EQUIPMENT ENERGY EFFICIENCY PROGRAM

DRAFT STRATEGY PAPER

Street Lighting Strategy

Prepared for the Equipment Energy Efficiency Program

July 2011

A joint initiative of Australian, State and Territory and New Zealand Governments

Prepared by Ironbark Sustainability.

Disclaimer

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This Report is available at
www.energyrating.gov.au

July 2011

1 Foreword

Through the Equipment Energy Efficiency (E3) program, governments in Australia and New Zealand work cooperatively to increase the energy efficiency of new appliances and equipment which are supplied into our markets. The aim of the program is to increase the average energy efficiency of equipment sold, increasing energy productivity and therefore competitiveness, reducing energy bills for consumers, and reducing greenhouse and other environmental emissions.

The intent of this draft strategy is to provide direction around options to improve energy efficiency in Australia. Where possible collaboration with similar programs in New Zealand are encouraged and considered.

There are approximately 2.28 million street lighting lamps in service in Australia, with around 33% on main roads and 67% on local roads. The annual energy cost of public lighting in Australia exceeds $125 million (and more than $250m including maintenance). Street lighting is the single largest source of greenhouse gas emissions from local government, typically accounting for 30 to 60 per cent of their greenhouse gas emissions.

This draft Strategy has been written to address the requirement of the Council of Australian Governments (COAG) National Strategy on Energy Efficiency (NSEE) which aims to increasing the energy efficiency of street lighting. The key elements of Measure 4.1.4 are to:

- Identify and address barriers to the uptake of more efficient street lighting.
- Collect and make available nation-wide information on energy efficient street lighting technologies and operational practices.
- Consider whether the use of incentive mechanism is needed to give effect to this measure.

This draft Strategy builds on a range of consultations during 2010 and 2011, including face to face workshops, meetings and online surveys of a wide range of stakeholders including state, federal and local governments, energy distribution businesses, consultants and manufacturers.

Actions identified in this draft strategy have been framed to be taken within the three years starting July 2011 leading to action to significantly improve street lighting energy efficiency by 2020.

Stakeholders are invited to consider the draft strategy and provide any comments to craig.walker2@sa.gov.au by COB 31 August 2011. A revised strategy will then be prepared for consideration by State, Territory and Commonwealth Governments.

Mel Slade Chair,
Equipment Energy Efficiency Committee

2 Executive Summary

Public lighting efficiency is a difficult area to gain traction. Many governments have tried to improve the efficiency of street lighting with minimal results. This is because historically action has been limited to small scale funding of projects and short term reports identifying the problems within the public lighting sector.

This Strategy seeks to take a different approach and identifies a targeted group of priority actions that if taken together can significantly alter energy use and greenhouse emissions from the provision of street lighting.

In particular it identifies the following key areas of action as a concise list of activities that has the best chance of creating significant change:

1. Introduce regulatory measures to phase out the use of energy inefficient HID lighting;
2. Provide communications support to the sector;
3. Deliver replacement programs in each Energy Distribution Business Area;
4. Address financial barriers;

The estimated costs to deliver the program over a 3-4 year period are just over $2m plus access to external financing. The overall benefits of the program would include annual energy savings of between $35 and $52m for public lighting customers and greenhouse savings of 400,000 to 635,000 tonnes of greenhouse emissions.

These savings would be achieved over a variable timeframe depending on the recommendations in a proposed Regulatory Impact Statement to phase out inefficient HID lighting and the financing support for delivering the projects. At the end of 2014 all aspects of the program should be in place and each region ready to deliver projects on scale.

These priority action areas could be actioned separately with varied results. A combined program is most likely to be successful.

3. Contents

4. Acknowledgements

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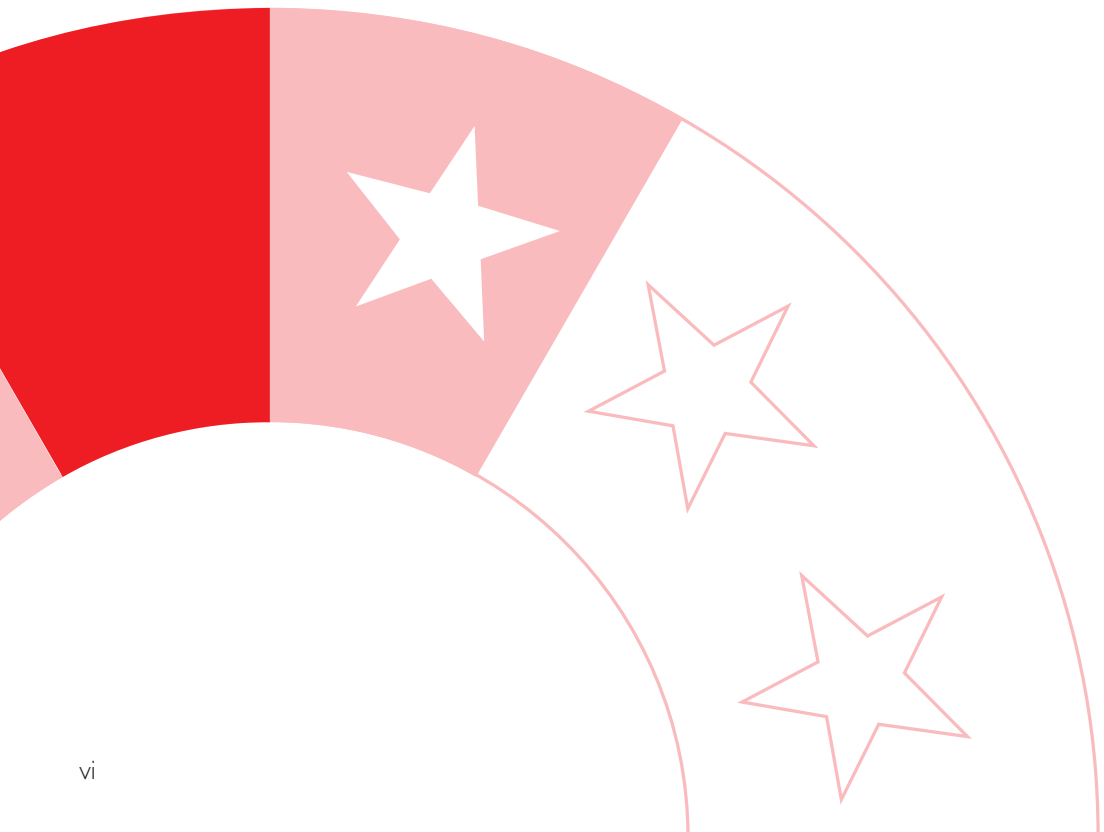


5. Glossary

Term	Definition
AR	Active Reactor
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
CCP®	Cities for Climate Protection Program
CFL	Compact Fluorescent lamp
EDB	Energy Distribution Business
ERA	Energy Regulation Authority (WA)
DCCEE	Department of Climate Change and Energy Efficiency
DEWHA	Australian Government - Department of Environment, Water, Heritage and the Arts
DTEI	Department for Transport, Energy and Infrastructure
GHG	Greenhouse Gas (typically in tonnes of CO_2 equivalents)
HPS	High Pressure Sodium lamp
ICLEI	International Council for Local Environmental Initiatives
IS	Ironbark Sustainability
Lamp	The light bulb in a Luminaire
LED	Light Emitting Diode
Luminaire	The lamp, fitting and control gear of the light
MEET	National Electricity Rule
MEPS	Minimum Energy Performance Standards
MH	Metal Halide lamp
MV	Mercury Vapour lamp
NEM	National Electricity Market
NER	National Electricity Rule
NGER (s)	National Greenhouse and Energy Reporting
OMR	Operation, maintenance and repair charge of the fitting
PE Cell	Photo Electric Cell. Senses ambient light levels to turn lights on and off.
SPL	Sustainable Public Lighting
T5	Efficient lineal fluorescent lamp

6. Introduction

There are approximately 2.28 million street lighting lamps in service in Australia, with around 33% on main roads and 67% on local roads. The annual cost of public lighting in Australia exceeds $250 million. Street lighting is the single largest source of greenhouse gas emissions from local government, typically accounting for 30 to 60 per cent of their greenhouse gas emissions.

This Plan has been written to address the requirement of the Council of Australian Governments (COAG) National Strategy on Energy Efficiency (NSEE). The NSEE includes a range of measures to substantially improve minimum standards for energy efficiency and accelerate the introduction of new technologies through improving regulatory processes and addressing the barriers to the uptake of new energy efficient products and technologies'.

Measure 4.1.4 in the NSEE relates to increasing the energy efficiency of street lighting. The key elements of Measure 4.1.4 are identified in the NSEE as follows:

- Identify barriers to the uptake of more efficient street lighting and develop strategies to address any identified problems, including considering introduction of mandatory standards for lighting energy efficiency while considering related cost implications for local government.
- Collect and make available to street lighting Service Providers and local governments nation-wide information on energy efficient street lighting technologies and operational practices.
- Consider whether an incentive mechanism for electricity distributors to install efficient equipment is needed to give effect to this measure.

Actions identified in the plan have been framed to be taken within the three years starting July 2011 leading to action to significantly improve street lighting energy efficiency by 2020.

Progress has been made in recent years to improve the energy efficiency of street lighting through trials of new technologies, bulk retrofitting projects and communications and training programs. Revisions to the Road Lighting Standards AS/NZS 1158 have also improved the lighting efficiency and reduced the use of hazardous materials (such as mercury) in 'greenfield' lighting schemes.

However, an opportunity exists to make a 'step-change' improvement in street lighting energy efficiency through the accelerated phasing out of inefficient product classes across existing public lighting networks in Australian. This Strategic Plan is intended to provide a coordinated and strategic framework to implement NSEE Measure 4.1.4.

6.1 Stakeholder Consultation

In developing the plan a range of stakeholder consultation has occurred.

Stakeholder meeting March 2010

A stakeholder meeting was held at the National Portrait Gallery in Canberra on 16 March, 2010.

The meeting brought together stakeholders to discuss past, current and future work on improving the energy efficiency of street lighting.

This meeting arose from the Council of Australian Government's (COAG) National Strategy on Energy Efficiency (NSEE), measure 4.1.4, which relates to increasing the energy efficiency of street lighting. The key elements identified in measure 4.1.4 include;

- Identify barriers to the uptake of more efficient street lighting and develop strategies to address any identified problems, including considering introduction of mandatory standards for lighting energy efficiency while considering related cost implications for local government.
- Collect and make available to street lighting service providers and local governments nation-wide information on energy efficient street lighting technologies and operational practices.
- Consider whether an incentive mechanism for distributors to install efficient equipment is needed to give effect to this measure.

Stakeholders suggested that an Implementation Plan for this NSEE measure could include:

- A communications program based on the current NZ work and the International Council for Local Environmental Initiatives (ICLEI) program.
- Further strengthening of energy efficiency standards either through AS/NZS1158 or by Government regulated Minimum Energy Performance Standards (MEPS) to where possible ban inefficient mercury vapour street lights in all applications
- Surveys of customer and distributors needs in phasing out of mercury vapour street lights;
- An investigation of feasible funding mechanisms for bulk replacements of mercury vapour street lights
- Investigation of available dimming and switching technologies that could be incorporated into AS/NZS1158
- Investigation of process for securing approvals from distribution businesses for use of efficient technologies
- Investigation of price setting mechanisms for operation and maintenance costs.

Public Lighting Sector Online Survey – December 2010 and February 2011

An online survey was undertaken in December 2010 to inform the development of a national strategy for efficient street lighting.

The survey received a very strong response, especially in the local government sector, despite a very tight timeframe. In total 159 useful responses were received.

The survey captures a picture of current street lighting activities, describes the difficulties facing stakeholders, and demonstrates strong support for a range of measures to improve the efficiency of street lighting in Australia.

The survey ran from Wednesday 8 December to Monday 20 December 2010.

The list of those to which the survey was distributed included:

- Key local government contacts
- Local government associations
- Distribution businesses
- Manufacturers
- Consultants, and
- State and federal government contacts

The survey was resent to Queensland contacts due to low response levels as a result of significant flood and storm events. Subsequently a further survey was circulated from February 8 to 28th 2011.

This survey resulted in responses from 202 organisations. Around 80% were local governments, 12% from the lighting supply or advice industry and 7% from EDB's and main road authorities.

Section 10 of this report discusses the barriers and challenges identified in the survey. Of these the following were identified as barriers for all stakeholders:

1. Financial Cost;
2. Approvals;
3. Stakeholder relations.

The remainder of the survey considers recommended strategies and actions to accelerate the use of more energy efficient lighting. Of these strategies the following areas were supported by both Local Governments and EDB's:

1. Minimum energy performance standards for street lighting;
2. Research and trials;
3. Approval of efficient lights;
4. Peer to peer information sharing;
5. Business cases for large scale changeovers.
6. An agreed process between distributors and governments to guide negotiations around bulk changes;

Each of these are discussed in further details in section 12 of this document.

6.2 Regulatory Barriers

To assist in the development of the strategy, DCCEE commissioned consultants PricewaterhouseCoopers to undertake a review of regulatory barriers to improved energy efficiency of street lights and to advise on possible mechanisms to overcome any barriers identified. The PricewaterhouseCoopers report is available as a separate document *Barriers to Energy Efficient Street Lighting – Draft Report*, PricewaterhouseCoopers for DCCEE, July 2011. Some general findings included;

- On the whole, the regulatory framework should encourage councils to upgrade street lights where it is efficient to do so.
- The regulatory framework provides pricing principles, and incentives, for distributors to set prices so they reflect costs. To the extent there is concerns about the efficiency of these tariffs this can be addressed through the Australian Energy Regulator's annual pricing approval process.
- If a mandatory roll out of energy efficient street lights was implemented, the costs would necessarily fall on councils and other street light customers, rather than the broader network customer base.

In terms of potential regulatory mechanisms to improve efficiency, the review found there may be some be benefit in proposing:

- A rule change to AEMC that requires AER to allow multiple approaches for recovery of residual costs associated with roll out of efficient street lights, and
- A rule change to provide more certainty to councils and distributors about the recovery of new costs that may arise from roll out of efficient street lights

It is recommended that this Draft Strategy be considered within the context of the PricewaterhouseCoopers report. Areas within this Strategy of relevance to regulatory issues include sections 10.6 and 11.1 and 12.3.

7. Relevant Standards and Legislation

Standards for lighting of roads and public spaces (AS/NZS 1158)

This is a voluntary standard that is commonly complied with nationally[1] , particularly in new developments. In existing (commonly rural or urban fringe) areas it is common to have areas which do not comply with these standards. The reason for this compliance is most likely due to risk of claims against street lighting providers if accidents occur.

Category P Lighting

One of two generic lighting categories in AS/NZS 1158 covering residential streets and many public open spaces. Also called minor road lighting and Pedestrian lighting. This lighting is typically white light and designed to avoid pedestrian to vehicle accidents.

Category V Lighting

One of two generic lighting categories AS/NZS 1158 covering main roads lighting. Also called Main/Major road lighting or Vehicular lighting. This lighting is typically yellow light (because of historic maintenance and energy efficiency) and is designed to avoid vehicle to vehicle accidents.

[1] For example the ACT Street lighting Design Standards states, "Design of street lighting in the ACT shall meet the requirements and recommendations of these (AS/NZS 1158) standards." Similar statements either recommending or requiring the use are found in standards for Local Government and EDB's.

8. Street Lighting Stakeholders

Energy Distribution Businesses (EDB's)

EDBs manage energy networks - the lower pressure gas pipes and low, medium and high voltage electricity lines that transmit and distribute gas and electricity from energy transmission systems directly to the doorsteps of energy customers. Australia's energy networks provide the final step in the delivery of gas and electricity to households, businesses and industries.

EDBs are largely responsible for maintaining and managing street lighting in most areas of Australia;

Local Governments

Local governments are largely responsible for paying for street lighting service in Category P lighting and partially in Category V. These payments are generally made to the EDBs. Local governments are also responsible for many planning and development decisions that are relevant to street lighting. In NZ LG's also manage street lighting in most areas;

Regulators

In terms of street lighting the AER and ERA (WA) provide pricing regulation to the street lighting services. This includes some capital projects (such as installation of street lights) and repair and maintenance programs. They can be called upon to make a determination about other pricing issues where agreement between the customer and the service provider cannot be otherwise reached.

AUSTRALIAN ENERGY REGULATOR (AER)

The AER regulates the wholesale electricity market and is responsible for the economic regulation of the electricity transmission and distribution networks in the national electricity market (NEM). The AER is also responsible for the economic regulation of gas transmission and distribution networks and enforcing the national gas law and national gas rules in all jurisdictions except Western Australia.

ENERGY REGULATION AUTHORITY (WA)

The Economic Regulation Authority (ERA) is the independent economic regulator for Western Australia. It regulates monopoly aspects of the gas, electricity and rail industries and licenses providers of gas, electricity and water services. The ERA also enquires into matters referred to it by the State Government.

Australian Energy Market Commission (AEMC)

The Australian Energy Market Operator (AEMO) was established on 1 July 2009 and its functions include implementing, administering and operating the wholesale exchange and managing the security of power system.

