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Philips Summary Paper of Australian Lighting Opportunities and Policy Suggestions

Summary

Numerous opportunities exist to improve the quality of Australian commercial and public lighting while significantly reducing both the total costs and green house gas emissions. However, most opportunities will only be achieved with the assistance of proactive joint industry-government policy actions.

As a supplier of consumer, commercial and municipal lighting applications, Philips has identified a number of areas where significant financial and environmental gains can be achieved for Australians with the technology available today. While the ban of incandescent lamps for consumers was a good first step, we believe the greatest change can be made in the area of Street, Office and Industrial Lighting.

Australia has asked consumers to make the switch. Now is the time for businesses and councils to all choose more efficient lighting solutions.

Philips sees three main areas where additional policy support would be beneficial for industry and the environment, these areas are summarised and further developed below:

1. Street and Municipal Lighting

- Federal Government to establish mandatory green procurement guidelines for public lighting purchasing through local councils.
- Support phase-out schemes for high pressure mercury, fluorescent lamps, incandescent light sources, electromagnetic ballasts and 'bare battens'.
- Develop new standards for public lighting to improve pedestrian safety.
- Support leasing schemes for energy efficient lighting renovations.

2. Office and Industrial Lighting

- Increase awareness of office and industrial lighting changes through consultation with Australian business community.
- Discourage use of T12 (38mm) fluorescent technology (40W and 65W) with electro-magnetic ballasts.
- Set targets for CO₂ per m² office/shop/building in consultation with lighting manufacturers and the lighting industry.
- Mandate lower mercury levels in fluorescent tubes current level of 15mg can easily be achieved.
- Promote green building awareness campaigns and initiatives through public bench-marking and renovation.

3. Recycling

- Promote additional recycling facilities and assist industry to create a financially viable scheme across Australia.

Philips' goal is to provide the Australian Government bodies with the tools to legislate effective energy management/climate change policy with respect to municipal and commercial lighting applications.

Overview of Current Lighting Landscape

Increasing demands from household and commercial lighting is a major contributor to the rise of greenhouse gases. Proven alternative lighting technologies exist that can significantly reduce the carbon footprint of lighting applications.

According to the International Energy Agency (IEA), on average 19% of worldwide electricity demand is accounted for by lighting. At a total cost of USD356 billion, this is equivalent to:

- The production of all gas-fired power generation or 1265 powerplants or 70% of world passenger vehicle emissions
- 1889 MtCO₂.

In Australia, lighting currently represents around 12 per cent of CO₂ or greenhouse gas (GHG) emissions from households, and around 25 per cent of emissions from the commercial sector¹. In 2005, Australia had electricity consumption per capita of 1282kWh per year, making it the second highest consumption worldwide behind North America.

Summary by Area of Opportunity

1. Residential Lighting

The recent Federal Government announcement regarding the ban of inefficient standard incandescent lamps is a world-leading decision that will have a significant impact in reducing GHG emissions. This reduction in emissions will ensue because:

- the choice to purchase inefficient light globes will not be available
- efficient technology is available to replace the incandescent light globe
- the cost and ease to switch to the energy efficient alternative is minor.

To maintain the GHG emission savings, it is imperative that the government:

- Legislates against other inefficient technologies
- Implements the adoption of minimum lamp efficiency requirements (CFLi; IRC halogen; LEDs) in consultation with lighting manufacturers and the lighting industry.
- Develops product quality standards for CFLi, IRC halogen and LEDs

2. Public Lighting

Another area where a significant reduction in GHG emissions can be achieved is in the area of public lighting.

Within Australia, public lighting costs approximately \$210 million over the 1.94 million lights, uses 1,035 GWh of electricity (0.57% of Australian total) and is responsible for 1.15 million tonnes of CO₂ emissions (0.63% of Australia's total GHG emissions from electricity). Public lighting electricity consumption has grown by 45% over the past 14 years and its projected annual growth is between 1.5 and 2%².

Of the 1.94million public lights, the breakdown between major and minor roads is tabled below.

Sector	Volume	Energy Used	CO ₂ emissions	Lamps Used
Major Roads	582K (30%)	549GWh (53%)	613,000 tonnes	High Pressure sodium – HPS (65.6%), Mercury Vapour – MV (33.0%)
Minor Roads	1.36 million (70%)	486GWh (47%)	537,000 tonnes	MV (69.3%), fluorescent (19.3% mainly NSW), High Pressure Sodium – HPS (7%), Other (3%)

The 80W mercury vapour (MV) lamp is the *de facto* standard for **minor** roads as it has been approved to Australian Standards AS1158.6 and is relatively inexpensive and reliable, with a service life of four years. However this lamp:

- has an efficacy of less than 40 lumens per watt, which decreases as the lamp ages
- provides less than 60% of its initial light output at end of life, thus providing very low levels of light for many thousands of hours beyond their useful life
- contains a large amount of mercury
- consumes about \$133 worth of electricity over its 4 year life and results in the production of 1.7 tonnes of CO₂³
- has poor colour rendition

A range of alternative products to MV are available that reduce GHG emissions. Due to the many alternatives available, a few are summarised below. Detailed information can be provided upon request.

