Aurora ENERGY

ABN 85 082 464 622

MANAGEMENT PLAN 2011

PUBLIC LIGHTING

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			Reviewed by	ST
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1. PURPOSE

The purpose of this document is to describe, for Public Lighting and related assets:

- Aurora's approach to asset management, as reflected through its legislative and regulatory obligations and Network Management Strategy;
- The key projects and programs underpinning its activities for the period 2012/2013 to 2016/2017; and
- Forecast CAPEX and OPEX, including the basis upon which these forecasts are derived.

2. STRATEGY

The objective of the Network Management Strategy is:

> *To minimise cost of supply to the customer whilst:*
>
> *a. Maintaining network performance;*
>
> *b. Managing business operating risks; and*
>
> *c. Complying with regulatory, contractual and legal responsibilities.*

3. SCOPE

The assets covered by the Public Lighting Asset Management Plan are:

1. **Luminaires**: apparatus which distributes, filters or transforms the light transmitted from one or more lamps which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamp and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply (as defined in reference 1);
2. **Lamps:** the light source in a luminaire (as defined in reference 1);
3. **Control equipment:** to switch the luminaires on and off at sunset and sunrise respectively; and
4. **Support structures:** to hold the luminaire at the right height and angle and to provide safe support, insulation and clearance from the ground, vegetation and building infrastructures. Specifically, road lighting columns and wide based poles. Wide based poles replacement programs are managed as part of this asset management plan but are funded by both the Road Lighting and Underground Threads with a 50% split of costs apportioned to each thread. The Structures Thread manages dual-purpose structures supporting luminaires, other electrical infrastructure and the inspection programs of all support structures (reference 4).
5. **Underground wiring systems:** are underground electrical circuits that connect the luminaires to the lighting schemes connection point (point of supply). In general, the Underground Asset Management Plan (reference

5) documents Aurora's requirements for managing underground wiring systems.

4. DESCRIPTION OF THE ASSETS

Road lighting is to provide a lit environment for the safe movement of vehicular and pedestrian traffic during hours of darkness and to discourage illegal acts.

4.1 Luminaires and Lamps

A luminaire is an apparatus which distributes, filters or transforms the light transmitted from one or more lamps which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamp and, where necessary, circuit auxiliaries together with the means for connecting them to the electrical supply.

A lamp is the generic term for the light source in a luminaire.

Luminaires are classified by AS/NZS1158 Lighting for roads and public spaces (reference 1) into the following categories:

1. ***Category 'V'*** - generally referred to as *Major Public Lighting*, this category is used on roads where the visual requirements of motorists are dominant.
2. ***Category 'P'*** - generally referred to as *Minor Public Lighting*, this category is used on roads where the visual requirements of pedestrians are dominant. It is also applicable to outdoor public areas, other than roads, where the visual requirements of pedestrians are dominant, for example outdoor shopping precincts.

The appropriate lighting category for a particular road is a matter for determination by or in consultation with the road or traffic authority concerned (reference 1).

Appendix A lists the number of both public road lights and private contract lights that are billed to customers within Tasmania. (King Island and Flinders Island are excluded because they are outside of the area that Aurora is licensed to serve).

Appendix A.2 details the types of Major Public Road Lighting installed in the system. All new fittings installed for Major Public Road Lighting are High Pressure Sodium Vapour or Metal Halide with power factor correction installed.

Appendix A.3 details the types of Minor Public Lighting installed in the system. The current standard fitting used for replacement of Minor Public Lighting installations is an 80-watt Mercury Vapour with power factor correction fitted with a transition to move to the 42 watt compact fluorescent fitting as a more energy efficient option.

The manufacturers of both major and minor public lighting luminaires currently being supplied under contract to Aurora quote an expected asset life of 20 years.

Field crews initially inspect the luminaire when responding to faulty light reports. Depending on what is wrong with the luminaire, a decision is made to by the crew to either repair or replace the fitting. Maintenance is performed on the fitting during the execution of the bulk lamp replacement program as described in 9.3.4. Luminaires are generally not relocated or altered.

4.2 Control Equipment

Road lighting circuits are connected to the low voltage system for their electrical supply. Aurora uses the following three types of control systems to turn road lighting circuits on and off:

1. Pilot wire;
2. Cascade; and
3. Photo-Electric (PE) control.

Pilot wire and cascade control systems are similar in that they use a control wire to switch dedicated control relays. These relays energise a switch wire that will energise road lighting fittings up to 400 metres in any direction from the relay. As at August 2010, there are approximately 540 control relays in the system.

Photo-Electric (PE) controls are fitted to and control individual luminaires. There are two types of PE controls commonly used by Aurora. The first type is the “NEMA” PE control. This type is a twist lock socket base type fitting and is most commonly used for category V / major road fittings (> 100 watts). The second type is “D2” PE control. These fittings are generally fitted to category P / minor road fittings (<100 watts).

