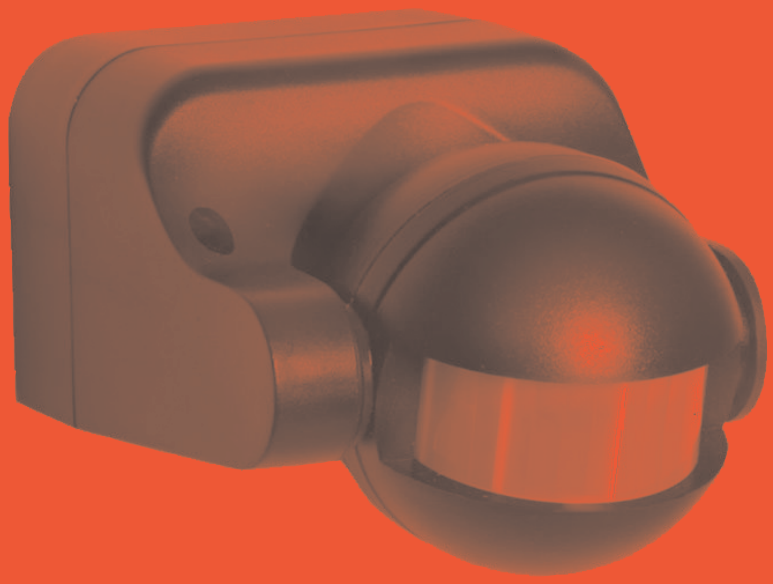
STANDBY PRODUCT PROFILE 2004/11

NOVEMBER 2004

PRODUCT PROFILE



MOTION SENSORS & SENSOR LIGHTS

AUSTRALIA'S STANDBY POWER STRATEGY 2002 - 2012

AN INITIATIVE OF THE MINISTERIAL
COUNCIL ON ENERGY FORMING
PART OF THE NATIONAL
GREENHOUSE STRATEGY

The National Appliance and Equipment Energy Efficiency Committee seeks comment on this proposal from any interested person or organisation.

Please email comments to:

energy.rating@deh.gov.au

Alternatively, hard copy comments can be mailed to:

Equipment & Appliances Team
Australian Greenhouse Office
Department of Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

Comments received by 28 February 2005 will assist in determining the final form of the policy proposals taken to government.

An electronic version of this Standby Product Profile and other Profiles released for public discussion can be obtained from www.energyrating.gov.au

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PRODUCT DESCRIPTION

This profile covers mains-powered sensor lights as well as mains-powered motion sensors typically used to switch 240V loads. It does not cover sensors used in alarm system applications, which do not switch loads and typically require 12 volts DC power. These are dealt with in a separate standby profile for security systems.

Motion sensors are used to detect movement in order to switch equipment on and off, usually outdoor or indoor lighting. They generally employ an infra-red detector and often include a photoelectric cell which prevents operation during daylight hours. Most units also incorporate an adjustable timer to switch off equipment after a pre-set time has elapsed. Figure 1 depicts a typical motion sensor.

Motions sensors are often packaged with lamp fittings and sold as 'sensor lights'. These are usually a single unit complete with sensor, lamp(s) and lamp holder(s). Typically sensor lights are placed in outdoor areas where illumination is required for short periods - for example in driveways or pathways. They provide night access lighting and also serve as a deterrent for intruders. Figure 2 depicts a typical sensor light.

For both motion sensors and sensor lights, it is the detector unit which continually consumes standby power in order to sense motion. When the sensor detects infra-red radiation, it produces an electric signal. A rapid change in radiation levels (generated by movement) energises the relay switch within the unit. If the unit incorporates a light level sensor, the relay can only be energised at night. If the unit incorporates a timer, then the relay will de-energise after a pre-set period of time.

FIGURE 1 TYPICAL MOTION SENSOR

FIGURE 2 TYPICAL SENSOR LIGHT

CURRENT OWNERSHIP AND SALES TRENDS

Motion sensors and sensor lights are commonly used in homes and businesses. ABS survey data [ABS 1999] showed that around one third of houses (not including apartments) had at least one sensor light in 1999. This was equivalent to around 2.1 million dwellings, some of which would have had more than one sensor light fitted. In addition, some houses would have had motion sensors installed to operate equipment other than lighting, and were therefore not recorded in the survey. Manufacturers' data indicates that sales of sensor lights and motions sensors have grown at around 5% p.a. over the last three years. Given this information, and allowing for an increase in the housing stock since 1999, the number of motion sensors and sensor lights in Australian houses is currently estimated to be around three million.

