EnergyAustralia Public Lighting
Submission to AER for Re-Determination 2010-14

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Review of Operating Expenditure

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1 Engagement

Energy and Management Services Pty Ltd (EMS) are engaged by the Australian Energy Regulator (AER) to review the operating expenditure (opex) components of EnergyAustralia's submission for the AER's re-determination of public lighting prices[1]. A copy of the Terms of Reference for review is provided in Appendix A.

In responding to the Terms of Reference, EMS is cognisant of the revenue and pricing principles as set out in Section 7A of the National Electricity Law (NEL). Specifically:

- A regulated network service provider should be provided with a reasonable opportunity to recover at least its efficient costs; and
- A regulated network service provider should be provided with effective incentives in order to promote economic efficiency.

Accordingly our review is framed around two questions:

- Do EnergyAustralia's proposals represent efficient costs?
- Have incentives been established for improving the present level of efficiency?

A range of documents has been provided for the purposes of this review. In cases where a party has claimed confidentiality over a document, EMS seeks to make references in such a way as to preserve specific data confidentiality subject to the need to properly substantiate our opinions and conclusions.

Disclaimer

The analysis, findings, conclusions and recommendations and all written material contained in this Report represent the best professional judgement of Energy and Management Services Pty Ltd (EMS), based on the information made available.

In preparing the Report, EMS has relied upon information provided by the Client and others. Whilst this information has been reviewed to assess its reasonableness and internal consistency, EMS does not warrant the accuracy of any information so provided.

[1] EnergyAustralia *Submission for the AER's re-determination of public lighting prices 2010-2014* January 2010. This document is referred to as *Submission* throughout this review.

2 Executive Summary

In accordance with the Terms of Reference, EMS has reviewed EnergyAustralia's *Submission* and supporting models and documents, including supplementary information provided in response to the AER requests. Our recommendations are summarised below.

Bulk Maintenance Cycles

1. That a four year bulk replacement cycle be adopted for all HPS lamps in TRL installations and a three year bulk maintenance cycle be adopted for all other lamp types. This will provide EnergyAustralia with the incentive for efficiency improvements and the opportunity to establish a service history that will provide an improved basis for future bulk replacement decisions.

General Assumptions

2. That the FY10 labour rate assumptions be adjusted to $56.96 per hour for normal time and $78.53 per hour for overtime.

3. That the EWP rate assumption of $45 per hour be accepted.

4. That the assumptions regarding non-lamp material costs be accepted.

5. That the overtime proportion assumption be amended to 17.4% to reflect historical overtime proportion in 2008-09.

6. That the assumption of 65% labour in total public lighting opex be accepted.

7. That the overhead rate assumption of 26.75% be replaced with the previously accepted figure of 25%.

8. That an efficient annual cost for quarterly night patrols undertaken by EnergyAustralia would be in the order of $144,000, representing a rate of approximately $1.00 per lamp inspected.

Spot Maintenance Assumptions

9. That the staffing assumption for spot maintenance (two staff generally and three when the work site is on a traffic route) be accepted.

10. That the time requirement assumption of 40 minutes per spot maintenance task be replaced with an assumption of 30.6 minutes.

11. That subject to the adjustment of inconsistencies of failure rates in multi-lamp configurations, the lamp failure rates adopted in the *Cost Model* be accepted.

12. That the average PE cell failure rate assumption of 1.42% be accepted.

13. That the 'other component' failure rate assumption of 1% be accepted.

14. That the connection repair unit rate assumptions be accepted.

Bulk Maintenance Assumptions

15. That the bulk replacement cycle assumptions used in the *Cost Model* be in accordance recommendation 1 above, that is, four years for all HPS lamps in TRL installations and three years for all other lamps.

16. That PE cell replacement be on the basis of "every visit" for HPS lamps in TRL installations, and "every second visit" for all other lamps. Accordingly, the *Cost Model* should assume a PE cell replacement cycle of four years for all HPS lamps in TRL installations and six years for all other lamps.

17. That the modelling of cycles and unit rates for other bulk replacement tasks be accepted.

Peer Assessment of the PB Independent Review

EMS agrees with many of PB's findings and conclusions. Points of difference are summarised below.

- EMS agrees with PB that the *Cost Model* yields a high level of allocative efficiency, but we differ with PB's tacit assumption that the total public lighting opex forecast by the *Cost Model* is efficient. EMS considers that the relative proportions of costs allocated to EnergyAustralia's public lighting customers are efficient, but the absolute values of the costs are overstated.

- EMS disagrees with PB's view that the 52% increase in forecast public lighting opex is efficient.

- EMS considers that PB's view, that EnergyAustralia is more efficient than other NSW DNSPs but worse than Victorian and Queensland DNSPs, is somewhat misleading in that EnergyAustralia's performance in terms of opex per street light for city/urban DNSPs is of the same order as some of the worst performing DNSPs.

Accordingly, EMS finds PB's overall conclusion, that EnergyAustralia is on average operating efficiently in its provision of public lighting services, to be somewhat generous.

3 Bulk Lamp Replacement Cycles

3.1 Design Approach

One of the key issues in determining the most efficient maintenance regime for public lighting revolves around the decision of whether a bulk lamp replacement (BLR) program should be adopted and if so, at what frequency.

Putting aside the opportunity that BLR programs provide for the identification and repair of non-lamp tasks (e.g. visor replacement), in terms of the lamps only, the cost factors that need to be considered in evaluating a BLR program are:

- cost of labour and plant hire for bulk replacement
- cost of lost remaining service life of lamps
- cost of labour and plant hire for routine patrols
- cost of spot maintenance activities.

In general, as the period between bulk replacements increases, the cost of the bulk replacement program and the cost of lost remaining lamp lives will decrease, while the need for routine inspections/patrols and the incidence of spot repairs will increase. The increase in spot maintenance costs is not of concern if it is equal to or less than the reduced bulk replacement costs.

In its simplest form, an evaluation of these costs will yield results along the lines of those depicted in Figure 3.1. The optimum BLR period is where the total costs are minimised.

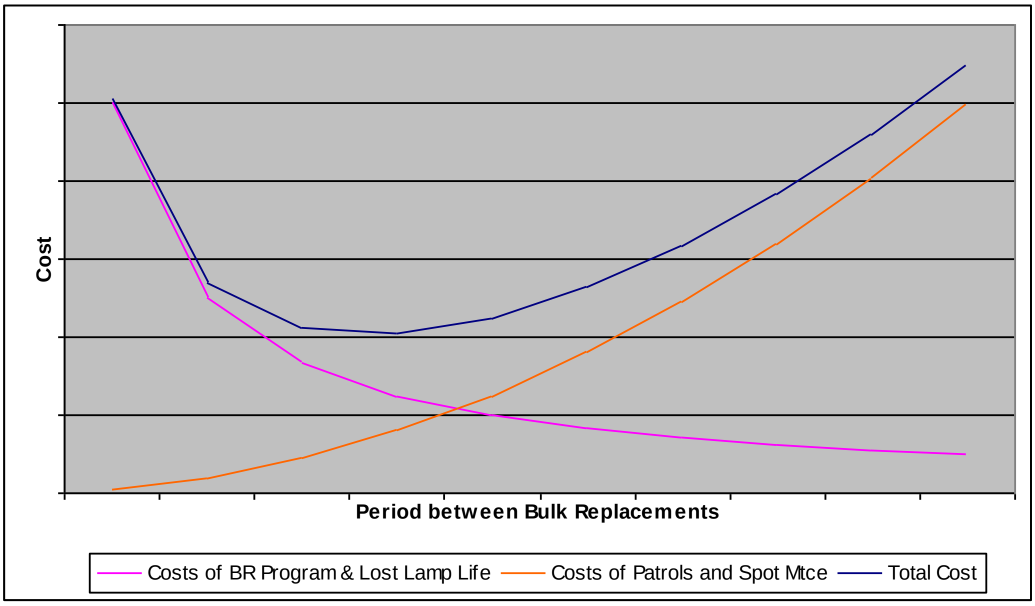

Figure 3.1 Public Lighting Maintenance Optimisation

From a design viewpoint, when considering a bulk replacement program, the first decision is to determine the point during the life of the "average lamp" that replacement should occur.

In this consideration, the deterioration characteristic of the lamps is the primary factor. Failure rates may add only a secondary dimension to the analysis.

Lamps of all technologies provide greater than their nominal output early in their life (up to 130% output), deteriorating to as low as 65% output prior to failure. Lighting designs are based on nominal luminous output, with the result that lighting levels are above design level when the installation is new and fall to below design level at some future time.

Subject to the standards applicable to the installation and the customer's specifications, it may be determined that lighting levels should be maintained at, say, 90% or higher of the design level. Typical deterioration characteristics will provide data on which the replacement periods can be determined in order to provide the adopted minimum lighting level. Whilst any bulk replacement program will sacrifice the remaining life of the replaced lamps, if the program is based on known average deterioration characteristics as applied to the adopted lighting level specification, then the cost of lost lamp life is zero, by definition. The statistical variation of the lamps will mean that there are as many lamps above the desired lighting level (incurring cost for lost life) as below the desired level (for which extra life has been obtained at no cost).

Failure rates take account of in-service mortality, both infant mortality (typically due to transport damage) and early mortality (due to manufacturing defect and/or harsh in-service conditions). It may be expected that the majority of the lamp population will burn, ultimately at low luminous output levels, for many years before failure.[2] Whilst failure rates should be included as part of the analysis for determining BLR cycles, failure rates, of themselves, will provide only rare-event statistics that are not necessarily reliable as a predictor of lamp behaviour across the entire lamp population.

Having determined the replacement period, then the cost of the bulk replacement program is settled and to a large degree, the cost of spot maintenance is also settled because the number of lamps that fail between bulk replacements will be determined by the statistical variation of lamp lives around the mean for each lamp type.

The remaining variable is the frequency of inspections (patrols) between bulk replacements. Inspections are still necessary in order to find lamp failures (the statistical variation mentioned above) and issues not associated with the lamps, such as luminaire damage or on-by-day failure (indicating a failure of the PE cell or control circuit). The degree to which the frequency of patrols may be reduced is a management decision based on experience.

