are largely asset management activities, so this document addresses ActewAGL's activity in this area first. It then addresses:

- the impact of reducing REPEX
- the consequential impact of reduced REPEX on OPEX needed
- the impact of reduced OPEX on levels of service received by customers.

The final section of the document draws conclusions.

[1] Draft decision, ActewAGL determination, AER, November 2014

2.0 ActewAGL's Asset Management Activity

The REPEX and OPEX assessed by the AER primarily relate to funding of asset management activities.

2.1 Compliance with Asset Management Standards

The Utilities ACT 2000 (ACT) requires the DNSP to have an up-to-date asset management system consistent with current standards.[2] Asset management now has an international standard (ISO 55001:2014), which replaced a publically available specification for optimised management of physical assets (PAS 55:2008) during 2014.

ISO 55001:2014 defines asset management as:

> *Systematic and coordinated activities and practices through which an organisation optimally manages its assets and their associated performance, risks and expenditures over their lifecycle for the purpose of delivering the organisation's business objectives.*

The draft standard:

- Has an explicit focus on maintenance, renewal and enhancement activities intended to deliver sustainable outputs valued by customers and funding providers at the lowest whole of life cost (as opposed to prioritising work predominantly according to asset condition).
- Integrates across boundaries between organisational functions and asset disciplines, and where relevant, between infrastructure managers and contracting organisations.
- Emphasises evidence-based decision making, optimising maintenance and renewal interventions based on knowledge of how assets degrade and the risk of failure.

This approach establishes a 'line of sight' between strategy and implementation, the ability to deliver sustainable performance with reduced volumes of work, and the ability to demonstrate to external stakeholders that activities are being undertaken at the lowest whole of life cost.

Certification to ISO 55001:2014 will demonstrate that the organisation is applying the principles required by the standard and is therefore considered to be operating in a 'least cost environment' consistent with its level of service obligations.

In our view, demonstrated compliance with ISO55001:2014 should be viewed as an acceptable evidence of an organisation's prudence and efficiency, and should be relied on by regulators for that purpose.

Compliance with the standard implies that asset-related financial projections are by definition 'least cost' (for specific level of service requirements, on a long-term mean annual basis), and it should be expected that a review of these projections would in practice be a review of levels of service applicable. A reduction in funding from the 'least cost' position would therefore imply a reduction in the level of service required.

ActewAGL is committed to complying with ISO 55001:2014. An initial assessment (against PAS 55:2008) in 2010 identified a number of areas of non-compliance, and ActewAGL developed and adopted an improvement roadmap to address these. A subsequent audit, including an assessment against the new ISO 55001:2014, was carried out in October 2014, and ActewAGL is addressing the remaining items of non-compliance.[3]

The latest audit noted that ActewAGL has made improvements since 2010, and demonstrated commitment to ensuring ongoing development of its asset management system. The audit found non-compliance to 3 clauses of PAS 55:2008 (of 24), and identified a number of actions for ActewAGL required to achieve full compliance to ISO 55001:2014. It concludes that:

- ActewAGL is managed in a professional manner by motivated and enthusiastic staff who demonstrated a commitment to improve the asset management capability of the business
- ActewAGL is making good progress towards compliance
- several areas of non-compliance are generic quality management issues rather than specific asset management challenges.

[2] s 59 and s 65, para 5.3
[3] PAS 55 and ISO 55001 Gap Analysis Report, AMCL, 28 October 2014

ActewAGL is not yet fully compliant with ISO 55001:2014, but in its asset management policy (adopted on 15 September 2012), it commits to achieving certification within the next regulatory period. The policy includes the following statements:[4]

1) all assets shall be managed in full compliance with any relevant statutory and mandatory legal and safety requirements

2) the management of asset related risk and Asset Management related risk shall be undertaken in accordance with the Corporate Risk Management Policy (DM 173864)

3) assets, systems and networks shall be managed in a sustainable manner including due consideration of long-term financial, societal and environmental impacts

4) the Asset Management approach shall be appropriate to the scale and relative importance of the assets and asset systems to achieving the overall organisational objectives

5) ActewAGL shall proactively seek continual improvement of its Asset Management capabilities and activities to assure value for money for customers and stakeholders.

This policy is implemented via an Asset Management Strategy, itself subject to review by the Board.[5]

While the company is not yet fully compliant, the majority of the asset management specific requirements of ISO 55001:2014 are already being met. ActewAGL considers that it is close to operating in a least cost manner consistent with its level of service obligations, and believes that this is demonstrated by its current ranking as a leading Australian DNSP based on average distribution network charge and system average interruption duration index (SAIDI).[6]

2.2 Renewal and Maintenance Strategies

ActewAGL expects to achieve a number of objectives with its asset management program, including:

a) safety of customers, the community and workers

b) quality, reliability and security of supply of electricity distribution and transmission services

c) compliance with codes, licences, contracts, industry standards and obligations

d) quality, reliability and security of supply performance risks

e) minimisation of whole-of-life costs through optimisation of capital costs, maintenance costs and operational risk costs

f) minimisation of the volatility of renewal works and associated material, skill and revenue requirements

g) minimisation of project delivery risks and the potential impact of renewal works on network availability, market participants and connected parties.

ActewAGL has invested in staff and support systems designed to enable cost effective supply of services to its customers. A leading software tool (Riva) was acquired specifically for that purpose, and work processes modified to make optimal use of the investment. Riva was designed to ensure that long-term capital and maintenance plans are optimised and integrated with work management systems, based on comprehensive and current asset information. The tool develops intervention and cost forecasts for the full lifecycle of assets and enables strategic risk management and budgeting.

The consequence of failure, including any loss of service to customers, is established for each major asset and combined with the probability of the event to establish risk costs. Assessments of the probability and consequence of failure are used to determine a risk priority number (RPN) which is used to prioritise interventions based on the impact on level of service (represented by customer minutes at risk or safety indicators), and to determine the extent and timing of renewal activities.

Ongoing benchmarking with other DNSPs and liaison through industry associations such as CIGRE and ESAA brings additional data, experience and insight that may affect prioritisation.

[4] Electricity Distribution Asset Management Corporate Policy 8.1, 15 September 2012
[5] Asset Management Strategy, Version 2.11, 23 May 2014.
[6] AEMC Residential Electricity Price Trends Report, December 2013; AER State of the Energy Market 2013.

Renewal of assets is planned where the following conditions apply:

- existing equipment cannot economically meet emerging functional requirements
- existing equipment cannot comply with current or emerging legislative requirements
- the equipment will present an uneconomic risk in terms of safe and reliable operation during the asset renewal-planning period
- the predicted costs associated with keeping the equipment in service over the asset renewal planning period present a higher net present value than an asset renewal option.

Planned asset renewal aims to optimise the life cycle costs of an asset or group of assets by predicting when operating and risk costs will exceed the cost of funding remedial works. This strategy assumes that performance and asset condition monitoring systems are able to predict service failures in enough time to enable assets to be renewed before they fail (and service is interrupted), and requires that:

- it is possible to collect critical knowledge of condition and trends to predict imminent failure
- there is sufficient warning time to arrange planned maintenance
- the cost of inspections is less than the difference between cost of failure and cost of planned maintenance
- there is sufficient flexibility in the planning window and delivery resource availability to vary renewal programmes in response to changing plant condition
- there is sufficient flexibility in network access to allow multiple outages of circuits.

Where these conditions cannot be met, usage-based renewal or run-to-failure strategies are applied:

- Usage based renewal is effective where the economic life of an asset can be estimated with reasonable accuracy, and a planned replacement is more economic than run to failure, despite sacrificing a portion of the expected life of the asset.
- Run to failure has the advantage of extracting the maximum life from the asset, and is most effective where there is little cost difference between planned maintenance prior to failure and replacement on failure. This strategy is effective where loss of functionality is not critical.

2.3 The Lowest Mean Annual Cost of Service Delivery

The principle involved in achieving the lowest whole-of-life cost is illustrated in Figure 1, which shows the mean total annual cost as a yellow line, the contributory direct costs (blue) and cost of service interruption (red). The lowest mean annual cost is the 'economic optimum' for a critical asset. Cost premiums could be applied to meet higher reliability targets (higher levels of service) or as a higher cost of risk (lower levels of service).

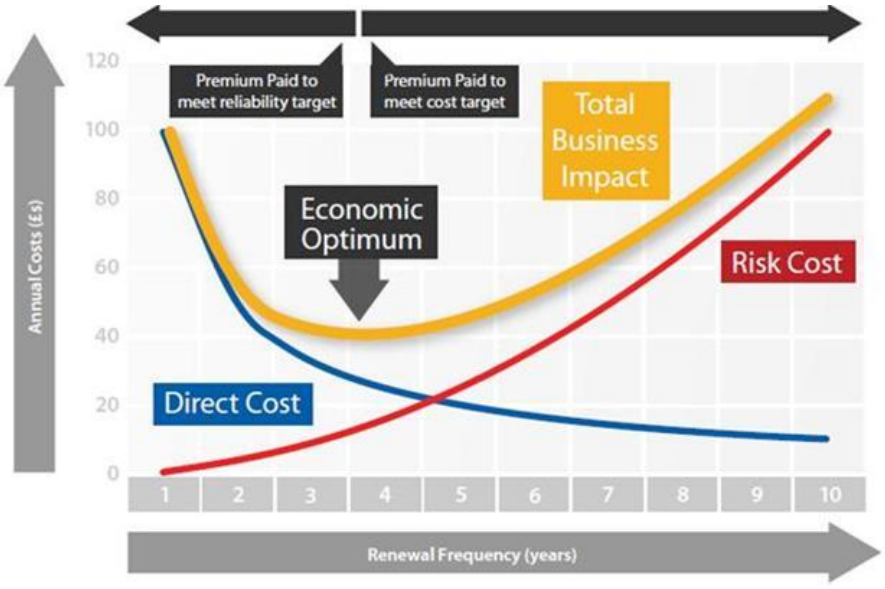

Figure 1 The impact of advancing or deferring renewal on mean annual total cost of ownership

ActewAGL optimises its costs by balancing intervention (maintenance) costs with asset risk over the lifetime of the asset. The value of risk that accrues to a given asset escalates every year as the asset ages and deteriorates. Eventually the annual cost of risk is high enough to warrant the REPEX required to replace the asset and therefore reduce the risk cost to the level it would be for a new asset.