Pilot wire and cascade control systems are primarily used in road lighting areas in Hobart, Launceston and Burnie and Devonport. The remainder of the system is individually switched by photoelectric cell. It is planned to retain much of the pilot wire and cascade control system for Major Public Road Lighting with a transition to PE cell control for Minor Public Lighting throughout the state.

Control systems will be run to failure and only maintained or replaced on this event.

4.3 Support Structures

The types of support structures that are used for road lighting are:

1. Dedicated wood pole (private);
2. Dedicated steel pole (private);
3. Dedicated steel pole (Aurora surcharge);
4. Wide-based steel poles (Aurora owned); and
5. Dual-purpose poles (excluded from this asset management plan).

Approximately 75 percent of road lighting is supported on distribution system poles. The other 25 percent of road lights are installed on dedicated poles.

Aurora is responsible for the installation and maintenance of Aurora owned poles. These poles are usually poles that support overhead electrical distribution assets. Road Authorities (Local Councils and Department of Infrastructure, Energy and Resources (DIER)) are responsible for the installation and maintenance of privately owned poles. These poles are usually poles that are dedicated to support the public light only.

Table 1 details the breakdown of poles with public lighting attached.

Table 1: Poles with Road Lighting attached (as at Aug 2010)

Support Structure type	Aurora - Number
Dedicated Wood Pole (private)	1,662
Dedicated Steel Pole (private)	3,720
Dedicated Aurora Owned (surcharge)	1,039
Dual Pole Use (Aurora owned)	34,922
Wide Based Steel Poles (Aurora owned)	4,107
Total Poles with Road Lighting Attached	**45,450**

The Structures Thread manages Aurora owned poles.

5. FACTORS INFLUENCING ASSET MANAGEMENT STRATEGIES

The principal factors influencing asset management strategies are classified as per objectives set out in Section 2.

5.1 Minimise Cost of Supply to the Customer

- Ensuring cost effective trade-offs are made between pro-active and reactive maintenance programs
- Ensuring maintenance activities are managed cost effectively to achieve a reasonable service life from the asset; and
- Capturing adequate information on the assets to facilitate informed decision making.

5.2 Maintaining Network Performance

- Ensuring the general operational condition of the assets is maintained to an acceptable level for reliable function; and
- Targeting activities in areas where targets are not being met.

5.3 Managing Business Operating Risks

- Ensuring all risks are identified and have adequate management plans integrated into the business' practices.

5.4 Complying with Regulatory, Contractual and Legal Responsibilities

- Ensuring adequate monitoring and inspection activities cover legislative compliance requirements and duty of care safety obligations.
- A list of the legislative, regulations, standards and codes of practice directly relevant to the management of Public Lighting is provided in Section 14.

6. SPECIFIC ISSUES

6.1 Failures of Luminaires

The bowls on some older luminaires have shown degradation from exposure to weather, repeated handling (due to maintenance activities) and ultra violet light deterioration. There is also evidence of water and insect entry on some luminaires that indicate the seals on these fittings are failing.

6.2 Wide-Based Poles

Wide-based poles were first installed in underground subdivisions in 1974. As well as providing support for minor road lighting, they also provide servicing points for the adjacent house allotments. Pole inspections have indicated that these poles are reaching the end of their life, particularly in areas with corrosive soil or in seaside conditions.

Wide based poles are being replaced as required based on asset condition assessments by Aurora's pole inspection program (inspection funded by Structures Thread, replacement funded by Road Lighting and Underground Threads).

6.3 Road Lighting Columns

This program is for the replacement of steel road lighting columns that have Aurora Energy ownership, including 1,039 surcharge poles throughout the state. In general, within the state, municipal councils or road authorities own the road lighting columns. The surcharge poles were assigned Aurora ownership during the period of 1974-1981, when CBD areas throughout the state were being under grounded, due to the inability of the councils to fund the cost of installation. Hydro at the time funded the road lighting columns so that the projects would proceed with an ongoing surcharge arrangement set up with the respective authorities.

Road lighting columns are being replaced as required based on asset condition assessments by Aurora's pole inspection program (inspection funded by Structures Thread, replacement funded by Road Lighting Thread).

6.4 Non-Compliant Private Contract Light Installations

In 2009 the Road Lighting Project identified that approximately 1600 Private Contract Light (PCL) installations are potentially non-compliant with current electrical standards or are installed in such a way that cause issues for Aurora Energy and or our customers.

The most common non-compliance is direct connection of a privately owned asset to the electrical infrastructure without being controlled and protected by a compliant electrical switchboard.