Summarising the design approach, the BLR period should be determined from lamp deterioration characteristics in order to preserve the specified level of lighting. In such a BLR program the cost of lost lamp life is zero, by definition. It remains that that the savings achieved from reduced spot maintenance and patrols should at least pay for the BLR program. That is, a BLR program is justified if the cost of bulk maintenance is less than the summation of the savings resulting from reduced costs of patrols and spot maintenance.

[2] EnergyAustralia's "surprising" analysis outcomes (*Submission* p30) reflect this fact.

3.2 Pragmatic Approach

Whilst the approach described above is adopted in areas where lighting levels are critical (e.g. sports stadiums and assembly plants), the key factor in the provision of public lighting is service availability. EMS notes that concepts of service in the NSW Public Lighting Code are based on issues of lamp failure or other obvious fault. The Code does not address the need to maintain lighting at the designed levels of luminous intensity.

Consequently, DNSPs adopt a failure-based approach to determining whether a BLR program is warranted and at what frequency. Discussions of street lighting maintenance practices have been included in regulatory proposals received by the AER from several DNSPs. None of the regulatory proposals indicates that lamp deterioration characteristics are used as the basis for determining BLR periods.

Instead, BLR cycles are determined pragmatically on the basis in-field experience and intuitive management decision. Put simply, long bulk maintenance cycles reduce BLR costs but increase the incidence of public lighting complaints and the cost of spot maintenance. In reality, years of experience are brought to bear from both within the organisations and from discussions with peers. It appears that four and five year cycles are normal in Victoria. Ergon Energy has recently adopted a BLR program with a three year cycle. Energex do not have a BLR policy except in isolated locations such as major intersections for which a four year cycle is adopted, depending on lamp type. In NSW, three year cycles are adopted by Integral Energy and Country Energy. EnergyAustralia has agreed to increase its present 30 month cycle to three years.

EnergyAustralia has undertaken a Weibull analysis of failures of 23 lamp types, as described in its document *Street Lighting Maintenance Requirements Analysis Review, January 2010 (Confidential).* The results summarised in Table 4.1 of that document show that, with one exception, all of the common lamp types have β factors of around 1.0. This means that the probability of failure for these lamps is essentially constant with time. The single exception is a recently introduced energy efficient lamp for which the analysis indicates that the failure rate peaks between 2 and 6 years. The technology of these lamps is still relatively new and improvements can be expected as design and manufacturing techniques are developed. EnergyAustralia's analysis also shows that the length of time to 10% failures for most of these lamp types exceeds 4 years. These findings support the discussion of rare-event failure rates provided in the previous Section of this report.

Using the results of the Weibull analysis, EnergyAustralia factored in lamp purchase costs, bulk maintenance contract costs and spot replacement costs to determine the optimum bulk maintenance cycle, similarly to that depicted in Figure 3.1 above. EnergyAustralia conclude that "there should be limited adverse total cost impact in moving from 2 year 6 months (900 days) to a 3 year bulk relamping."[3] EnergyAustralia also note that "[t]his outcome is sensitive to the average cost of a spot replacement task…"[4]

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[3] EnergyAustralia *Street Lighting Maintenance Requirements Analysis Review, January 2010 (Confidential)* p18
[4] *ibid*

Discussion elsewhere in this report will suggest that EnergyAustralia's estimates of spot replacement are possibly excessive. Lower spot replacement costs will shift the optimum bulk maintenance cycle beyond three years.

EnergyAustralia's attempts at accurately determining the optimum bulk maintenance cycle based on failure rates are commendable. It remains however, that the analysis is based on rare-event statistics which may lead to unreliable conclusions. EnergyAustralia admit that its findings on spot failure rates are surprising.[5]

It appears that in reality, the science is dominated by practical experience. Australian DNSPs adopt three, four and five year cycles without clear cost/benefit differences. In an independent review of public lighting costs undertaken for EnergyAustralia, Parsons Brinckerhoff found that of eight Australian DNSPs with mostly city and urban distribution areas, EnergyAustralia ranked sixth in terms of public lighting opex per light installed. The actual costs were $25, $29, $33, $43, $58, $59(EA), $60 and $63 per light installed.[6] There is little correlation between actual costs per light and the DNSP's respective bulk maintenance policy.

A simple empirical guideline can be concluded: three years is a minimum BLR cycle; five years is a maximum, and, regardless of the cycle, costs can be minimised by other somewhat unrelated efficiency opportunities.

3.3 BLR Cycles for EnergyAustralia

In its 2009 Final Determination, the AER applied a four year BLR cycle for 150W, 250W and 400W HPS lamps, compact fluorescent and fluorescent lamps and a three year BLR cycle for all other lamps.[7] The decision was based on failure rate data provided by lamp manufacturers. EnergyAustralia challenged the decision on the grounds that in many areas, its lamp population is not homogenous and the cost of working two different BLR cycles in the same area would exceed the cost of one three-year cycle covering all lamps.

EnergyAustralia's public lighting inventory involves 41 different lamp types which are used in 102 different configurations. Of these, 43 have populations of less than 10.[8] EMS suggests that the huge range of lamps and configurations will lead to

- excessive inventory costs
- a high probability of wasted field trips due to crews not being equipped with the appropriate equipment and spares
- the need for a broad scope of staff competencies (possibly leading to the need for higher grade staff than would otherwise be required), and
- an unnecessarily slow pace (and therefore high cost) in the bulk maintenance programs.

[5] *Submission* p30
[6] Parsons Brinckerhoff *Independent Review of Public Lighting Costs - Addendum – EnergyAustralia (Confidential)* 19 January 2010, p7
[7] AER *Final Decision NSW Distribution Determination 2009-10 to 2013-14* 28 April 2009, p 345
[8] *Submission* p30 and *Cost Model* "Input-Inventory" worksheet

It recognised that under the NSW Pubic Lighting Code, EnergyAustralia "must continue to support, on fair and reasonable terms, all existing Public Lighting Assets … until the end of the useful economic life of those assets or until the Customer has agreed to the removal of the asset"[9]. EMS considers that the perpetuation of a huge range of uncommon lamps is neither fair nor reasonable. It also seems likely that a review of the costs created by the need to maintain such a broad inventory of lamps may indicate that some minor populations have reached the end of their useful economic lives.

EnergyAustralia acknowledged in 2004 that "The difficulty in reaching a final strategy for the management of street lighting is due to the variety of street lights currently in service, and the fact these do not exist in large areas of homogenous populations except possibly at intersections and along portions of the Traffic Route Lighting."[10] In its 2010 submission, EnergyAustralia states that, "[t]his situation has not materially changed."[11] It appears that EnergyAustralia recognises the inefficiencies of its disparate public lighting infrastructure but action has not been taken to address the situation.

One of the NEL pricing principles is that a regulated network service provider should be provided with effective incentives in order to promote economic efficiency. The principle would be denied if EnergyAustralia were allowed to continue to recover the inefficient costs that flow from a long history of non-standardised public lighting provision without any incentive to deal with such inefficiencies. The retention of some aspects of the AER's three year and four year bulk maintenance decision would provide an incentive for EnergyAustralia to work with its customers to replace significant portions of non-standard lamps with standard lamps that support a four year bulk maintenance cycle.

In particular, many TRL installations will comprise mostly SON luminaires (HPS lamps) for which a four year cycle is appropriate, according to manufacturer's failure data. EnergyAustralia's analysis indicates that the failure rate of all SON lamps, other than the very rarely used SON1x1000, is constant or declining over 6400 days[12]. It is recognised that EnergyAustralia's records indicate that the time to 10% failure is generally less for SON lamps than MBF lamps, however, this may be due to the influence of other factors including the 2.5 year bulk replacement program that has been applied for some years in TRL areas.

On the evidence, EMS considers that it is reasonable for EnergyAustralia to adopt a four year cycle for SON lamps in TRL installations as generally they stand alone (not intermingled with, for example, residential areas) and are extensive enough to provide for efficient work plans without the need to mix three year and four year cycle areas. This will provide the incentive to replace any lamps in the TRL installation for which a four year cycle is inappropriate. It could also be argued that establishing homogeneity in such installations would also improve the public lighting facility.

[9] NSW Department of Industry and Investment *NSW Public Lighting Code* 1 January 2006, Para 15.1
[10] EnergyAustralia *2004 Network Maintenance Report* quoted in *Submission* p39
[11] *Submission* p39
[12] EnergyAustralia *Street Lighting Maintenance Requirements Analysis Review, January 2010 (Confidential)* p49

As noted above, decisions on whether three year cycles or four year cycles are optimum are essentially pragmatic, based on real in-field experience. EnergyAustralia now has records that relate to a 30 month bulk replacement program that has been in place since 2006. The adoption over the 2010-14 regulatory period of a four year cycle in TRL areas will provide records that will provide a sound and practical basis for making future bulk replacement decisions.

Whilst the AER's 2009 Final Decision required four year BLR cycles for three HPS lamp sizes (150W, 250W and 400W) [13] EMS notes that variance of failure rates for all HPS lamp sizes is not great and in any case, decisions based on laboratory tests and statistical analysis are dominated by pragmatic decisions grounded on real in-field experience. EnergyAustralia should be encouraged to adopt a four year cycle for all HPS lamps in TRL installations. This will provide for least cost bulk replacement for all such installations and a broad base of field records on which future bulk replacement decisions can be made.

EMS accepts that compact fluorescent and fluorescent lamps are mostly found in residential areas and a high level of intermixing with other lamp types exists. Therefore, to enhance the efficiency of the bulk replacement program, it is reasonable to adopt a consistent three year BLR cycle for these lamps.

- EMS recommends that a four year bulk replacement cycle be adopted for all HPS lamps in TRL installations and a three year bulk maintenance cycle be adopted for all other lamp types. This will provide EnergyAustralia with the incentive for efficiency improvements and the opportunity to establish a service history that will provide an improved basis for future bulk replacement decisions.