The National Electricity Market (NEM) is a wholesale exchange for electricity for the Commonwealth adjacent areas[2] and those States and Territories that are electrically connected - Queensland, NSW, ACT, Victoria, South Australia and Tasmania. The NEM commenced operation on 13 December 1998 with just NSW and Victoria, with other regions progressively joining since then.

Main road authorities

Generally state or territory based and responsible for lighting in many Category V road lighting. Many main road authorities have ownership and management responsibility for lighting infrastructure in locations such as major freeways. These numbers are usually low in comparison to those directly managed by EDB's. However, in the ACT all road lighting is owned and the contract for maintenance directly managed by Roads ACT.

This responsibility includes managing their own assets and paying EDB's for the management of EDB assets. This dual responsibility extends to most lights in major roads (33% of numbers and 60% of energy use.

[2] Adjacent area' has the meaning given in section 5A of the Petroleum (Submerged Lands) Act 1967, i.e. the area between 3 nautical miles of the coastline and the outer limits of the Australian Continental Shelf.

Table 1 below provides a general comment on the ownership and regulatory position in each state[3]:

Table 1: State based regulation and ownership of street lighting

Location	Lighting ownership	Lighting maintenance	Regulation	Payment of lighting service[4]
ACT	Roads ACT, a unit in the Department of Territory and Municipal Services (TAMS)	Contracted to ActewAGL	Australian Energy Regulator (AER) and Australian Energy Market Commission (AEMC)	Roads ACT
NSW	Largely state owned EDB's – Energy Australia, Country Energy and Integral Energy (now Ausgrid,	As per ownership	AER and AEMC, Industry and Investment NSW manages Public lighting code	Local Governments (LG's) and NSW Roads and Traffic Authority (RTA)
NT	Power and Water Authority (PAWA)	PAWA	AER	LG's and NT Roads and Transport Assets
Qld	Largely state owned EDB's – Energex, Ergon and Country Energy	As per ownership	AER, AEMC, Department of Mines and Energy (DME) and the Queensland Competition Authority (QCA).	LG's and Department of Main Roads
SA	Privately owned EDB - ETSA	As per ownership	AEMC, AER and Essential Services Commission of SA	LG's and Department of Transport, Energy and infrastructure
Tas	State owned EDB – Aurora Networks.	As per ownership	Office of the Tasmanian Economic Regulator	LG's and Department of Infrastructure, Energy and Resources
Vic	Privately owned EDB's – SP-Ausnet, Jemena, United Energy, CitiPower and Powercor	As per ownership	Essential Services Commission (Vic), AER and AEMC	LG's and VicRoads
WA	Largely state owned EDB's – main one is Western power and Horizon power, several other local EDB's providing power to specific locations	As per ownership	Economic Regulation Authority (WA)	LG's and Main Roads WA

For further details on a state by state summary of regulation and roles see http://www.iclei.org/index.php?id=6632

[3] This table is not detailed and exhaustive and there are many examples where this table does not cover all situations – however in order to provide a general overview this is adequate for the purpose of this report and covers the vast majority of street lights.

[4] Local government listed first and state government main roads authority listed second.

9. Quantification of Energy Consumption

Public lighting in Australia is provided by a wide range of lighting types. In order to identify priorities for potential savings, data has been collected on the quantities of the various types.

Figure 1 below identifies that of all the energy use in street lighting 95% comes from either Mercury Vapour (43%) or High Pressure Sodium (52%) lights. Small, but growing numbers of fluorescents and metal halide lights add a further 4%.

Table 2 next page shows that there are more than 2.2million street lights managed by EDB's and main road authorities. These cost around $125m per year in energy to run, with a further estimated $100-150m in maintenance costs. Street lighting generates around 1.5m tonnes of Co2-e are from the 1,400 GWh of energy used annually.

There are 15 EDB's that manage 94% of all street lights. The remainder are directly managed by Main Road Authorities and some small areas by local governments. These numbers do not include other external metered lighting, such as those used in open space, sports facilities and car parks. These would normally add around 10% to the light numbers of a typical local government.

Figure 2 below shows that the energy use is spread widely amongst these organisations. The largest user of energy for street lighting is Energex, followed closely by Western Power, Ausgrid and CitiPower/Powercor.

Figure 1: Percentage of total street light energy use by light type

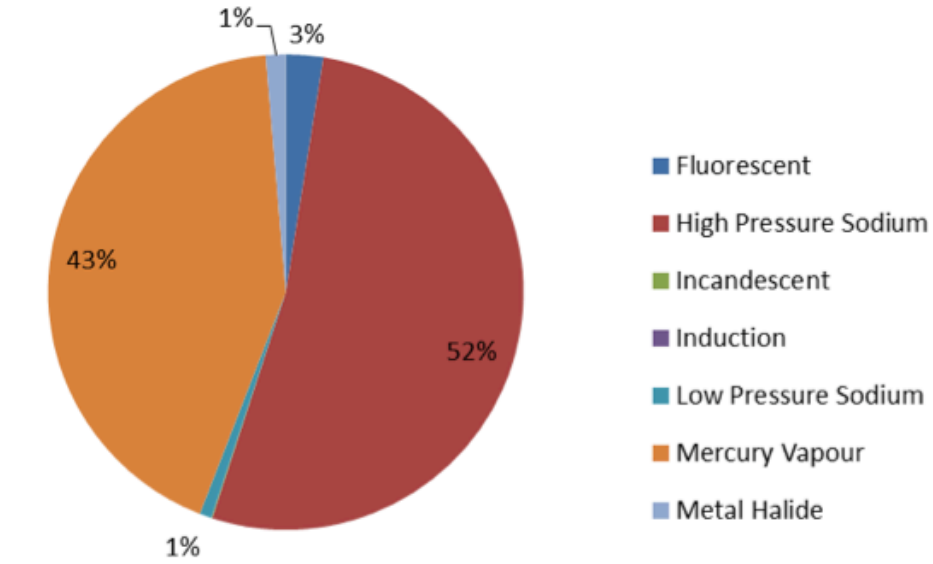


Figure 2: % of total national street light energy use by EDB area

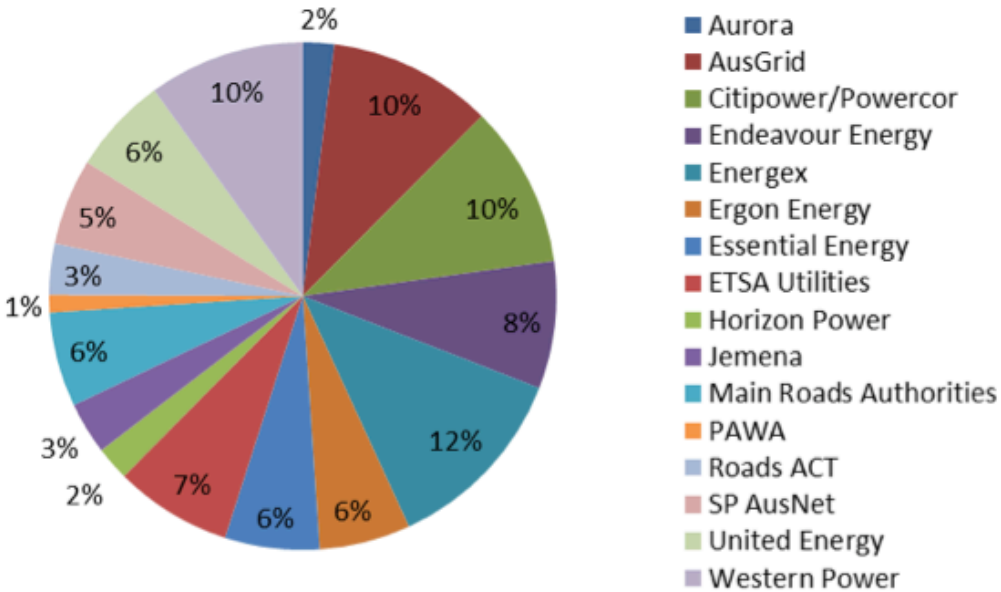


Table 2. Road Lighting numbers, energy and greenhouse in Australia in 2011

Distributor	Total est. energy cost (GST exc.)	Total annual energy (kWh)	Number of lights	Total annual greenhouse (tCO2-e)
Aurora	$ 2,495,605	27,728,949	48,047	9,705
AusGrid	$ 13,089,475	145,438,615	245,688	155,619
Citipower/Powercor	$ 12,909,820	143,442,449	229,744	196,516
Endeavour Energy	$ 10,140,718	112,674,648	188,887	120,562
Energex	$ 15,287,085	169,856,495	319,964	173,254
Ergon Energy	$ 7,274,946	80,832,730	134,424	82,449
Essential Energy	$ 7,525,477	83,616,406	145,130	89,470
ETSA Utilities	$ 9,364,947	104,054,967	218,631	88,447
Horizon Power	$ 2,698,415	29,982,385	32,189	30,768
Jemena	$ 4,152,884	46,143,153	77,271	63,216
Main Roads Authorities	$ 7,544,200	83,824,445	67,680	77,852
PAWA	$ 1,387,731	15,419,233	22,410	11,873
Roads ACT*	$ 4,079,988	45,333,201	73,188	48,507
SP AusNet*	$ 6,859,991	76,222,120	127,778	104,424
United Energy	$ 7,769,721	86,330,233	139,310	118,272
Western Power*	$ 12,454,934	138,388,157	211,607	128,701
Grand Total	**$ 125,035,937**	**1,389,288,187**	**2,281,949**	**1,499,635**

*Estimated as figures not provided

9.1 Minor road lighting (Category P of Australian Standards)

During the 2011 year minor road lighting generates around 40% of the energy for street lighting and consists of 67% of the 2.28 million streetlights installed nationally. Of the minor road lights 75% of these are mercury vapour (MV).

Replacement options for these lights are well established and accepted in many areas. Typically low wattage fluorescents are being used to replace mercury vapour lights. For areas where these lights are not approved – this would need to occur in the short term.

9.2 Major road lighting (Category V of Australian Standards)

Major road lighting makes up only 27% of the 2.28 million streetlights installed nationally but represents 60% of the energy consumption. The major lighting types are mercury vapour (12% of major road lighting national numbers – down from 25% in 2002/3) and high pressure sodium (86% of national numbers – up from 75% in 2002/3).

Of the recommendations for major road lighting replacing high wattage Mercury Vapour lights is the easiest way to reduce emissions although this only covers 15% of major road lighting and is declining (down from 25% in 2003). Improving the energy efficiency of high pressure sodium lights has less clear alternatives as these lights are already reltaively energy efficient, however, the advent of LED lighting and sophisticated control gear (such as the Active reactor) is showing there is opportunity over the longer term for improved efficiency.

9.3 Description of current technologies and scope for energy efficiency

A range of alternative lighting technology have been identified as being approved by at least some of the EDB's nationally. Note this does not include new light types such as LED technology.

These products offer between 20% and70 % energy savings in comparison to current public lighting. Energy savings indicated below are greater than 40% of the total installed energy consumption of current street lighting.

Tables 3-5 below provides a summary of some costs and benefits from replacing current lighting types. It is important to note that there are commonly several options available to choose from to replace a given technology and choices around different technologies can vary because of climate, cost and general suitability. Additionally these tables do not consider the need for the light, in many situations it is possible to change the current light for a light that is better suited to that location with a lower energy use or to remove the light altogether.

Table 3: Estimated energy efficiency accelerated replacement costs and savings for major light types

Current Type	Estimated total cost (accelerated replacement)	Estimated total energy savings	Sum of Annual Greenhouse savings if replaced	Simple payback period (yrs, energy only)
Fluorescent	$39,970,840	599,774	6,578	66.6
High Pressure Sodium	$ 563,520,784	17,075,482	209,285	33.0
Incandescent	$ 704,775	53,978	630	13.1
Induction				
Low Pressure Sodium	$ 1,411,059	31,662	210	44.6
Mercury Vapour	$ 589,511,727	33,873,508	409,603	17.4
Metal Halide	$14,930,904	641,590	9,035	23.3
Grand Total	**$ 1,210,050,088**	**52,275,994**	**635,341**	**23.1**

Table 3 identifies that the main opportunity for efficiency gains is through replacement of Mercury Vapour (MV) technologies. By replacing MV lights with the efficient options identified above the total energy savings would equate to 27.1% of total street lighting energy use.

Although improved maintenance savings may also occur from these refits it can be seen that the paybacks for energy alone are long.

A life cycle cost assessment will typically improve the costs and paybacks. For example the Mercury Vapour replacement improves from 17 years to around an average of 10 year once all costs and savings are considered over the 20 year life of the asset.

The next largest savings are in major roads, for HPS lights. However, the simple savings from these actions have long paybacks.

When considering these projects based upon a replace on fail program plan the additional costs are significantly reduced. Although it is expected this process would take around 20-30 years for the lights to be replaced at the rate of luminaire failure. Table 4 below summarises the costs and benefits from a replace on fail project plan.

Table 5 summarises the costs and savings by the replacement option. This table identifies the savings by the replacement option that were used in these calculations. It should be noted that the savings and ROI (Return on investment) are calculated using energy savings only. Once maintenance charges are considered many of the actions identified here may have further savings that are identified.

Table 4: Energy efficiency replacement upon fail - costs and savings by light type

Current Type	Estimated total cost (replace upon fail)	Estimated total energy savings	Simple ROI	Simple payback period (yrs)
Fluorescent	$ 4,441,204	$ 599,774	14%	7.4
High Pressure Sodium	$ 211,979,754	$17,075,482	8%	12.4
Incandescent	$ 124,465	$ 53,978	43%	2.3
Low Pressure Sodium	$ 564,424	$ 31,662	6%	17.8
Mercury Vapour	$ 65,501,303	$33,873,508	52%	1.9
Metal Halide	$ 5,239,444	$ 641,590	12%	8.2
Grand Total	**$ 287,850,594**	**$ 52,275,994**	**18%**	**5.5**

Table 5: Energy efficiency replacement costs and savings by replacement option

Possible replacement option	Annual Greenhouse savings if replaced	Estimated total cost	Estimated annual total energy savings	Simple energy ROI
Same with Active reactor (AR)	201,313	$ 530,842,250	$16,057,071	3.0%
Replace light with HPS and AR	72,378	$ 70,248,302	$ 6,394,009	9.1%
Replace with Metal Halide	341	$ 159,772	$ 29,281	18.3%
Replace with Fluorescent	361,309	$ 608,799,764	$29,795,634	4.9%
Grand Total	635,341	$ 1,210,050,088	$52,275,994	8.7%

The technologies mentioned in this table are commercially available and have been approved for use in more than one jurisdiction in Australia. These replacement options in most situations can directly replace existing technologies. In addition to improved energy efficiency, to be considered a suitable replacement an alternative lighting product must also meet other requirements such as light quality, light output, light distribution, cost, maintenance requirements and climate suitability. An analysis was undertaken to ensure they have similar or better spacing requirements, due to their luminaire design, lumen depreciation patterns and corresponding light output.

While all of these alternative ligthing technologies are currently available in the market, there are a range of potential barriers to their installation. For example, several of the technologies listed above and some not listed (such as LED lighting) have a low level of approval for use by EDB's (see Section 11 for more comment on barriers to energy efficency in street lighting) .Typically this involves technologies that are less known such as the Active reactor and more efficient Photo electric (PE) Cells.

Appendix 2 provides more detail on key lighting types and alternative products listed above in Table 5.

Recommendation 1: Replace all Mercury Vapour lights with the most efficient replacement option. This can save around 27% of the energy in street lighting.

10. Identification of barriers and constraints for improved energy efficiency

A range of barriers and constraints for improved energy efficiency in street lighting have been identified, with many stakeholder survey respondents demonstrating a clear understanding of the central issues and commenting on their frustrations around the restraints. In many cases respondents were also clear in articulating solutions to barriers.

The survey highlighted consistent responses to certain barriers, especially around financial costs and working with external stakeholders. Importantly, those barriers that weren't rated as strong overall (such as state regulation) nevertheless received a significant number of respondents citing the barrier as important. This suggests that barriers are diverse and illuminates the importance of a strategic approach to solutions.