A software tool (Riva) is used to determine the optimal combination of replacement, refurbishment and inspection costs that enables the asset to deliver acceptable levels of service over its life, and therefore identify the strategy that provides the least mean annual cost.

The timing of renewal can be deliberately scheduled away from the economic optimum:

- Early renewal can be scheduled for risk reasons, generally for critical assets that should not be allowed to fail, where the total cost of ownership is accepted as being higher than the least cost for strategic (risk) reasons. In practice, this strategy involves a cost premium being paid to achieve a higher reliability target.
- Late replacement can be done for budget reasons, where renewal is delayed past the point that represents the least cost timing because funds are not available for the asset concerned at the time required (the asset is a low priority). The risk cost includes:
    - higher than optimal intervention costs (unplanned replacement generally comes at a higher cost than when planned)
    - higher maintenance costs (a higher rate of inspections, more frequent temporary repairs and costs associated with repairs and other interventions that would not have been necessary if the assets were renewed at the optimal time)
    - the cost to customers (and ActewAGL) of service interruptions.

    In practice, a late replacement policy for a critical asset implies a devaluation of the value of the service and an increase in the cost of interruptions for customers and ActewAGL.

ActewAGL's life cycle cost benefit analysis of wood versus fibreglass poles in rear-of-block applications was referenced in its submission to the AER.[7] The study found that fibre glass poles have both a lower initial installed cost and a lower maintenance cost in rear-of-block applications, giving a lower total cost of ownership.

ActewAGL is confident that its pole replacement program represents prudent and efficient REPEX. This was accepted by the AER in its draft decision.

Figure 2 Life Cycle Cost Optimisation of Poles

ActewAGL compared the cost of replacing cable based on condition with the cost of reactive work driven by cable failure.[8] A summary of the findings is presented below:

Cost ($m, constant dollars)	FY15	FY16	FY17	FY18	FY19
Condition Monitoring OPEX	$0.15	$0.15	$0.24	$0.24	$0.24
Cable Replacement CAPEX	$0.18	$1.13	$1.13	$1.13	$1.13
Condition Monitoring Total Cost	**$0.33**	**$1.28**	**$1.37**	**$1.37**	**$1.37**
Cable Reactive repair work OPEX	**$1.89**	**$1.33**	**$1.78**	**$2.29**	**$2.87**

It is clear that a strategy of cable replacement based on condition rating is the least cost solution, and therefore represents prudent and efficient OPEX and REPEX.

Figure 3 Life Cycle Cost Optimisation of Underground Cables

[7] Operating and capital expenditure 'site visit' clarifications, ActewAGL, 3 October 2014. Section 3.3
[8] HV Underground Cable Condition Assessment Business Case, ActewAGL, 4 April 2014. Page 7

ActewAGL's level of service obligation is subject to agreement from time to time with customers or their representatives.[9] ActewAGL has supply contracts with significant or large customers, which include specific reliability, availability and/or fault response times as part of the contract specification.

In all cases, there is an implied relationship between the level of service expected and the willingness to pay for that service. This trade-off is illustrated in Figure 4. It should be noted that not all assets are critical (where their failure will cause a service interruption), and non-critical assets are generally managed under a run-to-fail regime.

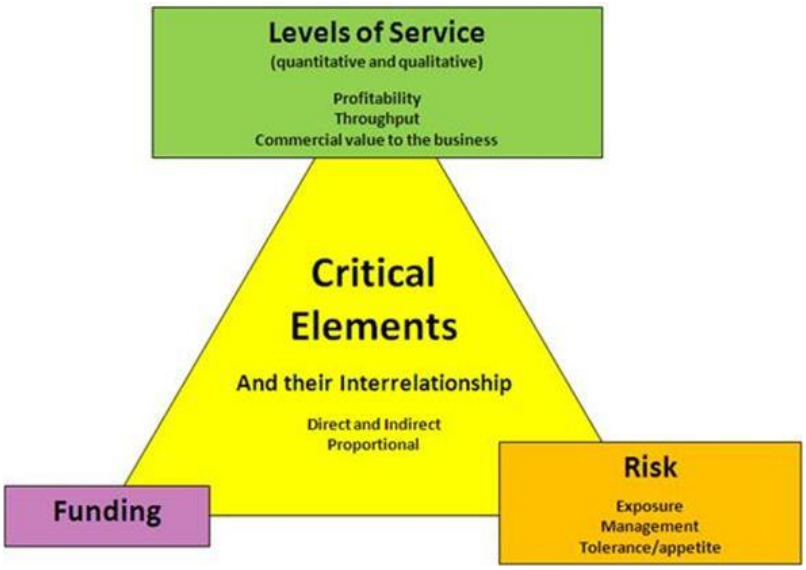

Figure 4 The trade-off of level of service, cost of service and risk

A reduction in funds available for management of ActewAGL's assets, whether capital for renewal or operational for maintenance and emergency management, will force an increase in the tolerance for risk by ActewAGL (and its customers), and reduce the level of service able to be delivered.

2.4 The AER's Use of Benchmarking to Assess Prudence and Efficiency

The National Electricity Rules require the AER to have regard to benchmarking ('relative efficiency') when determining efficient expenditure allowances. Following the Rules, the AER has made extensive use of benchmarking in reaching its determinations, although it notes that other evidence is also used to make a 'holistic' decision.[10] Benchmarking is, however, considered by the AER to be central to assessing the efficiency of the base year for OPEX purposes.

2.4.1 The AER's Benchmarks

In our view, many of the benchmarks used have little relevance in practice because they do not reflect the nature of the business being assessed. Many also use inaccurate data, so conclusions drawn are likely to be misleading. For example:

- The AER's decision to reduce REPEX draws on data represented graphically in Attachment 6, Figures A-8 and A-9, which are intended to show a correlation between REPEX and customer density and demand density.[11]

  The two graphs do not show the correlation intended, and it should be clear that no such correlation would be expected for distribution utilities such as ActewAGL.

[9] Minimum network distribution reliability requirements are documented in EN 4.4 P07 - Distribution Network Reliability & Standard Supply Arrangement
[10] Adopting an approach presented in its Expenditure Forecast Assessment Guideline, published in November 2013
[11] Draft Decision ActewAGL distribution determination 2015-15 to 2018-19, Attachment 6: Capital Expenditure.

- The AER also uses a chart comparing DNSP REPEX to their RAB (Figure A-10).

  This chart indicates a better correlation, and uses an indicator which is more relevant for DNSPs, noting that local conditions should be considered when interpreting the chart. The AER appears to misinterpret the data, however - it notes that ActewAGL has incurred an '*average proportion of REPEX relative to the size of its RAB when compared with other service providers'*, whereas the chart as presented shows that ActewAGL was significantly better than all other DNSPs.

  The RAB is not a "perfect" denominator for use in comparing DNSPs, because individual DNSP RABs were established at different points in time, using different unit rate costs, with asset quantity data of varying accuracy, and differing capitalisation policies.

  The RAB includes depreciation, so the REPEX / RAB ratio for existing assets will increase over time (ignoring new assets), and will therefore be higher for DNSPs with older assets (ignoring other factors). This could be misinterpreted as a decline in efficiency, but is in fact a predictable outcome for any utility.

A strong correlation is expected between REPEX and mean (weighted by replacement value) asset age. This measure was not benchmarked by the AER, although it has included commentary on asset age ('*asset health*').

This measure would be expected to show that REPEX increases as mean remaining economic life decreases (and would show the impact of deferring REPEX). The AER, in contrast, appears to expect that future REPEX should be similar to past REPEX, and uses this as a basis for refusing projected increases in REPEX funding. This expectation does not match reality.

2.4.2 Utilities are primarily 'fixed cost' businesses

ActewAGL, like most distribution utilities, is largely a fixed cost business where costs are incurred primarily in relation to assets. A small proportion of costs (typically less than 10%) can reasonably be considered to be variable (where variable means dependent on the quantity of energy shipped), so indicators used for benchmarking based on energy supplied have very little relevance. REPEX and OPEX costs are typically not dependent on demand either, although AUGEX costs will clearly relate to demand in the long term.

An efficient utility using a particular asset class will have to deliver the same range of interventions that any other utility would for that class, with variations due to asset age, different load profiles leading to different economic lives, and regional variations because of ease of access to the asset, etc.