[13] See AER *Final Decision NSW Distribution Determination 2009-10 to 2013-14* 28 April 2009, p 350.

4 Cost Build-Up Model

The Cost Build-Up Model[14] is a spreadsheet developed by EnergyAustralia to support its submission. The *Cost Model* seeks to determine the projected opex for operating and maintaining EnergyAustralia's public lighting infrastructure encompassing both bulk maintenance and spot maintenance. The validity of the *Cost Model* is reviewed in this Chapter.

4.1 Spot Maintenance Cost Forecast

4.1.1 General Assumptions

4.1.1.1 Labour Rates

EnergyAustralia has assumed labour rates (FY2010) of $100.80 ph for normal time and $106.96 ph for overtime. This is intended to cover related labour on-costs and direct labour overheads.[15]

Prior to reviewing the labour rates, it is necessary to clarify the definitions of "oncost" and "overhead". EMS is of the view that oncosts represent only the extra costs that are added on to the wage actually paid to the employee. That is, the cost faced by an employer per hour in order to pay an employee a given rate per hour. Conversely, overheads are all indirect costs associated with ensuring employees are able to undertake their work. These include management and administration, IT support, corporate affairs, training, etc.

From the information provided by EnergyAustralia in its *Submission* and in response to the AER's subsequent questions, and on the basis of the above definition, EMS considers that the labour rates assumed by EnergyAustralia overstate the oncosted rates that apply to workers normally engaged in public lighting maintenance activities. In order to preserve the confidentiality of EnergyAustralia's data, the details that support EMS's opinion are contained in Appendix B (confidential).

- ➢ EMS recommends that the FY10 labour rate assumptions be adjusted to $56.96 per hour for normal time and $78.53 per hour for overtime.

4.1.1.2 Elevated Work Platform Rate

Costings for EWP usage in the *Cost Model* are based on a rate of $45 per hour. A review of typical EWP purchase costs and re-sale values assuming a ten year life, and typical daily operating costs, indicates that this rate is valid.

- ➢ EMS recommends that the EWP rate assumption of $45 ph be accepted.

[14] EnergyAustralia *10 01 06 Cost build-up model.xls* (*Confidential).* This model is referred to as *Cost Model* throughout this review.
[15] *Submission* p32

4.1.1.3 Lamp Costs

EMS understands that unit rates for lamps were accepted by the AER in the 2009 Determination and therefore did not review the lamp costs.

However, EMS has concerns about some apparent inconsistencies in individual lamp prices used in the *Cost Model*. Please refer to Section 4.3.1 below.

4.1.1.4 Non-Lamp Materials Costs

EnergyAustralia provided copies of recent invoices to substantiate the assumed prices for PE cells and Visors adopted in the *Cost Model.* The PE cell price assumption is in line with the invoice figures. Visor costs vary widely. EnergyAustralia advise that the price assumption in the *Cost Model* is an average. It is not clear whether the average has been weighted according to usage (visors for MBF1x80 and TF2x20 lamps, which account for nearly half of the total lamp population, are considerably cheaper than other visors). However, a brief review of alternative averaging assumptions indicates that the effect on the total opex figure is not significant.

EMS also made independent enquiries of lighting manufacturers and suppliers. The budget prices advised by the suppliers confirm EnergyAustralia's proposed unit rates for non-lamp materials.

EMS notes that while provision exists in the *Cost Model* for miscellaneous materials, no such items are included in the modelling.

- ➢ EMS recommends that the assumptions regarding non-lamp material costs be accepted.

4.1.1.5 Proportion of Overtime

EnergyAustralia assumes that 20% of spot maintenance labour is required in overtime hours. EnergyAustralia states that this reflects

> "… the fact that the more complicated work or work on traffic routes require greater access and are usually undertaken outside core business hours.
>
> In particular, work on Sydney's traffic routes require RTA permits and must be completed in the windows offered by the RTA (which inevitably are in overtime hours)."[16]

EnergyAustralia add a footnote stating that

> "Excluding on-costs, overtime represented 24% of direct labour costs in 2008-09".[17]

A cost proportion of 24% equates to 17.4% of total labour hours occurring as overtime, assuming 'time-and-a-half' rates[18].

[16] *Submission* p32
[17] *Submission* p32
[18] Calculation details are provided in Appendix C.

In the discussion of overhead costs, EnergyAustralia states that "approx 15% of lamps [represent] Category V lamps".[19]

EMS accepts that the RTA will often require public lighting maintenance on traffic routes to be undertaken outside normal business hours. From the evidence presented in the *Submission*, the proportion appears to be in the order of 15% to 17.4%.

- EMS recommends that the overtime proportion assumption be amended to 17.4% to reflect historical overtime proportion in 2008-09.

4.1.1.6 Proportion of Labour in Total Opex

EnergyAustralia has assumed that the labour proportion of public lighting opex is 65%. Whilst this is higher than most DNSP opex categories it is recognised that public lighting assets are generally of low value (compared to maintenance and repair of substation equipment for example) so the materials proportion of opex is low, and the nature of public lighting works requires a significant proportion of non-productive time in moving from site to site (compared to maintenance and repair of a substation or pole top for example, where the crew may be located at one site for several hours). It is noted that the AER approved the proportion of 65% in the 2009 Determination.

- EMS recommends that the assumption of 65% labour in total opex be accepted.

4.1.1.7 Overhead Costs

The historic contribution of overheads is 25% and this figure was accepted by the AER in the 2009 Determination. EnergyAustralia is unable to precisely identify the overhead costs which may validly be allocated to public lighting opex. The *Submission* includes a list of the type of costs which are meant to be recovered through the overhead charge rate:

> "… non-operational staff, for example the business analysts and administration staff managing the following:
> - asset register;
> - billing systems;
> - fault notification systems;
> - debtor management;
> - dispute management (between two public lighting customer as to asset ownership);
> - contact centre operations; and
> - corporate/executive costs."[20]

EnergyAustralia go on to discuss the conduct of quarterly night patrols of Category V lamps, being 15% of lamps at $1.50 per lamp, yielding an annual cost of $225,000. It is noted that such patrols are in accordance with EnergyAustralia's Public Lighting Management Plan[21] and since it is a requirement of the NSW Public Lighting Code that such a Plan is to be developed and implemented "in consultation with each of [the public lighting service

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[19] *Submission* p38
[20] *Submission* p38
[21] EnergyAustralia *Public Lighting Management Plan* June 2006, Paragraph 3.1

provider's] customers"[22] then EMS assumes that EnergyAustralia's customers agree that such patrols should occur.

EnergyAustralia claim that the cost of $225,000 incurred each year since the introduction of quarterly night patrols of Category V lighting should be added to the overhead costs, thereby increasing the overhead rate by 1.75% to a new rate of 26.75%.

EMS notes that although the patrols were introduced in 2006, EnergyAustralia's 2008 Pricing Submission did not include a claim for the increased overhead.

EMS notes that the overhead rate of 25% is a historically accepted figure that is approximate at best. It is unlikely to match precisely the actual overheads incurred by EnergyAustralia's public lighting function but is accepted as sufficiently accurate for the purposes of allocative efficiency and cost-reflective pricing. We point out that making a precise adjustment to an approximate figure results in just another approximate figure.

- EMS recommends that the overhead rate assumption of 26.75% be replaced with the previously accepted figure of 25% on the grounds that
    - The additional 1.75% likely overstates the additional costs faced by EnergyAustralia in undertaking its patrol regime (see Section 4.1.1.8 below);
    - The rate of 25% was proposed by EnergyAustralia in its 2008 Proposal and accepted by the AER; and
    - In view of the fact that a precise adjustment to an approximate figure only results in another approximate figure, then the accepted approximate figure of 25% should prevail.

4.1.1.8 Cost of Quarterly Patrols

The annual cost of $225,000 for quarterly patrols provides for a per-night expense of around $940, assuming 240 working-nights per year. EnergyAustralia state that Category V lamps account for 15% of the total lamp population, that is, around 36,600 lamps. The quarterly patrols will need to observe these lamps over 60 working nights, that is, around 600 lamps per night.

Assuming lamps are installed on both sides of the traffic route and at 50m spacings[23], then the distance covered will be 15km per night. Allowing for slow progress in order to make detailed and methodical observations, and periodic stopping to identify, locate and record defects, in EMS's opinion such a workload should require at most, around five labour-hours including time for travelling to and from the depot. That is, five hours for one person working alone, or 2.5 hours for two persons – one driving at reasonable pace while the other observes and records. The labour cost at EnergyAustralia's assumed overtime rate will be in the order of $500 per night and vehicle costs would be no more than $100 per night[24]. That being the case, a per-night expense of $940 appears to be excessive. A more likely cost

[22] NSW Department of Industry and Investment *NSW Public Lighting Code* 1 January 2006, Section 7
[23] Many TRL spacings are less than 50m
[24] Assuming a sedan or light truck is used at $20 ph.

would be $600 per night, resulting in an annual cost of $144,000, or around $1.00 per lamp inspected.

- EMS recommends that an efficient annual cost for quarterly night patrols of Category V lighting would be in the order of $144,000, representing a rate of approximately $1.00 per lamp inspected. In accordance with the previous recommendation, this cost should be specifically identified rather than merging it into overhead costs.

4.1.2 Spot Maintenance Assumptions

4.1.2.1 Staffing Requirements

EnergyAustralia has assumed two staff are required for all spot maintenance work and one additional person when the work site is on a traffic route.

EMS recognises that OH&S developments in the last decade or so have all but abolished “aloft alone”[25] work. It is also accepted that work on defined traffic routes will frequently require a flag operator. Whist some traffic route jobs will not require a flag operator, others may require two.

- EMS recommends that the assumed staffing requirements be accepted.

4.1.2.2 Time Requirements

EnergyAustralia’s assumptions on the total time required to undertake spot maintenance encompasses travel time, job preparation time and repair time.

Dealing firstly with job preparation time, EMS accepts that OH&S requirement require site and hazard assessment, EWP manoeuvring and stabilisation, and traffic control measures. Accordingly, 10 minutes is accepted as reasonable.