10.1 Financial Costs

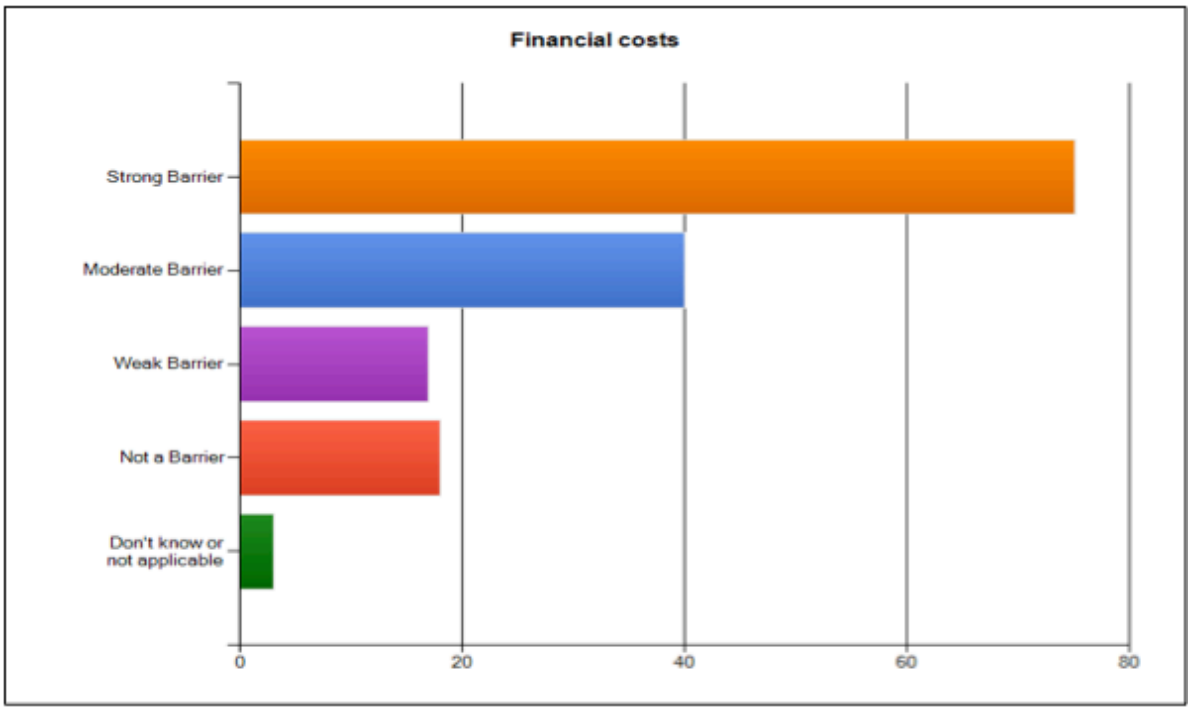
Financial costs was clearly the biggest barrier, rated strong or moderate by 75% of respondents. Additionally, of those that considered financial costs a barrier, almost twice as many considered it a "strong" barrier than a "moderate" barrier.

> *"Solve this problem (financial costs), and we can solve the rest"*

Around 20% of respondents added specific comments on upfront or capital costs being a key barrier. For many customers it is in the order of millions of dollars and a source of frustration, with one respondent commenting that it is a "very very significant barrier, and there's nothing we can do about it."

When choosing to spend money on new technologies (and to thus accelerate efficiency gains) it is important to ensure all stakeholders consider not just the capital cost but the total life cycle costs. More efficient technologies generally fare better considering life cycle costings.

Graph 1: Response to financial costs as a barrier



10.1.1 ECONOMIC BARRIERS BY REGION

Within the sector there are some immediate and concerning economic barriers present based along geographic considerations. This can be because of increased costs to service remote areas and also due to different regulatory decisions.

10.1.2 FINANCE IN LOCAL GOVERNMENTS:

Below is a short summary of a report completed for the Australian Local Government Association (ALGA) by PricewaterhouseCoopers (PwC) to complete a national study on the financial sustainability of local government[5] . This is useful in order to summarise some common themes that can influence the roll out of national street lighting programs.

The study identified that local government is responding to rising community expectations by providing a growing range of essential services and infrastructure that underpin local communities. This expansion in roles and service quality, coupled with growth in input prices generally exceeding the average rate of revenue growth, has seen a significant number of councils develop financial operating deficits.

Some relevant recommendations from this report are:

- Further realise the gains from greater economies of scale and reduce unit costs via approaches such as regional or shared service provision, outsourcing, use of state-wide purchasing agreements etc.
- Exercise caution prior to stepping in to attempt to resolve regional, state or national issues without a sound funding plan.

What this report indicates is that some Councils will never be able to implement significant technological change in street lighting without outside capital. For example the average rural remote Council has around 25% of total operating expenses that come from rates (compared with over 66% for urban regional Councils). This means that without external funding (grants, loans etc.) it would be very difficult for many of these councils to partake in a bulk change program.

10.1.3 LIMITS TO BORROWING MONEY:

However, there are real constraints for many Councils in borrowing money to fund bulk change projects. Most Councils are limited to borrowings by statutory requirements. This means they may not be able to borrow to fund projects such as these for many years.

10.1.4 REGULATORY APPROACHES THAT IMPACT ON ECONOMIC BARRIERS

The regulators for pricing of street lighting services, the AER and ERA (in WA) can influence both capital cost and ongoing cost of standard and energy efficient street lighting services. The AER is currently in a transition period away from state based pricing regulation for all states except WA. The historic state based approaches have resulted in a variety of inconsistent outcomes for pricing of these services.

For example in NSW the asset value determined during the recent regulatory price review (and thus directly impacting upon the written down value (WDV) if the asset is retired early) attributed to street lights is around $250-400 per light. Noting that the actual cost of a new (inefficient) version of the current assets in NSW is probably on average $150 plus $100 installation. Hence the WDV currently assumed would be similar to a completely new asset base.

Comparatively, in Victoria, significant asset write downs occurred in 2004 such that the values of the old assets were identified as close to zero. The Victorian WDV is now largely based on increased spending outside the standard maintenance framework by the EDB's since then (so the current WDV for EDB's in Vic ranges from $25 to $95 per light).

This difference in cost is likely to double the project cost in NSW for a comparable project in Victoria. This is a key potential barrier to accelerating replacement of out of date infrastructure to more energy and maintenance efficient ones.

Recommendation 2: Any approach to address economic barriers needs to consider the role of the regulator and current variations in pricing schedules that create barriers to change.

[5] *National Financial Sustainability Study of local Government*, Price Waterhouse Coopers, Commissioned by Australian Local Governments Association, Nov 2006.

10.2 Resourcing

Resourcing was another major barrier with a majority of respondents (57%) identifying timing or staff resourcing as a strong or moderate barrier. More than twice as many respondents considered resourcing to be a "moderate" barrier than "strong".

Street lighting can involve large projects and complex relationship management between all levels of government, energy distribution businesses (EDB's) and other stakeholders, requiring significant resourcing that many local governments lack.

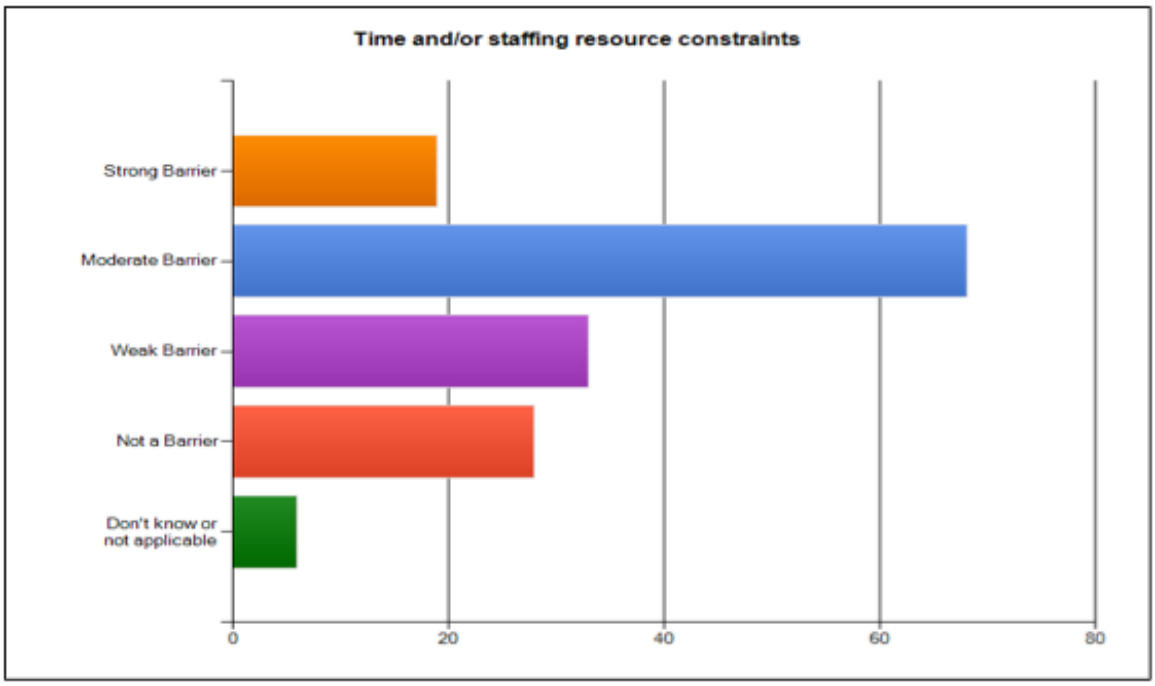
In order to complete region based bulk street lighting changes Councils in the Southern area of Sydney have been co-operating to engage with their EDB since 2003. The Street Lighting Improvement Program (SLIP) was established by the Southern Sydney Regional Organisation of Councils (SSROC) and has involved working with their local EDB (Energy Australia) to implement a number of technology, service and policy improvements.

However, EDB's also have competing demands on resourcing and the capacity and time to manage large scale refits vary in different areas. A combination of internal and external project management and delivery may need to be considered for roll out programs. Noting that in some jurisdictions the ability to outsource these projects to a large degree is available.

Recommendation 3: Regional based action is a more successful model for delivering projects.

Resourcing is closely linked to another key barrier, expertise.

Graph 2: Response to resourcing as a barrier



10.3 Expertise

Expertise (or lack thereof) in areas such as design knowledge and the ability to compare products was split across respondents – around half (51%) seeing it as a strong or moderate barrier and just under half (48%) a weak barrier or not a barrier.

There is a pattern between those respondents who have the internal resources and can source external expertise and those where staffing and resourcing is a constraint. Some respondents from smaller councils commented that often there is only one staff member across all areas of sustainability and energy efficiency leaving little time and resourcing for building internal capacity around street lighting knowledge.

Technical expertise was the main gap, with some respondents citing comparison of new and emerging technologies a challenge.

Many respondents indicated that they were aware that information and expertise is readily available from consultancies and other bodies, others sourcing information from the internet and networks. One respondent has been successful in implementing "action based learning" to develop internal capacity and learn by doing.

Within EDB's technical expertise in managing and dealing with new technologies is highly varied. In Victoria and in some areas of Qld and NSW there are formal processes to engage and work on technical issues around street lighting. These networks come together for comprehensive programs to deal with technical issues generally (some areas of NSW and all of Victoria), or based upon specific trials (Queensland and most other states on a limited level).

10.4 Approval of efficient lighting

Approval of efficient lights also rated high on the "strong" (30%) and "moderate" (31%) scales with respondents claiming that long delays in testing and lack of efficient lighting choice on the load tables is a major issue.

Many claimed that the verification process for new energy efficient technologies is too long and arduous, one citing that the "usual approval marathon" is a major constraint.

> *"Our streetlight provider does not have efficient street lights on their load table. An 8 year energy efficiency trial is only just coming to fruition now and one of the two options will not make it to the load table - which goes completely against what the users (local governments) want."*

WHY ARE APPROVALS LENGTHY AND DIFFICULT?

There are a wide range of reasons why technical approvals for new lighting assets can be lengthy and difficult. Some of these are listed below:

- Loss of key staff and knowledge. In many areas staff experienced in dealing with street lighting approvals are no longer present. This is occurring because of retirement and also through industry rationalization (particularly in privatised markets like Victoria).
- Difficulty in changing corporate systems. In order to use on a large scale new technologies a systematic change in supplies and maintenance regimes may be required. This can take some time to work through;
- Difficulty in identifying the life of products. How long is an LED going to last? Well no one really knows. So how do you then price the maintenance of these assets….? For most new technologies this issue comes up again and again. For example – variations on the same issue apply for the Active reactor, electronic PE Cells, LED lights, long life CFL and T5 lights, any lights with electronic control gear etc. [6]

[6] There are ways to work around this including providing a controlled release that states up front the uncertainties, charges according to medium to low life, then checks and reimburses the customers at regular intervals when real data on life becomes available. Thus the risk is put back on the customer if technologies do not meet manufacturer's claims.

Victorian technical approvals process

See www.mav.asn.au/cic for further details.

A formal statewide lighting approvals process was established through a MOU of all key stakeholders, including local and state government and Victorian EDBs in 2008.

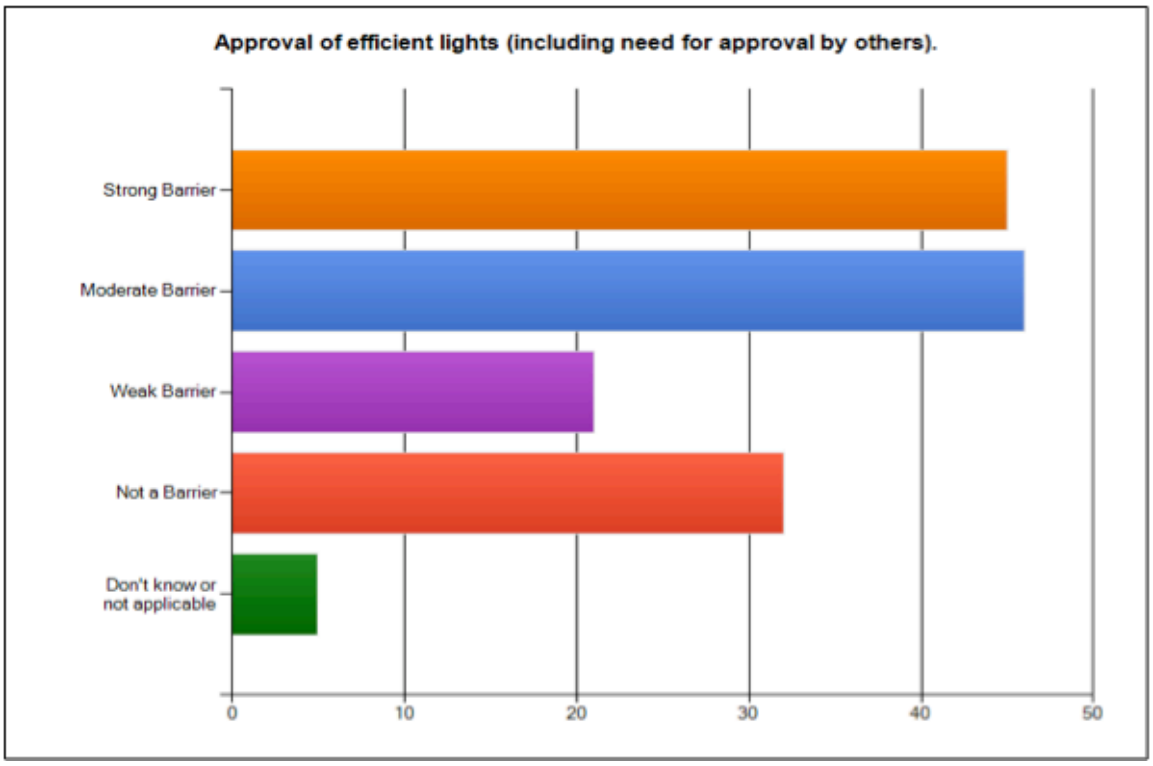
The two step process involves initial filtering from the MAV Customer Innovation Committee (CIC). The customers review technical reports covering environmental, technical and cost performance.

If it meets minimum standards and the need of the customers then the technology is referred to the Victorian Public Lighting Approvals Board (VPLAB) which includes the EDB's.

The EDB's then assess and prepare cost models for capital and maintenance programs for these technologies prior to a final approval by each EDB.

This assessment process draws on information on trials throughout the country and internationally as well as generating information from new trials.

Graph 3: Response to approval of efficient lights as a barrier



- Trials take time. Trials are designed to test the technology in the field. Trials typically will assess aspects such as lifetime, lumen maintenance and environmental situations (including extreme weather events, power surges, lightning, vandalism, etc.). This takes time but are imperative for publically funded infrastructure which typically aims to last longer than 20 years.
- Desire for product familiarity. Because each business has varying levels of expertise in the more efficient lights and the risks associated with using new technologies, the process is slow for this technical approval.
- Low importance internally within the business. EDB's pride themselves on reliability of supply (this is their core business). Street lighting is a minor part of any distribution business. This can lead to lack of internal resourcing of the businesses to effectively address sustainability in street lighting, and in street lighting generally. Without clear mandates to perform tasks based on sustainability outcomes for street lighting it is unlikely that projects to make it more sustainable will be high on the priority projects list for many EDB's.
- Lack of economic incentive for EDBs. Many EDB's do not view street lighting services as a significant profit earner. For example some EDB's have a profit target of 15% for capital expenditure whilst street lighting has a regulated capital return of around 10%. There is generally not a disincentive for reducing power usage as the EDB network charges are the averaged costs across the network. If energy is reduced the price per unit of energy for network services would then increase to cover actual costs.
- Agreement around greenhouse reporting. The National Greenhouse and Energy Reporting Act requires that organisations over a certain size report greenhouse emissions. All EDB's and a few LG's are required to do this. This issue is not a direct disincentive to energy efficiency in street lighting, however, it adds another layer of complexity to an already complex issue.

The current process to adopt SPL technologies can be relatively long-winded and ad hoc, with players working separately from each other. See Table 6.1 for a summary of the current approvals process.

