

Basket of Products

A means of regularly measuring new product releases to track global standby power trends

Introduction

Standby power consumption, which is the power used by appliances when they are not performing their primary function, has been recognised as one of the most cost effective potential end-use energy efficiency measures. While the amount of standby power varies markedly between countries, the global energy consumption from standby has been estimated by the International Energy Agency (IEA) at between 200 TWh and 400 TWh per year.

Studies in Australia have shown that standby power, which occurs across a range of low power modes, constitutes around 11% of total residential energy consumption and costs Australian consumers around AU \$950 million annually. While the contribution of standby to total electricity consumption is likely to vary by country, it nonetheless is significant in virtually every country because of the globalisation of traded goods. At the recently held Standby Conference in Canberra Australia in November 2006, international experts reiterated the view that standby power levels could be easily and cost effectively reduced through changes in design for internationally traded goods.

In the 1990s, the IEA encouraged the development of a notional 1 Watt standby consumption target culminating in a call to action in 2000 over the coming decade. Although the IEA has enabled and encouraged members to combat excessive standby consumption, there is no general global consensus on a uniform approach at this stage. At the International Standby Conference in Canberra, government, industry and efficiency advocates agreed that international cooperation, data sharing and early communication with stakeholders are essential to overcome excessive standby power.

Standby power is now used by a myriad of electronic products. Most people will be familiar with a television with a remote control. When the remote control is used to turn the television off, the television still uses some power to keep the remote control circuit active so that the remote control can be used to turn the TV on again. This is one form of standby power.

Some 20 years ago, almost no product used any power when not performing its main function. Now, “standby power” is present on a huge range of products and used to power a wide range of modes and functions. The many small lights emanating from appliances seen at night is a demonstration of the pervasiveness of standby power. Standby power can deliver a range of functions desired by the end-user (clocks, remote controls, communications, sensors, controllers) but it can also be due to poor design and though the use of inefficient components.

While global understanding of standby power is growing rapidly within governments and efficiency advocate circles, there is still little comparative data available which indicates the range of standby levels found in typical products and whether these power levels are in fact improving or deteriorating over time. The level of information

currently varies substantially by country and no simple metric exists to compare data between even those countries that collect data.

There is growing international pressure from governments for manufacturers to reduce standby levels on new products so that they still deliver the same or improved functions but using much lower levels of power than are delivered to the market today. Various studies have estimated that global standby power levels could be reduced to less than 30% of current levels using existing technology with little additional manufacturing cost. What is needed is information to track what is happening in the global market to inform all market players and to track the effectiveness of standby reduction policies.

Quantifying Trends in Standby Power

The aim of this report is to propose a representative “basket of products” for which standby power levels can be measured and tracked in any country around the world. This basket can be measured by interested parties to compare trends in standby power within that country and across countries. Many of these products will be global commodities with small differences in standby power levels (some may be due to voltage and frequency effects). However, some products may be subject to regional differences as a result of local standby programs or other influences. For other products which are more regional in nature in terms of their design or configuration, there may be larger differences in standby power levels between countries.

The purpose of these standby measurements on a common set of products is to allow national and international comparison of these like products across different countries and regions. Such measurement will heighten the awareness of stakeholders of the magnitude of standby power and will provide a focal point to highlight differences across regions. Such measurement will demonstrate the effectiveness of the policy mix used in individual countries and promote products that meet the standby power challenge.

Because information will be collected at an individual product level, differences between brands and models can also be examined. The information can be used to encourage manufacturers which supply products with good standby attributes and can be used to put pressure on manufacturers which supply products with poor standby attributes to make rapid improvements.

Eventually, the data collected will also provide trends in standby power by product type over time so that the rate of improvement or deterioration can be quantified within and between markets as well as by product type and even brand.

Such improved information at a product level will assist national governments to formulate specific responses to the issue of standby power. It will eventually allow specific manufacturers to be identified if they continue to supply products with poor standby attributes in selected markets. Such information is important for monitoring the market and for measuring program effectiveness.

Test Methods and Measurement Approaches

The test procedure IEC62301 was published in 2005 and provides a common technical basis for the formal and accurate determination of standby power in appliances and equipment around the world. This method has now been adopted as the umbrella test method for individual national standards in many countries. The IEC standard does not define the relevant modes for all products but it does define relevant test conditions and equipment for accurate measurement of standby power.