In practice, the cost of managing assets will not vary a great deal with the procurement method being used, except in relation to the indirect and overhead costs applicable and the impact of differing labour agreements (governing overtime, etc):

- Material costs will be much the same for all utilities, with small changes in price depending on the model of assets used, procurement policies and practices.
- Economies of scale will not be readily available because, subject to the qualifications noted above, the direct workload required is related to the number of assets employed (in each class).
- The benefit of outsourcing (as an alternative business model) is largely:
  - an opportunity to reduce overhead in favour of a lower overhead contribution from the outsourced provider
  - a potential opportunity to avoid paying for staff while they are under-utilised.
- Economies of scale will therefore only be apparent in indirect and overhead costs which are not directly linked to the number of assets - a larger organisation should be able to achieve a lower overhead impost on direct costs.

Economies of scale should therefore exist for utilities, but be relatively minor in scale. This point can be illustrated with a chart taken from a 2007 comparison for Queensland Treasury of selected water utilities, which included a comparison of OPEX per connection (Figure 5). The chart shows high variability for small utilities, as would be expected (local factors would be expected to be more significant for small operations), but shows a small benefit for larger organisations. The sample size is small, but does appear to support the expected outcome.

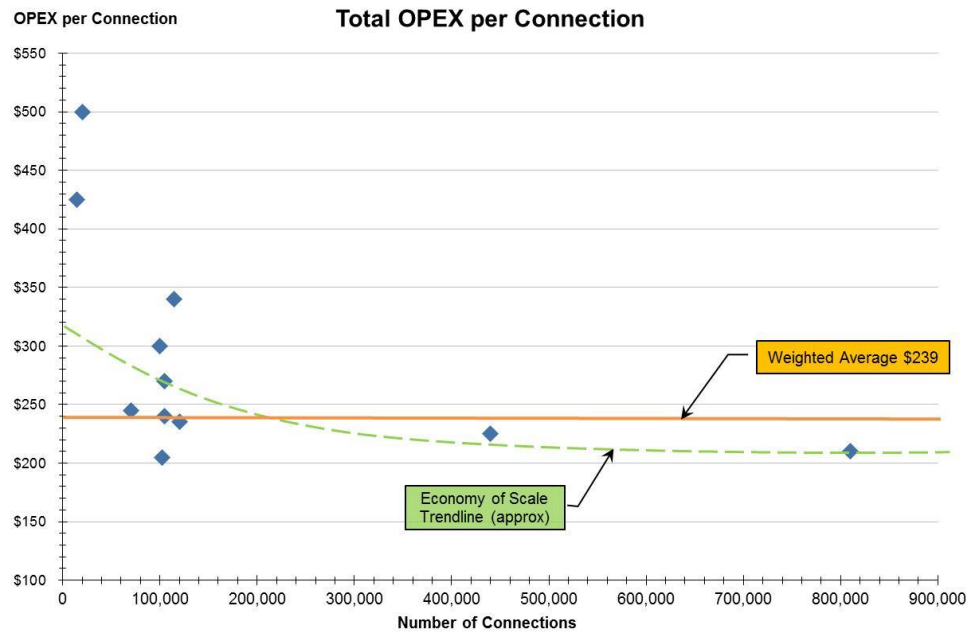

Figure 5 Example of benchmarking of utilities showing small economies of scale

In our experience, benchmarking between utilities, especially small ones, is strongly affected by local circumstances, and has very limited reliability.

2.4.3 Trends in asset-related costs over time

Some useful comparison can be made, however. A comparison of 'written down asset value' to 'current replacement costs' using the same utilities (Figure 6) indicated that most were, in practice, budgeting for a decline in mean asset age, implying a long-term deterioration in asset quality and a long-term increase in risk to services provided.

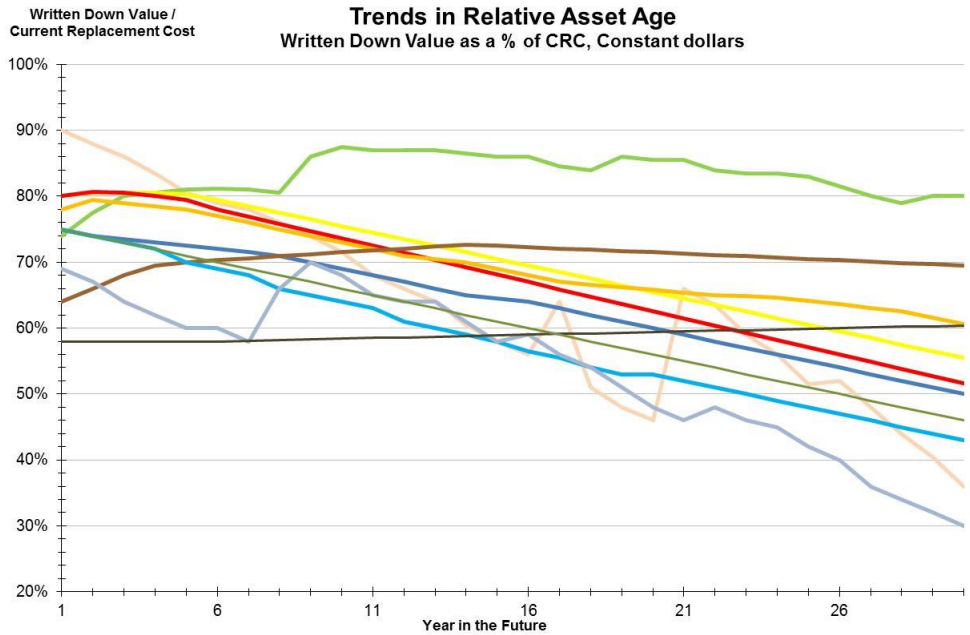

Figure 6 Benchmarking of relative asset age

We note that a decline in asset condition for *new* assets is acceptable, assuming that the required 'state of good repair' is not equivalent to new asset condition (refer to Figure 7, which uses data sourced by AECOM and presents a standardised decay curve for the asset nominated, based on a large sample of this asset class drawn primarily from US operators).

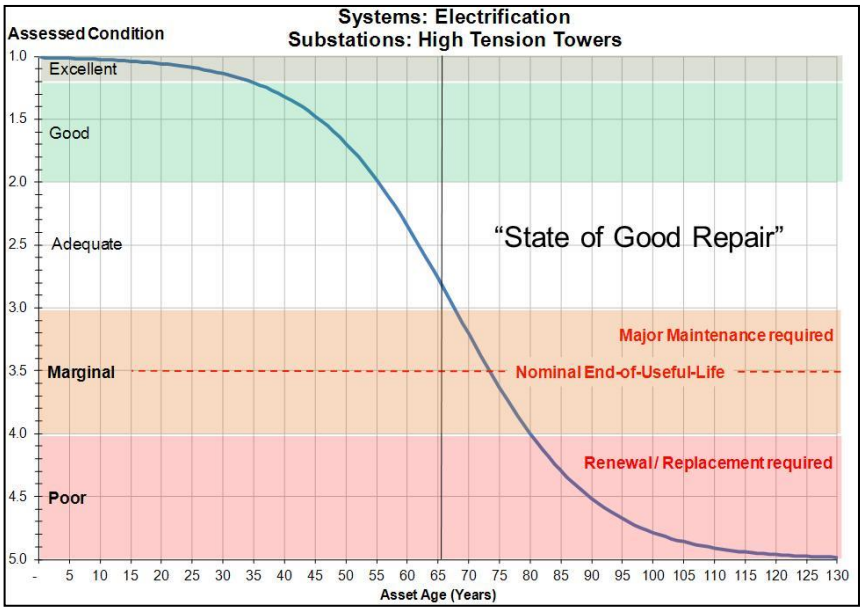

Figure 7 Example of the decline expected in asset condition over time

As the assets reach the nominated range of 'state of good repair' (representing the asset owner's determination of 'acceptable' risk of failure or risk of service interruption), asset-related costs (OPEX and REPEX) will increase to keep the assets within the band of acceptable condition / risk (this is the basis of the cost increases indicated in Figure 1, and is shown below in Figure 11 using ActewAGL data for underground cables).

A projected long-term decline in asset age / quality below the nominated 'state of good repair' is a significant issue for future customers. We note that REPEX can be deferred (at a cost) but not avoided, and maintenance OPEX can be reduced for a period but will result in an increase in a backlog of works and higher total costs of ownership (unless a higher risk of service interruption or decline in level of service can be tolerated, in which case the 'state of good repair' indicated in Figure 7 will be re-positioned lower on that chart).

Although ActewAGL has not presented data in this form in its submissions, we are confident, after conversations with its asset managers, that it is conscious of the risk that a decline in asset quality poses to its customers in the future and that this issue is given proper consideration in its forward planning. We note, however, that without an accepted definition of the acceptable level of risk to services (from which would be derived the 'state of good repair', ActewAGL has had to establish its own default policy on this issue, and has developed its cost projections accordingly. A change in the level of acceptable risk would enable these cost projections to be adjusted.

Using the same principle, a reduction in REPEX and OPEX budgets of the scale currently proposed by the AER will force a decline in future asset quality, in effect lowering the acceptable 'state of good repair' and implying a higher tolerance of risk to services provided by ActewAGL.

2.4.4 Benchmarking of REPEX

Finally, it would be expected that REPEX for utilities would vary according to the value and type of assets employed, but particularly with their mean age (weighted by replacement cost).

