SSRoC
SOUTHERN SYDNEY REGIONAL ORGANISATION OF COUNCILS

15th August 2008

Mike Buckley
General Manager
Network Regulation North Branch
Australian Energy Regulator
c/o aerinquiry@aer.gov.au

Dear Mr Buckley,

Re: SSROC Supplementary Submission on EnergyAustralia's Public Lighting Proposal for 2009 - 14

This submission is a supplement to the 8 August submission made by SSROC on behalf of the 34 Councils in the SLI Program.

On 13 August, the AER forwarded further information from EnergyAustralia to Councils. This consisted of two documents that had already been made available by the AER (Attachments 7.1 & 7.2 to EnergyAustralia's Regulatory Proposal) as well as a spreadsheet with some Council-specific lighting figures. On 14 August, EnergyAustralia also provided a paper entitled Energy Efficient Road Lighting 2008 (copy attached).

In summary, the additional information provided by EnergyAustralia does not address the points raised in the original SSROC submission or fully respond to the 16 July letter from SSROC to EnergyAustralia requesting Cost-to-Serve modeling. Specifically:

1) Important Modeling and Cost Information Still Not Provided
In its distributions to Councils of 13 August, EnergyAustralia has provided the assumed TOTAL capex for each capital item but no breakdown of how this capital cost was arrived at (eg assumed labour component vs assumed item cost). Similarly, EnergyAustralia has provided the assumed TOTAL annual opex costs for each lamp type but no breakdown (eg assumed consumables costs, assumed failures rates and labour costs for spot repairs).

In the last pricing reset in 2004/05, EnergyAustralia and its advisors provided a wide range of detail information including:

- the breakdown of installation labour allocations between brackets and luminaires;
- total assumed installation times;
- total assumed spot repair times;
- assumed spot replacement rates per annum by component;
- total labour costs per hour for a two person crew (with bucket truck and overheads) on the two different road classifications;
- assumed of traffic control costs for Traffic Route Lighting repairs; and

Suite 4C, Hurstville House
34 MacMahon Street
Hurstville

PO Box 536
Hurstville NSW 1481

Ph: 9330 6455
Fx: 9330 6456

- assumed component capital costs.

This information was provided in the form of a document entitled the Street Lighting Cost To Serve Final Report (Document EA6487/03) prepared by PB Associates and at least three supplementary briefings and presentations delivered by PB Associates and EnergyAustralia on the model and related assumptions.

Without similar information for this pricing review, it is simply not possible to substantiate unexplained and material variances between lighting types or the basis of total proposed increases. The absence of this information, coupled with the very large proposed price increases, highlights the need for a detailed public AER-led modeling effort, as discussed in the 8 August SSROC submission to the AER.

We also note that claims of confidentiality did not obstruct the public pricing review process in the Victorian ESC determination of 2004. Capital costs, consumables costs, assumed failure rates, labour costs and labour productivity were all presented and validated, and revised in an open process. Both the AER and the customers of a monopoly service require full information access. If there are some elements that are genuinely commercially confidential (eg relating to purchases in a competitive market), Councils would be happy to abide by any reasonable confidentiality undertakings.

Councils strongly welcome the AER's 30 July comments about the importance of transparency and the acknowledgement of the significant information asymmetry in the review of public lighting price proposals. As a first priority, it is vital that the lack of reasonable disclosure be addressed.

2) Annuity-Based Financial Calculations

As discussed in the SSROC submission of 8 August, EnergyAustralia has proposed an inappropriate and costly change in pricing approach referred to as annuity-based financial calculations (Part II - Section 7.4.1). SSROC noted the lack of comparable precedent, the withdrawal of a previous similar proposal in 2004-05, a major flaw in that model and the cautions raised by IPART's consultants in 2004 about the proposed approach.

In 2004-05, EnergyAustralia's proposed approach, prior to it withdrawal, overstated the appropriate capital cost recovery for existing street lighting assets by approximately 12%.