Very accurate determination of relevant low power levels requires careful measurement and the use of sophisticated equipment in controlled conditions as well as a good understanding of product behaviour. However, in a policy context where suppliers are encouraged to design product to meet the achievable standby power target of “1 Watt in passive standby” it is not necessary to conduct very accurate measurement in testing facilities. It is possible to take measurements of products in the field with reasonable accuracy, as long as some sensible precautions are taken and the limitations of such measurements are well understood. In-store measurement surveys are practical (even non-technical but trained staff can take the measurements), cost effective (they are much cheaper when compared to transporting product to a third party facility for measurement), are compatible with industry declaration schemes and past surveys conducted from time to time.

Australia’s practice of in-store surveys grew out of the first residential standby study that was undertaken for the Australian marketplace in 2001 and are now repeated every 6 months. These surveys target new appliances being offered for sale in selected major retailers (measured in situ) and complement related surveys of individual homes measuring all electronic products. This information has proved to be extremely valuable because it provides trend data in standby power for new products. As a wide range of products were measured over the course of the next five years, with seasonal adjustments in appliance availability taken into account, a very extensive database of measurements has been created. The database has enabled policy makers to very quickly establish which appliance types have increasing or decreasing standby trends. These surveys were also very useful in identifying new appliance types entering the marketplace and in conjunction with the use of periodical residential surveys, important trends in standby over time can be established. Anyone may access the Australian database of almost 14,000 entries by visiting www.energyrating.gov.au

Policy making is as only as good as the data behind it and policy decisions are fundamentally flawed if the information supplied is based on poor or incomplete data. For both governments and industry, having good data is essential and the use of regular, methodical store surveys is the most cost effective and practical way of gathering this data. Where such surveys are conducted regularly, standby trends, problem products and brands can be ascertained and reported. The costs of collecting such data are modest (trained staff, basic instrumentation and retailer cooperation are all that is required) though there are obviously a number of limitations to collecting standby data in the field. In general terms these limitations can be summarised as:

- Most field measurements are conducted with meters with reasonable accuracy. There may be some cases where products with highly distorted current waveforms result in a small measurement error.

- It is not possible to regulate the supply voltage or test conditions in field measurements. Comparisons of the test results from in-store and in-laboratory surveys shows that this has only a very small effect on standby power consumption.
- On mode for certain products (where these may be of interest) can be affected by the operating state (eg TV picture can affect power consumed).
- It is not possible to monitor product behaviour for a long periods when undertaking field measurements. There may be cases where power levels may slowly stabilise to a slightly different value or in some cases there may be power management features that change the state of the product automatically (eg temporary modes) – in these cases the reading taken may not be representative of normal use.
- Sometimes remote controls are not available for testing in retail stores so some modes of interest on some products cannot be activated.
- Some products of interest may be hard to access in the field because they may be normally locked up for security reasons (eg high value small products – eg mobile telephones and laptops).

Most of these problems can be overcome provided the data is used for its intended purpose – that is to track trends in product standby power levels over time. As many thousands of individual product measurements are made over time, any small errors or data collection issues are generally negligible in this context. Moreover, as the surveys are to be repeated regularly, any inherent methodological inaccuracies are not significant if repeated in future surveys. While the actual measurement may not be as accurate as would be obtained in a controlled testing facility, the inherent inaccuracy is constant if the same method is used for future surveys - meaning that the crucial trend data obtained over time is reasonably accurate. Where a field measurement shows that a particular product is not complying with local requirements (for example limits for Energy Star, compliance with local maximum standby requirements), then it is critical that field measurements be confirmed with accurate laboratory measurements prior to public reporting or the instigation of any other action.

Australia proposes to encourage other countries that wish to undertake their own data collections by sharing its methodology for detailed data collection and its format for reporting that data to facilitate comparisons.

Proposed “Basket of Products”

The list of appliances and equipment reproduced below are proposed for inclusion in an internationally coordinated “basket of products”. The data collected will provide a central pool which can be used to track standby power trends over time for different product types in different regions around the world.

Australia currently collects data on about 50 product types representing all products readily available in our market. Some products have been excluded as they are unlikely to be widely available for measurement in retail stores. Others have been excluded due to either due to the specialised nature of these products, the installation method (do not use a plug (hard wired) – typically smoke alarms and split system air

conditioners) or the nature by which these products are displayed in-store (ie in packaging or in cabinets – most typically mobile phones). For products that have a variable standby consumption depending on how they are setup (ie computer boxes which depend on operating system settings), field measurements of all modes are not generally possible.