Utilities with older assets would therefore be expected to require higher REPEX, as noted above. Benchmarking of this relationship for the same utilities referred to previously shows a relatively poor correlation (Figure 8), indicating that local conditions have a significant impact and perhaps suggesting a wide range of performance among the utilities involved.

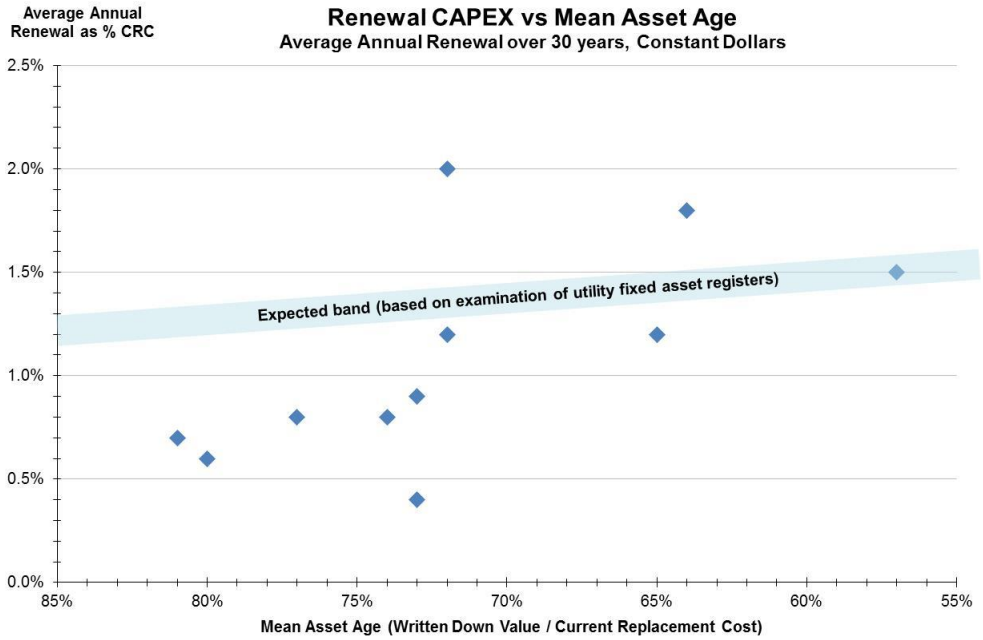

Figure 8 Benchmarking of REPEX using mean asset age

2.5 The AER's Predictive Modelling

The AER's view is that "*ActewAGL's long-term REPEX requirements* ***as evidenced by its past expenditure*** *will provide ActewAGL with a reasonable opportunity to recover at least its efficient costs.*"

As noted in the previous section, this view is not the reality for utilities. Assets deteriorate during their economic lives, tend to suffer an increasing rate of failure and require increasing inspection and maintenance towards the end of their lives. Historically low levels of REPEX are not sustainable, unless levels of service are allowed to deteriorate, and lower than recommended REPEX or OPEX is likely to result in higher than average funding requirements at some stage in the future. Future funding requirements for REPEX and OPEX cannot be assumed to be the same as past expenditures.

It should be noted that most DNSPs are likely to assign condition-based REPEX a lower priority than customer-driven or demand-driven CAPEX or regulatory, statutory/environmental or safety-related CAPEX. It is therefore common for DNSPs to defer less critical replacement and refurbishment of assets because of funding constraints. REPEX requirements cannot be deferred forever, however.

The AER has noted that a significant proportion of ActewAGL's asset population has survived to an older age than would be expected.[12] It shows (in Figure A-10) that past REPEX has been lower than all other DNSPs, and then includes a view of ActewAGL's REPEX (Figure A-18) which shows the 'bow-wave' of deferred expenditure that should be expected from an historic under-investment in REPEX.

Later, in its charts A-11 through A-17, the AER effectively confirms the low level of recent asset REPEX reported to it by ActewAGL in Appendix B17.1 of its submission (which indicates that the weighted average age of the network increased from 24.9 years in 2007/08 to 26.3 years in 2012/13).

The AER concludes, however, that the REPEX projection is incorrect, that the economic lives being achieved are longer than expected, and therefore that future REPEX should be reduced. A view more consistent with the evidence would be that the projection includes deferred REPEX. Imposing further deferral through severe budget reductions is likely to rapidly increase the risk of failure.

The AER's calibrated model trends forward ActewAGL's observed replacement practices from the previous regulatory period, relying on benchmarked life expectancies derived from DNSPs and possibly other sources with considerably different operating conditions to ActewAGL.

[12] Draft Decision ActewAGL distribution determination 2015-15 to 2018-19, Attachment 6, p6-59

2.6 Conclusions

We conclude from this review that indicators used for benchmarking should be either:

- highly specific, with all significant localised causes for variation removed or accounted for; or
- high level, but selected to be reflective of and relevant to the nature of the business.

We also note that conclusions drawn using benchmarks should be tested against reality before use, to confirm their reasonableness for the purpose.

In our view, the benchmarks used by the AER do not provide useful information in relation to ActewAGL, and any conclusions drawn using them should be heavily qualified.

We have noted that an alternative means of assessment now exists and could be mandated for the next round of pricing determinations (use of certification to ISO55001:2014).

3.0 The Impact of Reduced REPEX

Asset management costs increase as infrastructure ages, because of the increasing need for repairs and the increasing cost of service interruption.

Any model that uses REPEX and OPEX as a fixed percentage of net capital stock (RAB) will indicate *declining costs* as the net value of the capital stock declines - this is exactly the opposite of what happens in practice, so modelling and benchmarking using this approach are not appropriate and should not be used.

A reduced REPEX budget represents, in practice, a deferral of asset replacement / renewal, since the assets will continue to deteriorate and will eventually have to be renewed or replaced when they are completely unserviceable. The impact of an extended deferral of asset replacement will be:

- a steadily increasing rate of service interruptions
- often a decrease in public safety
- an increase in the backlog of unfunded works
- an increase in future service costs (early interventions are usually simpler and cheaper – a coat of paint not applied may eventually result in a need for rust removal instead of painting, for example).

3.1 Experience in Other Sectors and Jurisdictions

It has become common in the US (and more recently, selectively, in Australia) to refer to a 'state of good repair' in relation to infrastructure, particularly in their transit sector (which includes rail, road and air transport infrastructure). The increasing rate of failure of critical transit infrastructure in the US has attracted the attention of Congress, and there have been many reports on the current state of good repair across the continent and many strategies developed to fund reduction of the 'backlog'.

By way of examples:

- The cost of delaying REPEX in the transit sector in Massachusetts has been summarised in Figure 9.

The economic case for transportation investment in Massachusetts includes, as a cost of doing nothing (to address the backlog):[13]

- Facilities not in a state of good repair increases operating costs for users and increase the likelihood of crashes, causing property damage, injury and loss of life, estimated to cost between $6.6 and $11 billion by 2030 (in discounted 2008 dollars).
- Increased congestion translates into greater travel times, diverting valuable time from productive work or non-work activities, estimated to cost the economy between $11 and $15 billion by 2030 (in discounted 2008 dollars).
- The diversion of additional resources to mitigate rising congestion and operating costs reduces the productivity of business in the Commonwealth. Job losses are estimated to be between 12,300 and 15,600 by 2030 due to a deficient transportation network.
- Rising congestion and bottlenecks erode travel reliability, increasing the contingency commuters and shippers must allow to achieve on-time delivery. To compensate, some shippers will hold higher inventories, raising their overall business costs.
- Deteriorating system performance translates into vehicles that are not operating at their most efficient levels, with environmental consequences including worse air quality, increased greenhouse gas emissions and increased water pollution.
- The cost of remediation may be higher in the future because construction costs are projected to increase faster than inflation - a cost in 10 years' time is expected to be 12% higher in real terms than today. State and federal revenue growth is likely to lag cost growth, aggravating the funding problem.

Figure 9 The Cost of Doing Nothing (deferring REPEX) in the Massachusetts transit sector

[13] The Cost of Doing Nothing: The Economic Case for Transportation Investment in Massachusetts, AECOM, January 2013

- The backlog of REPEX for bridges alone (in the US) has been estimated to be about $76 billion, almost 6 times the current annual budget. Each day in 2013 more 200 million trips used deficient bridges.[14]

- A recent review of American Water Works noted that current REPEX requirements for water mains are estimated to be $15 billion per annum, significantly more than current budgets.[15] It notes that:

  'the prospect of not making the necessary investment is even more chilling.

  Aging water mains are subject to more frequent breaks and other failures that can threaten public health and safety (such as compromising tap water quality and fire-fighting flows).

  Buried infrastructure failures may impose significant damages (for example, through flooding and sinkholes), are costly to repair, disrupt businesses and residential communities, and waste precious water resources.

  These maladies weaken our economy and undermine our quality of life. As large as the cost of reinvestment may be, not undertaking it will be worse in the long run by almost any standard.'