Further details on this issue can be found in Reference 3 *Discussion Paper for Developing Strategies, Business Rules and Policies for all Non-Compliant UMS Installation Types*.

6.5 Non-Compliant Public Road Light Installations

From time to time, inspection, maintenance and other activities identify road lighting installations that are not compliant with either electrical standards or Aurora design manuals. An example of this would be electrical cables that are not buried to the correct depth. In the 2010 calendar year, two of these installations were discovered.

7. MANAGEMENT PLAN

7.1 Capital Expenditure

7.1.1 Reactive Replacement – Luminaires Major

This reactive replacement program caters for the replacement of major luminaires as they fail in service. Failures may occur for a number of reasons such as vandalism, accidents, lightning or asset failures.

The quantities forecast for replacement are based on historical figures (see Appendix B.1.).

This program addresses the issues identified in Section 6.1.

7.1.2 Reactive Replacement – Luminaires Minor

This reactive replacement program caters for the replacement of minor luminaires as they fail in service. Failures may occur for a number of reasons such as vandalism, accidents, lightning or asset failures.

The quantities forecast for replacement are based on historical figures (see appendix B.1.).

This program addresses the issues identified in Section 6.1.

7.1.3 Aurora or Road Lighting Authority (RLA) Initiated Design - Category V Bulk Replacement

This program may have a project initiated by a Road Lighting Authority (RLA) due to changes to roads or other infrastructure or be initiated by Aurora.

When initiated by Aurora, this program targets the replacement of Category V luminaires that are generally in poor conditions because of the following reasons:

1. Fittings that are identified as damaged beyond reasonable repair due to vandalism, accidents or other external events;

2. The bowls on luminaires have shown deterioration from exposure to weather, repeated handling and / or ultra violet degradation;
3. Luminaires have shown evidence of water and insect entry because the seals have deteriorated; or
4. The luminaire type has an unacceptable / increasing number of repairs being performed during fault response calls. These statistics are documented in Appendix B.1.

The current program aims to replace approximately 600 mercury vapour fittings per year until all the remaining mercury vapour major lights are replaced. See Appendix A.1 for current light numbers.

7.1.4 Aurora or Road Lighting Authority (RLA) Initiated Design – Category P Bulk Replacement

This program may have a project initiated by a Road Lighting Authority (RLA) due to changes to roads or other infrastructure or be initiated by Aurora.

When initiated by Aurora this program targets the replacement of Category P luminaires that are generally in poor conditions because of the following reasons:

1. Fittings that are found to be damaged fittings beyond reasonable repair due to vandalism, accidents or other external events;
2. The bowls on luminaires have shown deterioration from exposure to weather, repeated handling and / or ultra violet degradation;
3. Luminaires that have shown evidence of water and insect entry because the seals have deteriorated; or
4. The luminaire type has an unacceptable / increasing number of repairs being performed during fault response calls. These statistics are documented in Appendix B.1.

Information and guidance on which fitting to maintain or exchange are provided in the Road Light Maintenance Area Rule Bases (References 6 and 7).

7.1.5 Supply OH/UG New Street Light Installation

Aurora has two programs to supply new public lights when requested by Developers and Road Lighting Authorities:

1. No design required; and
2. Design required.

Details of these programs are given in the following sections.

No Design Required

This program is for the connection of new streetlights on existing Aurora Infrastructure. The light type is nominated by the RLA and compliance with AS/NZ1158 (reference 1) is not a requirement of the installation.

The volumes have been based on historical data.

Design Required

This program is for the design and construction of new public lighting for special projects such as new subdivisions, intersections and road junctions initiated by developers, municipal councils or government authorities.

For new subdivisions, the public light design is undertaken as part of the subdivision's electrical infrastructure design that includes the underground cabling and associated equipment.

The volumes are based on the historical data.

7.1.6 Replace Control Relays on Pilot and Cascade Control Systems

As part of the National Broadband Network (NBN) roll out in Tasmania, NBNCo is removing the switch wire in order to increase the height available on Aurora's poles to run optical fibre. Aurora will recycle components of relays removed as part of this project and retrofit to existing relays as they fail.

Whilst the NBN roll out in Tasmania continues, Aurora will run its existing fleet of control relays to failure until 2016/2017. Relays and cascade control systems will remain for CBD areas and arterial routes. The funding required for this program during the next seven years is artificially low due to the NBN and will be required to be increased in the period beyond this.

7.1.7 Replace condemned Wide Based Steel Poles

To address the issues outlined in Section 6.2 Aurora has a program to replace wide based poles that are condemned through condition based assessment.

The wide based columns provide support for minor public lighting within underground subdivisions, as well as providing servicing points of supply for the adjacent house allotments. This type of pole is replaced with a slim line steel road lighting pole and a turret to cater for the servicing. The capital cost of the new slim line will be negotiated with the relevant municipal council with the expectation that they will meet capital cost.