Based on figures provided to Councils on 13 August 2008, EnergyAustralia's latest annuity-based financial calculations appear to overstate the capital costs by about 18% compared to a standard return-of-capital / return-on-capital approach.

3) Proper Treatment of Average Asset Life

EnergyAustralia's additional information to Councils of 13 August 2008 confirms that it has inappropriately used 20 years as the average asset life for brackets and poles in its calculations. Proper treatment of the average asset life of these asset classes is essential to appropriate financial calculations. SSROC reiterates that the detailed cost assessment performed by the Essential Services Commission Victoria determined that the appropriate life of brackets and dedicated poles is 35 years.

4) Energy Efficient Road Lighting

As per SSROC's 8 August 2008 submission to the AER, EnergyAustralia's proposed prices for energy efficient lighting is a major source of Council concern. EnergyAustralia provided Councils with additional information about the reliability of the key energy efficient lighting types on 14 August 2008 in the form of a joint paper prepared by parties including EnergyAustralia personnel (see attached paper Energy Efficient Road Lighting 2008). These lighting types are a key element of the pricing reset as they are expected to comprise up to 50% of the residential road lighting network by the end of the determination period.

The paper shows the EnergyAustralia field experience with energy efficient T5 and CFL luminaires to be 31-38% <u>more</u> reliable than the 80W mercury vapour luminaires that they would replace. Specifically, Table 5 of the paper shows actual experience with 2*14W T5 lighting resulting in a total of 2% failures per year (1.5% lamp failures and 0.5% electronic control gear (ECG) failures), 42W

CFL lighting having 2.2% total failures per year (1.8% lamp failures and 0.4% ECG failure) and 80W MV lighting having 3.2% total failures per year. The data is broadly consistent with manufacturers' claims and, in the case of the 80W MV lighting, broadly consistent with the assumed failure rate of this light type in the 2004 ESC pricing determination.
However, the reliability figures established by EnergyAustralia personnel in the paper appear inconsistent with EnergyAustralia's proposed annual maintenance charges for these luminaires (referred to by EnergyAustralia as "Lamp" charges). Specifically, EnergyAustralia has proposed maintenance charges for energy efficient lighting types that are markedly higher than the current default 80W mercury vapour lighting as follows:

a) 2*14W T5	$56.49/yr	(108% higher than 80W MV maintenance charge)
b) 42W CFL	$43.24/yr	(59% higher than 80W MV maintenance charge)
c) 80W MV	$27.18/yr	

The above proposed maintenance charges are sourced from pages 6 and 7 of Attachment 7.2 of EnergyAustralia's Regulatory Proposal.

To re-iterate a key point in SSROC's 8 August 2008 submission to the AER, these anomalies highlight the urgent need for an AER-led modeling effort and the need for greater disclosure by EnergyAustralia of the basis of its cost proposals.

In summary, EnergyAustralia's ongoing, rapid price increases appear excessive, substantially unexplained and anomalous in key respects. They therefore demand the highest standard of disclosure, substantiation and regulatory review.

SSROC welcomes further discussion with the AER about any of these items as well as matters raised in previously submitted documents.

Yours sincerely,

David Lewis
General Manager
SSROC

CC: Cr Genia McCaffery, President, Local Government Association
Richard Connors – Senior Policy Officer – Roads & Transport, LGSA
Dominic Johnson – Executive Director, NSROC
Leta Webb – Executive Director, SHOROC
CEO - Hunter Councils
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Energy Efficient Luminaires for Local Road Lighting – a Trial

Alec Fisher, E-Consultancy; Michael Brien and Karmen Wang, Energy Australia

Abstract

There has been a growing emphasis on energy efficiency in road lighting and the consequential reduction in associated greenhouse gas emissions. Of particular interest is the recent availability of luminaires with T5 or compact fluorescent lamps plus electronic ballasts for local road lighting systems. These offer large energy savings, whilst still able to comply with lighting performance requirements at acceptable luminaire spacing. The largest Sydney lighting service provider has undertaken a major trial of these luminaires; data presented here suggests that in-service reliability of these luminaires is as good as those currently installed and that there is no technical reason preventing wide scale installation.