  A related report published in 2002 estimated that the backlog in maintenance expenditure on drinking water infrastructure would reach 44% of annual requirements by 2018 if funding is not increased.[16]

- The US Dept of Energy notes that 41% more outages affecting 50,000 or more consumers occurred in the second half of the 1990s than in the first half (affecting on average 15% more consumers each time).[17]

- The American Society of Civil Engineers estimates an annual investment capital budget requirement for distribution systems of $57 billion by 2020, compared to current average budgets of $20 billion. If budgets are not increased, the annual cost to the economy due to unreliability in power distribution is estimated to be about $23 billion by 2020.[18] The report notes that:

  '*the costs incurred by failing to close the investment gap are higher than the investment itself. This means that it is economically inefficient for households and businesses to allow this higher cost scenario to occur.'*

- Engineers Australia assessed the nation's infrastructure in 2010.[19] It gave the ACT's distribution system an overall rating of B+ at the time, but noted that

  '*the average age of ActewAGL's electricity assets has been increasing … the implication of this is that there will need to be an increase in [REPEX] over the next decade to restore the assets to today's average asset age*.'

- Delayed replacement of critical assets contributed to the Auckland power supply failure in 1998, the first of several significant cable failures there:[20]

  The Ministerial inquiry into the 1998 Auckland power supply failure found that the economic loss was equivalent to between 0.1% and 0.3% of GDP, and was critical of the utility's risk management and contingency planning, its operations and asset management practices, and its governance arrangements.

  The failure has resulted in a much greater emphasis on security of supply in service contracts, in turn putting more emphasis on risk evaluation and management.

[14] 2013 Report Card for America's Infrastructure, ASCE, 2013.
[15] Buried No Longer: Confronting America's Water Infrastructure Challenge, American Water Works Assn
[16] The Clean Water and Drinking Water Infrastructure Gap Analysis, US Environmental Protection Agency, 2002.
[17] The Smart Grid: Exploring the imperative of revitalizing America's electric infrastructure, 2004
[18] Failure to Act: The Economic Impact of Current Investment Trends in Electricity Infrastructure, ASCE, 2013.
[19] Australia's Infrastructure Report Card, Engineers Australia, 2010.
[20] One of four cables supplying Auckland CBD failed in 1998, possibly due to unusually hot and dry conditions, and a second failed nearly 3 weeks later. Both cables were past their expected replacement dates. The increased load caused the remaining two cables to fail a week later, and 20 city blocks in the CBD lost power for 5 weeks.

- A review (by AECOM) of RailCorp's asset management performance and funding in 2012 for Transport for New South Wales (TfNSW) established a definition for a 'state of good repair' for the rail system in NSW, and worked with RailCorp to confirm the level of funding required to maintain the existing rail system in that state. The impact of a potential reduction in funding for REPEX and OPEX (maintenance) was assessed and presented to TfNSW in terms of the cost of the backlog of required works that would not be funded.

  It was estimated that the funding reductions being considered would result in an increase in the value of RailCorp's backlog of REPEX to 40% of its annual budget within 5 years. The report noted that:

  > '*the backlog does not represent discretionary work – it represents work that will have to be done at some stage if service-related failures are to be avoided.*' It also noted that *'if renewal or refurbishment is not done at the optimum time, the consequence is an inefficient use of funds'.*

  If the funding reduction being considered had been implemented, both the scale of the backlog and the rapidly deteriorating level of service provided by NSW's rail system would quickly have become significant enough to make it a political issue.

- Similar work carried out recently for the Department of Defence (by AECOM) found that a significant proportion of the Defence estate had deteriorated to a level where rehabilitation is probably unaffordable. Defence, however, is able to continue operating with lower levels of service from its estate.

There is currently no accepted definition of 'state of good repair' for DNSPs in Australia. The term is used overseas as a proxy for risk tolerance – a higher level of 'good repair' implies a lower tolerance of risk of failure, and a higher level of service obligation.

Risk (of service interruption) is a fundamental driver for best practice asset management in that it helps the asset owner determine the level of maintenance that should be delivered and funded (a low level of funding implies lower levels of maintenance and that a higher risk of service failure is acceptable).

The limited use of this concept in Australia and the current absence of a suitable definition for the term is problematic, and may be contributing to the same long-term deterioration of asset quality seen in the US.

3.2 The Impact of Reduced REPEX on Underground Cables

The principles outlined in Section 2.3 can be illustrated using ActewAGL's underground cable fleet.

Data was provided to the AER on ActewAGL's cable fleet, including a summary of cable age, as part of ActewAGL's regulatory submission.[21] This illustration uses that data to indicate the expected impact of aging assets on the risk of service interruption.

The risk of failure for the cable fleet can be projected using asset age, assessed condition and expected remaining economic life. We note that:

- The failure point of an individual asset cannot be predicted accurately in advance, but mean failure rates across a fleet can be predicted with more certainty.
- Failure rates increase as assets age. Aside from infant mortality, young assets will generally need less maintenance and will fail less frequently than older assets.
- REPEX and maintenance costs do not remain constant through the life of an asset, and it is not reasonable to assume that future funding can be constrained to levels applying at some time in the past without affecting levels of service delivered.

ActewAGL has a high proportion of underground cables compared to its peers, which needs to be taken into account when benchmarking. 27% of this cable fleet will have exceeded its expected economic life by 2020, and failure rates are increasing (Figure 10).[22]

[21] Regulatory Submission Support – Phase 3, CAPEX/OPEX Trade-off Issues 26 May 2014. Section 4.
[22] Asset Specific Plan, UG Cables, Section 8.1. ActewAGL, 29 May 2014

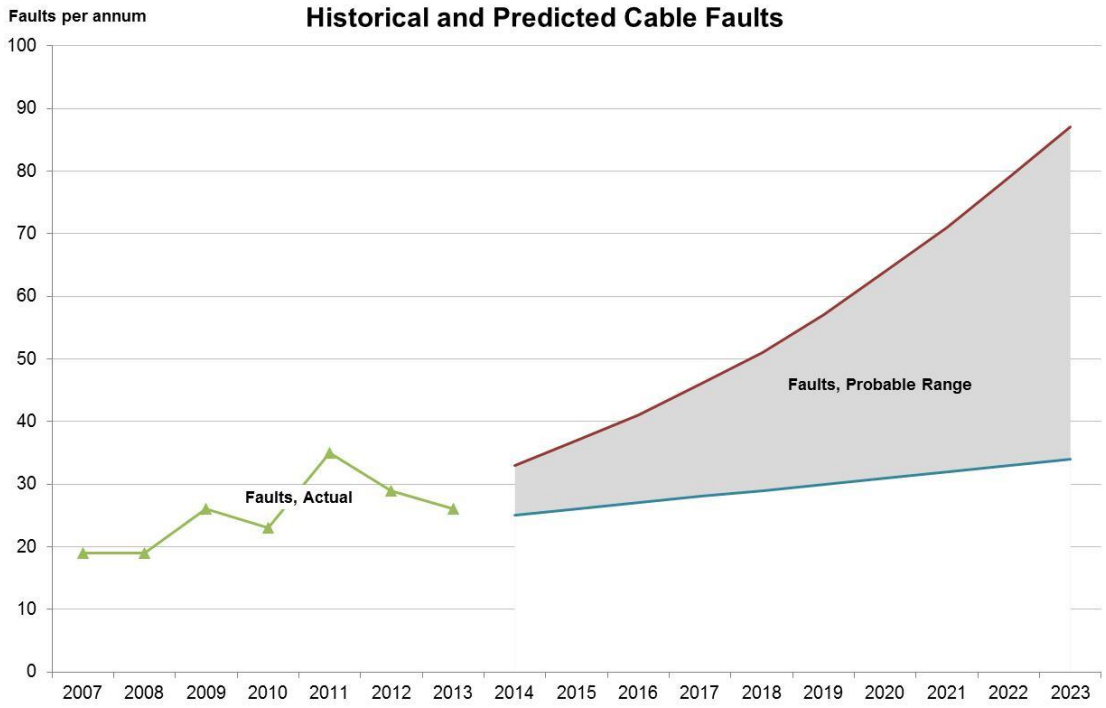

Figure 10 Historical and projected cable failure rates

This predicted failure rate, expressed as a risk of failure, is shown in Figure 11, together with the capital budget that would be required based on a policy of renewal of critical assets at 99% of their nominal life:

- the solid line indicates the mean weighted risk of failure if renewals are not carried out
- the dotted line shows the expected mean weighted condition of the fleet if the renewals are implemented as planned
- the bars indicate the capital expenditure considered necessary to achieve the risk tolerance specified.

Figure 11 has been generated by AECOM using standard deterioration curves for this asset class.

ActewAGL's actual experience with its cables enables standardised deterioration curves to be adapted based on specific conditions and experience in the ACT, and this has been used to derive the underground cable REPEX projections included in ActewAGL's submission.

The AER, in contrast, has derived theoretical remaining lives for these cables in its calibrated model that are more than double ActewAGL's assessment (for underground cables rated up to 11kV), which significantly affects REPEX budget projections.

If the AER's determination prevails and their life estimates are proven incorrect, there will be a significant increase in service interruptions caused by cable failures.