The quantities are based on historical figures.

7.1.8 Replace Public Lighting Columns

To address the issues outlined in Section 6.3 Aurora has a program to replace Public Lighting Columns that are condemned through condition based assessment.

All public light columns as described in 4.3 are routinely inspected every 3.5 years as part of Aurora's greater pole inspection program. Details of this inspection program are detailed in the Overhead System and Structures Management Plan.

The quantities are based on historical figures.

7.1.9 Audit and Rectification of Non-Compliant Private Contract Light Installations

To address the issues associated with non-compliant private contract light installations (refer Section 7.5) it is necessary to first understand the extent of the issues associated with these installations.

An auditing program is required to identify, capture, and clarify information regarding all non-compliant private contract light installations.

The program would see a suitably qualified person visit every Private Contract Light installation and describe in detail why each installation is regarded as being non-compliant or having some other issue.

To spread the funding requirements evenly, this program has been split into simple and complex connection types. 358 simple connections and 318 complex connections have been split over the 5-year period from 2012/13 – 2016/17.

The audit results will then be used to develop a plan to rectify the non-compliant installations. This rectification work will fall into two programs:

1. Rectification of non-compliant Private Contract Light installations
2. Re-establish new points of supply for non-compliant Private Contract Light installations.

Each program is broken into simple and complex installations with simple installations defined as those with a connection with one Private Contract Light and complex installations defined as connections with more than one Private Contract Light.

7.2 Operating Expenditure

7.2.1 Public Lighting Reactive Maintenance – General

The aim of this reactive maintenance regime is to inspect and repair lighting components that have failed, inspections occur as notified by customers through Aurora's Call Centre, advice from Road Lighting Authorities or Aurora initiated inspections.

When a faulty light is attended, if the fitting is in good condition and serviceable, the faulty component (usually the lamp, PE cell or fuse) will be replaced.

If the fitting is not serviceable, the fitting will be exchanged as part of one of the Reactive Maintenance Programs Replacement Programs (Sections 7.1.1 and 7.1.2).

The quantities forecast for replacement are based on historical figures.

Aurora Network has established its customer charter to reflect the requirements of the Tasmanian Electricity Code clause 8.2.3. The clause states 'a distribution network provider must repair or replace an item of public lighting within seven business days of being notified by any person that such repair or replacement is

necessary, unless the public lighting provider has contractual or other arrangements with another party'.

7.2.2 Public Lighting Audit – Night Patrols

To ensure that Aurora meets the requirements of AS/NZS 1158.1.2 Section 14.5.2, which requires the minimum service availability of lamps at a compliant public lighting installation to be 95% and to ensure that all major lighting schemes maintain the as designed illumination levels that provide a safe environment for the public, a night patrol program for major public lighting has been implemented. Night patrols are also necessary for Major Public Road Lighting because customers are unable, or it is unsafe for customers, to report faulty lights on major traffic routes.

The patrols are to be performed in the months of April (before the onset of the darker winter months), August (at the end of Winter when the lights have longer operating hours per day) and December (before the start of the holiday period).

7.2.3 Trials/ Evaluation of New Road Lighting Technology

Aurora is currently assessing the benefits and suitability of more energy efficient light fittings.

Aurora is currently establishing the parameters and business requirements for how the assessment of new public lighting technology is conducted, before we assess and trial the new lighting products themselves.

7.2.4 Bulk Lamp Replacement Program

The aims of the Bulk Lamp Replacement Program are to:

1. Maintain the light output levels of all public lights to the standards as set out by AS/NZ1158;
2. Maintain the public lighting assets in a manner that is efficient and cost effective; and
3. Reduce light failures by replacing the lamps and PE cells in accordance with the manufacturers specifications.

The bulk lamp replacement program is conducted on a 4-year cycle and includes:

1. The replacement of the lamp;
2. Replacement of the PE cell (if this is the method of control);
3. A condition assessment of the wiring systems, support brackets and mounting and protective fuses;
4. Cleaning of the diffuser.
5. Fixing of immediate safety issues; and
6. Testing to ensure the luminaire is operating after completion of work.

The program is split into two components:

1. Major Public Road Lighting; and
2. Minor Public Lighting.

The lamps that may fail prematurely will be repaired under the Road Lighting Repair and Maintenance work category (RLREM).

Coordinating the bulk replacement of category P light program (RLMIN) in conjunction with the bulk lamp replacement program (RLBLR) realises a more cost effective and efficient service delivery.