Table 6.1: Current SPL technical approvals process

1. When they have capacity, various local governments and DBs work independently, or at times in groups, to research and trial new SPL technologies. Each spend considerable time understanding related issues of technology and adoption process;
2. DBs attend various group meetings – often organised by lighting manufacturing companies. Local governments attend various networking meetings and discussion of SPL occurs;
3. Once a technology's performance has been effectively proven, DBs each undertake a process to approve the technology for use;
4. Each customer undertakes an internal business case analysis and decides whether to commit to the new technology;
5. Individual customers or groupings and DBs negotiate and agree to a roll out program for adoption of the new technology.

Australian approvals largely considers the requirements of the AS/NZS 1158 roadlighting standards, spacing of lights, cost (maintenance and capital) and the capacity of the supplier to supply and continue to supply into the future.

There has been some effort to fast-track approvals processes via collective effort. The Public Lighting Approvals Network has recently emerged to share information on trials, technical approvals and reports on specific products. This network is voluntary and is open to EDB's and other key stakeholders (such as major roads authorities) nationally. The Network is currently active in Victoria and some areas of NSW.

LIGHTING APPROVALS - WHERE AND HOW TO IMPROVE

Lighting approvals are a critical part of any lighting efficiency program. In order to address the problems in this, a strong program focusing on information exchange and creation is required.

To accelerate the adoption of SPL technology strategic support to these processes during both research and adoption stages.

This support to regional groups of stakeholders in the form of strategic coordination of research and results, dissemination of information, financial modeling, and advice on how to roll out the technologies. This would enable regional groups to understand the complexities of public lighting, collectively make decisions and speed up the adoption process.

RECOMMENDATIONS AROUND INFORMATION CREATION

Several of the technologies listed in Section 10 and some not listed (such as LED lighting) have a low level of current approval in street lighting. Typically this involves technologies that are less known such as the Active reactor and more efficient PE Cells. Without market intervention it is likely that these technologies will remain underutilised.

According to a recent report on National technical approvals and barriers to the use of energy efficient lighting information creation is required in the following areas.[7]:

1. 'Control gear' assessments for major roads;
2. Electronic PE cell assessments;
3. The role of the Australian Standards (AS 1158), including working on:
   - Recognition of the CE Mark and other relevant international standards and tests (or outlining how aspects of the standards are not required if this is provided);
   - Identifying specific requirements for new technologies such as LED lights, dimming and lighting control systems (inc. electronic PE Cells);

Specific intervention in these areas is recommended. For other technologies most information to determine approvals is already available and simply sharing information or providing clear direction to stakeholders will be sufficient to drive change.

RECOMMENDATIONS AROUND INFORMATION EXCHANGE

Much information is created weekly throughout the country and internationally that could assist street lighting approvals if managed in a useful way for stakeholders. Specifically improvements can be made through:

1. Creating or expanding the role/range of useful information storage and dispersal points[8];
2. Providing direct engagement and support to Customers and EDB's to facilitate a faster and more transparent approvals process.

Both information creation and exchange is directly related to another barrier/opportunity:

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7 Australian Sustainable Public Lighting Technical Acceptance Report Part B, Ironbark Sustainability, commissioned by Department of Energy, Water, Heritage and the Arts, May 2009 .
Another useful reference is Cities for Climate Protection National Sustainable Public Lighting Accelerated Deployment Project Proposal (2008ii), G.C. Breen.

8 For example the Victorian Customer Innovation Committee creates a centralised contact point for technology manufacturers to access the Victorian Approvals Process, whilst the Public Lighting Approvals Network (facilitated by the authors) collates and distributes technical reports and recommendations to EDB's and road authorities on new technologies.

10.5 Working with other stakeholders

The other barrier that clearly rated high on the "strong" and "moderate" scales was working with other stakeholders. 56% of respondents rated this factor as "strong" or "moderate".

A common theme amongst respondents was the difficulty in working with EDB's and the frustration around the unequal relationship between stakeholders. For example, many stressed they had been attempting to implement energy efficiency measures and changes and tried to negotiate with EDBs but ultimately there was no incentive for them to change and they "wouldn't come to the table".

The typical relationships in public lighting are outlined in Table 1. To summarise, in most areas the EDB's own and manage road lighting infrastructure. The role of the Customer (either main roads or local government) is practically to pay for the service and to identify the need for new installations (this can include a role in planning approvals for lighting in new estates). In a few areas (such as the ACT) the customer fully manages the role of the contractor to provide a road lighting service.

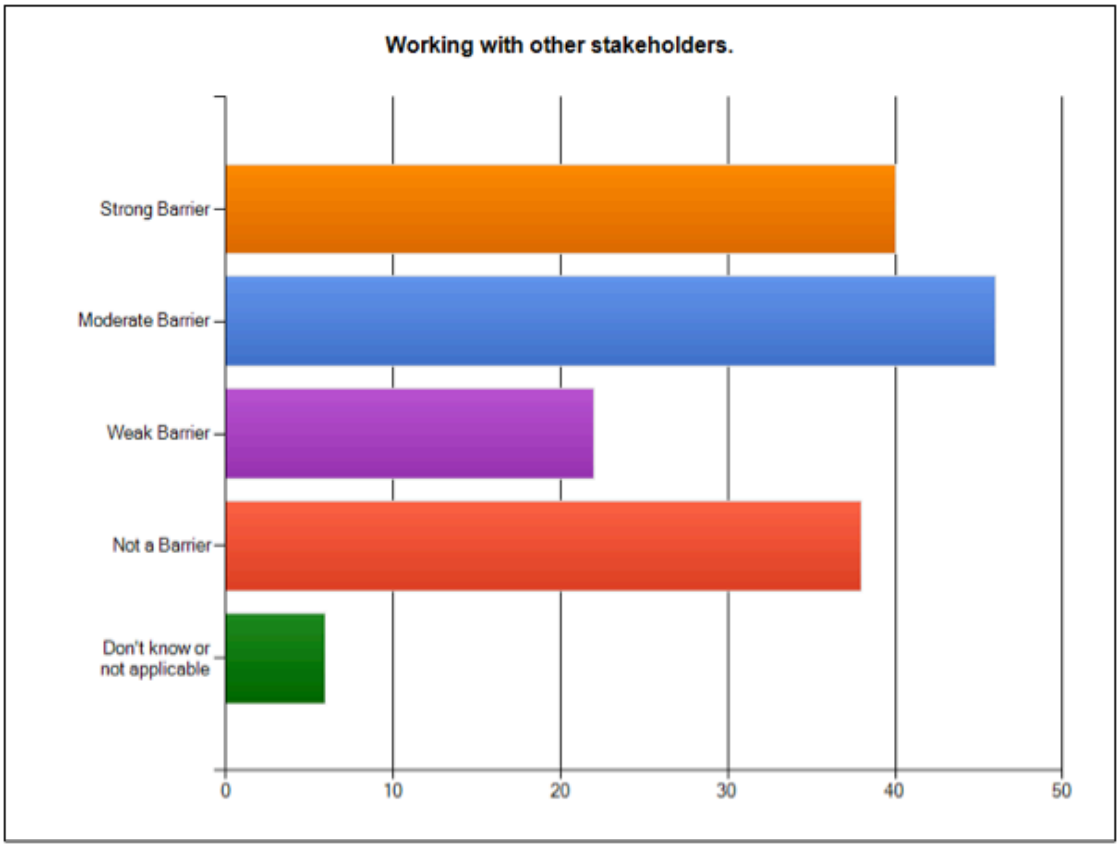
One respondent commented that "resourcing would be made available (from council) if the provider engages in more efficient provision", reflecting many of the comments. Another wrote that there was a willingness on behalf of local government to invest time and money but only if the "are met at least half way by providers".

EDB's main responsibility is for safe and reliable energy supply. Street lighting, and energy efficiency in street lighting, is not a critical concern compared to these issues. For LG's and main road authorities they are typically the ones who pay the bills and do not provide much other systematic or strategic advice on the design, management and maintenance of these assets.

In some areas EDB's are "coming to the table" to allow, or make it easy for customers to engage with large scale bulk replacements. This occurs where there is regional or statewide action and a clear and consistent message from the customers of what is being required. At this point it becomes easier for the EDB to co-operate than to ignore the issue. There are few locations where this is happening and even in these areas progress is slow because of the other barriers to implementation.

> *"The committee is not very effective and is stacked against Councils in favour of the utilities."*
>
> Altered to remove specifics but referring to a regional committee that aims to negotiate improved street lighting outcomes between Councils and EDB's.

Graph 4: Response to working with other stakeholders as a barrier



THE LURE OF THE COMMITTEE

Committees and trials can be attractive to EDB's and other stakeholders. They can be used to collect information and make decisions in a transparent and defensible manner.

However, stakeholders indicated that there can be traps that can lead to disempowerment (where someone would otherwise make a decision simply), delays and deferring responsibility for changing the current technology suite and system. Stakeholder comments indicated that committees can end up supporting the weakest position in order to please all stakeholders and spending significant time discussing minor issues or old technology when there are already better or newer options on the market.

Committees should be formed simply to provide a forum for ongoing collaboration, decision making should stay with the people or organisations with the power to enforce the decisions. In other words share information and make and review decisions based on the best information to hand.

10.6 Standards and regulation

The response to both standards (national road lighting standards) and state based regulation was evenly distributed. For each of these, every possible choice (strong barrier, moderate barrier, weak barrier, not a barrier, not applicable) received between 15% and 30% of responses with no major outlier. While some respondents clearly understood the role of standards and state regulation, there was also a degree of confusion apparent.

Respondents that cited standards as a barrier commonly referred to a lack of understanding around the standards. The confusion was clear from the responses with some commenting that they had been informed that new energy efficient lighting was not up to the relevant AS1158 standard and this was used as a reason to delay more efficient lighting. On the other hand, many were aware of efficient lights that exist that do meet the standards.

Comments around state based regulation were varied with a lack of regulation in the sector a common theme and request for a national framework.

Recommendation 4: Any education component of programs coming out of this strategy should consider including explanations of regulation and standards for the sector.

10.7 Internal Support

The majority (57%) of respondents cited internal support as not a barrier or a weak barrier. Of those that did identify internal support as a strong (5%) or moderate (33%) barrier, size and resource constraints seemed to also be a factor – i.e., those from smaller and lower-resourced councils that have less capacity to institute change lack internal support. For some others, improving energy efficiency in street lighting is simply "not viewed as a corporate priority, beyond meeting the minimum requirements".

Recommendation 5: Encourage regional collaboration or co-operation that provides targeted support to understand and simply deliver efficiency projects.

10.8 Other key barriers

Respondents added further comments around other key barriers however nearly all were addressed through the eight barriers provided. For example, some commented on overall misunderstandings and misinformation between industry participants (which relate to barriers around working with other stakeholders and expertise). Others commented further on the cost to change over to energy efficient street lighting (covered under financial costs).

Some respondents cited lack of competition in the market place ("dealing with monopolies") and legalities around service agreements. A few made suggestions around the need for an overarching federal legislative approach and the lack of incentives for EBD's to implement more energy efficient technologies as they pass on the costs to customers.

10.9 Summary of Barriers:

All of the potential factors suggested in the survey were deemed as barriers by a sufficient number of respondents to be worthy of further investigation and action.

> *"While finding staff with the time to manage a transition is certainly an issue, money (up-front and ongoing costs) is the biggest barrier for us."*

The standout barrier is clearly financial cost, with resourcing, expertise, delays around lighting approvals and working with external stakeholders also significant barriers. For factors where a majority of respondents considered them to be a weak barrier or not a barrier (e.g., standards, regulation, internal support) there were still noteworthy numbers identifying them as strong or moderate barriers.

The strong response is consistent with the complex nature of the issue of energy efficiency in street lighting. It also reflects the current situation where there has been a lack of widespread action despite significant attempts by certain stakeholders, notably local government. It also supports the need for a strategic approach to the issue. It is likely that no single initiative will be sufficient to untangle the web of financial, regulatory and expertise issues preventing progress. The variations in arrangements between different states and territories also need to be taken into account.

11. Options for Action to improve energy efficiency

This section summarises the options around effecting change to address the barriers discussed above to achieve improved energy efficiency of street lighting.

These include options to:

- Foster technology change;
- Reduce financial barriers;
- Align and support stakeholders to accelerate and improve action;

11.1 Regulatory options to accelerate technology change

By considering the information summarizing current technologies and replacement options (in Section 10) it becomes evident that technology choice is a critical determinant of activities to improve the energy efficiency of the road lighting system.

Regulatory action can be further strengthened with linking possible bulk collection of MV lamps with the Federal Governments Fluorocycle scheme. This would have the dual benefit of removing hazardous materials and provide energy efficient lighting. Stakeholders can be signatories to the scheme and benefit from public recognition as being progressive businesses and councils.

During the survey work in preparation for this report 91% of respondents identified this as important or very important, including 100% of EDB's.

11.1.1 REGULATORY PATHWAY

Energy efficiency regulations are based on energy performance tests, and labelling and minimum performance requirements published in joint Australian-New Zealand Standards, and are established through a consultative standards process. Australian State and Territory, and New Zealand regulations then call up any energy labelling or MEPS requirements which are contained in these standards. They also specify penalties for non-compliance. in Australia, State and Territory legislation is necessary because the Australian constitution gives these jurisdictions responsibility for resource management issues, including energy.

Any regulatory change would require the preparation of a Regulatory Impact Statement (RIS) for decisions that "… would encourage or force businesses or individuals to pursue their interests in ways they would not otherwise have done …[9] "

[9] The Council of Australian Governments (COAG) Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies. (COAG 2004)

Consultation with New Zealand

In June 2004, COAG asked the ORR to confer with the Regulatory Impact Analysis Unit (RIAU) in New Zealand on draft consultation RISs, where there are New Zealand impacts and issues or where a proposal in Australia would affect Trans-Tasman trade. This would need to be considered during an RIS process.

In order to influence technology choice a range of options are available for consideration. These are summarised below:

11.1.2 BUSINESS AS USUAL

Currently there are no specific regulatory approaches to reduce energy use in street lighting. There a number of largely market or voluntary measures which have led to improved energy performance in street lighting, including:

- AS/NZS 1158 which was amended in 2010 to require that MV technology is not used in new installations (this is voluntary);
- Financial benefit. Where based on a full life cycle assessment it makes sense for customers to retire inefficient assets early.
- Environmental benefit. Many customers are deciding to change assets in order to reduce greenhouse gas emissions.

It is fair to say that some of these items above are able to change behavior and technology. However, currently they are used sporadically and have led to only small change in the last 8years since the previous street lighting survey was completed. Significantly lighting levels overall have resulted in an increase in total street light numbers of around 13.1% (or 270,000 lights).

11.1.3 A NATIONAL ELECTRICITY RULE (NER) ON STREET LIGHTING LUMINAIRE EFFICIENCY

A Rule could apply to all National Electricity Market (NEM) distributors (and a similar rule introduced into the NT and WA) to require efficient lighting to be used (or inefficient lighting to be phased out). To obtain a Rule, a proposal to the Australian Energy Market Commission (AEMC) must be made and, after consultation, approved.

The AEMC power to make rules is determined by the National Electricity Law and this law and the NER do not drill down to the detailed technical standards level envisaged for lighting efficiency. Thus the AEMC may not progress the proposal. Currently there are no Rules about street lighting and it is unlikely that this kind of Rule could be made as the NER address mainly security, safety, reliability and economic matters.

11.1.4 MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS) FOR STREET LIGHTING ENERGY EFFICIENT LUMINAIRES

MEPS have been introduced for some types of lights, and the program is ongoing. MEPS requires state based legislative implementation and a reference to the relevant Australian Standard. This could be the Electrical Products Act 2000, associated Regulations 2009 and the Australian Standards AS/NZS 1158.6. In order to introduce an energy efficiency standard choices need to be made around the scope (i.e. lamp type (MV or HID generally)), sector (all lamps, Public lighting only) and the method (e.g. using an energy performance measure like lumens (light output) per watt or aiming for the lamp type itself).

The MEPS could be coordinated nationally and then added to the Distribution Code as adopted by the AER and ERA (in WA).

11.1.5 MANDATED ENERGY EFFICIENCY TARGET FOR STREET LIGHTING

Mandate as a condition of their licence, that EDB's abate a given amount of greenhouse gases through a suite of defined measures. This could be linked to requirements around greenhouse reporting and through ensuring information submitted as a result of NGERs can be used to check progress.

11.1.6 SUMMARY AND COMMENT ON REGULATORY OPTIONS:

By excluding Business as usual (which is not leading to significant change in a timely manner) the main options to address technology change are:

1. A National Electricity Rule (NER);
2. Minimum Energy Performance Standards (MEPs); or
3. Mandated Energy Efficiency Target (MEET);

MEPs and MEET are the most common tools and most likely to be used in this situation. The NER is designed for security, safety and economic management of the electricity system and street lighting is not currently dealt with in this manner.