Regarding average repair time, EMS recognises that tasks such as cleaning visors and minor mechanical and electrical repairs are frequently done in addition to the simple replacement of a lamp or PE cell. Even so, lamps and PE cells in most luminaires can be changed very simply and EMS is of the view that an average time of 10 minutes actual repair time is likely to be overstating the requirement. To support its submission, EnergyAustralia provided a report of a field observation undertaken over a brief period on 16 December 2009.[26] EMS notes that the actual repair task commenced at 9.12am and involved:

- examining the light
- removing the casing
- checking the lamp
- replacing the lamp
- restoring the casing

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[25] It is generally considered inappropriate from an OH&S viewpoint for a worker to be working aloft (for example, in an EWP) unless accompanied by another worker.

[26] EnergyAustralia *Field observation of spot lamp replacement task – File note of 16 December 2009* (Confidential)

- inspecting the light
- positioning the EWP back to the truck.

The operator exited the EWP at 9.17am – a total time of 5 minutes. EMS notes that the next job was not attempted because of its complexity, and the third job took in excess of 18 minutes (the observer left the site before it was completed).

Whilst a brief observation of a few hours of one crew's daily activity may be of interest, it provides no sound basis for drawing any conclusions about the average time required for actual repair work. EMS is of the view that 10 minutes for the average lighting repair is likely to be on the generous side but, in the absence of better information, accepts the figure.

In relation to travel time, EnergyAustralia points out that Sydney traffic is known for its congestion and cites several examples of travel time required within the northern zone.[27] Work in this zone emanates from Gore Hill and sample travel times are:

- to Palm Beach, over one hour
- to Brooklyn, 50 minutes
- to Manly, 30 minutes
- to Kirribilli, 10 minutes
- to Carlingford, 20 minutes.

EnergyAustralia claim that the above times relate to car travel and that truck or EWP travel would be slower. EMS questions this. EnergyAustralia are claiming that the travel times are lengthy due to congested traffic. However, in congested traffic, cars and heavy trucks proceed at the same speed.

Accepting that the furthest points serviced from the Gore Hill depot require around one hour to reach, then by simple logic, the average travel time requirement across the whole northern area is half this, i.e. 30 minutes. However, EMS notes that the density of public lighting in the outer areas of the northern area is very much less than in the inner suburbs, which means that the incidence of spot maintenance jobs will concentrated nearer the depot, leading to an average travel time from the depot to the first job which is considerably less than 30 minutes.

EMS considers that average time required for travel to the first job site is in the order of 20 minutes, and similarly for return from the last job site.

With regard to travel between jobs, EnergyAustralia states that it "routinely groups replacement tasks within a common locality. However, the ability to do this is limited within the target of 8 days repair times".[28] EMS notes that the eight day repair time is a requirement of the NSW Public Lighting Code and is reflected in Section 8 of EnergyAustralia's Public Lighting Management Plan.

[27] *Submission* p33
[28] *Submission* p33

In its review of EnergyAustralia's public lighting costs, Parson Brinckerhoff report that in 2008-09 the average repair time was 3.4 days.[29] More specifically, in the month of November 2009, the average repair was 2.1 days.[30] EMS accepts that some of the improvement will flow from the fact that quarterly patrols provide a natural bundling of repair tasks in one area. However, low average times can also result from a management policy that prioritises repair rate over cost efficiency. An average repair time of 3.4 days when 8 days are available may indicate a lack of focus on the need to bundle jobs in order to reduce costs. The actual repair times far exceed the levels agreed with the public lighting Customers. EnergyAustralia may chose to provide a higher level of service, but its public lighting customers should not be expected to pay for anything more than the service they settled on when the Public Lighting Management Plan was finalised.

EMS is of the view that a more judicious approach to the bundling of spot maintenance tasks would result in travel times between jobs averaging no more than five minutes.

On that basis, an average day for a spot maintenance crew can be derived as follows:

- Start of shift admin, stores replenishment, etc — 30mins[31]
- Travel to first job site — 20mins
- Site preparation — 10mins
- Repair work — 10mins
- Travel to next job — 5mins
- Repeat site preparation, repair work, and travel to next job 'n' times
- Return from last job site — 20mins
- End of shift clean up and admin — 15mins.

The EnergyAustralia Consent Award provides for an average of 7.2 hours actual working time per day (meal breaks are additional to the 7.2 hours). Simple arithmetic will reveal that the average number of spot maintenance tasks achieved will be 14.1 per day. By comparison, in their respective 2008 Proposals, Country Energy modelled a spot replacement rate of 18.94 per day, and Integral Energy 18.75 per day.[32] EMS considers that a proposed figure of 14.1 per day for EnergyAustralia represents a very generous allowance for the challenges caused by Sydney's traffic.

The *Cost Model* assumes 40 minutes is required for all spot maintenance tasks, including travel, preparation and actual repair time. The *Submission* indicates that this time also allows for start-of-shift and end-of-shift activities.[33] EMS suggests that on the basis of the above analysis, the *Cost Model* will produce more reliable results if the time for 'normal

[29] Parsons Brinckerhoff *Independent Review of Public Lighting Costs – EnergyAustralia* January 2010, p11
[30] *Submission* p38
[31] EnergyAustralia state that between 15 and 45 minutes is required for relevant administrative tasks before and after a shift. *Submission* p33
[32] AER *Final Decision NSW Distribution Determination 2009-10 to 2013-14* 28 April 2009, p 352. In the Final Determination, the AER adjusted the rates to 18.5 per day (Country Energy) and 25.33 per day (Integral Energy). These DNSPs have accepted these rates.
[33] *Submission* p33

time' tasks is taken to be 7.2 hours divided by 14.1 tasks. That is, an average time of 30.6 minutes per task.

Intuitively, it would be expected that spot maintenance tasks undertaken after hours (i.e. overtime) would require less time due to easier traffic movement. However, given the relatively small proportion of task undertaken after hours, detailed analysis is not warranted.

- EMS recommends that the time requirement assumption of 40 minutes per spot maintenance task be replaced with an assumption of 30.6 minutes.

In the context of this discussion, EMS notes that EnergyAustralia manages its public lighting maintenance in three geographical areas:

- South (broadly bounded by Auburn, the City of Sydney, Bondi, Cronulla and Bankstown);
- North (broadly bounded by North Sydney, Palm Beach, Brooklyn, and Baulkham Hills); and
- Central Coast, Newcastle and Hunter.[34]

EnergyAustralia's submission regarding travelling times is based on a management arrangement whereby all spot maintenance activities in the northern area emanate from one depot in Gore Hill.[35] A similar arrangement may be adopted in other areas.

It is accepted that a major component of public lighting spot maintenance costs results from travel requirements. EMS submits therefore that in the northern area, and possibly other areas, a management arrangement that requires such broad areas of congested Sydney to be serviced by crews emanating from a single depot is almost certain to result in sub-optimal efficiency. Other depots and facilities must exist that could be used as the base for crews, including parking of plant and storage of imprest stock, requiring only an occasional trip to the central depot for administrative purposes.

From the information provided by EnergyAustralia in support of its *Submission,* it appears that works orders, reporting and recording are all paper-based. Consideration could be given to the introduction of modern technology such as personal digital assistants (PDAs) for recording field data which provides for download of data and upload of daily task instructions without the need for face to face contact. The cost of such devices would quickly be recovered from the savings of avoided journeys to the central depot.

The reduction of the average time requirement to 30.6 minutes will provide an incentive for EnergyAustralia to explore alternative management options and achieve further efficiencies.

4.1.2.3 Average Failure Rates of Lamps

EnergyAustralia has undertaken detailed analysis of failure rates for 24 of its 41 lamps types and found that failure rates for some lamps are well below the assumed failure rates presented in its 2008 Proposal to the AER. EnergyAustralia state "Our analysis was surprising. Failure rates for many lamps have reduced significantly, some well below rates

[34] EnergyAustralia *Public Lighting Management Plan* June 2006, Paragraph 2.1
[35] *Submission* p33

determined by the AER in April 2009."[36] These findings support the discussion in chapter 3 of this report.

The failure rates determined by EnergyAustralia are listed in the *Cost Model.* Data for the most populous lamps are:

Lamp ID #	2.5 Year Failure Rate	3 Year Failure Rate	4 Year Failure Rate
57	3.35%	2.96%	2.91%
59	1.96%	1.68%	1.47%
60	1.70%	1.45%	1.29%
61	4.27%	4.01%	5.66%
62	1.06%	1.01%	1.01%
65	2.77%	2.43%	2.30%
95	3.31%	2.93%	3.18%
97	4.15%	3.66%	3.65%

It is noted that all but one of the lamp types show a declining failure rate as the bulk replacement cycles increase, implying that longer BLR cycles would reduce costs. EnergyAustralia agrees with this observation but cautions that it "has not had sufficient time to interrogate this analysis and with more time we would prefer to interrogate the data further."[37]

In the *Cost Model*, EnergyAustralia has adopted the failure rates resulting from its own analysis or, in the absence of such results, the failure rates determined by the AER. With the single exception of the MBF1x80 lamp, EnergyAustralia's failure rates are lower than the AER's[38]. That said, there appear to be some inconsistencies in the data. The EnergyAustralia failure rate appears to have been adopted in single lamp configurations but the AER figure in multi-lamp configurations of the same lamp type.

- Subject to the adjustment of inconsistencies of failure rates in multi-lamp configurations, EMS recommends that the failure rates adopted in the *Cost Model* be accepted.

4.1.2.4 Average Failure Rate of PE Cells

In information provided on 12 February in response to a question from the AER, EnergyAustralia advised that the assumed PE cell failure rate of 1.42% represents the annual percentage of PE cells that failed and were recorded as repaired, as applied across all public lighting assets. The underlying failure numbers relate only to tasks where EnergyAustralia has recorded a job to repair a PE cell and do not include PE cell replacements where a crew attends a site for another reason.

[36] *Submission* p30
[37] *ibid*
[38] EnergyAustralia's failure rate for the MBF1x80 lamp is 2.43% whereas the AER figure is 2% (*Submission* p36).