The bulk lamp replacement program also targets the removal of redundant switch wire conductor and the associated control gear (relay). As all fittings will eventually have individual PE cells fitted for control, the relays in targeted areas will become redundant. The first four-year bulk lamp replacement program (2008/2009 – 2011/2012) has targeted the removal of switch wire in remote townships where increased travel times to respond to faults increases costs. The second bulk lamp replacement program (2012/2013 – 2015/2016) will be targeting the removal of all switch wire and relays in category P areas.

A four-year bulk lamp replacement program has been chosen for the following reasons:

1. Most manufacturers of lamps commonly state that the average life of the lamps they manufacture is 20,000 hours, which, for a light on for 12.5 hours per day, gives a life of 1600 (20,000/12.5) days or 4.38 (1600/365) years. To avoid inefficient fault response or spot replacement costs, lamps should be proactively exchanged before they fail in service.
2. To ensure Aurora appropriately maintains lighting schemes that have been constructed to the Australian Standard for Public Lighting (AS/NZ1158). The standard stipulates a maximum maintenance cycle of four years for this category of lights. Lights that are not maintained to this standard will have a reduced light output level. A reduced light output level of a public light can increase the risk of accident / injury or incidents affecting members of the public. Any incident of this nature can expose Aurora to potential litigation and creates negative public image issues.

A four-year maintenance cycle has been factored into the network tariff build up for public lights.

8. PROPOSED OPEX PLAN

Table 2 shows the Public Lighting OPEX actuals from 2007/2008 to 2009/2010 and the proposed expenditure from 2010/2011 to 2016/2017.

Table 2: Public Lighting OPEX

Public Lighting	2007/08 ($m)	2008/09 ($m)	2009/10 ($m)	2010/11 ($m)	2011/12 ($m)	2012/13 ($m)	2013/14 ($m)	2014/15 ($m)	2015/16 ($m)	2016/17 ($m)
Maintenance	0.852	$1.525	$2.347	$1.937	$1.396	$2.627	$2.644	$2.597	$3.049	$2.955
Actual $$	$0.852	$1.525	$2.347							
Proposed $$				$1.937	$1.396	$2.627	$2.644	$2.597	$3.049	$2.955

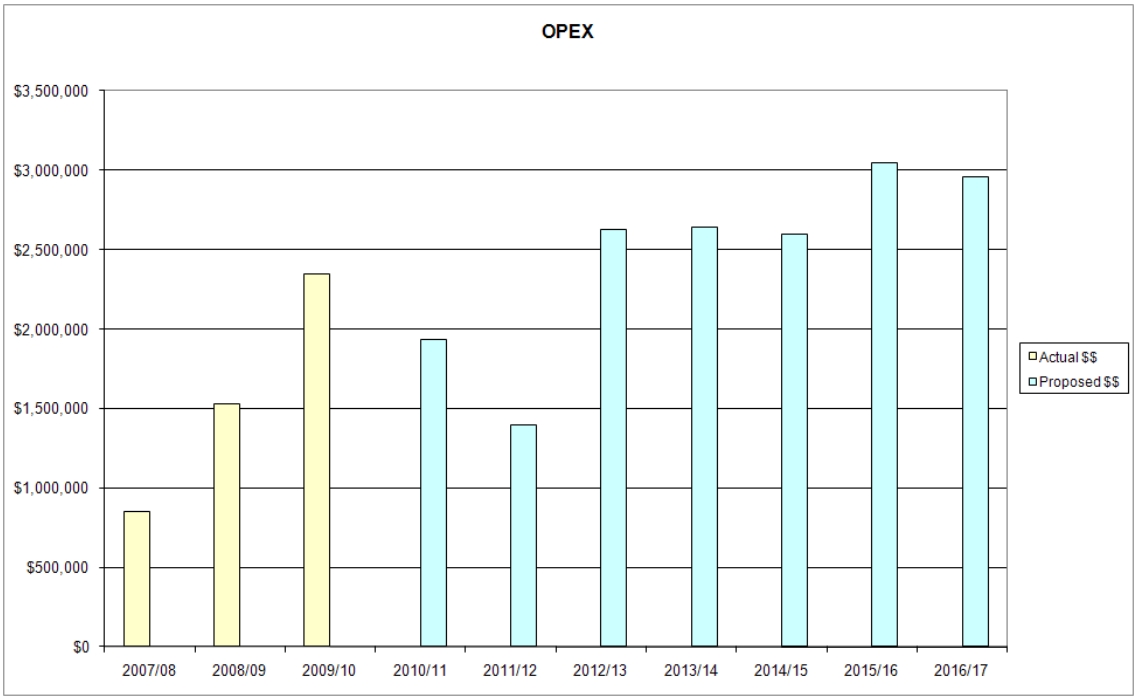

Figure 1: Public Lighting OPEX (Actual and Proposed)

The OPEX reductions in 2010/2011 and 2011/2012 as shown above have been adjusted to meet the OPEX cap as set by the Aurora Network management team. Reductions in the amount of discretionary spending in work programs such as the Bulk Lamp Replacement program (RLBLR) have been made to achieve the reduction.