Alternatives to MV lamps include:

- **Cosmopolis** (similar to ceramic metal halide discharge lamp)
 - 50%+ energy savings compared to traditional MV/HPL, and lasts longer, reducing GHG emissions and recycling burden
 - Compact size and low weight, reduces material use and transport volume
 - Low hazardous materials content
 - Improved optical performance
 - White light and a Colour Rendering Index (CRI) of 65, thus improving safety and providing a more socially attractive light
 - Optional dimming ballast that adapts the light level to the situation (to a minimum of 60% power and 50% light), again reducing GHG emissions
- **Metal Halide**
 - Ceramic discharge Metal Halide (CDM) and high pressure metal halide (HPI-T)
 - For new installations, these lamps require less luminaires and lamps than MV and have an improved CRI of 85.
 - The additional benefit of these lamps is that they use the same ballast/gear as the HPS lamps commonly used on major roads. This means the HPS lamps can be replaced with the metal halide lamps resulting in whiter light, better colour rendition and thus safety

An additional alternative light source to MV is fluorescent. Benefits of fluorescent include long life, energy efficiency, excellent colour rendering and lumen maintenance. Cost is currently the main factor for not using these lamps.

3. Office lighting

The average energy use of an office building in Australia is approximately 250kWh/m². Many offices, schools and other commercial premises still use the older T12 (38mm) fluorescent technology (40W and 65W) with electro-magnetic ballasts. However, these lamps can easily be replaced with T8 (26mm) lamps, 36W and 58W respectively, giving a 10% energy saving and 50% more light at the end of the tube life. This means that fewer lamps are required, saving both money and energy. To encourage adoption of T8 lamps, the importation of T12 lamps should be banned.

Even more energy can be saved and GHG emissions reduced with the T5 fluorescent system (with electronic ballast). This system:

- uses less wattage per m² than other fluorescent systems and
- its high light output results in fewer lamps being used, thereby reducing CO₂ emissions.

The Minimum Energy Performance Standards (MEPS) currently legislates that fluorescent lamps should contain no more than 15mg of mercury (Hg). However, to lower the environmental impact at end of life, the mercury content should change from 15mg to 5mg of mercury per lamp.

For smaller meeting rooms that use halogen or incandescent lighting, EasyDim, dimmable electronic ballast, provides energy saving by switching to linear fluorescent dimming without the need for complicated wiring changes.

The ideal lighting system, such as Philips Actilume, is one which is designed around each occupant. This automatic fluorescent dimming system regulates light by adapting light schemes to the use and surrounding office environment. The benefits of such a system include:

- movement and daylight detection
- up to 70% energy saving
- easy installation and use
- simple push button control of sensor mode to ensure automatic energy saving by incorporating on-off scheduling in open spaces and adjusting the level of lighting depending on the amount of natural daylight in the office.

4. Industrial Lighting

Quality industrial lighting is important not only for people's health and well being, but also their ability to perform tasks quickly and free from error. The lighting solution depends on the application.

Recommended industrial lighting includes:

- High Intensity Discharge (HID) lamps, including high-quality, high pressure sodium lamps (SON) Metal halide lamps (HPI) and Ceramic Discharge Metal Halide lamps (CDM)
- Fluorescent lighting, including T5 and Master TL-D Super 80 (26mm)
- Use of electronic control gear where required.

Due to the numerous lighting opportunities available, more detailed information can be made upon request. Furthermore, energy saving calculations can only be determined once a replacement system is selected and compared to the incumbent system.

5. LED – Solid State Lighting

A relatively new lighting technology currently gaining popularity as a decorative light source is LED or Solid State Lighting. This light is general used in signage applications and is a great replacement option for building light signs and coloured floodlighting in public spaces.

6. Recycling

A national approach between government and industry must be developed to assist the community in the recycling of lamps.

At present limited recycling options are available in Australia and this is an area in which significant in-roads can be made. However with few recycling facilities in Australia we must be cautious in the approach to collection and disposal so as to create a viable financial model without the creation of mercury hot spots.

¹ Media Release The Hon Malcolm Turnbull MP 20 February 2007 T11/07

² Kevin Poulton & Associates, Genesis Automation and Deni Greene Consulting Services for the AGO in the Department of the Environment and Heritage, *Public Lighting in Australia – Energy Efficiency Challenges and Opportunities. Final Report 2005.*

³ Calculation based on load of 96W operating for 4,341 hours per year and electricity costs of 8 cents per kWh. The CO₂ emissions are based on 1kg CO₂ per kWh.

⁴ Exergy Australia Pty Ltd Website: Exergy Making Energy Efficiency Work for you