Energy efficiency in road and public space lighting

The then Australian Greenhouse Office (AGO) published *Greenlight Australia* (AGO 2004) setting out a programme for ensuring the energy efficiency of all lighting and the minimisation of associated greenhouse gas emissions. Some measures will be implemented by government regulation, as in interior lighting, and others by inclusion in requirements in Australian standards, as with road lighting (Kenny and Fisher 2007). Subsequent publications documented the Australian road lighting inventory (AGO 2005a) and measures recommended to be implemented for traffic route (Category V) and for local road (Category P) lighting schemes (AGO 2005b and 2007).

Local road lighting accounts for about 70% of the some 1.94 million lighting points on Australian roads. These account for about half of the energy used in road lighting; although much more in number than those on traffic routes the wattage ratings of the lamps used for local road lighting are much less than for the latter.

Originally local road lighting generally employed 2x20W tubular fluorescent lamps (TF) of relatively low efficacy in a simple luminaire with poor downward light output ratio, now obsolescent, one on every other electricity reticulation pole. There has been widespread replacement of these by luminaires with 80W high pressure mercury (HPM) lamps, yielding both better maintenance characteristics and Cat P lighting performance.

Low wattage energy efficient luminaires for Cat P lighting schemes have recently become available which have high efficacy tubular fluorescent lamps, either compact (CFL) or linear (T5), with more complex electronic control gear in place of the conventional ferromagnetic lamp ballast. The energy usage of these lamps is given in Table 1, together with the currently used 80 W HPM and the obsolescent 2x20W TF lamps.

The AGO (2007), recognising the potential energy efficiency of these luminaires, encouraged local government to conduct trials to establish in-service reliability of the new untried luminaires. A number of trials have been implemented by various State authorities. Energy Australia, one of the largest energy service providers in Australia and responsible for a road lighting network of 250,000 luminaires, has conducted a very large trial. Results of the in-service reliability to date, of two luminaire, both Type 4 (see Table 2.10 of AS/NZS 1158.3.1), one using a 42W compact tubular fluorescent lamp (CFL) and the other 2x14W T5 linear tubular fluorescent lamps (T5) are reported in the next section.

Table 1   Energy usage by lamp type (including control gear)

Lamp	CFL 42W	T5 2x14W	HPM 80W	TF 2x20W
Energy usage	47W	30W	89W	50W

Category P lighting trial of energy efficient luminaires

- **Details of Trial**

Tables 2 and 3 give the numerical details of the trial. Existing luminaires (mostly obsolescent 2x20W tubular fluorescent) were replaced in 18 locations by either of the luminaires under trial; 13 locations with T5 and 5 with CFL. The locations were in a variety of residential suburbs and topography included coastal high wind areas.
The average trial period for the 1175 T5 luminaires installed was 19 months, the 248 CFL luminaires were installed later with an average trial period of 13 months, as at May 2008.
The trial of the all CFL luminaires is continuing at all locations and of the T5 at five locations.

Figure 2   The 14W T5 and 42W CFL luminaires (left) and associated lamps, with comparison to the 80W HPM (right)

Table 2 The number of trial locations by type, number of luminaires and average duration of trial.

Location / No luminaires	Luminaire Type	Average duration of trial period - months	Location / No luminaires	Luminaire type	Average duration of trial period - months
1/97	T5	29 [1]	10/179	CFL	14 [2]
2/92	T5	26 [1]	11/189	T5	15 [2]
3/98	T5	24 [1]	12/25	T5	15 [2]
4/95	T5	25 [1]	13/24	CFL	14 [2]
5/97	T5	30 [1]	14/23	T5	14 [2]
6/93	T5	26 [1]	15/29	CFL	13 [2]
7/101	T5	10 [1]	16/10	CFL	11 [2]
8/161	T5	14 [1]	17/6	T5	15 [2]
9/98	T5	9 [1]	18/6	CFL	14 [2]

Notes: 1 - trial ended; 2 - trial continuing

Table 2 reflects the lesser number of CFL luminaires and the lower average time in service. None-the-less the luminaire numbers with, effectively, a year in service, i.e. 4 000 hours operation for each luminaire, give a sound basis to judge whether there are excessive early failures and hence to give an indication of in-service reliability.