The Parsons Brinckerhoff review states that the figure is "based on the historical average of 3472 failures per year since 2006".[39]

- EMS recommends that the average PE cell failure rate of 1.42% be accepted.

4.1.2.5 Average Failure Rate of Other Components

In information provided on 12 February in response to a question from the AER, EnergyAustralia provided data on other components which are repaired specifically as a response to a works order, ignoring those which are repaired where a crew attends a site for another reason. The rate of such repairs, as applied across all public lighting assets, is 0.83% which EnergyAustralia rounded up to 1%. The effect of the rounding up on total opex costs is immaterial.

- EMS recommends that the 'other component' failure rate of 1% be accepted.

4.1.2.6 Connection Maintenance Assumptions

From time to time repairs are required on the connection to public lights. In the case of lights supplied by underground cables, connection repairs may be expensive especially if excavations are involved.

Connection maintenance events are rare with the result that expenditure in any one year may be very high or very low in comparison to the long term average. Unfortunately EnergyAustralia does not routinely keep data associated with connection maintenance tasks.[40] EnergyAustralia states that the connection repair costs included in its 2008 Proposal were based on the same rates, in nominal terms, as those proposed to IPART in 2005 and that in the *Submission,* the same connection repair costs have been maintained, in real terms, from its 2008 Proposal. [41]

EMS notes that the *Cost Model* provides for an annual cost of $2,081,466 for connection maintenance. This is allocated to four connection types: OU, UGORDA, UGR1 and UGR2. The basis of the allocation is not explained. Applying the total cost to the number of connections yields flat rates for each connection repair task. To the extent that the total connection repair cost is unchanged from the EnergyAustralia's 2008 Proposal, 'back-solving' into rates for particular connections appears to be valid.

- On the basis that the connection cost rates are the same as proposed in EnergyAustralia's 2008 Proposal, EMS recommends that the connection repair unit rates be accepted.

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[39] Parsons Brinckerhoff *Independent Review of Public Lighting Costs – EnergyAustralia* January 2010, p23
[40] *Submission* p37
[41] *ibid*

4.2 Bulk Maintenance Cost Forecast

4.2.1 Basis of the Model

EnergyAustralia's bulk maintenance cost forecasts are based on the tasks and unit rates contained in current competitive contracts. EnergyAustralia provided a copy of a current contract by which EMS was able to confirm the accuracy of the unit price rates used in the *Cost Model.* Tasks undertaken by bulk maintenance contractors are

- Servicing of luminaire (lamp replacement)
- Replacement of visor
- Replacement of PE Cell
- Minor non-electrical work
- General electrical work
- Minor electrical work
- Major electrical work

Additional tasks, mostly undertaken by EnergyAustralia staff are

- Other electrical work
- Quarterly night patrols of traffic route lighting[42]
- Annual night patrol of all serviced luminaires
- Ad hoc works[43].

The rates for each of the above tasks have been derived from the bulk maintenance contracts and then applied to the replacement cycles assumed in the contracts and the number of lights being maintained. The total cost of bulk maintenance produced by the *Cost Model* therefore equals the total contract value (adjusted for CPI). The advantage of the model is that it identifies the cost per luminaire-type and therefore yields a higher degree of accuracy in the 'per lamp' bulk maintenance prices. This yields, in turn, an improved level of allocative efficiency and cost-reflectivity in the public lighting charges.

4.2.2 Bulk Maintenance Assumptions

4.2.2.1 Lamp Replacement Cycle

This issue is fundamental to the development of an efficient public lighting maintenance regime and is discussed at length in Chapter 3 of this report. Cycles of 3, 4 and 5 years are adopted by Australian DNSPs based on in-service experience. Statistical analysis alone does not support robust conclusions as to optimum BLR cycles. Real world experience indicates a range of cost/benefit outcomes flowing from different BLR cycles.

- EMS recommends that the bulk replacement cycle assumptions used in the *Cost Model* be in accordance with our recommendation on page 9 above, that is, four years for all HPS lamps in TRL installations and three years for all other lamps.

[42] Some night patrols are assigned to contractors.
[43] Ad hoc works are spot maintenance tasks that are assigned to bulk replacement contractors for completion during the bulk maintenance cycle. Accordingly, they are factored into the *Cost Model* under bulk maintenance.

4.2.2.2 PE Cell Replacement Cycle

EnergyAustralia assumes that PE cells will be replaced on a six year cycle, that is, on every second bulk replacement visit. EMS notes that the failure rate of PE cells, at 1.42%, is much less than half the failure rate of most lamps.

EMS accepts that the cost of PE cells is not great and that the incremental time required to replace a PE cell during a bulk replacement visit is minor. On the other hand, the cost of a spot maintenance job just to replace a PE cell is high. This is particularly so in TRL installations and in view of the above recommendation for a four year cycle for HPS lamps in TRL installations, EMS accepts that extending the life of PE cells to eight years in such installations may introduce an unacceptable probability of high cost PE cell spot replacement tasks. Accordingly, if the previous recommendation is adopted, an 'every visit' policy is recommended for PE cells in HPS TRL areas. Interrogation of the *Cost Model* indicates that the additional cost of changing from a six-year cycle to a four-year cycle for PE cell replacement for lamps in "traffic" areas would not be excessive. EMS considers that the additional cost would be a reasonable approach to mitigating the risk of high cost PE cell replacement tasks in years 5 to 8 of an eight year cycle. Also, PE cell failure results in the lamps operating continuously, thereby unnecessarily consuming energy and shortening lamp life.

- EMS recommends that PE cell replacement be on the basis of "every visit" for HPS lamps in TRL installations, and "every second visit" for all other lamps. Accordingly, the *Cost Model* should assume a PE cell replacement cycle of four years for all HPS lamps in TRL installations and six years for all other lamps.

4.2.2.3 Cycles and Unit Rates for Other Bulk Replacement Tasks

The *Cost Model* lists assumptions regarding the replacement cycles and unit rates of other bulk maintenance tasks (visor replacement, minor electrical work, etc).

EnergyAustralia has determined the replacement cycle assumption of each such task by dividing the number of lights serviced by the bulk maintenance contractors by the quantity of each task undertaken, based on historical data relating to the period from November 2008 and November 2009.[44] As such, the assumptions are simply "modelling constructs" that seek to allocate the costs of other tasks to each lamp type. As noted above, this enhances the *Cost Model's* ability to provide improved cost-reflectivity in the determination of prices for individual lamp types.

In response to a request from the AER, EnergyAustralia provided a copy of a current bulk maintenance contract and a spreadsheet listing the unit rates for each of the tasks listed in Section 4.2.1 extracted from EnergyAustralia's four current contracts. These data verified the unit rate assumptions adopted in the *Cost Model*. The bulk maintenance contracts are sourced from the competitive market. Two different contractors are currently engaged to provide services in four areas of EnergyAustralia's distribution area. The fact that the contracts are sourced competitively suggests that the total contract values are efficient.

- EMS accepts that the modelling of other bulk replacement tasks is efficient.

[44] See *Submission* p29

EMS notes that the *Cost Model* includes costings for "Quarterly Night Time Traffic Route Luminaire Patrols" and that the total annual value is $76,672. EnergyAustralia staff undertake these patrols in the Central Coast, North and Upper Hunter regions. Contractors cover all other regions.[45]

As discussed in Paragraph 4.1.1.7, EnergyAustralia has sought to include the cost of quarterly night patrols in the overhead rate and estimate the cost to be $225,000. It is presumed that this refers only to patrols undertaken by EnergyAustralia staff. That is, EnergyAustralia seek to recover the cost of patrols by contractors as a specific task in the *Cost Model*, and the cost of patrols by EnergyAustralia staff as a cost overhead.

Notwithstanding that EMS considers it inappropriate to recover the cost of in-sourced patrols through overhead charges (as discussed in Paragraph 4.1.1.7), the comparative value is revealing. Contractors are able to patrol the South (including the City of Sydney), Newcastle and Lower Hunter regions for a cost of $76,672 whereas EnergyAustralia estimate the cost of the in-sourced patrols for the Central Coast, North and Upper Hunter regions to be $225,000. The cost ratio is almost 3:1. EMS suggests that the ratio of TRL lamps in the two regions is much less. Considering that the contractors are covering the cities of Sydney and Newcastle, the Contractors may in fact cover more TRL lamps than EnergyAustralia.

In light of this, EMS's recommended adjustment in Paragraph 4.1.1.8 appears very generous.

4.3 General Comments on the *Cost Model*

4.3.1 Data Inconsistencies

EnergyAustralia's public lighting inventory comprises 41 different lamp types in 102 different configurations. It would be expected that the cost per lamp would be the same regardless of whether the lamp is in a one, two, three or four lamp luminaire. Examination of the *Cost Model* indicates that this is not the case. For example, one particular lamp is used in four configurations. The lamp prices for each configuration are:

ID #	No. Lamps	Cost per Lamp[46]	Total Lamp Cost per Replacement[47]
65	1	$2.62	$2.62
71	2	$5.90	$11.81
75	3	$7.86	$23.58
77	4	$10.48	$41.92

[45] *Submission* p29
[46] From *Cost Model* 'Input-Inventory' worksheet, FY10
[47] From *Cost Model* 'Calc-Opex' worksheet, FY10. Column 4 shows that the *Cost Model* multiplies the cost per lamp by the number of lamps, proving that the figures in column 3 are in fact 'per lamp' costs.

Other examples exist where the 'per lamp' price is simply the multiple of the number of lamps in the configuration, for example:

- Items 97 and 103: $13.99 each in a single lamp luminaire and $27.97 each in a two lamp luminaire,
- Items 109 and 110: $65.40 each in a four lamp luminaire and $130.80 each in an eight lamp luminaire.

Similarly, as mentioned in paragraph 4.1.2.3, EMS would expect that the failure rates of lamps would be the same whether they are in a single lamp or multi-lamp configuration. This is not the case in the *Cost Model*. For example, the failure rate of Item 65 is 2.43% (single lamp configuration) but the same lamp in two, three and four lamp configurations is assigned a failure rate of 6% (items 71, 75, 77). Several other similar inconsistencies can be found.