The increase in expenditure in 2012/2013 is attributed to returning expenditure the required levels to keep the bulk lamp replacement volumes to the requirements that maintain a four-year replacement cycle.

The forecast increase in expenditure in 2016/2017 is attributed to the start of the third four-year cycle of the Bulk Lamp Replacement program. In this year it is forecast that all the 80-watt Sylvania B2224 fittings will have been replaced in the prior four-year maintenance cycle and there will be an increased number of luminaires requiring maintenance not replacement in this year.

9. PROPOSED CAPEX PLAN

Table 3 shows the Public Lighting CAPEX actuals from 2007/2008 to 2009/2010 and the proposed expenditure from 2010/2011 to 2016/2017

Table 3: Public Lighting CAPEX

Public Lighting	2007/08 ($m)	2008/09 ($m)	2009/10 ($m)	2010/11 ($m)	2011/12 ($m)	2012/13 ($m)	2013/14 ($m)	2014/15 ($m)	2015/16 ($m)	2016/17 ($m)
Major	$0.867	$1.340	$1.971	$1.590	$1.251	$1.339	$1.331	$1.315	$1.287	$1,.76
Minor	$0.620	$0.815	$0.916	$0.662	$1.048	$0.323	$0.317	$0.314	$0.243	$0.205
Actual $$	$1.488	$2.156	$2.888							
Proposed $$				$2.252	$2.300	$1.663	$1.648	$1.629	$1.531	$1.481

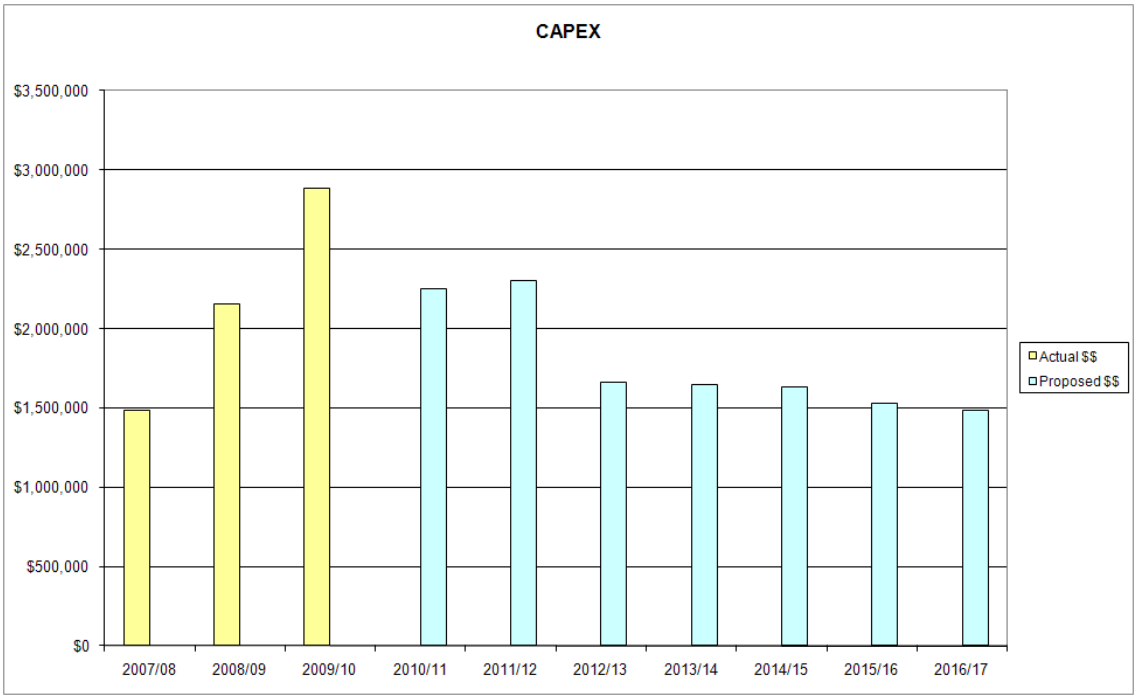

Figure 2: Public Lighting CAPEX (Actual and Proposed)

The reductions in capital expenditure are attributed to two factors:

1. Aurora has renegotiated with NBN and Aurora will no longer be budgeting for and funding the public light upgrades which enables the removal of the overhead switch wire from the Network assets, which in turn allows for the installation of the fibre optic cable.
2. The years 2008/2009 and 2009/2010 saw an increase in the number of new lights installed. This was driven by the Tasmanian government's investment in new major road infrastructure. For the next regulatory period it is expected that the level of capital expenditure driving the need for new lighting installations to return to the levels as experienced in 2007/2008.