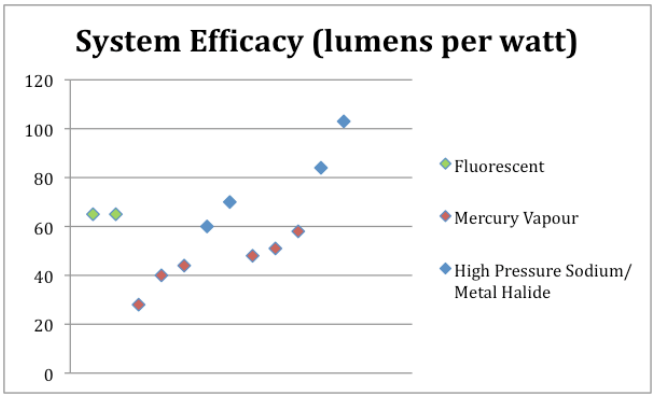
MEPS are mandatory standards applying to many products sold in Australia, set at a level to prohibit sale of the worst performing products in the marketplace. They currently apply to a range of appliances, lamps and other products in Australia and New Zealand. MEPs does not currently cover HID lamps (which covers MV, MH and HPS lamps).

By using MEPs the definition of what types of technology can be regulated is outlined. A Regulatory Impact Statement (RIS) would be required to complete this process.

A RIS would consider the costs and options to deliver efficiency during various scenarios such as:

- Business as usual;
- Voluntary MEPs;
- Mandatory MEPs.

Figure 3: System efficacy for the most common road lighting types in Australia



As can been seen in Figure 3 above using a lumens per watt measure shows that Mercury Vapour are the lowest performing street light. Many MV lamps are replaced on a 3 or 4 year maintenance cycle. By removing the lamps from sale this would result in a requirement to source alternative products and is likely to lead to a turn-over of MV luminaires to new models. Alternative lamps may be sourced or luminaires replaced to manage this change (a typical cost for luminaire change ranges from $300 to around $1000 for decorative luminaires). It is likely that for more expensive options retrofit methods will be used for newer lights.

Figure 3 shows that high wattage MV lights (700-1000W) have similar system wattages as the low wattage HPS luminaires (50W). Thus an approach to have a tiered MEPS may be useful in order to clearly delineate lights of different wattages (e.g. above and below 400W). In addition consideration of using a system vs. lamp lumens per watt measure should be considered. Logically using the lamp lumens/watt would be easiest to implement without considering the plethora of luminaire options. These issues would be assessed further during the RIS.

Some lights are expected not to be replaced quickly as part of this program. Typically higher wattage lights and lights in private operations may not have a scheduled maintenance program. As such some of these lamps can last for 10 years or more in situ. This could cover as many as 30-50% of the MV lamps nationally.

Costs for administration are low – for example costs for MEPs for lineal fluorescent lamps were estimated at around $150,000[10] in 2003.

[10] REGULATORY IMPACT STATEMENT: Minimum Energy Performance Standards and Alternative Strategies for LINEAR FLUORESCENT LAMPS, Dec 2003

MEET programs include the Victorian Energy Efficiency Target (VEET) and the SA Residential Energy Efficiency Scheme. In its May 2008 budget, the Victorian Government allocated an estimated $5 million to the establishment of the VEET scheme[11]. However, the REES in SA is a simpler model whereby it doesn't involve tradeable certificates (and a trading market). It simply mandates, as a condition of the energy retailer's licence, that they abate a given amount of greenhouse gases through a suite of defined measures. The cost for the scheme is passed onto all consumers. This system would be fairly simple for street lighting and would be expected to have a similar cost as the MEPs program.

A program for MEPs alone would address the majority of standard installations where regular maintenance occurs (typically at 3 or 4 year intervals for street lighting). A program that included MEPs and MEET would ensure action was taken on the larger wattage lights in street lighting and in areas where regular maintenance programs do not occur.

Either of these approaches are likely to result in increased short term capital costs which can be an issue for customers.

11.2 Options to reduce financial barriers

This report summarises the financial context and barriers for energy efficient lighting programs:

- financial cost barriers were identified as clearly the biggest (perceived) barrier by most respondents to the online surveys in December 2010 and February 2011;
- Some Councils will never be able to implement significant technological change in street lighting without outside financing;
- (many) "Councils will choose those projects which have incentives (or low capital cost) in order to justify spending to their communities."
- Incentive payments may be required if projects need to be completed that would not otherwise occur, such as where they are not cost neutral over the asset life (including through borrowing capital).
- Clear and concise language to leave no room for misunderstanding around the provision or otherwise of incentives is required – otherwise stakeholders will delay projects for long periods of time in the hope of receiving future financial assistance;
- Most Councils are limited to borrowings by statutory requirements. This means they may not be able to borrow to fund projects such as these for many years;
- Cost of up front capital was noted as the greatest concern for financial barriers. Sometimes this included the impact of regulatory rulings on the cost to retire early existing infrastructure (known as residual or written down values).

11.2.1 HOW MUCH MONEY IS REQUIRED TO SIGNIFICANTLY CHANGE FINANCIAL BARRIERS IN STREET LIGHTING

To significantly change the financial barrier for large capital projects in street lighting significant cost is required... According to a study on non-regulatory mechanisms to minimize costs of public lighting, bulk changes are expected to cost "$570m at most"[12]. Five years later this figure produced as a comment on around 70% of street lighting is likely to be well over $1 billion today for all street lights that can be replaced. So a figure of $300-$500m is a more likely subsidy or loan fund to be effective. There will still remain a number of Councils who will not choose to access this money because of the corresponding capital cost to them.

The main options to reduce the up-front financial costs are through the use of incentives or financing.

11.2.2 THE NEED FOR INCENTIVES

From the 2010 Municipal Association of Victoria's Council CEO's conference, which covered action on street lighting energy efficiency, the following statement was a clear indication of their position on financial incentives:

"Incentive funding is essential because of the infrastructure demands all Councils are facing. Councils will choose those projects which have incentives in order to justify spending to their communities. This was supported by many rural Councils and some urban Councils."

Councils are used to having incentives from state and federal government for infrastructure projects. It is also worthwhile stating that few, if any typical infrastructure projects have a payback. Street lighting, and efficiency project generally, do have a payback.

11.2.3 ARE INCENTIVE PAYMENTS NECESSARY TO GET COUNCILS AND OTHER BODIES TO COMMIT TO BULK CHANGE PROJECTS?

The short answer is not in all cases. There are many examples of Councils acting without external funding to support significant bulk changes. This includes large projects in locations such as Coffs Harbour, Southern Sydney, large areas of metropolitan Melbourne and areas of Perth. These projects have been somewhat limited in scope (around 50,000 lights being replaced within a total population of over 2 million).

[11] http://new.dpi.vic.gov.au/energy/policy/efficiency/veet-statement/cost-benefit

[12] "Scoping Study – non-regulatory mechanisms to minimise the cost of energy efficient public lighting on minor roads", pg. 14, Syneca consulting, 16/6/2006 for Australian Department of Environment and heritage.

11.2.4 WHEN ARE INCENTIVE PAYMENTS NECESSARY?

For some project types, where the paybacks are poor or non-existent, the use of targeted incentives may help to deliver projects that would not otherwise occur. This needs to be weighed against the need to deliver cost effective changes.

When a program to ban or phase out a particular technology requires significant cost to the users of the old technology there may be a need to provide incentives. In the case of street lighting using incentives becomes a political and budgetary consideration first.

Our recommendation is that incentives should only be considered if the program is not cost neutral over the asset life (including through borrowing capital). For example for many decorative streetlights (many containing mercury vapour lights) to replace the entire light fitting would result in a payback period of around 20-30 years. The asset life is only 20 so this project would not pay itself back. Before considering incentives for this project technology choice should be considered. For example replacing the lamp with a more efficient non-mercury vapour lamp type could reduce the cost by as much as 3-5 times – this would then bring the project back into the range of those projects not requiring incentives.

However, it is fair to say that many Councils will wait for external funding whilst there remains hope this may occur. So, whatever, decision is made about external funding incentives, clear and concise language to leave no room for misunderstanding is required.

11.2.5 CURRENT INCENTIVE FUNDING OPTIONS

Low Carbon Communities is a funding program being administered through the Federal Department of Climate Change and Energy Efficiency. It will provide $330 million to support local councils and community organisations to cut pollution and reduce their energy costs through energy efficiency upgrades to street lighting, community facilities and council buildings. The program will also assist communities to reduce carbon pollution through investment in cogeneration facilities or energy efficient upgrades to community icons such as stadiums, education facilities, town halls and nursing homes.

Low Carbon Communities will provide competitive grants to local councils and operators of community facilities via three funding streams.

1. the **$200 million Low Carbon Communities program** will provide competitive grants to local councils and community organisations to support energy efficiency upgrades to council and community-use buildings, facilities and lighting;
2. the **$100 million Low Income Energy Efficiency Program** will support consortia of local councils, community organisations and energy service companies to trial energy efficiency approaches that assist low income households to reduce their energy costs; and
3. the **$30 million Household Energy and Financial Sustainability Scheme** will support low income households to improve their energy and financial sustainability. [Note: this scheme will be administered by the Department of Families, Housing, Community Services and Indigenous Affairs].

More information on the Low Carbon Communities program will be available shortly. For information on the Government's climate change plan go to www.cleanenergyfuture.gov.au.

Similar programs have been suggested in Victoria. While this funding will assist the transition in certain areas, the scale of these incentives are not likely to result in large scale change on their own.

11.2.6 CURRENT FINANCING OPTIONS

Once the EDB's and customers have a clear and simple framework to deliver large scale energy efficiency projects then financial constraints are the main barrier to further implementation.

Currently Customers have the option of funding projects upfront through capital contributions or borrowings in most areas. In some locations (such as areas of NSW) financing off the project can occur by the EDB and the program is then paid off using the regulated maintenance pricing system. EDB's generally have a regulated return on capital that is typically around 10%. This compares to financing available to Councils of around 7% and through organisations like super funds and the Australian Carbon Trust of under 5-6%.

As mentioned sometimes Councils cannot borrow due to their regulatory obligations.

Third party financing

A simple way to address financial barriers would be to provide a process to deliver programs that included sourcing finance from a third party.

This means the Councils would not have to find the budget to make the bulk change happen.

The choice for Councils choosing to implement bulk changes would then be:

- Council funds the program up front; or
- Funding upfront from a third party at low cost of capital with repayments covered by savings over lifetime;

At either of these steps incentive funding could be sourced as available.

Incentive funding is not recommended unless the cost benefit of particular projects results in:

- The programs identified not having a positive return on investment;
- And the other applicable projects nationally are not sufficient to meet the targeted energy reduction.

11.2.7 HOW TO MAKE FINANCE AVAILABLE

There are over 500 local government representative organisations within Australia. Providing finance or the option of finance to each of these would be very difficult to achieve. There are only 15 EDB's who manage street lighting for the majority of these Councils.

A sensible way to manage the program is to provide a simple finance option through the EDB's to manage the cost to energy efficient lights. This can then be part of the roll out program negotiated with each EDB.

It is important that any financing includes oversight by Council representative bodies and accesses the lowest cost for the capital. This can also include any incentive mechanisms at state or federal level to drive energy efficient street lighting managed at a regional level.

The Australian Carbon Trust manages the Energy Efficiency Program has funding of $87.6 million and will make co-investments to stimulate private sector investment in projects for energy efficiency retrofits, seeking a positive return on its investments and addressing traditional barriers and market failures in implementing energy efficiency improvements. This resource would be one avenue open to the program to begin the process of accessing finance.

11.3 Options to align and support stakeholders to accelerate and improve energy efficiency action

Delivering change in a timely manner is very hard. This – of anything is the key learning from the last 10 years of working towards improved energy efficiency in street lighting.

In the survey work for this project "An agreed process between distributors and governments to guide negotiations around bulk changes" was identified as the second most important action. 91% of respondents indicated this was important or very important.

In order to allow the options discussed above to be effective there needs to be collaboration to deliver real projects on the ground. In order to make this happen a working relationship is required that enables a smooth process across the nation to replace old with new.

There are many methods to make this happen and much diversity in the needs, relationships and ability to commit to and implement change programs.

Some examples of successful programs to create change include the regional SLI Program (described in section 11.1.1), the Victorian street lighting programs (where there are now options for all Local governments to change their residential streets on bulk in an accelerated manner) and through action by individual Councils like Coffs Harbour and Subiaco Councils. The options can be summarised as follows:

- National;
- Statewide;
- Regional;
- Localised (with EDB);
- Localised (through competition);

In each of these examples a similar model has been used and is outlined in Figure 5 below.

Before discussing these options in depth it is worth reflecting on the intent of this Strategy (i.e. to significantly accelerate the use of energy efficient street lighting). This means to take action that is:

1. Timely;
2. Efficient, and
3. Reduces energy consumption.

Typical stages to progress an energy efficient street lighting bulk change

After a technology is chosen (which can be complicated in itself) the key stages that are required to make sure any program is simple for the customers, cost effective and systematic are shown below.

Program detail should be developed in each EDB region in order to manage the different cost and management structures. Cross regional co-operation and comparison is useful.

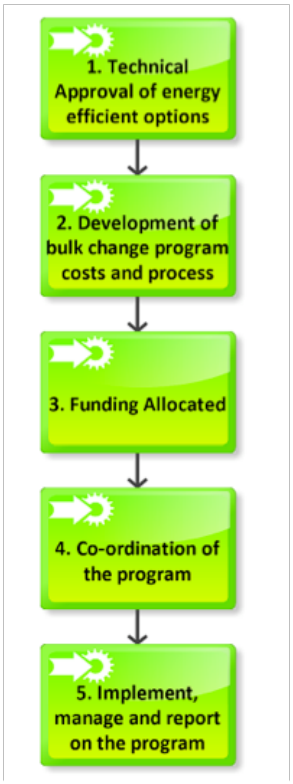


Figure 4: Key Stages in an energy efficient lighting changeover

11.3.1 NATIONAL ACTION (TO ALIGN AND SUPPORT STAKEHOLDERS TO ACCELERATE AND IMPROVE ENERGY EFFICIENCY ACTION)

Historically action at a national level has largely focused on tool, reports and resources or adjustments to standards. More recently funding for bulk street lighting changes has been considered (and is currently in the design phase). These programs have been largely dealing with small aspects of the barriers around street lighting efficiency. As such they have been a useful but small scale intervention in the sector.

11.3.2 STATE/TERRITORY AND REGIONAL ACTION (TO ALIGN AND SUPPORT STAKEHOLDERS TO ACCELERATE AND IMPROVE ENERGY EFFICIENCY ACTION)

In an ad hoc fashion regional and state based action has had varying success. Where programs have been successful in leading to bulk street light changes (such as in Vic and the EA area of NSW) there has been consistent and ongoing work in formal forums with both customers and EDB's. In Victoria there has been a formal MOU signed to enable co-operation to occur.

In many areas work to attempt to create regional action has not created significant change.

Table 7: Examples of National action

Examples	What has worked	What has not worked	Recommendations
Communications support (Public Lighting Toolbox (PLT) and Rightlight programs ~ see break out boxes)	Lots of very good information has been shared. The PLT was ICLEI's most popular website link. Righlight program included training and face to face information exchange	Rightlight program has not yet been assessed for actual impact. Information only so not directly dealing with finance, approvals and stakeholder relations barriers.	A national program to link the parts of a combined program makes sense. A national approach to communications of generic information is also logical.
Strategic planning (for Councils/regions by ICLEI-Oceania)	Established/supported regional action in Vic, SA and WA. Has led to some direct action.	By not directly dealing with the approvals processes and relations with EDB's this approach has not led to much direct action.	Provide information only for this (e.g. examples/templates (available on PLT)).
Commissioning reports (inc.	Useful to understand the volumes of lights, technical opportunities and barriers.	Has not led to significant change as the main barriers are not informational.	May still be required in targeted manner. Information itself is not the main barrier.
AS/NZS Standards efficiency criteria	The AS/NZS 1158 road lighting Standards now require that MV technology is not used in new installations.	The standard is voluntary and in many jurisdictions approval of energy efficient replacement options has taken some time.	Introduction of a mandatory standard may accelerate the transition.
Low Carbon Communities funding program	Provides funding of up to $500,000 to local governments planning bulk street light changes.	An $80m fund for cogeneration and other efficiency programs. Likely to cover a small number of street lighting specific programs.	Funding such as this should consider how it can support the actions in this strategy.

Table 8: Examples of State/Territory and regional action

Examples	What has worked	What has not worked	Recommendations
Victorian Public Lighting Taskforce	All the main players have agreed to work together. This has led to a process for each EDB to deliver energy efficient bulk changes of residential street MV lights.	Further technical approvals are slow (mainly grappling with the issue of how to assess life). Other outcomes including communications and information delivery have not occurred due to lack of resourcing.	Support these groups through jointly communicating the local and national program.
SA	Created tools to assist Councils to complete Sustainable Public Lighting Action Plans.	Alone these programs have not led to significant technology change	
ACT	Bulk change of high wattage Mercury Vapour lights. Lighting standards now require stepped switching and voltage regulation in HPS and MH luminaires.	?	

11.3.3 LOCAL ACTION (TO ALIGN AND SUPPORT STAKEHOLDERS TO ACCELERATE AND IMPROVE ENERGY EFFICIENCY ACTION)

It has been possible for some few examples of individual action to significantly change street lighting emissions to occur.

Most examples of individual action have led to small or non-existent changes. However, it should be recognized that the action of individuals to address barriers in particular regions are the only thing that has led to real change. When combined with regional level action local action (to fund bulk change programs for example) can be very successful.