Whilst the *Cost Model* appears to be soundly constructed, inconsistencies such as those described above erode the confidence that EMS would otherwise have in the reliability of cost estimates produced by the *Cost Model.*

4.3.2 Applying the *Cost Model* to EnergyAustralia's 2008 Proposal

In its 2008 Proposal, EnergyAustralia presented a top-down analysis of public lighting maintenance costs, leading to a proposed annual operating expenditure of $15.83million (FY2009)[48]. The proposal was based on a set of lamp failure rates and a bulk maintenance cycle of 2.5 years.

Applying EnergyAustralia's 2008 proposed failure rates and a 2.5 year bulk replacement cycle, the *Cost Model* yields a total public lighting opex cost of $23.89million (FY2009), some $8 million or 151% greater than the 2008 Proposal figure.

EMS recognises EnergyAustralia's statement that the 2008 model "did not capture the full suite of costs incurred by EnergyAustralia in operating and maintaining public lights. For example, EnergyAustralia's model did not identify the costs involved in operating an elevated work platform."[49] However, we find it difficult to accept that there were sufficient genuine cost omissions to account for a difference of $8million in $15.8million.[50]

[48] *Submission* p23
[49] *Submission* p24
[50] The *Cost Model* estimates the FY09 EWP cost to be $3.2million

5 Parsons Brinckerhoff's Independent Review – Peer Assessment

5.1 PB's Findings

Parsons Brinckerhoff (PB) were engaged by EnergyAustralia in December 2009 to review its proposed expenditures for public lighting in the 2009-14 regulatory control period and to provide an opinion on whether EnergyAustralia's proposed forecast operating expenditure represents the efficient costs of providing public services in its distribution area. PB finalised their report on information available at the time and submitted it to EnergyAustralia in January 2010. [51] Shortly after, more up to date information on the public lighting opex proposals of the Victorian DNSPs became available and subsequently PB submitted an addendum to their original report.[52] The documents are referred to respectively as *PB Review* and *PB Review Addendum* throughout this Chapter.

PB summarises the key findings[53] as:

- The model developed by EnergyAustralia to forecast expenditures for the 2009 to 2014 regulatory period is well constructed and robust;
- The model is sensitive to input data, in particular the spot failure rate of lamps, and given the lack of accurate spot failures for time periods beyond 3 years, that the model should not be used to determine the optimal bulk lamp replacement period;
- The lack of rising trend in the spot failure rate of lamps in the available data indicates that the current bulk replacement period of 2.5 years is too short and should be lengthened;
- The optimal bulk lamp replacement period cannot be determined from the available data;
- Examination of bulk lamp replacement periods adopted by EnergyAustralia's peers indicates that a period of 3 years should be adopted, with further data collection and review required to assess whether or not this could be economically extended.

From the discussion in Chapters 3 and 4 of this report, it will be clear that in general terms, EMS supports these findings. In particular:

- ➢ EMS agrees that the *Cost Model* is well constructed and robust. However EMS has concerns about the validity of input data, as discussed earlier in this report. We question EnergyAustralia's assumptions on labour rates, proportion of overtime,

[51] Parsons Brinckerhoff *Independent Review of Public Lighting Costs – EnergyAustralia (Confidential)* January 2010.
[52] Parsons Brinckerhoff *Independent Review of Public Lighting Costs – Addendum – EnergyAustralia (Confidential)* 19 January 2010
[53] *PB Review* p24

overhead costs, cost of quarterly patrols, time requirement per spot maintenance task, BLR cycles. We also identify inconsistencies in the prices and failure rates of lamps.

- EMS agrees that the *Cost Model* is sensitive to input data.
- EMS agrees that the *Cost Model* should not be used to determine optimal BLR cycles.
- EMS agrees that the current 2.5 year bulk maintenance cycle should be lengthened.
- EMS agrees that the optimal bulk lamp replacement period cannot be determined from the available data since, as discussed in Chapter 3, rare-event data may be unreliable and in practice, BLR cycle decisions are pragmatically based on in-field experience.
- EMS agrees that further data collection and review are required to assess whether EnergyAustralia's proposed three year bulk replacement cycle could be economically extended. However, we question how such data will be obtained unless a trial of an extended cycle is undertaken. EMS's recommendation for a four year cycle on SON lamps in TRL installations will be a key input into fulfilling PB's suggestion for further data collection and review.

5.2 PB's Specific Conclusions[54]

The *PB Review* includes a Table of findings and conclusions which addresses seven specific elements of efficiency reviewed by PB. EMS's assessment of the validity of each of PB's conclusions is discussed in this Section.

5.2.1 Link Between Services and Forecast Expenditure

PB found that "services based on the type of lamp provide high certainty that only the costs relevant to the service being provided would be charged to the customer" and concluded that the link between services and forecast expenditure is efficient.

As discussed previously (e.g. Section 4.2.1) EMS agrees that the allocative efficiency of the model is sound. EMS concurs with PB's conclusion but only to the extent that it relates to the breakdown of total costs to each lamp type and then to the relative costs for each public lighting customer.

As discussed at several places in Chapter 4, EMS considers that several of the assumptions on which the *Cost Model* is based require adjustment and that as a consequence, the total opex forecast is overstated.

[54] *PB Review* pp24, 25

- EMS considers that the relative cost proportions of public lighting opex are efficiently allocated but that the absolute values of costs are overstated.

5.2.2 Historical Cost Review

PB found that "an average cost increase of 52% over the current period is due to increasing volumes[55], increase in material and labour costs over and above CPI, and improving performance in accordance with stated plans and objectives under the public lighting management plan". They conclude that the cost increase is efficient and warn that costs may continue to rise as customers exercise a growing preference for energy efficient lamps.

EnergyAustralia's average public lighting opex during the 2004-09 regulatory period was $10.9m pa and is proposed to rise to $16.9m pa in the 2009-14 period.[56]

PB identified the key elements of this 52% increase to be growth in street light population of 3.8% and increase in materials and labour costs above CPI of 2.3%. Simple mathematics will show that a 3.8% increase compounded over five years yields an average increase of 4.1% pa. Similarly, 2.3% yields an average increase of 2.4% pa. Thus these two factors account for only 6.5% of the 52% increase in costs claimed by EnergyAustralia.

To further account for the cost increase, PB noted that EnergyAustralia's obligations under the Public Lighting Code have increased costs since 2006. This amounts to "better reporting, customer interaction and recently the introduction of night patrols to assess repairs. As such, this was a major contributing factor to the change in opex levels in 2007/08 required to service public lighting and this effect [essentially doubled public lighting opex]".[57]

EnergyAustralia's estimate for the cost of additional night patrols is $225,000 pa which EMS recommends be adjusted downward to $144,000 pa (see paragraph 4.1.1.7 above). With regard to the need for better reporting and customer interaction, EMS suggests that this would require at most, three additional full time staff, at an estimated cost of say $200,000.

Thus the cost of ramping up to the new requirements of the NSW Public Lighting Code, in EMS's view, would amount to some $344,000 pa. PB suggest in their Figure 3.2[58] that the increase in average public lighting opex from 1999-2007 of $6.9m pa, to a forecast opex during 2007-2014 of $16.3m pa, is wholly due to the Public Lighting Code. EMS considers that the cost increase of $9.4m pa suggested by PB is more likely to be no more than $0.5m.

PB claim that the increase of 52% in EnergyAustralia's public lighting opex is validated by comparison to similar trends in other NSW and Queensland DNSPs. PB's Addendum Figure 1[59] compares EnergyAustralia's opex increase of 52% with two wholly rural DNSPs (increases of 72% and 57%) and five city/urban DNSPs (increases of 56%, 29% and three at 15% each).

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[55] EMS notes that the *Cost Model* does not provide for any volume growth.
[56] *PB Review* p10
[57] *ibid*
[58] *PB Review* p11
[59] *PB Review Addendum* p3

In EMS's view, rather than validating EnergyAustralia's opex increase, the figures demonstrate that EnergyAustralia's proposed public lighting opex is inefficient. EnergyAustralia's public lighting infrastructure and the costs it faces in operating and maintaining it may be compared to other city/urban DNSPs. No valid comparison can be made with the wholly rural DNSPs. Only one city/urban DNSP exceeds EnergyAustralia and four propose substantially lower public lighting opex increases.

- EMS considers that PB's conclusion, that EnergyAustralia's proposed cost increase is efficient, does not reflect the facts as presented.

5.2.3 Benchmarking

PB found that "on all indicators, EnergyAustralia's service provision is more efficient than other NSW DNSPs but worse than Victorian and Queensland DNSPs. Taking into account the difference between states that PB is aware of, the benchmarking supports that EnergyAustralia is operating at a reasonable level of efficiency."

In their review, PB considered the characteristics of EnergyAustralia's distribution area as compared with other DNSPs. PB made no firm conclusions as to the relative advantages and disadvantages of customer density, traffic factors, etc.

PB then benchmarked EnergyAustralia against other DNSPs in terms of "street light opex per distribution network customer" and "street light opex per street light". In the first comparison, EnergyAustralia came in at third of the eight city/urban DNSPs (discounting connection opex to provide a like-for-like comparison).[60] However, EMS considers this benchmark to be of little value since the causal link between customer numbers and street light opex is weak.

In terms of opex per street light (which clearly has a strong causal link) PB found that of eight Australian DNSPs with mostly city and urban distribution areas, EnergyAustralia ranked sixth in terms of public lighting opex per light installed. The actual costs were $25, $29, $33, $43, $58, $59(EA), $60 and $63 per light installed (again discounting connection opex to provide a like-for-like comparison).[61] The worst figures ($60 and $63) relate to Victorian DNSPs, which as PB notes, are based on proposed 2011-16 expenditure rather than AER approved expenditure. The better figures relate to a mixture of Queensland, NSW and Victorian DNSPs.

Wholly rural-based DNSPs showed figures of $101 and $116 per light installed. EMS considers that benchmarking EnergyAustralia's performance against wholly rural DNSPs is invalid.