Discussions with manufacturers revealed that combined sales of motion sensors and sensor lights were around 400,000 in 2003. Based on an estimated life expectancy of 10 years, this suggests a current total stock of around four million units. Therefore an estimated one million products exist in commercial, industrial and apartment buildings.

RELEVANT MODES FOR THE ONE WATT POWER PLAN

Motion sensors and sensor lights ordinarily operate in two modes. 'On-mode' occurs when the motion sensor has been activated, the relay energised and the lamp or other device is switched on. For sensor lights, energy consumption in on-mode includes the energy consumed in the lamp as well as in the motion sensor. On mode power consumption is not relevant to the standby power plan.

'Standby mode' occurs when the relay is not energised but the sensor unit is drawing power in order to sense movement. In the units tested, no significant difference in standby mode consumption was observed between night and day operation.

'Off mode' in appliances is generally when the appliance is plugged into the mains but switched off with a 'hard' switch. However this mode rarely applies to motion sensors and sensor lights.

The majority of sensor lights are hard wired into homes and businesses (they are purchased without a mains plug, similar to a conventional light fitting). Motion sensors are also purchased as stand-alone units, incorporating an electrical terminal block used to permanently connect mains wiring.

Of 64 households surveyed as part of a NAEEEC 2001 household study [NAEEEC 2001], only one house had a sensor light with a mains lead and 240V plug attached. In this case it is likely that the mains lead was wired onto the sensor light by the installer, for ease of connection to the mains supply.

Anecdotal evidence suggests that the majority of motion sensors and sensor lights are wired either without a hard off switch, or with a hard off switch (i.e. conventional light switch) which is rarely switched off. Hence it is assumed that, on average, typical motion sensors and sensor lights operate in standby mode for around 23 hours per day.

KNOWN STANDBY DATA FOR NEW PRODUCTS AND INSTALLED STOCK

Standby power consumption data for a wide range of motion sensors and sensor lights was obtained from several sources including: the NAEEEC 2001 household survey [NAEEEC 2001]; information supplied by product manufacturers; measurements taken at a number of households; and measurements of a number of sample products supplied by manufacturers. Figure 3 depicts this data, which is considered to be representative of the Australian stock of motion sensors and sensor lights.

Figure 3 shows that standby power consumption ranges from 0.2 W to 1.5 W, with the majority of tested products using 1.0 W or less.

On a sales-weighted basis, the average consumption in standby mode was 1.0 W. No correlation was found between standby power consumption and additional functionality of the products tested, such as daylight detection or timer.

No evidence was obtained to suggest that standby power in these products has changed over recent years. However the development of lower-consumption units, such as the product consuming only 0.2 W, indicates that reductions are feasible. This particular product is soon to be released onto the market. It should also be noted that the power factor measured in all devices was poor, at around 0.1.

GREENHOUSE EMISSIONS

The stock of motion sensors and sensor lights is estimated to be four million and these products are assumed to be in standby mode for 23 hours per day. The average standby mode consumption of 1.0 W is unlikely to have changed significantly in the last 10 years, nor is it likely to change in future without some Government intervention. Given this data, it is calculated that motion sensors and sensor lights are currently responsible for the emission of an estimated 32,000 tonnes CO_2-e per annum in standby mode.

Sales are currently growing at around 5% per annum, and if the stock grows at 3% p.a. in future, emissions could reach 46,000 tonnes p.a. by 2020. The projected greenhouse gas emissions for the business-as-usual (BaU) scenario are illustrated in Figure 4.

Given the low power consumption of at least one new product, NAEEEC considers that a limit of 0.25 W could be achieved with some care in design. If this level is achieved for all new products by 2012, significant greenhouse gas savings are possible, as illustrated by the 'with Improvements' curve in Figure 4.

The greenhouse emissions reduction potential for this proposed standby target (0.25 W for new products by 2012) is estimated to be around 4,000 tonnes CO_2-e p.a. by 2010, and 15,000 tonnes p.a. by 2015. Cumulative greenhouse savings to 2015 are estimated at 60,000 tonnes.