11.3.4 SUMMARY OF ACTIONS TO ALIGN AND SUPPORT STAKEHOLDERS TO ACCELERATE AND IMPROVE ENERGY EFFICIENCY ACTION

In order to accelerate and support action on energy efficiency in street lighting action is usually taken on either national, regional/state or a local level. In order to deliver significant change it is very difficult for local level actions to be successful.

For a successful program to occur a range of stakeholders need to be engaged and co-ordinated. For example a regional steering committee can most effectively deal with local management of bulk roll outs (including power companies and customer representatives) to implement project management and design, quoting and management sign off of expenditure.

Regional programs (based in each EDB area for example) could be supported at a national level with resources such as communications, business cases and finance that are most efficiently collected at the national level.

Locally the individual customer would need to agree to the project and the costs associated with it.

Table 9: Examples of local action

Examples	What has worked	What has not worked	Recommendations
Coffs Harbour Council (NSW)	Changed all inefficient 80W MV lights with low wattage HPS.	The lamp type was a good choice at the time (reliable, known, affordable). Choices of technology now would be more efficient and white light.	
Frankston City Council (and several other local governments in Vic)	Replaced around 20,000 80W MV's with efficient replacements to date. A further 20,000 expected over the next 12 months. Leveraged off state wide action to allow bulk changes to happen.	Sometimes expensive, varied experiences in ability to reduce pricing. Negotiations have taken significant time to work through detail in some areas. Difficult for Councils to engage with this process without support.	Support the Councils through a centralised process for expressions of interest.
Subiaco (WA)	Council has taken over management of 60% of street lights (1350 units). Of these over 1000 have been replaced with energy efficient CFL decorative lights and underground power schemes.		Explore further how competition can enable faster (or more affordable) transition to energy efficient lighting.
Trials	Many Councils, EDB's and road authorities have completed/begun street lighting trials. This has led to a greater understanding of the technical parameters of many technologies.	Much of the information generated by these trials has not been formally assessed and shared.	Share information from trials and other technical information.

12. Priority Actions

There are many actions that can be implemented to improve the energy efficiency of street lighting as has been discussed in Section 11 above. Subsequently the actions that are listed here were chosen by considering the following:

- Identified barriers and opportunities;
- Listening to input across the breadth of stakeholders consulted;
- Addressing locally specific barriers;
- Aiming for highest greenhouse reduction at lowest cost and disruption;
- Providing equity of response;
- Projects that are proven to have the capacity to be expanded rapidly (and do not reinvent the wheel);
- Projects that need proving should be proven in simple initial steps before considering expansion;
- Each action needs to be useful within the context of strategic, long term action;
- Where possible and preferable consider how activities can continue beyond the period of the program;
- A concise list of actions that can realistically be achieved within the timeframe of the Plan.

This section covers the detail of the recommendations. Section 13 provides a summary of the actions, expected costs and timeframes for each of these actions.

12.1 Levels of intervention that could be undertaken

The sections above have discussed the barriers to efficient public lighting and options for intervention.

Table 10 summarises the different levels of intervention that may be considered to reduce energy consumption in street lighting.

These range from the simple to the more complex. The main differences as you move down the Options Table (from simple to complex) are:

1. Centralised costs and resourcing increase;
2. EDB's are likely to source the information more efficiently to make better and faster decisions;
3. Customers are better able to organise and gain fairer pricing and more acceptable delivery models; and
4. Delivering on targets will be easier to manage and report on;

The authors recommendation is to implement the intervention at Level 4 as this has the most chance of success in creating long lasting change in the sector at the lowest cost. Each option is discussed further in the remainder of this section. However, selection of one or more option in combination may also be chosen.

12.2 Areas of action

Below is a list of recommended areas for action as a result of this Strategy. These areas group a range of specific actions in a manner to make it easy to understand and measure.. These actions are based on the discussion of options earlier in this chapter, the results of consultation and how successful programs have been delivered in different areas. These areas for action are:

5. Introduce regulatory measures to phase out the use of energy inefficient HID lighting;
6. Provide communications support to the sector;
7. Deliver replacement programs in each Energy Distribution Business Area;
8. Address financial barriers;

12.3 Introduce regulatory measures to phase out the use of inefficient HID lights

HID lights are the most common road lighting type for Australian and New Zealand roads. There are a number of accepted technologies that can replace inefficient street lighting options. Just over half of all road lights (around 1.1 million) are inefficient Mercury Vapour lights.

Additionally it is estimated that there is approximately 4 times the number of Mercury Vapour lights in non-street lighting applications.

12.3.1 AIM

To assess the regulatory impact of mechanisms to require the replacement of existing inefficient lighting assets in order to remove disincentives (in particular for EDB's) to energy efficiency.

12.3.2 SPECIFIC RECOMMENDATION:

During the period of the Strategy develop an RIS to evaluate options to address the least efficient public lighting including options to:

- Introduce a Minimum Energy Performance Standard for lamps and/or luminaires;
- Introduce a Mandatory Energy Efficiency Target for street lighting;
    - o Include a detailed analysis of impact on non-street assets including the preparation of education materials/case study for non-street applications (see 10.1.1);

12.3.3 RESPONSIBILITY:

1. Equipment Energy Efficiency Committee under the auspices of the Ministerial Council for Energy.

Table 10: Levels of strategic intervention

Intervention Levels	Why do this?	Pros	Cons	Current status	If this was not done:
Level 1: Regulate	To require levels of energy efficiency within a set time	• Sets clear reduction targets; • Requires them to occur through a defined mechanism.	• Can lead to increased costs (capital); • May effect supply chains	Not begun	EDB's would have no need to drive energy efficiency
Level 2: Regulate and centrally communicate	As above *and* to provide information to help support and implement the change	As above *and*; • Reduces effort to make change; • Likely to lead to improved outcomes.	As above; *and* • Requires greater centralised resourcing.	Some information is available and being shared.	As above *and* decision making process may lengthen and/or result in perverse outcomes.
Level 3: Regulate, communicate and regionally co-ordinate	As above *and* provide further support to organise the program regionally. Essentially to delegate the actual program delivery locally. (and provide support if required to these regions).	As above; *and* • Improved information exchange and co-ordination; • Increased ability to communicate and ensure a fair cost and delivery model; • Aligning regional stakeholders will improve stakeholder relations and support under resourced groups.	As above; *and* • More complicated central support;	Currently underway to some level in many states and territories. Consistent, wide scale co-ordination is not available at the level required to deliver significant energy reductions.	As above, *and* expertise and ability to negotiate fairly is compromised. Costs to customers could increase – particularly in regions where collective action is ineffective.
*Level 4: Regulate, Communicate, Co-ordinate and Finance**	As above *and* to deliver low cost finance to make projects easy to deliver.	As above; *and* • Removes barrier of finding capital cost.	• As above.	Localised only.	As above *and* would result in higher than necessary cost (of capital) for customers.

**Finance can occur at any of Levels 1-3 also*

12.4 Strengthen and develop communications within and to the sector

The programs described above require strong communication and information support throughout the sector. Communications are an integral part of any successful Strategy. This action areas outlines the requirements of a national communications program.

12.4.1 AIM

All customers can access information that helps overcome barriers to energy efficient street lighting.

Effective face to face and web based support is available.

12.4.2 SPECIFIC RECOMMENDATION

Communication needs to occur on many levels including:

- National co-ordination to regional co-ordination;
- Regional co-ordination to region members;
- EDB to EDB (for approvals and trials information, for example);
- Customer to customer;

In addition this communication needs to be provided in many forms in order to reach those interested (e.g. the respondents to the surveys included many Urban Councils as well as representatives from Christmas Island and other remote areas of Australia). These forms include:

- Web based support information (SPL Toolbox/ RightLight program – recommend altering these existing resources before recreating);
- Communication of the other parts of the program and how to be involved. Email and webinars combined with recruitment of partner organisations to provide articles, web blogs and other promotional opportunities;
- Email and web based Q&A available for all to ask questions and communicate;
- Rolling national communications about the program (at least biannually in each major city and as many regional locations) and other street lighting issues generally including where information barriers were identified during the consultation for this program, such as:
    - Regulation and standards;
    - Energy Efficiency Solutions
        - Design;
        - Technical;
        - Policy

This could include producing a site that takes the best parts of the Righlight and SPL Toolbox websites and expanding the role of existing information storage and dispersal points with a focus on providing direct engagement and support to Customers and EDB's

Rightlight Road lighting - NZ

The RightLight.govt.nz/roadlighting website has been developed to provide a complete online source of tools and information to achieve optimal standards, designs and technical solutions for cost-effective road lighting in New Zealand.

Developed in conjunction with councils, the New Zealand Transport Agency (NZTA), road lighting specialists, Local Government New Zealand and members of the AS/NZS 1158 Standards committee.

The program includes training, tools and an online presence.

In NZ roadlighting is fully contestible with management split between the NZTA and local governments.

In addition the communication and development of specific materials is required including:

- Information creation for 'intelligent control devices' and electronic PE cells. This is expected to include the completion of trials, assessment and information development.

12.4.3 RESPONSIBILITY:

1. Federal co-ordination of the national strategy and information around this;
2. Potential support through NZ and/or ICLEI or similar;
3. Local and regional development and sharing of information;
4. EDB's to co-operate and contribute actively.

12.5 Deliver replacement programs in each Energy Distribution Area

There is a common list of barriers to energy efficient street lighting, however, these barriers have significant variations and nuances in different regions. These can be broadly managed and defined by considering the 15 energy distribution areas. Noting that of the 8 states and territories 4 of these have EDB's that cover the entire state. So the action would be a state based activity. In those locations with more than one EDB a state based approach may also be preferred.

This recommendation focuses on implementing and allowing for bulk change roll outs in each Distribution area nationally by 2014. Additionally it is to support and accelerate existing processes.

12.5.1 AIM OF THIS PRIORITY ACTION:

At the end of the 3 year Strategic plan period have at least 70% of customers able to access fairly priced energy efficient street lighting bulk change programs.

12.5.2 SPECIFIC RECOMMENDATION:

Distribution area specific consultation and support programs will be defined and implemented in each EDB area – supporting or building upon existing programs wherever possible. This would include the establishment of a steering group consisting of Local and State Government and the local EDB whose role it is to deliver the following:

1. Preparing for the regulatory measures that would require MV lights to be replaced by:
   - Identifying specific opportunities for influencing current investment choices to 2020 (e.g. currently in the Energy Australia area (NSW) a lighting program to replace major road lights is being designed (this will effect tens of thousands of lights over the next 5 years)) ;
   - Confirming technology options for energy efficient changeovers (and links to national approvals processes – see 10.4 Lighting Approvals);

Sustainable Public lighting toolbox

The SPL Toolbox was a website (http://www.iclei.org/index.php?id=6473) established in 2004 by ICLEI Oceania using funding by the Victorian and subsequently Australian governments. The Toolbox was predominantly aimed to provide information for local government.

The program includes training, tools and an online presence.

In NZ roadlighting is fully contestible with management split between the NZTA and local governments.

The Toolbox became the most heavily used of all ICLEI's sites (with over 600 hits each month) and included information on news and events, taking action to improve energy efficiency, state, national and international context, technologies and publications.

Up until 2007 it was largely a passive site and then a free Q&A service was developed. This service which ran for a few months resulted in around 50 enquiries and led to further information develop for the site.

In 2008 funding was withdrawn and the site has been dormant since.

– Allowing a simple buy-in processes (for customers) to opt in to replacement processes including:

i. Incremental spot replacement;
ii. Selected bulk changes;
iii. Council or region wide bulk changes;

2. Additionally co-operating with other actions including:
   – Provide communications support to the sector;
   – Addressing financial barriers;

Specific Outcomes:

- Complete a bulk change of lighting (at least 2,000 units) in each EDB Area in order to identify the real process and outcomes for future roll out by July 2013;
- Identify and confirm the best practice options for delivering a program roll out whilst managing pricing and competition;
- Sharing of information on lighting technologies and approvals occurs;
- Develop communication material with the EDB on how Local governments and other road authorities can take part in these roll outs, including:
  i. Business cases including cost, savings and financing;
  ii. Process;
  iii. Simplified engagement and project confirmation;

What if a region is already well on the way to implementing the recommendation above?

Some regions and areas already have many of these options underway or organised. For these regions the intent is not to supersede but to support and assist if relevant in meeting the aims of this Strategy.

12.5.3 RESPONSIBILITY:

1. Federal framework development and initial engagement with EDB's required. Possible engagement with regulatory bodies (e.g. around pricing);
2. Localised co-ordination from state authorities or LGA in that state;
3. EDB's to co-operate actively.

12.6 Remove financial barriers

Once the EDB's and customers have a clear and simple framework to deliver large scale energy efficiency projects then financial constraints are the main barrier (as discussed above – for some councils) to further implementation.

A simple way to address financial barriers would be to provide a simple process to programs that included sourcing finance from a third party. This third party should not be the local EDB, but instead an organisation like the Australian Carbon Trust, superannuation funds or other financiers. This is because the weighted average cost of capital through the EDB's is around 10%, whilst at a national level financing in the order of 4-6% should be possible.

This means the Customers would not have to find the budget to make the bulk change happen and would have access to affordable capital – removing the capital cost as a barrier for most projects.

The choice for Customers choosing to implement bulk changes would then be:

- Customer funds the program up front; or
- Funding upfront from a third party at low cost of capital (to be repaid through savings over lifetime). To be delivered through the regional roll out model;

At either of these steps incentive funding could be sourced as available.

Incentive funding is not recommended until a thorough assessment of program options and business cases are completed as part of the 3 year roll out preparation program. Once these assessments are completed this funding may be made available if:

- The programs identified do not have a positive return on investment;
- And the other applicable projects nationally are not sufficient to meet the targeted energy reduction.

12.6.1 AIM OF THIS PRIORITY ACTION:

Make available, simple financing for large scale street lighting programs.

12.6.2 SPECIFIC RECOMMENDATION:

A financial mechanism for street lighting energy efficiency programs is made available for the national street lighting program.

This funding to be released through distribution businesses at an agreed cost of capital by sourcing funding from lowest cost providers.

During this program Councils be offered the choice of:

- Funding the program up front; or
- Funding upfront from a third party at low cost of capital. To be delivered through the regional roll out model;

12.6.3 RESPONSIBILITY:

1. Federal Government - overall program management;
2. Other financial organisations (e.g. super funds, Australian Carbon Trust etc.) – further funding.
3. Regional co-ordination to draw in customers and provide shop front access to the program (as per 12.5 above);

13. Priority actions cost, timetable and responsibility matrix

Priority Action	Ref.	Stages	Timetable	Primary responsibility	Secondary responsibility	Estimated 3 Yr. Cost
Overall progam co-ordination		Overall progam co-ordination and advice to regional groupings	Established by Start of 2012. Funded until Start of 2015.	Central program (Fed/COAG/ E3 to sponsor))		$500,000
Introduce regulatory measures to phase out inefficient HID lights	12.3	Produce RIS	Completed by mid year 2013.	Central program (Fed/COAG/ E3 to sponsor)		$100,000
		Implement recommendations from RIS	Defer to RIS timetable.			
Provide support and education opportunities to the sector	12.4	Website update and maintenance	Upgrades complete mid 2012. Ongoing support through program	Public Lighting Toolbox or similar	Centralised delivery based on needs co-ordination from state authorities or LGA's.	$550,000
		Q&A service	Ongoing support through program	Technical Support provider		
		Training and information exchanges	Specific packages to be further defined during 2012.	Central program (Fed/COAG/ E3 to sponsor))	Various to be further ID'ed. Including Lighting Council and EcoSmart electricians.	
		Forums	Annual. Ideally during existing forums.			
		Webinars	Ongoing. First during first 6 months.			
Address lighting approvals	10.4	Information Creation	Program to begin during 2012. Delivery to be further refined.	Technical Support provider		$310,000
		Information Exchange	Web based information provided during first 6 months. Information exchange methods refined during the program.	Public Lighting Approvals Network or other	Discuss/partner/consult with ENA/other sector support bodies	
Deliver replacement programs in each EDB area	12.5	Workshopping and liaison with the different parties	Begin Start of 2012. Align all well established networks by EO 2012. Create new networks by SO 2013. Initial bulk changes complete in new networks by SO 2014.	Regional groupings to be supported or established. Support from LGAs and others required	Central program (Fed/COAG/ E3 to sponsor))	$600,000
Remove financial barriers	12.6	Financing options	Begin mid 2012. Models available So 2013. Depending on fed funding availability consider moving more quickly on this.	Central program (Fed/COAG/ E3 to sponsor))		External financing 00m-$1.2B)
				Total (exc. finance)	$2,060,000	

The estimated costs of the program are just over $2m plus access to external financing. The overall benefits of the program would be in the order of annual energy savings of between $35 and $52m for public lighting customers and greenhouse savings of 400,000 to 635,000 tonnes of greenhouse emissions. These savings would be achieved depending on the timetable for the regulatory approach and the financing support for delivering the projects. At the end of 2014 all aspects of the program should in place and each region ready to deliver projects on scale.