Focusing only on comparable city/urban DNSPs, the figures indicate that PB's conclusion is somewhat misleading. EnergyAustralia's performance is marginally worse than the other NSW city/urban DNSP and considerably worse than one Queensland and three Victorian city/urban DNSPs.

[60] *PB Review Addendum* pp6,7
[61] *PB Review Addendum* p7

- EMS considers that PB's conclusion on benchmarking is somewhat misleading in that EnergyAustralia's performance in terms of opex per street light for city/urban DNSPs is of the same order as some of the worst performing DNSPs.

5.2.4 Robustness of Forecasting Methodology

PB found that "the models used by EnergyAustralia were found to be well constructed and robust" and therefore conclude that the forecasting methodology is efficient.

As discussed previously, EMS agrees that the *Cost Model* is well constructed and efficient but has concerns about some of the input assumptions and data.

- EMS agrees with PB that the forecasting methodology *per se* is efficient.

5.2.5 Identification and Assessment of Key Assumptions

PB found that "except for spot failure rates, the key assumptions made by EnergyAustralia in forecasting its expenditures were found to be reasonable." PB states that a move from the current 2.5 year lamp replacement period to a longer period is necessary to demonstrate efficiency.

EMS has addressed questions about bulk maintenance cycles and *Cost Model* input assumptions at length in Chapters 3 and 4 of this report. In summary, EMS is concerned about EnergyAustralia's assumptions on labour rates, proportion of overtime, overhead costs, cost of quarterly patrols, time requirement per spot maintenance task, BLR cycles, and inconsistencies in the prices and failure rates of lamps.

Although PB's review of these issues has led to some findings which conflict with EMS's views in certain specific areas, we concur with the conclusion that the current bulk maintenance period should be lengthened. The matter is dealt with in more detail in PB's overall findings as discussed in Section 5.1 above.

- EMS agrees with PB's conclusion that EnergyAustralia's current bulk maintenance period should be lengthened.

5.2.6 Identification of Alternatives

PB found that "an assessment of the trade off between the bulk replacement of lamps and spot repairs has been undertaken and the bulk lamp replacement period extended from 2.5 years to 3 years for all lamp types." PB conclude that the identification of alternatives is "efficient, but further work [is] required to fine tune the replacement program".

As discussed in Section 5.1, EMS agrees that further work is required to fine tune the replacement program. EMS's recommendation for a four year cycle on SON lamps in TRL installations will be a key input into fulfilling this recommendation.

- EMS agrees with PB's conclusion relating to the identification of alternatives.

5.2.7 Efficiency over the Long Term

PB found that "the introduction of energy efficient lamps (at higher initial cost and replacement cost) has been made" and refer to the fact that EnergyAustralia outsources most installation and bulk lamp replacement work which provides for least cost over the long term. PB concludes that this is efficient and cautions that "continuing work [is] required to ensure the outsourcing approach is delivering efficiencies".

EMS considers that PB's review of this element is rather lacking in depth. We agree that increasing competitive outsourcing will contribute to improving efficiencies but consider that it is too early to determine whether the use of energy efficient lamps will be beneficial in terms of public lighting opex efficiency. In this Report, EMS has identified other factors such as the rationalisation of lamp types, increasing the number of depots to reduce travel costs, and introducing modern technology for work orders and reporting.

- EMS agrees with PB's conclusions relating to efficiency over the long term but find that the review of this particular element to be rather lacking in depth.

5.3 PB's Overall Conclusion

Overall, PB concludes that in its view, "EnergyAustralia is on average operating efficiently in its provision of public lighting services" and "EnergyAustralia's forecast of expenditure for public lighting services is efficient as envisaged by the NEL and NER."[62]

- In view of EMS's assessment of efficiency elements in paragraphs 5.2.1, 5.2.2, and 5.2.3, EMS considers that PB's overall conclusion on the efficiency of EnergyAustralia's proposed public lighting opex is somewhat generous.

[62] *PB Review* p26, reflected in *PB Review Addendum* p8

6 Shortened Forms

AER	The Australian Energy Regulator
BLR	bulk lamp replacement
Cost Model	EnergyAustralia *10 01 06 Cost build-up model.xls* (Confidential)
DNSP	distribution network services provider
EMS	Energy and Management Services Pty Limited
EWP	elevated work platform (bucket truck)
NEL	National Electricity Law
NER	National Electricity Rules
PB	Parsons Brinckerhoff Australia Pty Limited
PE cell	photo-electric device that controls luminaire/s in response to ambient light level
RTA	Roads and Traffic Authority (NSW)
Submission	EnergyAustralia *Submission for the AER's re-determination of public lighting prices 2010-2014*, January 2010
TRL	traffic route lighting, that is, Category V lighting (AS1158) designed specifically for defined heavy traffic routes

Appendix A – Terms of Reference

EnergyAustralia Public Lighting Proposal
Terms of reference (opex review)

The following sets out the specific areas that the AER seeks advice from an appropriately qualified consultant.

General assumptions

The consultant is to review EnergyAustralia's general assumptions (listed below) contained in 'General – input' sheet of its cost build up model (rows 17 to 27) and for each assumption advise whether the assumption is reasonable. If an assumption is not considered reasonable please recommend an alternative assumption. Specifically, the following assumptions are to be reviewed:

- labour rate
- overtime labour rate
- Elevated Work Platform hourly rate
- average visor cost
- average PE cell cost
- the proportion of work in overtime hours
- labour as a proportion of opex
- overhead cost allocation.

Overhead costs

EnergyAustralia states that the historic contribution of allocated overheads is 25%. The consultant is to advise whether application of this rate of overheads is reasonable.

Additional overhead allocation for quarterly patrols

EnergyAustralia states that it undertakes quarterly night patrols on major traffic routes in its network area. It has assumed a cost of $1.50 per lamp inspected. It notes that this cost per lamp is based on its bulk lamp contracts. Please advise whether an assumed cost of $1.50 per lamp inspected is a reasonable assumption?

Spot lamp replacement (repair) assumptions

The consultant is to review the spot maintenance assumptions on the 'Input - General' tab of EnergyAustralia's cost build up model (rows 50 to 56) and provide advice for each assumption as to whether it is reasonable. If an assumption is not considered to be reasonable the consultant is to recommend an alternative assumption. EnergyAustralia's assumptions are:

- that a spot maintenance task on a non-traffic route requires 2 staff
- that an additional staff member is required for traffic routes
- that 20% of work is undertaken in overtime hours
- labour rate
- 40 minute total repair time (travel time of 20 minutes, job preparation of 10 minutes and repair time of 10 minutes).[1]
- PE cell replacement of 40 minutes (same as spot lamp replacement)
- other spot replacement task of 40 minutes (same as spot lamp replacement)
- average failure rate for PE cells
- average failure rates for other components.

Assumed spot failure rates

In its 2009 final decision on public lighting the AER had concerns that the spot failure rates proposed by EnergyAustralia were overstated. As a result the AER applied revised spot failure rates based on technical data provided by Sylvania Lighting (see page 343 of the AER's final decision).

EnergyAustralia has since undertaken a more recent review of spot failure rates and found them to be much lower than it proposed in its June 2008 proposal. However, EnergyAustralia considers that these rates might be understated.

The consultant is to provide advice on the following issues:

- based on a review of a sample of spot lamp failure rates contained in EnergyAustralia's cost build up model (see tab 'Input – Inventory' and column AC), are the spot failure rates proposed by EnergyAustralia reasonable?
- is the technical analysis contained in EnergyAustralia's Street Lighting Maintenance Requirements Analysis Review (January 2010) analysis that a prudent operator would undertake and does the analysis support the adoption of the spot failure rates and a 3 year bulk replacement cycle?

EnergyAustralia considers that failure rates cannot be justified on the basis of laboratory testing in preference to its own field analysis (see p.41 of their

1. The AER assumed that EA could undertake 25.33 spot replacements per day. That is, a single spot maintenance task would take about 20 minutes (based on a 8.33 hour day). This assumption was based on a references to productivity rates in ESCV decisions on public lighting (see page 352 of the AER's final decision). EA's considers that its assumptions regarding the time required for average spot lamp replacement reflect the particular circumstances of EA's business and an analysis of the type of tasks undertaken by EA.

regulatory proposal). Is it reasonable to base assumptions regarding spot failure rates on technical information provided by lighting manufacturers?

Bulk maintenance cycle assumptions

EnergyAustralia's bulk maintenance cycles are located on the 'Input - General' tab of EnergyAustralia's cost build up model (rows 32 to 45). EnergyAustralia has developed bulk maintenance cycles for the following:

- Servicing of minor luminaire - scheduled
- Servicing of major luminaire - scheduled
- Replacement of a minor luminaire
- Replacement of a major luminaire visor
- Replacement of photo electric cell
- Minor non-electrical repair
- General electrical work
- Minor electrical work
- Major electrical work
- Electrical work previously completed by EnergyAustralia
- Quarterly night time traffic route luminaire (TRL) patrol
- Annual night time patrol of all serviced luminaires
- Ad hoc works order
- Ad hoc patrolling and reporting of defects (per crew hour).

EnergyAustralia has included a cycle of 3 years for bulk lamp replacement of lamps (major and minor) – rows 32 and 33. The consultant is to review the information in the 2010 proposal on this issue and the information contained in EnergyAustralia's Street Lighting Maintenance Requirements Analysis Review (January 2010) and advise as to whether a bulk lamp cycle of 3 years appears reasonable. If this assumption is not considered to be reasonable the consultant is to recommend an alternative assumption.

EnergyAustralia has included a cycle of 6 years for replacement of PE cells (see row 36), that is, PE cells are replaced every second round of bulk lamp replacement. The consultant is to advise whether this assumption is reasonable. If this assumption is not considered to be reasonable the consultant is to recommend an alternative assumption.

EnergyAustralia has calculated the remainder of the bulk maintenance cycles using the quantity of tasks information in the table on page 29 of the regulatory proposal. The cycles have been calculated by dividing the number of lights by the number of tasks undertaken between November 2008 and November 2009. The consultant is to review these cycles and advise whether they are appropriate.