Table 3 The number of luminaires by lamp type and the average time in service.

Lamp Type	Number of luminaires	Average days in service
T5 2 x 14 W	1175	593
CFL 42 W	248	405

❑ Details of Failures

Table 4 gives the absolute numbers of failures of both of both types of lamps and electronic control gear, to date. The cause of the failures were identified by technical staff and referred to the manufacturer.

Table 4 Data of luminaire failures

Component	Number installed	No failed	% failed
T5 lamp *	2350	56	2.4%
T5 ECG	1175	10	0.9%
CFL lamp	248	5	2.0%
CFL ECG	248	1	0.4%

Notes: * two lamps per luminaire; ECG electronic control gear

More meaningful is the data of Table 5 where the first year failures are expressed as a percentage of each populations involved. These are compared with those expected by the manufacturers, derived from published technical data and with Energy Australia expected failure rate (x1.5 that given by the manufacturer). Failure rates are also given for the 80W HPM luminaire for comparison.

Table 5 First year failure rate of luminaire components

Luminaire	Source	Lamp failure %	ECG failure %
2 x 14W T5	Trial	1.5%	0.5%
	Manufacturer	1.1%	0.6%
	EA's expected	1.7%	0.9%
42W CFL	Trial	1.8%	0.4%
	Manufacturer	1.0%	0.6%
	EA's expected	1.5%	0.9%
80W HPM	Historical	3.2%	N/A
	Manufacturer	2.2%	N/A
	EA's expected	3.3%	N/A

Several points emerge from the Table 5:
(i) There is no excessively large premature failure rate for any component,
(ii) All lamp failure rates are somewhat higher than that expected from manufacturer's data but less than that expected by the service provider, except in the case of the CFL lamp. Here

the rate is about 20% greater than expected but still well below that for the conventional 80W HPM lamp,
(iii) The failure rate for the ECG is below both that expected by manufacturer and service provider, although the failure number for the 42W CFL is too small to be completely reliable.
(iv) The failure rates for the two trial lamps are well below that for the 80W HPM lamp.
These results point to the reliability of the energy efficient lamps and control gear being at least as good as the 80W HPM lamp and that the question of reliability should not be a bar to their general use.

Application of energy efficient luminaires in lighting schemes

In addition to being energy efficient the luminaires must give acceptable spacing (S) in roadway lighting schemes. Table 6 gives the maximum spacing whilst complying with the light technical requirements of Cat P sub-categories for these luminaires and that for the 80W HPM and 2x20W TF luminaires.
For P5, generally applicable to older areas and only to be used in refurbishing lighting on overhead reticulation poles, the requirement is at least S=80m, i.e. the general distance of two pole spacings. All luminaires (bar the 2x20W TF) fulfil this requirement with the 80W HPM providing the greatest latitude. If there are exceptionally long pole spacings the use T5 2 x 24W will provide that necessary luminaire spacing.

Table 6 Indicative spacings for the different luminaires

Luminaire	Category P3 H = 7.5m	Category P4 H = 7.5m	Category P5 H = 7.0m
T5 2 x 14W (2540 lumens for two lamps)	26.1m	65.7m	81.9m
42W CFL amalgam lamp (3200 lumens)	36.7m	70.6m	84.1m
T5 2 x 24W amalgam lamp (3500 lumens)	41.8m	74.5m	89.1m
80W HPM (3800 lumens)	43.7m	71.5m	87.2m
T8 2 x 20W fluorescent lamp (2300 lumens)	-	17.9m	48.9m

Note: These spacings are derived for the parameters: Road reserve width (RRW) = 20m; Luminaire offset = 0.25 RRW; MF = 0.8. These parameters are not necessarily used by Energy Australia.