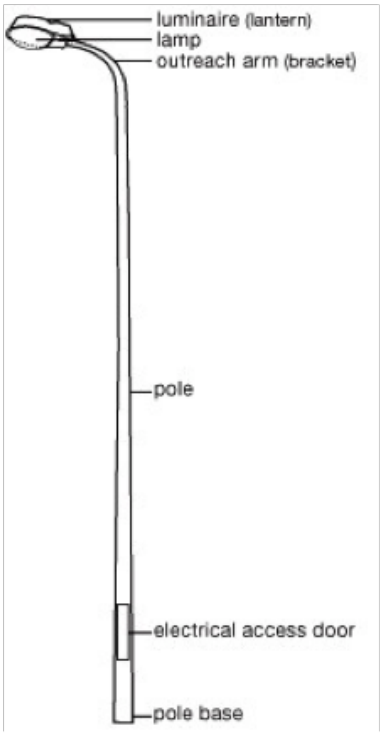
14. Risks for the program

Risk	How to manage
1. Financial	
1.1 Program costs not funded or insufficient;	Scale would need to be reduced and refined
1.2 Program runs longer than expected;	Build within all aspects either redundancy or long term funding/management ability
2. Completion of program does not result in large scale roll outs	Prepare Regulatory Impact Statement at the same time
3. Political risk from the regulatory approach	Provide support at a regional level to ensure costs are reasonable; Provide financing to manage the transition

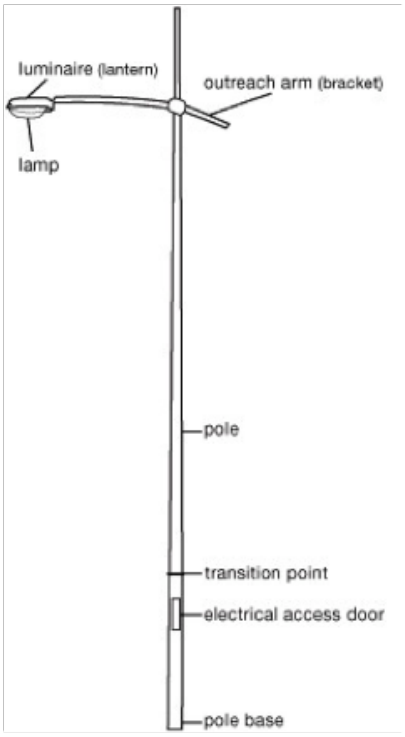
APPENDIX 1: Street Light Parts

Street lighting found in residential streets and main roads has standard or non-standard poles, both containing the same basic parts.

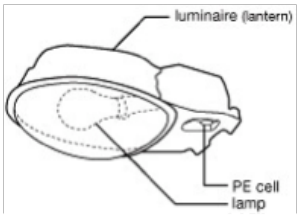
Figure 5: Diagrams of street lighting



Standard Pole



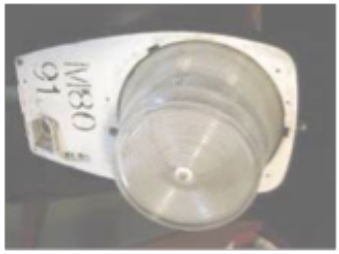
Non Standard Pole
(Lincoln)



A luminaire

1. Luminaire (lantern) – A device that distributes, filters or transforms the light given by a lamp or lamps and which includes all the items necessary for fixing and protecting these lamps. Examples of luminaires include 80 watt mercury vapour, high pressure sodium and T5.

Figure 6: Different types of street light luminaires



2. Lamp (globe) – The lamp emits light and is located within the luminaire (lantern)

   For example, a T5 luminaire will host two T5 lamps.

3. Photoelectric (PE) Cell – A device that is normally incorporated in a luminaire that detects outside light levels to automatically switch the luminaire on and off as required.

4. Pole

- Base –the lower section of the pole that is secured to the ground.
- Bracket- (outreach arm) – the supporting connection from the pole to the luminaire.

APPENDIX 2: Replacement options for current street light types

Mercury Vapour (MV)

Mercury vapour lamps are largely found in minor roads. In most states MV technology has also been widely used to replace older less effective technologies (such as T8 Fluorescents). They are an energy inefficient type of light that provides a white light appropriate for lighting designed for pedestrian use. The preference/need for white light for pedestrian safety is one determinant in identifying alternatives and has been confirmed through a formal de rating of all HPS lights for minor roads.

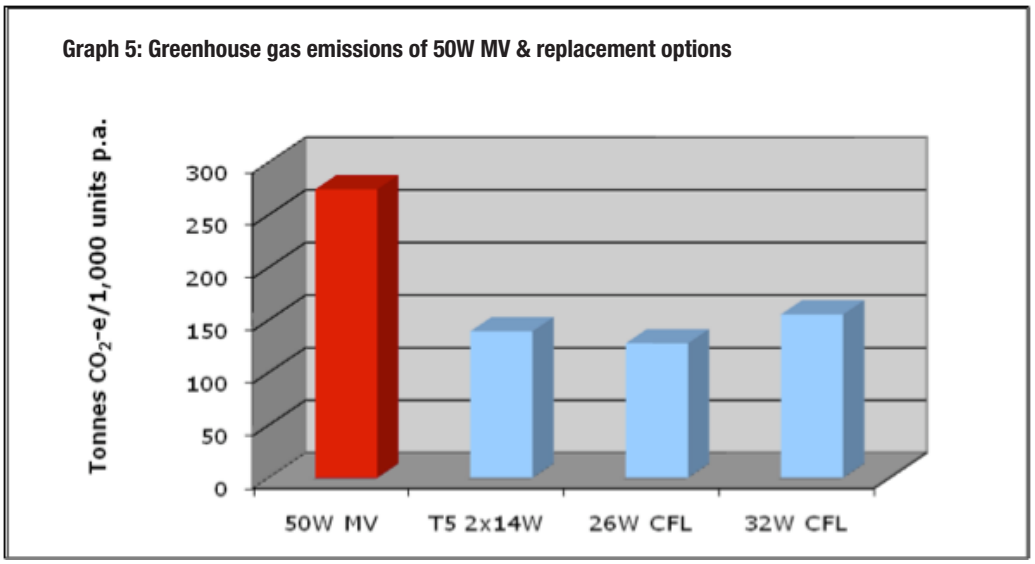
Current trials and roll outs of alternative efficient technologies have largely focussed on replacement options for 80W and 50W MV luminaires in minor roads. Alternatives include Fluorescents (T5 and CFL) and LED lights. Of which the 2x14W T5 and 32W CFL provide the most effective and efficient replacement technology

Large wattage MV lights have been largely replaced over the last 10-12 years with lower wattage HPS lights. A 150W HPS can replace a 250W MV and a 250W HPS a 400W MV. The HPS have longer life lamps and a lower rate of lumen depreciation. It is expected that the numbers of large wattage MV's will steadily decline over time.

50W MV

50W MV's are most commonly used in SE Queensland with smaller numbers found in most other states. They represent approximately 12% of national street lights and 5% of national street light GHG emissions.

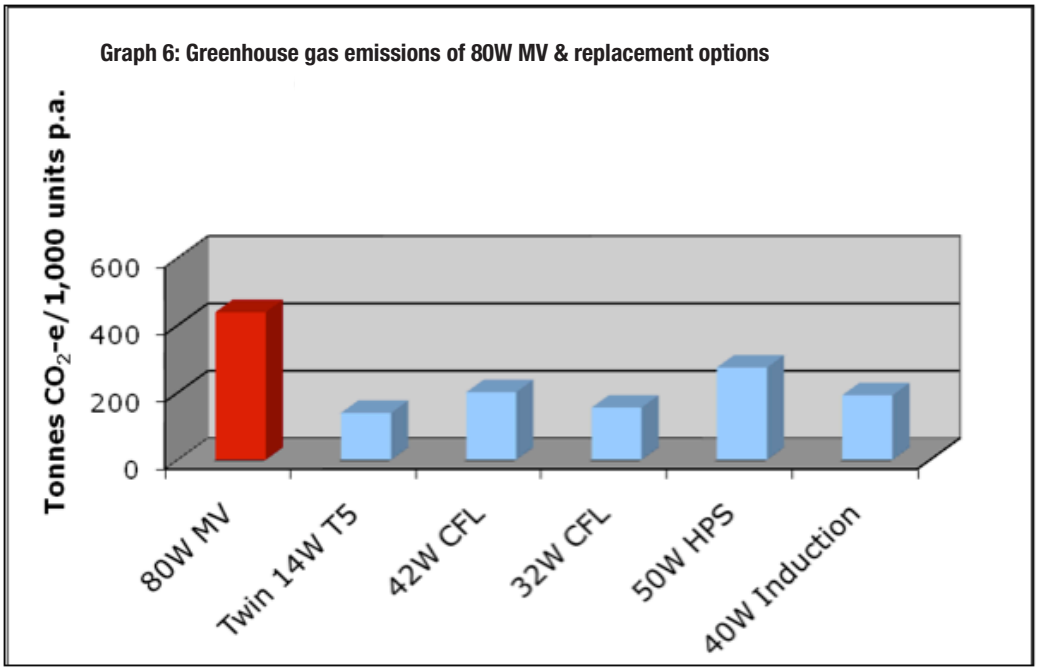
Graph 5: Greenhouse gas emissions of 50W MV & replacement options



80W MV

80W MV's are the most common street light in Australia and are found commonly in all states and territories. They represent approximately 39% of national street lights and 27% of national street light GHG emissions.

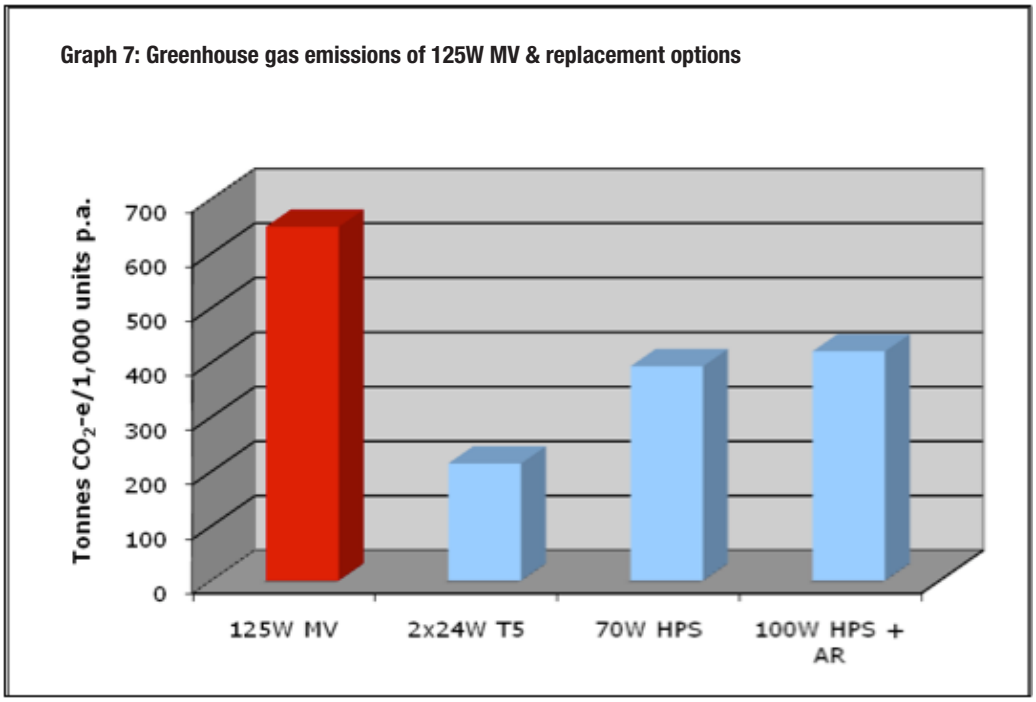
Graph 6: Greenhouse gas emissions of 80W MV & replacement options



125W MV

125W MV's are the normally used for areas of high use or to highlight traffic treatments such as roundabouts and speed humps. They represent approximately 4% of national street lights and 4% of national street light GHG emissions. 250W MV

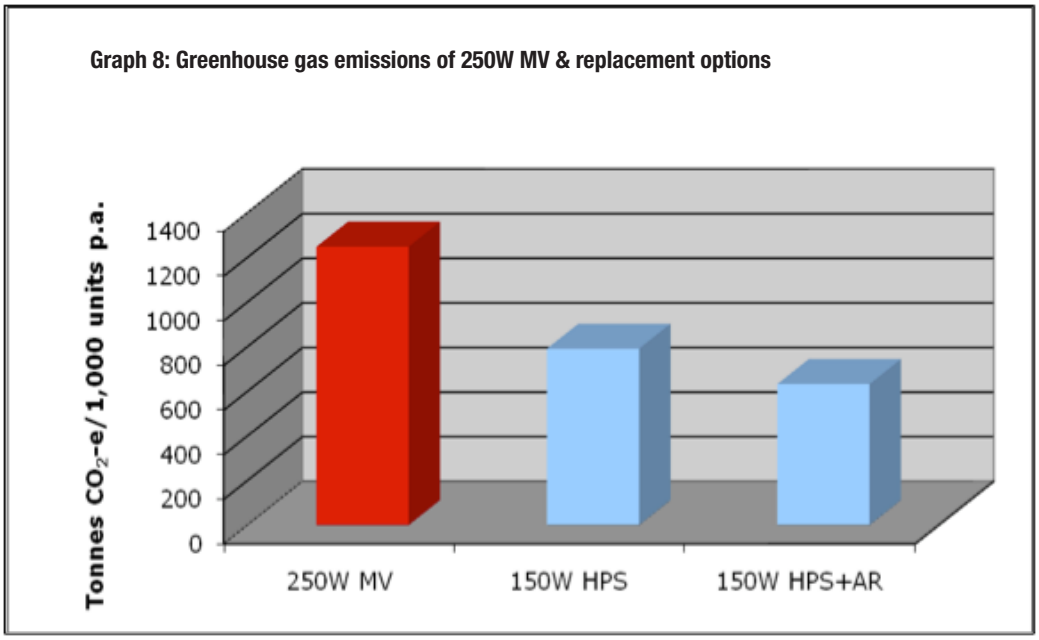
Graph 7: Greenhouse gas emissions of 125W MV & replacement options



250W MV

250W HPS's are used in arterial and major roads. They represent approximately 4% of national street lights and 8% of national street light GHG emissions.

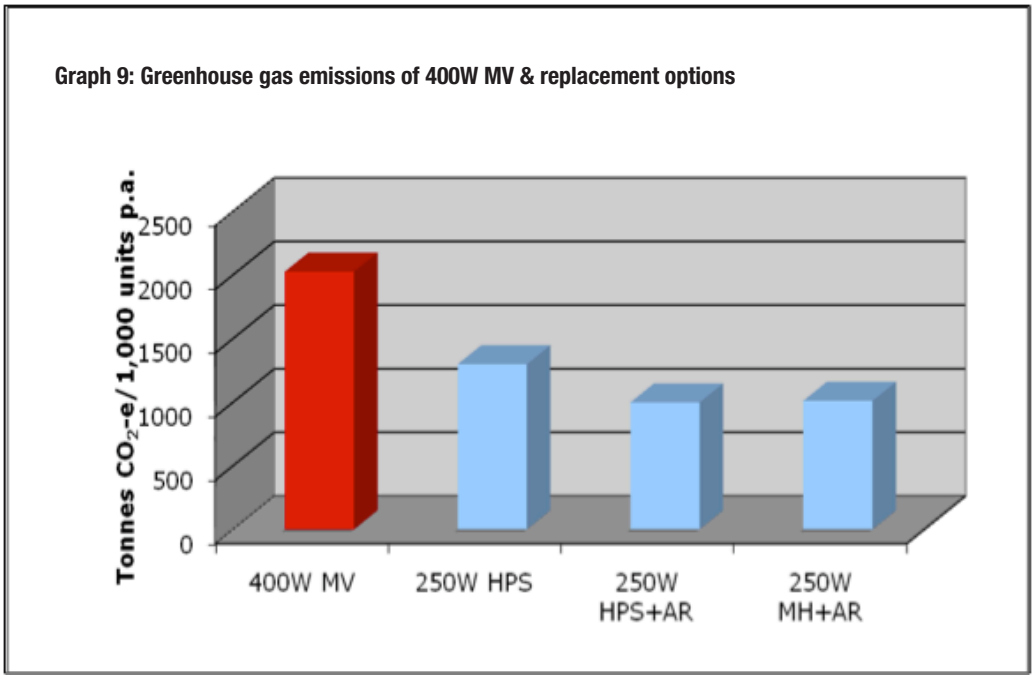
Graph 8: Greenhouse gas emissions of 250W MV & replacement options



400W MV

400W HPS's are used mostly on freeways and major intersections. They represent approximately 2% of national street lights and 8% of national street light GHG emissions.