Bulk maintenance unit rates

The 'Input-General' tab of the cost build up model (column H) sets out unit rates for the 14 bulk maintenance tasks that EnergyAustralia has included in its modelling of opex. The consultant is to review the unit rates and advise whether they are reasonable. EnergyAustralia indicates that the rates have been taken from their bulk maintenance contracts with third party providers.

Reasonableness of twin bulk lamp cycles

In its 2009 final decision the AER rejected EnergyAustralia's 2.5 year bulk lamp replacement cycle and modelled a new bulk lamp replacement cycle of 4 yrs for specific lamps and 3 years for all other lamps (see page 343 of the AER's 2009 final decision).

The consultant is to provide advice on whether a twin bulk lamp replacement cycle would not be reasonable based on the information provided.

EnergyAustralia has indicated that five years after the 2004 Network Maintenance report was developed there remains a large variety of types of lamp types and that these are interspersed removing any benefit from scale economies under bulk lamp replacement. The consultant is to provide advice as to whether a prudent operator would be expected to reduce the variety of lamp types and develop more homogenous populations of lamp in order to achieve maintenance efficiencies.

Connection maintenance assumptions

EnergyAustralia states that while only a small number of underground connections fail per year, the cost of the repair is fairly high as they are time consuming, labour intensive and faults are difficult to find and complicated to repair. EnergyAustralia also indicates that it is common for these tasks to require traffic control. EnergyAustralia has calculated opex associated with connections by multiplying a flat rate by the number of connections. The flat rate has been calculated by reference to actual costs of repairing underground connections.

The consultant is to advise whether the flat rate per connection is a reasonable assumption.

Benchmarking

Parsons Brinckerhoff (EA's consultant) has developed a benchmarking analysis of EnergyAustralia's operating costs for public lighting compared to other distributors. The consultant is to review the benchmarking report (and a recently provided addendum) and provide commentary on the validity of the review.

Information to be reviewed

The consultant will need to have regard aspects of the following information:

- EnergyAustralia, 10 01 06, Cost build up model, January 2010 Confidentiality claimed over entire file
- AER, Final Decision, NSW Distribution Determination 2009- 2010 to 2013-2014, 28 April 2009 Not confidential
- AER, Supplementary draft decision New South Wales - Alternative control services, March 2009 Not confidential
- AGLE, Submission to ESC, 21 November 2003 Not confidential
- Citipower Powercor, Submission to ESC, 26 November 2003 Not confidential
- Citipower Powercor, Submission to ESC, 25 June 2004 Not confidential
- Documentation regarding Sydney traffic congestion Not confidential
- EnergyAustralia, Actual operating expenditure for alternative control services FY09, January 2010 Not confidential
- EnergyAustralia, Documentation of contractor RTA access request, 4 January 2010 Confidentiality claimed over entire document
- EnergyAustralia, Field observation of spot replacement task, 16 December 2009 Confidentiality claimed over entire document
- EnergyAustralia, Public Lighting Management Plan, June 2006 Not confidential
- EnergyAustralia, Quote for works for a public lighting customer Confidentiality claimed over entire document
- EnergyAustralia, Regulatory Proposal, June 2008 Not confidential
- EnergyAustralia, Revised Proposal and Interim submission, January 2009 Not confidential
- EnergyAustralia, Street Lighting Maintenance Requirements Analysis Review, January 2010 Confidentiality claimed over entire document
- EnergyAustralia, Street Lighting Analysis report, 9 January 2004 Not confidential
- EnergyAustralia, Submission on the AER's public lighting supplementary draft decision, 3 April 2009 Not confidential
- ESC, Review of public lighting, 28 August 2003 Not confidential
- Google, Maps search - distances from sites, January 2010 Not confidential
- NSW Department of Energy Utilities and Sustainability, The NSW Public Lighting Code, 1 January 2006 Not confidential
- NSW Department of Industry and Investment, NSW Public Lighting Code review, December 2009 Not confidential
- Parsons Brinckerhoff, Independent Review of public lighting costs, January 2010 Confidentiality claimed over entire document [Addendum provided 19 January]
- Parsons Brinckerhoff, Streetlighting cost to serve document, October 2003. Confidentiality claimed over entire document

- SAHA International, Electricity Distribution Business Operational Expenditure Review, 4 April 2008 Confidentiality claimed over entire document
- TXU, Submission to the ESC, 21 November 2003 Not confidential
- Wilson Cook and Co, Review of EnergyAustralia capital and operating public Lighting Expenditure, August 2005 Not confidential

Appendix B – Labour Rates (CONFIDENTIAL)

Appendix C – Overtime Hours Calculation

In paragraph 4.1.1.5 of this Report, it is stated that an overtime cost proportion of 24% equates to overtime hours proportion of 17.4%. This is determined as follows:

Let
Ro = overtime rate ($/hr) (direct labour only, no oncosts)
Rn = normal rate ($/hr) (direct labour only, no oncosts)
Co = cost of overtime labour
Cn = cost of normal labour
Ho = overtime hours
Hn = normal hours

Then
Ro = 1.5*Rn (assuming all overtime is paid at time-and-a-half) (see note below)
Co = Ho*Ro
Cn = Hn*Rn

EA state that overtime represented 24% of direct labour costs, i.e.
Co = 0.24*(Cn + Co)

That is
Ho*Ro = 0.24*(Hn*Rn + Ho*Ro)

Replacing Ro with 1.5*Rn, this solves to
Ho/Hn = 0.24/(1.5*(1-0.24))
Or
Hn = Ho/0.2105

Thus, proportion of overtime hours
Ho/(Hn+Ho) = Ho/(Ho*(1+1/0.2105)) = 0.174 = 17.4%

Note:
The EnergyAustralia Consent Award provides for a 1.5x pay rate for first two hours and a 2x pay rate thereafter. Since some overtime will be at double time, Ro = p*Rn where p is a number between 1.5 and 2. As p increases, the proportion of overtime hours that yields an overtime cost of 24% decreases. For example, if p = 1.9 (as assumed in Appendix B), the proportion of OT hours is 14.25%.

Whilst it is likely that the proportion of overtime hours is less than 17.4%, EMS accepts that the *Cost Model* is framed around a time-and-a-half overtime assumption and therefore considers that the 17.4% figure is acceptable within the context of the modelling.

Appendix D – About EMS

The Business

Energy and Management Services Pty Ltd (EMS) is an energy consultancy established in 1996 specialising in providing assistance to commercial and industrial clients, agribusinesses, and small/medium enterprises in their dealings with energy companies. Our key personnel are people who have lengthy experience in the electricity distribution industry and in recent years have changed the direction of their careers to work instead as consultants for the customers rather than executives and engineers for the distributors.

EMS offers extensive experience, insight and competence from both sides of the market divide: on the one side, extensive knowledge of the DNSP operations; and on the other, practical experience of the real economic effects in, and responses of, the marketplace flowing from electricity network pricing determinations.

EMS has been engaged by the AER on several occasions since the transfer of electricity distribution regulation responsibilities to the AER from the State Authorities. EMS undertakes reviews of DNSP's submissions and proposals, provides peer assessments of other Consultant's reviews, and responds to a wide range of ad hoc enquiries and requests for advice.

The Personnel

The personnel involved in this engagement have a combined experience in the electricity distribution industry of over 80 years, encompassing both urban and rural networks.

PETER HALYBURTON
Bachelor of Science (Technology) in Electrical Engineering, University of Newcastle
Master of Business Administration, University of Newcastle
Fellow, Institution of Engineers Australia

Peter Halyburton founded Energy and Management Services after leaving Advance Energy in 1996. His career in the electricity distribution industry spanned 34 years and covered three separate DNSPs. At Shortland County Council he held several engineering positions before being appointed Assistant Divisional Engineer - Design. Peter headed a specialist group to take control of the Hunter Valley 132kV system and augment its capacity by over 200MVA to cater for coal mining expansion. In 1984 he was appointed as Deputy Chief Electrical Engineer at Peel-Cunningham County Council and in 1987 he moved to Macquarie County Council (Western Power) initially as Chief Electrical Engineer and then became the first General Manager. In 1995 he was appointed by the Minister as CEO of MidState Energy (which became Advance Energy), the successor of five DNSPs covering the Central Western area of NSW.

Peter was a Board Member of the Electricity Supply Engineers' Association for eight years and served as its President in 1992. He was Chairman and Member of a number of State

Committees including the Uneconomic Lines Working Group, the Community Service Obligations Working Group, the 132kV Assets Transfer Working Group and the Electricity Industry Insurance Working Group. He was also a Member of the Committee of Enquiry into Broken Hill City Council and Electrification of the Far Western Region in 1991.

RON CRAGGS
Bachelor of Engineering (Honours), NSW Institute of Technology (UTS)
Graduate Diploma of Management, Capricornia Institute (UCQ)
Fellow, Institution of Engineers Australia

Ron's 40 years experience in the electricity supply industry has spanned technical, engineering, administrative, and senior executive roles. After 15 years in Sydney he took up a position with a NSW rural electricity distributor with responsibility for designing and installing electrical protection systems, metering and communications, OH&S training and implementation, standardisation, procurement and logistics, pricing, economic analysis, marketing, regulatory strategy, and energy advisory services. The major re-structuring of the electricity supply industry in the mid-90s resulted in the formation of a new corporatised entity, NorthPower. Ron gained a senior management role in the new organisation, with the key tasks of establishing the wholesale trading function and merging the widely varying cultures, systems, policies and procedures in the retail side of the corporation. In 1997, Ron was appointed Corporate General Manager and Company Secretary. This role continued into Country Energy, formed in 2001 to provide energy services to all of rural and regional New South Wales.

Ron represented NSW electricity distributors as a Councillor on the Electricity and Water Ombudsman of NSW Council from its foundation in 1997 to 2005. He was appointed by the NSW Minister for Education as a member of the Council of the North Coast Institute of TAFE from 2003 to 2006.

In 2005 Ron concluded his DNSP career to seek opportunities as an engineering and management consultant. He commenced with Energy and Management Services in 2006.