FIGURE 3 STANDBY POWER DATA FOR MOTION SENSORS AND SENSOR LIGHTS

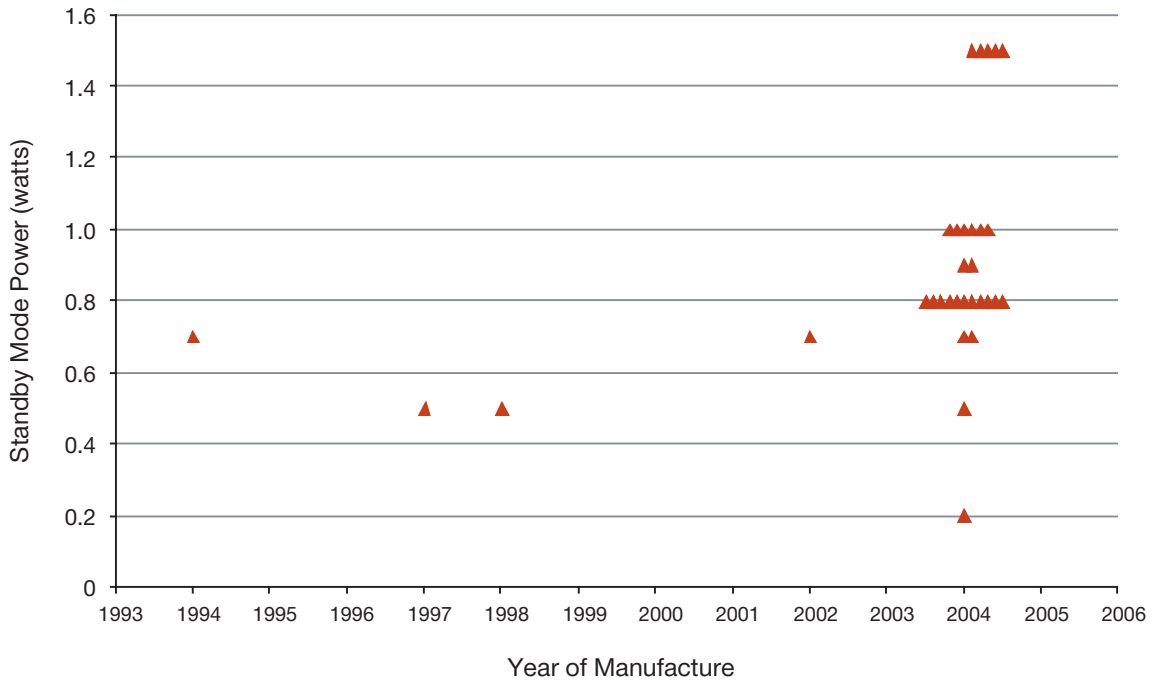
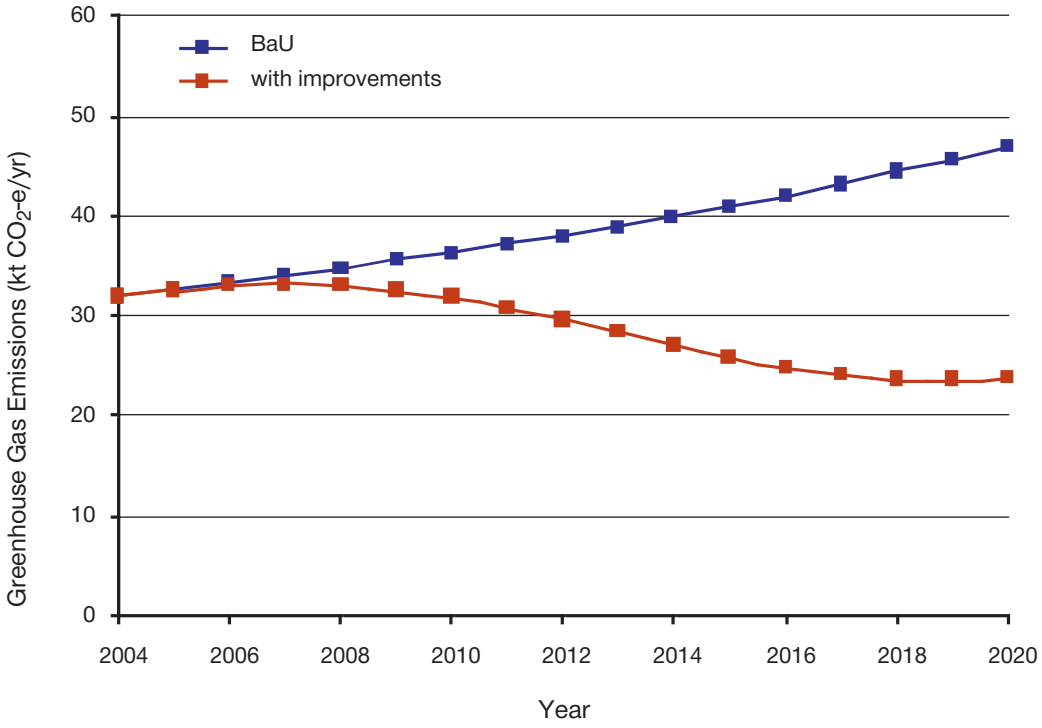