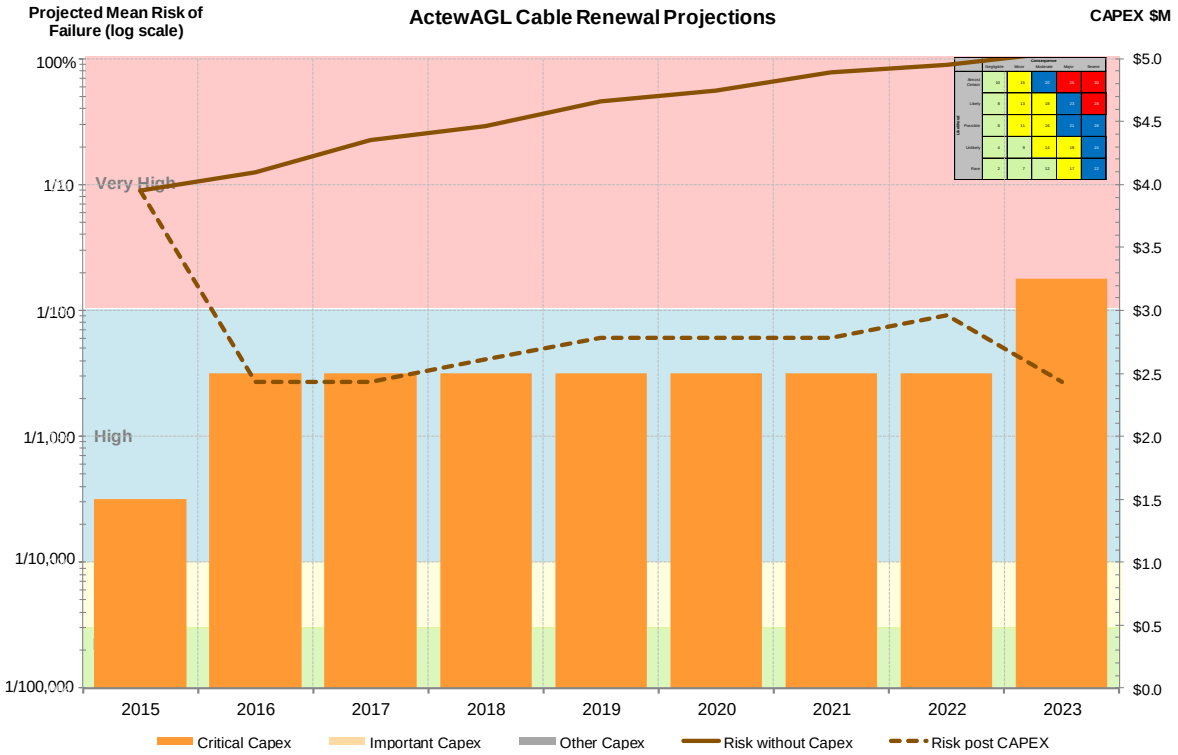

Figure 11 Replacement program and risk for underground cables (constant dollars)

Figure 11 is also intended to illustrate the impact on risk to service of applying funding constraints (refer to the two lines). The funding profile presented would keep the risk of service interruption at around 1 in 100 (3.5 failures each year), whereas the risk of service interruption during 2015 is indicated to be around 1 in 12 (approximately 30 failures in the year), and is projected to continue increasing if REPEX is deferred.

The increased risk associated with funding constraints also means that average asset condition will deteriorate more in the future than would otherwise be the case. The effect will be that current consumers will have their cost of service reduced, but future consumers will have to pay more (to replace badly deteriorated assets) while receiving an inferior level of service compared to current consumers.

A reduction in funds available would force a delay in the renewal program, therefore increasing the risk of service interruption for those customers involved. The significant reduction proposed by the AER would substantially increase the risk of service interruption faced by ActewAGL's customers.

There are alternative strategies that ActewAGL could adopt in response to a significant constraint on funds for this program. The most likely strategy would involve prioritising level of service issues for customers with supply contracts that involve a specified reliability or availability of supply.

Any remaining funds would be applied to other customers, but the majority of these would face a high and increasing rate of unplanned failure and service interruption. This outcome is in stark contrast with ActewAGL's exemplary track record, and ActewAGL would have to advise its customers of the forced change in service levels.

Customers unable to accept a decline in level of service or an increased risk of service interruption will have to invest in contingency measures. The forced reduction in funding will therefore increase supply costs for some customers, and force the remainder to accept a lower level of service.

3.3 The Impact on Other Asset Classes

Similar conclusions apply to other classes of assets operated by ActewAGL that are critical to service delivery, and ActewAGL has made reference to some of these in its submissions. We understand, for example, that the majority of potheads still in use have exceeded their expected service lives. Failure rates have been running at an average of 2.5 per year – this rate is expected to increase, with associated safety issues (Figure 17).

3.4 ActewAGL's Strategic Options if Forced to Reduce REPEX

ActewAGL has undertaken an internal review of its REPEX projections to determine works that would be deferred if its REPEX budget were to be constrained as proposed by the AER.

The overall impact has been estimated to be as indicated in Figure 12, which shows recent history of REPEX in today's dollars (in blue), ActewAGL's current projected REPEX requirement (in red), and the most likely outcome of the constrained budget as proposed by the AER (in green).

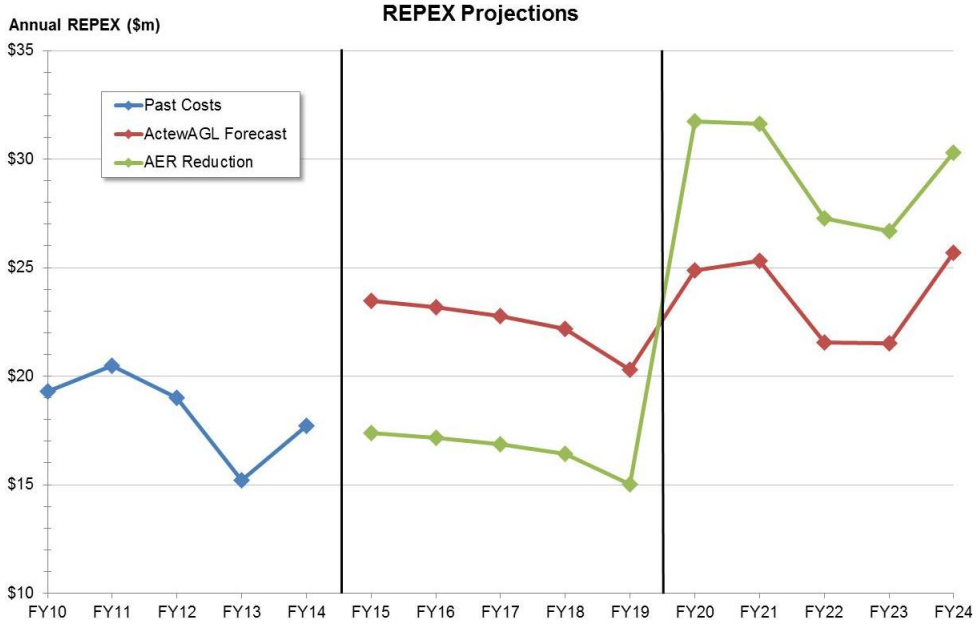

Figure 12 Impact of the AER's REPEX funding reduction, if unfunded REPEX must be deferred to the next regulatory period

It should be noted recent under-expenditure by ActewAGL (as a result of past prioritisation and deferral) has created a small 'bow-wave' of investment needed in the next regulatory period. The same would occur if ActewAGL has to cope with a constrained REPEX budget during the next regulatory period – the underfunded REPEX from the first regulatory period of approximately $29 million would be required during the following period to avoid unacceptable service interruptions, as indicated by the peak in expenditure shown in FY20.

This deferral of REPEX to the following regulatory period will increase the risk of failures. In its planning for a reduced REPEX budget, ActewAGL has been forced to assume a lower rate of unplanned asset failure than has been the case over recent years (Figure 13).

Item	% Reduction	$ Reduction
EN Asset Replacement		
Avg two padmount substations are damaged by car accidents, lightening pa.	**50%**	478,160
Replace two chamber transformers due to oil leak, internal fault etc.	**50%**	308,980
Avg 4 padmount/kiosk subs replaced reactively due to equip. failure, major oil leak	**50%**	956,320
Test New Ground Transformer before stores acceptance	**0%**	0
Replace 4 RMUs due to accident or fire damage	**50%**	325,380

(Excerpt from ActewAGL scenario planning analysis)

ActewAGL has included REPEX budget to cater for expected failures (refer to the excerpt above for an example). Faced with a REPEX budget reduction and with due concern for its service priorities, ActewAGL would budget for repair of only half the number of units expected to fail each year (as shown). If the expected failures do occur, either there will be no funds available for repair and an extended service interruption will occur, or funds will have to be moved from another program, shifting the service risk elsewhere.

Figure 13 Example of rationale used to prepare an alternative REPEX budget if funding is reduced by the AER

A similar impact assessment is in progress for the maintenance program if that is also budget constrained.

4.0 The Impact of CAPEX Reductions on OPEX Requirements

A forced delay in ActewAGL's renewal program will force an increase in the risk of failure and an increase in maintenance and repair costs. Unplanned interventions come at a significantly higher cost to the service provider, and often at a higher cost to both the customers affected and ActewAGL:

- Planned interventions can be scheduled to take place at times that represent the least impact on customers, with advance notice provided so that they can make alternative arrangements. Unplanned interventions can occur at any time, and will have little or no advance warning. This compounds the actual failure by removing any prospect for the customers affected to make contingency plans.
- Reactive maintenance is generally more expensive than planned maintenance, because it is often required outside preferred working hours, when materials and equipment are not ready and waiting. It forces deferral of other planned activities, therefore increasing the risk of failure in other parts of the network, and may mean that shift hours exceed regulated maximums so that staff involved are not available for the next period and cannot work on scheduled activities, so these have to be deferred as well.