For P4, generally applicable to newer subdivisions where the lighting scheme has dedicated lighting columns, the requirement is S = 55 to 60m. All luminaires (bar the 2x20W TF) fulfil this requirement.
For P3, applicable to newer subdivisions where a higher level is specified, the spacing will decline to ~ 40m. The use of T5 14W lamp obviously does not provide the necessary light flux and they need to be replaced by 24W lamps. As with P4, the 2x20W TF is entirely unsuitable for P3 lighting schemes.

The replacement of the obsolescent 2x20W TF luminaires with T5 and CFL will yield immediate energy saving, whereas their replacement by 80W HPM luminaires would have led to a large increase in energy usage; see Table 1. Additional energy saving should accrue from maintenance because these lamps have longer rated lives, in turn requiring less frequent lamp change visits. Further the lighting performance on the road will be greatly enhanced; see Table 6. The future replacement of the 80W HPM luminaires will also lead to further energy efficiency in local road lighting.

Discussion

The most important aspect of concern, currently, for road lighting is energy efficiency and the consequential reduction in associated greenhouse gas emissions. Road lighting is reasonably efficient in basic design, so the big advance is to be had in the use of the most energy efficient lamps and control gear. For Cat P lighting schemes the new lamps and electronic control promise big savings in energy use – the trial documented above suggests strongly that the reliability, at least in the short term, is as good as the components in current use, noting that ferromagnetic ballasts have a longer stated life than the more complex electronic control gear.

The attraction of the widespread use of these lamps and control gear is that it would further the Federal Government *Greenlight* policy, whilst offering road lighting users, generally local government, savings in energy costs and enhanced credentials as environmentally aware organisations.

In response to such concerns and with the encouraging results of the trials carried out, recently Energy Australia offered its customers the choice of the luminaire using CFL and T5 lamps and that over the next six years a program to replace 60 000 obsolescent 2x20W TF luminaires will be implemented. The customer's decision may be influenced by the tariff structure which may reflect other aspects of the two luminaires and components, which are outside the scope of this paper.

Conclusions

Road lighting can be more energy efficient and the associated greenhouse gas emissions reduced by replacement of inefficient lamps. In Category P lighting schemes, this may be achieved by action programs at all levels of government and by service providers to replace energy inefficient luminaire and obsolescent ones with ones using CFL or T5 lamps with electronic control gear.

In addition the AS/NZS 1158 series should be amended forthwith to give these lamps and associated control gear normative, rather than informative, standing.

References

AGO (2004) *Greenlight Australia*

AGO (2005a) *Public lighting in Australia-Energy efficiency challenges and opportunities*

AGO (2005b) *Minimum energy performance standards-Design energy limits for main road lighting*

AGO (2007) *Lighting the way - A local government guide to energy efficiency public lighting on minor roads*

Fisher A (2001b), *Energy efficient road lighting - A contribution to greenhouse gas reduction,* Lighting (IESANZ), 21(6)

Kenny P and Fisher A (2007), *The future energy efficiency requirements for road lighting,* Lighting (IESANZ) 27,4

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The authors are grateful to Energy Australia for the provision of the data from the trial and permission to publish it. However the published information here should not be viewed as Energy Australia's entire view of the merits of the two types of road lighting luminaires and should not be used to influence that organisation's commercial arrangements with its customers. The opinions of the authors are not necessarily those of Energy Australia.

Authors
Alec Fisher is Chair of Standards Australia/New Zealand Committee LG002 Lighting for Roads and Public Spaces
Michael Brien is Street Lighting Co-ordinator, Energy Australia
Karmen Wang is Senior Engineer - Distribution Engineering Services, Energy Australia
All three have membership of the IES