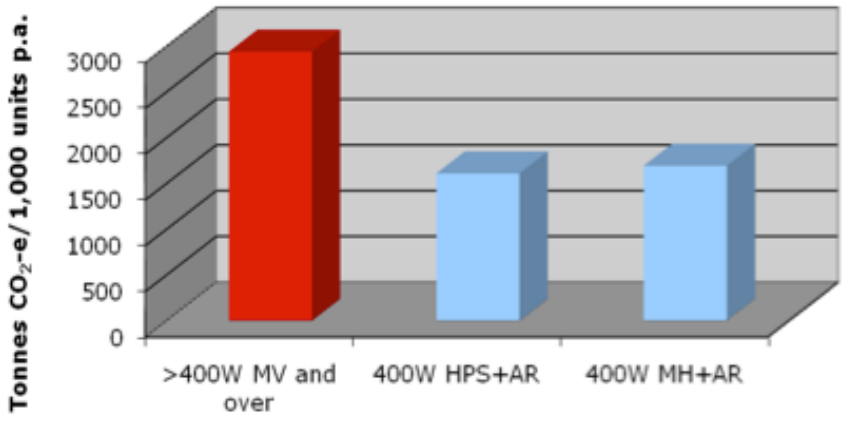
Graph 9: Greenhouse gas emissions of 400W MV & replacement options



Greater than 400W MV

There are few applications where street lights over 400W MV are required. The most commonly used lights in this bracket are 600W MV's. These are used in specialist applications like car parks for high use sites. They represent only 0.1% of national street lights and 0.5% of GHG emissions.

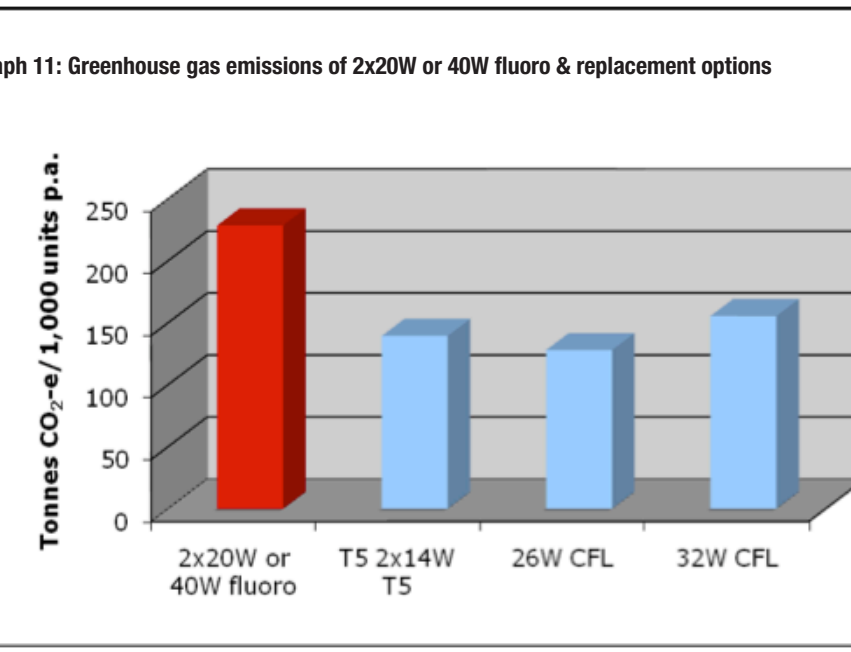
Graph 10: Greenhouse gas emissions of more than 400W MV & replacement options



Fluorescent (40W and Twin 20W T8)

In many areas 80W and 50W MV lights have replaced T8 fluorescent technology. This is because the T8 luminaires require more regular replacement of lamps, have in the past had lower quality luminaires (in terms of enabling moisture and dust to come into the lamp and control chambers) and provide poor lighting output. All the options below have significantly higher spacing characterics than the T8 fluorescents. They represent approximately 13% of national street lights and 5% of national street light GHG emissions.

Graph 11: Greenhouse gas emissions of 2x20W or 40W fluoro & replacement options



High Pressure Sodium (HPS)

High Pressure Sodium luminaires are largely found in higher wattage applications for major road lighting. The most common types of lighting in Category V lighting are the 150W and 250W HPS. These make up 75% of total major road lights.

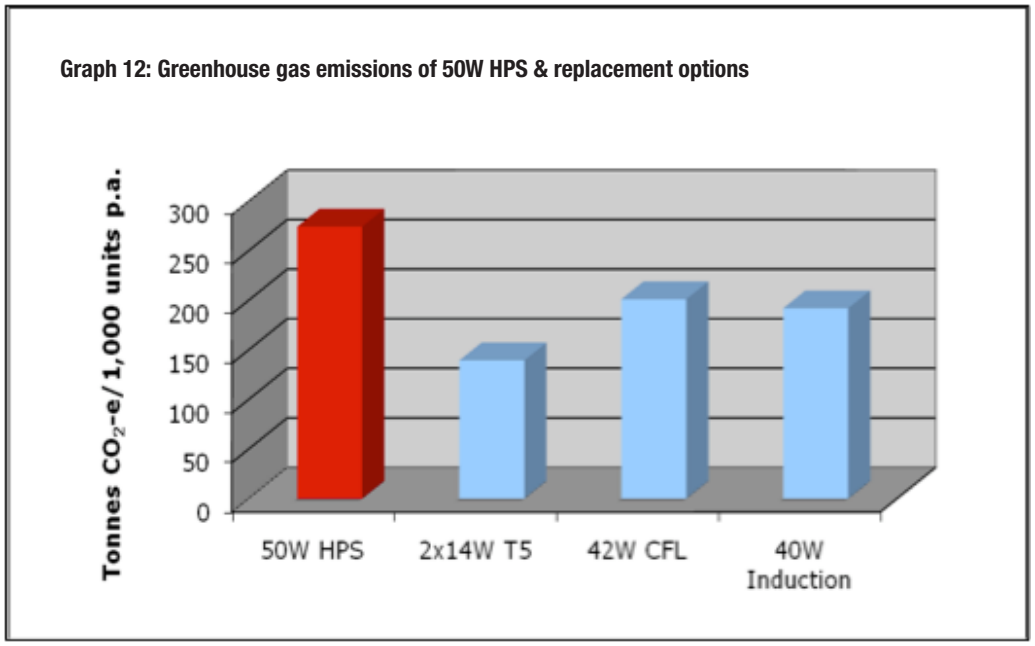
For pedestrian lighting in particular where pedestrian safety is the key purpose of this lighting there is strong evidence to support the use of white light in residential streetlighting. It is unlikely that HPS will continue to provide a large percentage of Category P lighting for minor roads into the future.

Recently the Australian Standards have reduced the rating of light output for design purposes on HPS lights for minor road lighting because of their colour rendition. This derating of 25% indictates the poor quality of yellow sodium lighting for colour and facial recognition by the human eye.

50W HPS

50W HPS's represent approximately 3% of national street lights and 1% of national street light GHG emissions.

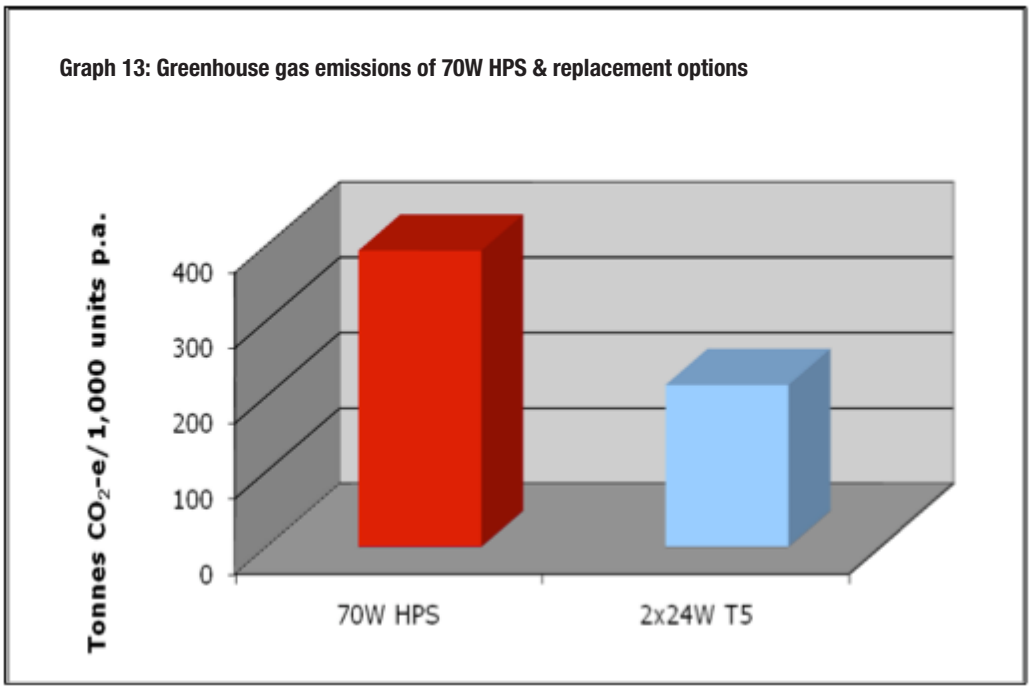
Graph 12: Greenhouse gas emissions of 50W HPS & replacement options



70W HPS

70W HPS's represent approximately 3% of national street lights and 2% of national street light GHG emissions.

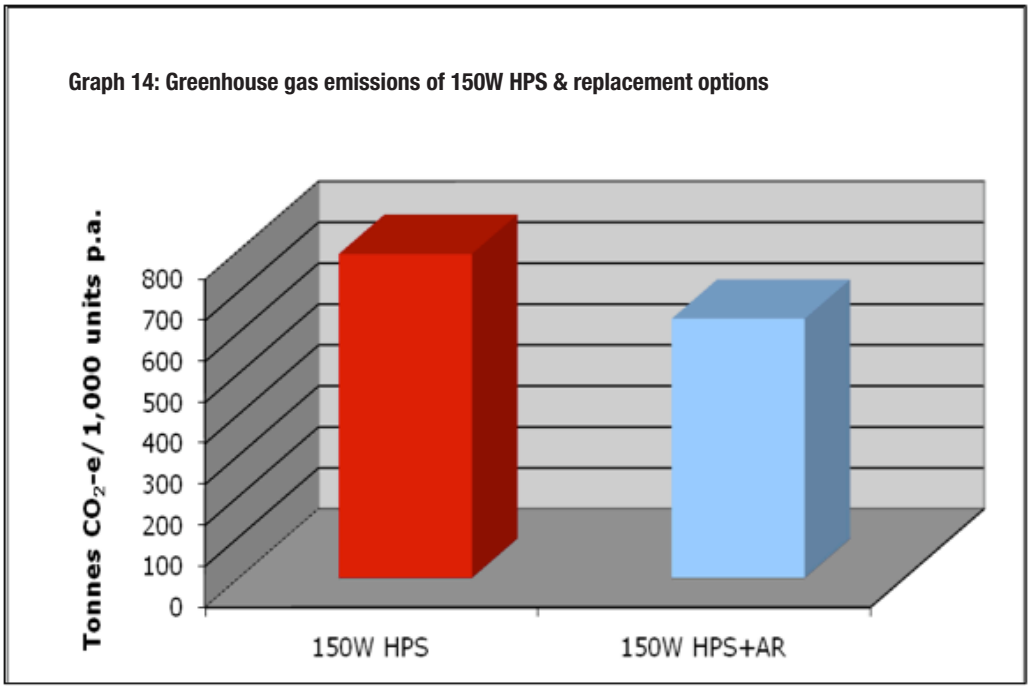
Graph 13: Greenhouse gas emissions of 70W HPS & replacement options



150W HPS

150W HPS's are very common and are used mainly in arterial and major roads. They represent approximately 9% of national street lights and 11% of national street light GHG emissions.

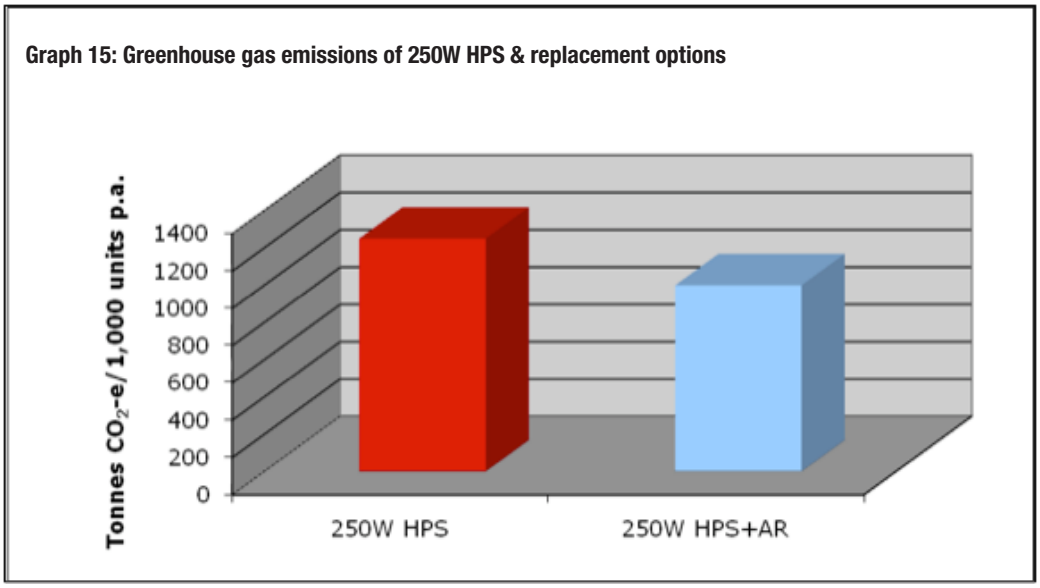
Graph 14: Greenhouse gas emissions of 150W HPS & replacement options



250W HPS

250W HPS's are the most common HPS light and the second highest user of street lighting energy in Australia. They are used mainly in freeways and major intersections where a high level of light is required. They represent approximately 10% of national street lights and 21% of national street light GHG emissions.

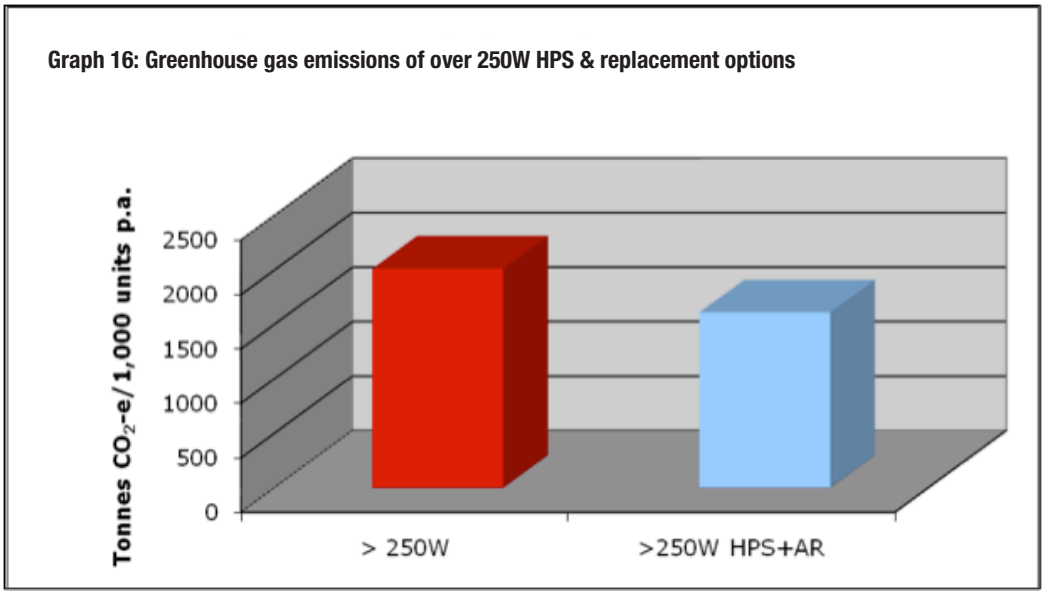
Graph 15: Greenhouse gas emissions of 250W HPS & replacement options



Greater than 250W HPS

There are few applications where street lights over 250W HPS are required. The most commonly used lights are 400W HPS with some 330, 275 and 600W units. These are used in specialist applications like car parks for high use sites. They represent around 1% of national street lights and 4% of GHG emissions.

Graph 16: Greenhouse gas emissions of over 250W HPS & replacement options



Efficient controls (inc. PE Cells, and dimming)

Energy efficient controls are very rarely used in street lighting. There are a number of reasons for this including the difficulty in applying dimming and other control measures to applicable Australian Standards for road lighting, cost and risk concerns.

Electronic PE Cells generally perform better than current cells at accurately maintaining a preferred switch on and switch off time. It is expected that the optimal PE cells will include cells that last twice as long as current cells and will save up to one hour per day based on the efficiency of the switching cycle. Trials completed at the Banyule test rig identified a common improvement of around ½ to 1 hour time savings. This represents energy savings of between 5 and 10% across the industry.[13]

Dimming requires the need for changed levels of lighting. This change can be controlled via timers, motion sensors or daylight sensors. Currently in Australia the most common road lighting standards are V3, V5, P4 and P5. These standards are close to the lowest lighting levels available under AS/NZS 1158. This means you could not dim the lights further and still meet the standards. It is not expected that on scale dimming would be an attractive widescale option currently in Australia.

[13] From Australian Sustainable Public Lighting Technical Acceptance, Part A: Technologies, trials and acceptance (November 2008). Ironbark Sustainability