A planned maintenance regime like ActewAGL's is established and managed to minimise service interruptions to customers where possible and reduce the cost of the interventions required. An increasing risk of failure because of delayed REPEX leads to:

- an increasing frequency of inspections in an attempt to reduce the impact of the failure by having at least some advance warning
- a higher cost of repair over the life of the asset, where interventions are carried out that would not otherwise have been necessary
- higher use of materials for repair than would otherwise be necessary, together with increases in procurement and inventory costs
- a higher total cost of ownership (together with a reduced level of service).

A reduction in AUGEX budgets may also have an impact on future REPEX and OPEX budgets. If planned augmentation for capacity reasons is not allowed, existing equipment may overload, increasing the risk of failure and potentially increasing maintenance costs.

Underground cable, for example, is rated to operate up to defined temperature limits. AUGEX avoided or delayed could result in sustained high loads that force the cable to operate at higher than rated temperatures. Economic life of cables is adversely affected by temperature above design levels, and failures are known to have occurred for this reason.[20]

A number of comparisons of strategic alternatives have been provided by ActewAGL to the AER in its submissions, generally to demonstrate cost optimisation or prioritisation. Figure 3 in this report is one of those, using underground cables:

- The optimal strategy is shown to be selective cable replacement (rather than reactive repair work), a strategy that was estimated to be 56% of the cost of the 'do nothing' option.
- If REPEX funding were not to be available, then the higher cost option (using OPEX) would have to be followed, increasing the total cost of ownership of the assets involved by an estimated 78%.
- If the OPEX required were also not available, ActewAGL would be faced with an unacceptable long-term loss of service to customers affected by cable failures, or a need to transfer funds from another lower priority application (thereby potentially forcing other customers to deal with loss of service).

A similar analysis was provided by ActewAGL for its pole replacement program, which has been accepted by the AER. The business case indicated a reduction in whole-of-life economic costs for poles of almost 50% (if timber poles are replaced by concrete poles). The corollary is that OPEX requirements for pole maintenance would have to almost double is the REPEX required were not available.[23]

[23] CAPEX/OPEX Trade-off Issues, Jacobs for ActewAGL, 26 May 2014.

5.0 The Impact of OPEX Reductions on Levels of Service

The AER states in its general approach to assessing recurrent expenditure that it prefers to use actual past costs as an indicator of future efficient expenditure requirements.[24] In this case, however, it has determined that ActewAGL's OPEX should be reduced by 42%, relying on econometric modelling and benchmarking.

5.1 ActewAGL's Management of Work

ActewAGL resources and manages its field force to match the workload required as efficiently as possible:

- ActewAGL's target utilisation percentage for its staff is 85%, meaning that 85% of staff time is expected to be spent on productive work (the balance used for training, reporting, toolbox meetings and other minor but essential work-related activities). This utilisation target is typical for the industry.

  Detailed records are kept of work performed, and ActewAGL is able to demonstrate that its target utilisation rate is being achieved on average across its workforce.

  Year to date utilisation as at May 2014 (including 11 months of the financial year) was 83%for Distribution staff and 81% for Service Delivery staff.

- ActewAGL's strategic planning for work management involves making an assessment of the range and quantity of work activity likely to be required, evaluating outsourcing opportunities, and the size and composition of its workforce is planned accordingly.

  Work is scheduled well in advance to achieve the utilisation target (refer to Figure 14 for an example using overhead line work planning). Scheduled maintenance work may be deferred if necessary to allow emergency work to be carried out as a priority.

ActewAGL has a very clear expectation of the work that is likely to be required from its workforce.[25] The annual budget for overhead lines and pole-top maintenance is based on the recent history of activities required. The workload plan for overhead lines includes:

Reactive (call-out)	• 231 arcing services • 67 brown outs • 1331 damaged assets • 2 drop out fuses	• 44 electric shocks • 60 spark/fire/explosions • 130 wires down • 1773 no supply call outs	• 831 part supply call outs • 1226 miscellaneous electrical faults
Unplanned maintenance	• 15 replace LV pot heads identified from pole inspections • 225 crossarm replacements identified from pole inspections	• 20 re-tension conductors due to low spans identified from pole inspections or customer complaints • 30 replace conductors due to low spans identified from pole inspections or customer complaints	• 150 install spacers on LV mains identified from pole inspections or due to tree-into-lines incidents • 10 install pole stays identified from pole inspections
Planned maintenance (FY2014)	• 1 overhead span on aircraft marker request	• removal of overhead lines at Gudgenby Homestead and Corin Dam once the RAPS is installed	• maintenance of Remote Area Power Supply • Rural pole top upgrade
Condition monitoring	• thermovision survey for 100 feeders	• Helicopter aerial inspection of the rural overhead lines every year, and of urban overhead lines every second year.	

Figure 14 Work planning for Overhead Lines

[24] Expenditure Forecast Assessment Guideline, AER
[25] Asset Specific Plan, OH Lines and Pole Hardware, ActewAGL July 2014

- The cost of ActewAGL's work activities has been shown to be comparable with its peers.

  Benchmarking by SKM concluded that activity costs for ActewAGL were better than the industry mean for 32% of the activities assessed, slightly worse for 45%, and more than 10% worse for 23%.[26] ActewAGL was on average approximately 2% more expensive than the industry mean, a result that was considered well within the margin of error.

ActewAGL has planned the size and composition of its workforce (including outsourced resources) to deliver the work required and achieve its utilisation targets, and can demonstrate that its costs per activity are, on average, within 2% of the average cost incurred by its peers for those activities.

This indicates an efficient organisation, not one carrying 42% of surplus capacity as implied by the AER.

5.2 The Impact of OPEX Reductions on Capacity to Work

The impact of reducing the operational cost budget by 42% would therefore be a drastic reduction in the volume of work able to be carried out, and a significant decline in level of service for ActewAGL's customers. This impact can be demonstrated using holiday periods (refer to Figure 15).

The impact of a sharply reduced operational budget can be illustrated using data from ActewAGL's CallTaker work management system for the 2013 financial year. On Tuesday 8 January, ActewAGL had 31% of its service delivery staff on leave (during the holiday period):

- There were 57 unplanned outages affecting a total of 11,000 customers and causing almost 9,200 customer hours of service interruption.
- Response times for the unplanned outages averaged 83 minutes on the 8th, in contrast to a more typical average of 45 minutes for the month of February, when ActewAGL had a full complement of staff.

Service Delivery staff on leave (%)	31%
Unplanned outages (number)	57
Total service interruption (customer hours)	9,200
Average response time (mins)	**83**
Planned outages, 8th and 9th January	39
Proportion of planned outages cancelled (%)	**33%**

- ActewAGL had scheduled 8 planned outages for that day, and another 31 for the day following. The short staffing forced cancellation of 3 of the 8 outages planned for the 8th, and 10 of the 31 planned for the following day (staff had worked too many hours on the 8th and were not able to work on the following day).

The impact of a 31% reduction in staff was that response times almost doubled (from 45 to 83 minutes), and 33% of planned outages had to be cancelled (unplanned faults are given priority).

Figure 15 Impact of Staff Absence on Service Delivery Performance

It should be noted that ActewAGL's policy has been to use OPEX for condition-based cross-arm replacement. It is now clear that this program should be treated as REPEX, and the policy has been changed. This change in policy would bring ActewAGL in line with other DNSPs, and have the effect of reducing OPEX and increasing REPEX.

A reduction in operations budgets of 42% as determined by AER will force ActewAGL to reduce its staffing on a permanent basis. The effect of this budget reduction would be:

- **An increased response time**, to more than double current performance, therefore increasing the total customer minutes of service interruption and delivering a reduction in level of service.
- **A reduction in ActewAGL's ability to carry out planned maintenance** by more than 33%.
- **A vicious cycle of increasing numbers of unplanned faults because planned maintenance would not be carried out, causing further increases to response times.**

If renewal capital budgets are reduced, and operational budgets also reduced to the extent determined by AER, the impact will be far more dramatic.

[26] Assessment of Efficiency of Unit Rates for Selected Activities, November 2013. SKM for ActewAGL.

ActewAGL will be faced with aging assets failing more frequently, an inability to carry out planned maintenance, and steadily worsening response times. The cumulative impact will be a drastically lower level of service for customers.

High voltage circuit breakers are an example of this issue (refer to Figure 16).

The maintenance of circuit breakers deserves special consideration because of their importance for routine switching and for protection of other assets. Significant outages and equipment destruction can occur if a circuit breaker fails to operate. Not maintaining these assets increases the risk of failure, especially when they have been identified to be in poor condition. The known consequences of failure include:

- Decreased system reliability (large numbers of customers are affected);
- Failure to trip has caused fires in substations, causing further damage;
- Environmental impacts from leaking gas and oil, and noise pollution;
- The potential for severe injury.

ActewAGL has 34 of these items, with an average age of 30 years. The manufacturer's recommendation is for maintenance intervals between 12 and 16 years, but minimal maintenance has been performed on these to date, and prior to 2013 no units had been overhauled. The condition monitoring program is now finding assets in poor condition, and as a result ActewAGL has now overhauled 7, with the remaining 27 units scheduled for overhaul during the 2014-19 period.