FIGURE 4 GREENHOUSE GAS EMISSIONS FROM MOTION SENSORS AND SENSOR LIGHTS



CURRENT OVERSEAS POLICIES AND TRENDS

There are no known international regulations applying to the standby energy consumption of motion sensors or sensor lights. However countries such as the US and Korea do encourage the use of sensor lighting over manually-switched lighting using a certification scheme.

The US Energy Star program (www.energystar.gov) awards a label to products that meet key voluntary energy efficiency criteria. The Energy Star criteria for 'Residential Light Fixtures' includes criteria for 'Outdoor Light Fixtures' [Energy Star 2003]. Outdoor light fixtures can either qualify for the Energy Star label by using an efficient light source (effectively a fluorescent lamp), or by having an integrated motion sensor with automatic shut-off timer. Both varieties must contain a daylight sensor to prevent operation during daylight hours. The Energy Star criteria do not include requirements for standby energy consumption of the sensor units.

The standby energy consumption of sensor lights and motion sensors has not been investigated in any depth either in Australia or overseas prior to this standby profile.

GOVERNMENT TARGET

In accordance with the National Standby Strategy, NAEEEC intends to recommend to the Ministerial Council on Energy an 'interim' target of 0.75 W by 2008. This will provide Governments with confidence that Australian products will meet the ultimate target of 0.25 W in 2012. If the 'interim' target is not met in the specified year, Governments will commence dialogue with industry to explore other options, including the possibility of moving to Stage Two mandatory measures.

The proposed targets for motion sensors and sensor lights are developed in the context of what is achievable.

1. INTERIM TARGET - 2008

Standby Mode (W)
Less than 0.75

This target applies to all motion sensors and sensor lights sold in Australia in that year. NAEEEC proposes to monitor the sale of these products in that year and to move toward regulation should that target not be met by a significant number of products.

2. NATIONAL STANDBY STRATEGY TARGET – 2012

Standby Mode (W)
Less than 0.25

This target should apply to all motion sensors and sensor lights from 2012.

Compliance with these targets is to be based on tests in accordance with AS/NZS 62301(Int):2003 'Household electrical appliances—Measurement of standby power'. The power consumption targets for motion sensors and sensor lights will be included as a new part of AS/NZS 62301 during 2005.

GOVERNMENT PROPOSALS TO MEET THIS TARGET

Government agencies intend to take the following actions to assist industry meet the standby targets for motion sensors and sensor lights.

Voluntary Tool Available	Action / Rationale	Date
Government procurement list	• MCE are considering a policy of preferencing the purchase of low standby motion sensors and sensor lights where available and fit for purpose. Qualifying products to be included on the government Energy Allstars procurement database.	2005/6
Australian Standard	• To communicate government expectations in a new part of AS/NZS 62301.	From 2005
Annual survey	• To collect data on new motion sensors and sensor lights and analyse trends. This data will be published annually.	ongoing

Government will announce whether this product should be targeted for stage two intervention under the National Standby Power Strategy (involving possible regulatory intervention) or whether the abovementioned actions together with industry intervention have been successful in meeting the target at the NAEEEC Forum in the year:

2009

REFERENCES

ABS 1999 Australian Bureau of Statistics, Home Security Precautions New South Wales, 4516.1, October 1999, Additional data for this report, sourced by telephone from ABS.

Energy Star 2003 Energy Star Program Requirement for Residential Light Fixtures, Eligibility Criteria, Version 3.2, 2003.

NAEEEC 2001 *Quantification of Residential Standby Power Consumption in Australia: Results of Recent Survey Work*, for the National Appliance & Equipment Energy Efficiency Committee, by Energy Efficient Strategies & EnergyConsult, April 2001.