10. CAPEX–OPEX TRADE OFFS

The operating expenditure programs are essential for identifying assets that require replacement for condition-based reasons.

Examples of this include the pole inspection program (managed by the Structures Thread) identifying work in the wide-based steel pole and public lighting columns programs and the Night Patrol Audits identifying reactive replacement work.

Planned preventative replacement of public lighting in the form of bulk replacement programs results in lower expenditure in reactive replacement programs.

11. ASSET MANAGEMENT INFORMATION

The condition of public lighting and associated equipment is based on failure rates and information obtained through the routine condition monitoring, inspections, testing and maintenance programs. WASP is used as the repository of the asset event and condition data, however the asset management capability is restricted due to the public lighting event and condition data being attributed to the pole the light is attached to. Asset standing data is stored in G/Tech a geospatial based Geographic Information System (GIS) where size, type, location and connection configuration is maintained for a majority of the fittings.

Aurora's Outage Management System (In Service) is also used to report faulty road lights for inspections/ repairs.

12. MANAGEMENT PLAN MONITORING

A review of this management plan will be conducted upon changes to external standards and codes of practice or upon changes to equipment purchased, with a review prior to each Pricing Determination period.

13. RESPONSIBILITIES

The maintenance and implementation of this management plan is the responsibility of the Metering Assets Manager.

Approval of this management plan is the responsibility of the Group Manager – Asset Performance and Information.

14. REFERENCES

1. AS/NZS 1158 Lighting for roads and public spaces
2. AS/NZS 3000 Electrical Installations (known as the Australian/New Zealand Wiring Rules)
3. Discussion Paper for Developing Strategies, Business Rules and Policies for all Non-Compliant UMS Installation Types (NW30072798)
4. Management Plan 2011: Overhead System and Structures (NW30161322)
5. Management Plan 2011: Underground System (NW30160588)
6. Road light Maintenance Area - Rule Base A (NW30009891)
7. Road light Maintenance Area - Rule Base B (NW30009892)

Appendix A **Public Lighting Populations**

A.1 **Total Population (as at 26 Aug 2010)**

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
Compact Fluorescent	Sylvania Suburban Eco	42	156
Compact Fluorescent Total			156
Fluorescent	Other	120	1
		160	1
		20	2
		40	29
		80	1
	Pierlite Greenstreet	48	24
Fluorescent Total			58
Incandescent	Other	100	1
		60	4
Incandescent Total			5
Mercury Vapour	Artcraft Flinders Encounter	80	17
	Artcraft Seaford Contempory	80	89
	Betacom Gough	80	11800
	Betacom Gough Aeroscreen	80	1
	Not Applicable	80	8
	Other	125	2
		250	10
		50	1
		80	206
	Rexel Optispan	250	49
		400	33
	Rexel Optispec	250	40
		400	71
	Sylvania	50	3971
		80	1
	Sylvania B2224	80	16517
	Sylvania Roadstar	250	109
		400	39
	Sylvania Suburban	80	938
	Sylvania Urban	125	2
		80	2

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
	Unknown	125	174
		250	1134
		400	1106
		50	101
		80	1114
Mercury Vapour Total			37535
Metal Halide	Other	150	9
	Rexel Sentry	250	1
	Sylvania Roadstar	250	28
	Unknown	150	1
		250	9
		400	5
Metal Halide Total			53
Sodium Vapour	Not Applicable	250	2
	Other	150	151
		250	88
		400	3
		70	79
	Rexel Optispan	150	1102
		250	1262
		400	86
	Rexel Optispec	150	56
		250	196
		400	19
	Rexel Sentry	250	8
		400	2
	Sylvania B2224	70	2
	Sylvania Roadstar	150	1969
		250	2346
		400	234
	Sylvania Roadstar Aeroscreen	150	4
	Sylvania Suburban	70	2
	Sylvania Urban	100	348
	Unknown	150	104
		250	164
		400	276
		70	89

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
Sodium Vapour Total			8592
		Grand Total	**46399**

A.2 Major Public Lighting Population (as at 26 Aug 2010)

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
Mercury Vapour	Other	125	2
		250	10
	Rexel Optispan	250	49
		400	33
	Rexel Optispec	250	40
		400	71
	Sylvania Roadstar	250	109
		400	39
	Sylvania Urban	125	2
	Unknown	125	174
		250	1134
		400	1106
Mercury Vapour Total			2769
Metal Halide	Other	150	9
	Rexel Sentry	250	1
	Sylvania Roadstar	250	28
	Unknown	150	1
		250	9
		400	5
Metal Halide Total			53