Figure 16 The consequence of failures of high voltage circuit breakers

An inability to fund the complete range of activity required to maintain service to customers will have other impacts. ActewAGL intends to ensure that customer safety is maintained, and a significant part of its planned inspection regime includes checking of compliance to safety codes and early identification of safety risks.

Safety is a priority for ActewAGL, but the practical impact of a 42% reduction in OPEX will inevitably be a reduction in the inspection regime, which, if accompanied by a delayed REPEX program, is likely to increase the risk and frequency of safety incidents.

5.3 Impact of OPEX Reductions on Maintenance Strategy

ActewAGL has provided examples of its selection of the asset management strategy that offers the lowest total cost of ownership in its submissions to the AER.

These generally address the trade-off required between REPEX and OPEX-based strategies, and the cable business case included previously in Figure 3 is one of those.

In Section 4.0 it was noted that under-funding of REPEX would force the adoption of a higher cost, reactive maintenance strategy. If the OPEX funding required for this alternative strategy is also not available, ActewAGL's options are extremely limited:

- Funds would have to be re-allocated from another program assessed as having a lower priority, potentially transferring the reduced level of service to another customer group.
- The service provided by the failed asset to customers affected would have to be terminated, and those customers forced to make alternative arrangements.

Both of these options are unthinkable for a responsible DNSP.

It is not possible to identify the services that would have to be terminated in the event that both REPEX and OPEX are heavily reduced, as proposed by the AER, without considerable analysis to identify strategies that would deliver the least negative impact on overall service delivery.

5.4 Impact of OPEX Reductions on Safety Levels

ActewAGL is required to meet stringent safety requirements. The Utilities Act 2000 (ACT) imposes specific technical, safety and reliability obligations (Section 5.3), and the NER v66 specifies factors that must be considered in relation to capital expenditure, including safety and security of supply.

Section 4 in Part 5 of the Utilities Act provides that the obligation does not apply if:

1) *The events or conditions are outside the control of the electricity distributor and prevent the electricity distributor from complying with this Code; and*

2) *The consequences of the events or conditions are not due to the electricity distributor's actions or lack of actions.*

The implication is that, if ActewAGL can be shown to have been prevented from undertaking necessary preventive action by a third party, the obligation and potential liability could be placed with that party.

All utilities must comply with ENA Doc 001 National Electricity Network Safety Code, and Standards, and Codes and Guides relating to the Design, Construction, Maintenance and Safe Electrical Operation and Work Practices for Distribution Systems sourced from organisations including Standards Australia (AS or AS/NZS), International Standards Organisation (ISO), International Electrotechnical Commission (IEC), Energy Networks Association (ENA), Institute of Electrical and Electronic Engineers (IEEE) and American national Standards Institute (ANSI).

ActewAGL is also bound by a specified duty of care included in the WHS Act 2011 (Division 2.2, 19).

There are many safety issues considered in the planning of ActewAGL's REPEX program. These would be affected by the significant budget cuts proposed by the AER:

- The low voltage cast iron pothead replacement program, required to reduce safety risk for our workers and the public from explosive failures (Figure 17).

In 2014, two cast iron potheads failed explosively, one nearly hitting a lineman.

ActewAGL has about 500 of these, with 116 classified as high risk of causing injury because they are located close to public areas such as schools and child care centres.

They have become a recognised safety risk in the industry, and although past failure rates have been low, they are aging and are now considered to be a significant threat to public and staff safety.

ActewAGL proposes to phase this class of asset out of service, prioritising by risk to the public.

Figure 17 Failure of Low Voltage Potheads

- Failure of pole-top hardware and cross-arms is the most common form of failure on the overhead distribution system, causing overhead conductors to sag excessively or fall to the ground. The risk to public and worker safety can be significant in such an event.

- Replacement of deteriorating cross-arms and pole-top hardware, and installation of vibration dampers, armour rods, and preformed distribution ties on rural high voltage overhead lines located in high bushfire risk areas is required to minimise the role that these assets can play in starting bushfires which are a significant threat to life and property (refer to Figure 18).

The 2009 Victorian Bushfire Commission found that 5 of 10 fires investigated were caused by failure of electricity assets, and that specific equipment and components on overhead distribution lines increase the risk of bushfires being started.[27] ActewAGL has some of these assets currently in service, and therefore has an obligation to reduce this risk to the community where possible by implementing a reasonable asset replacement or risk mitigation policy (for its pole-top assets).

The Commission notes that:

> *'Victoria's electricity assets are ageing, and the age of the assets contributed to three of the electricity-caused fires … DNSP capacity to respond to an ageing network is, however, constrained by the electricity industry's economic regulatory regime. The regime favours the status quo and makes it difficult to bring about substantial reform. As components of the distribution network age and approach the end of their engineering life, there will probably be an increase in the number of fires resulting from asset failures unless urgent preventive steps are taken.*
>
> *The Commission considers that now is the time to start replacing the ageing electricity infrastructure and to make major changes to its operation and management. The seriousness of the risk and the need to protect human life are imperatives Victorians cannot ignore. The number of fire starts involving electricity assets remains unacceptably high—at more than 200 a year.'*

The Commission's recommendations 27 through 34 address electricity-caused fires, and ActewAGL considers that its duty of care obliges it to apply them on its own network to reduce fire risk in the ACT. Recommendation 33, for example, involves installing vibration dampers on all rural overhead spans longer than 300 metres – at the end of FY2014, ActewAGL still had 112.5 km of rural feeders in this category.

The rural pole-top upgrade program includes targeted upgrading of pole-top equipment, starting with the highest risk locations, to significantly reduce the risk of bushfires initiated by ActewAGL's overhead system. This program will reduce risk to life, improve safety and reduce any associated liability.

Recommendation 28 relates to asset inspection. ActewAGL carries out regular ground-based surveys and some aerial surveys to determine the condition and serviceability of cross-arms and pole-top hardware, most of which requires renewal / refurbishment at least once during the life of the pole. Assets assessed as unlikely to remain in a safe state until the next routine inspection are scheduled for replacement.

The effect of the projected temperature increase in the ACT caused by climate change could more than double fire frequency, and increase average fire intensity by 20%.[28]

Figure 18 Bushfire risk and the pole-top replacement program

Safety is an essential service provided by ActewAGL, but drastic funding reductions proposed by the AER could force ActewAGL to re-assess the extent of its safety management program.

[27] Final Report, 2009 Victorian Bushfires Royal Commission, July 2010.
[28] Be Prepared: Climate Change and the ACT Bushfire Threat, Climate Council of Australia, 2014

6.0 Conclusions

This report demonstrates that ActewAGL is prudent in its approach to asset management and efficient in its use of resources, as would be expected from a DNSP that rates among the best in the country in terms of cost to consumer and level of service achieved. ActewAGL intends to become certified to ISO 55001:2014 (the new asset management standard), which requires a 'least cost' approach to asset management on a whole-of-life basis, and a demonstrated commitment to continuous improvement.

This report also indicates the impact that a forced reduction in REPEX and OPEX of the scale suggested by the AER would have on the level of service ActewAGL is able to provide to its customers, potentially including an impact on safety levels associated with its assets. Various examples of this impact have been provided from other sectors to support those taken from ActewAGL itself.

If ActewAGL's own estimates are eventually proven more reliable than those used by the AER, the REPEX and OPEX reductions currently included in the AER's determination will cause a significantly higher rate of failures and a corresponding deterioration in levels of service provided to customers than would otherwise have occurred. We concluded Section 3 with the statement that:

> Customers unable to accept a decline in level of service or an increased risk of service interruption will have to invest in contingency measures. The forced reduction in funding will therefore increase supply costs for some customers, and force the remainder to accept a lower level of service.

This report was also intended to contrast the approaches taken by ActewAGL and the AER in determining future cost structures. In summary:

- The projected optimal replacement timing for critical assets is derived from expected service lives, and is informed by condition assessments carried out under a scheduled inspection regime. ActewAGL's experienced engineers use all the information available to them and sophisticated analysis tools to estimate remaining economic service lives for critical assets and therefore project the optimal timing for replacement (and therefore for REPEX).
- The AER has relied on generic econometric models and distantly related data from other sources to over-rule ActewAGL's experience-based projections, in many cases using 'average' asset lives that are almost double ActewAGL's actual experience and expectations.
- The benchmarks used by the AER have little or no relevance to a DNSP, and in our opinion judgements made based on them have limited value.
- A more reliable approach would be to rely on audited certification to current asset management standards (ISO 55001:2014) which require demonstrated application of systems and processes that achieve an optimised (least cost) management regime consistent with level of service obligations (and also require demonstrated continuous improvement processes). ActewAGL is not yet certified, but is committed to achieving certification.

Finally, the ultimate measure of prudence and efficiency for a DNSP should be, in our opinion:

1) its long-term average distribution network charge
2) its long-term ability to meet level of service obligations
3) its ability to preserve its assets in an appropriate state of good repair on behalf of future users.

Poor performance against any of these measures would be a valid reason for action by a regulator. In this case, ActewAGL is a leader among its peers on the first two points, and the AER has not required (or made) any assessment of the third point.

We have noted that the lack of a commonly accepted definition of 'state of good repair' by the regulator and the DNSPs means that the appropriate level of tolerance of risk to service delivery is not accepted by both parties, and therefore that it is difficult to reach agreement on future funding for asset management activity.