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
Sodium Vapour	Not Applicable	250	2
	Other	150	151
		250	88
		400	3
	Rexel Optispan	150	1102
		250	1262
		400	86
	Rexel Optispec	150	56
		250	196
		400	19
	Rexel Sentry	250	8
		400	2
	Sylvania Roadstar	150	1969
		250	2346
		400	234
	Sylvania Roadstar Aeroscreen	150	4
	Unknown	150	104
		250	164
		400	276
Sodium Vapour Total			8072
Grand Total			10894

A.3 Minor Public Lighting Population (as at 26 Aug 2010)

LAMP_TYPE	LUMINAIRE_DETAIL	NOM_RATING	Total
Compact Fluorescent	Sylvania Suburban Eco	42	156
Compact Fluorescent Total			156
Fluorescent	Other	120	1
		160	1
		20	2
		40	29
		80	1
	Pierlite Greenstreet	48	24
Fluorescent Total			58
Incandescent	Other	100	1
		60	4
Incandescent Total			5
Mercury Vapour	Artcraft Flinders Encounter	80	17
	Artcraft Seaford Contempory	80	89
	Betacom Gough	80	11800
	Betacom Gough Aeroscreen	80	1
	Not Applicable	80	8
	Other	50	1
		80	206
	Sylvania	50	3971
		80	1
	Sylvania B2224	80	16517
	Sylvania Suburban	80	938
	Sylvania Urban	80	2
	Unknown	50	101
		80	1114
Mercury Vapour Total			34766
Sodium Vapour	Other	70	79
	Sylvania B2224	70	2
	Sylvania Suburban	70	2
	Sylvania Urban	100	348
	Unknown	70	89
Sodium Vapour Total			520
Grand Total			35505

Appendix B **Failure Trends**

B.1 **Number of Maintenance Tasks by Luminaire Type (2004 to 2010)**

This table has been established from the data in document NW #30127559

Count of ID		Created Year Status							
		2004	2005	2006	2007	2008	2009	2010	Grand Total
LUMINAIRE_DETAIL	WATT_TYPE								
Artcraft Seaford Contempory	80MV					8	4	1	13
Betacom Gough	80MV	10	139	378	405	841	842	575	3190
Betacom Gough Aeroscreen	70SV						7		7
	80MV		2	1		3			6
Not Applicable	80MV							1	1
Other	100INC						1	1	2
	150MH		3	8	1	2	3	6	23
	150SV			3	26	10	9	4	52
	1x20FL			2					2
	250SV			2	24	8	4	6	44
	2x20FL			8	13	7	3	5	36
	50MV				1				1
	70SV		1	5	1	1	21	5	34
	80MV		2	16	20	7	17	20	82
Pierlite Greenstreet	2x24T5		1						1
Rexel Optispan	150SV	1	21	41	51	121	160	108	503
	250MV			2	4	4	21	1	32
	250SV	2	20	28	17	132	170	146	515
	400MV		1	1	2	5	8		17
	400SV			4	2	6	12	14	38
Rexel Optispec	150SV		2	16	9	14	10	10	61
	250MV			1		3	9	6	19
	250SV		6	28	23	13	14	19	103
	400MV				5	14	15	20	54
	400SV			1	3		2	1	7
Rexel Sentry	250SV			2	1		1	1	5
	400SV					1			1
Sylvania	50MV		10	84	52	129	170	149	594
	80MV							1	1
Sylvania B2224	70SV		1	1					2
	80MV	55	287	821	693	962	1329	1079	5226
Sylvania Roadstar	150SV		26	129	139	158	127	169	748
	250MV		4	9	4	11	12	21	61
	250SV		42	184	73	170	214	185	868
	400MV		3	2		3	5		13
	400SV		55	42	12	44	26	46	225
Sylvania Suburban	80MV		8	19	14	48	157	72	318
Sylvania Suburban Eco	42CF			1	2	2	5	18	28
Sylvania Urban	100SV			7	6	47	36	34	130
Unknown	125MV			4	10	8	24	12	58
	150MH			3	5	1	2	1	12
	150SV		6	20	8	17	22	6	79

	250MH			5		2	2		9
	250MV		52	124	126	150	155	99	706
	250SV		3	9	26	17	19	12	86
	400MV		19	61	44	94	144	91	453
	400SV		47	32	35	74	32	30	250
	50MV		3	15	33	26	20	12	109
	70SV		2	15	1	6	15	11	50
	80MV		10	41	24	103	93	77	348
Grand Total		68	776	2175	1915	3272	3942	3075	15223

B.2 Pilot and Cascade Relay Repairs

Task Description	2005	2006	2007	2008	2009	2010	Grand Total
Repair Relay ONE PHASE	2	2	1	1	6	8	20
Repair Relay THREE PHASE		2	2		7		11
Repair Relay TWO PHASE	5	11	6	9	19	5	55
Grand Total	7	15	9	10	32	13	86