The final proposal of the “basket of products” is intended to be as representative as possible across most markets. The basket of products is divided into two categories, the core 13 products for collection and a secondary grouping of another 29 products should stakeholders have the capacity to collect data on globally traded products. The attachments explain that data collection targets collecting around 20 examples of each product type suggesting almost 250 appliances must be located and measured within the core basket.

The core products have been selected for the following reasons:

- they are relatively common in most markets
- they should be readily available in major retail outlets
- they have a high or increasing penetration within markets
- they have relatively simple modes which can be readily measured.

The secondary group present some measurement challenges but the Australian experience will be shared in relation to measuring these appliances as well.

Basket of Core Products (14)

Major Appliances (2)

- clothes washers
- microwave ovens – electronic

Home Entertainment Products (6)

- televisions – CRT (conventional)
- televisions – LCD
- televisions – plasma
- portable stereos
- integrated stereos
- Digital Video Disc players (DVDs)

Office Equipment (5)

- computer monitors – CRT
- computer monitors – LCD
- computer printers – laser black and white
- computer printers – inkjet
- multi-function devices (MFDs – combination scanner, printer and fax)

Other Equipment (1)

- external power supplies (no load in addition to equipment powered)

Basket of Secondary Products (another 29)

Major Appliances (6)

- clothes dryers
- dishwashers
- clothes washer/dryer combination units
- air conditioners (any type with a single phase power plug – typically only window wall types)
- instantaneous (non storage) gas water heaters (with electronic ignition)
- microwave ovens – manual timer

Home Entertainment Products (8)

- televisions – rear projection
- set top boxes (including variations – digital/analogue tuners, hard drive)
- DVD recorders without hard drive (digital/analogue tuner)
- DVD recorders with hard drive (digital/analogue tuner)
- DVD/VCR combinations
- Video Cassette Recorders
- audio visual receivers (home theatre)
- subwoofers

Office Equipment (15)

- computers (off mode only)
- computer speakers
- computer printers – laser colour
- computer printers – inkjet
- network switches (including hubs)
- routers
- DSL or ADSL modems
- scanners
- facsimiles (fax machines)
- photocopiers – black and white (categorise by copy speed)
- photocopiers – colour (categorise by copy speed)
- telephone answering machines
- cordless phones – primary base station
- cordless phones – secondary base station
- cordless phones – with answering machine

Attachment

- Field guide to conducting standby measurement surveys
- List of relevant modes and advice for core and advisory product types

A separate data collection instrument will be available for participating organisations.

Attachment: Field guide to conducting standby measurement surveys

EES, V1a, 16 January 2007

Measuring appliances offered for sale in retail outlets is a simple, practical and cost effective method of collecting standby (or low power mode) data. This data can demonstrate overall standby trends, changes in markets and stock characteristics. This report explains what is needed to collect appliance standby data.

Skills of field staff

Field operators will need:

- to be familiar with the basic workings of a range of appliance types;
- to understand the definitions of technical terms relating to standby modes;
- to follow the survey methodology;
- an aptitude for using meters and computers; &
- to take care in terms of health and safety.

Much of surveying work is simple repetition and once the field operator has measured the appliance type in its different modes a couple of times, continuing to measure these appliances will be simple and straight forward. Experience shows most difficulty lies in measuring a new type of appliance or dealing with an abnormal variation of an existing appliance type. This will require the field operator to exercise some initiative when measuring such products in different modes (or even in establishing what modes exist in the product) and in recording those difficulties to establish the standardised way to address this issue in the future. The Australian experience is that field operator skills do improve with time and experience.

Checklist of required equipment

The following items are required for field measurements of standby modes in retail outlets or, for that matter, in homes or offices:

- Laptop computer – the use of a computer for data entry will greatly increase the efficiency of an audit when compared to using pen and paper. Not only does the data need to be entered into a computer for analysis reasons anyway, but the software prompts provide a safeguard to entry error. It also overcomes transcription errors. The project is expedited if a laptop is used together with the standard data collection input spreadsheet. Ensure the laptop's own power supply available.
- Measurement device – an accurate and easily transportable power meter is essential for any store survey. Care should be taken to ensure that the meter is accurate and correctly working – a faulty meter means inaccurate measurements. Meters should be checked against laboratory instruments for a range of power levels and product types and where possible a calibration curve

determined prior to use. It is strongly recommended that any meter used in the field have standard mains single phase plug and socket connections. The meter should be the direct connection type (use of current transformers are not suitable for standby measurements). No bare wires should be exposed in or around the meter. The user should not have to configure or alter the meter in the field.

- Power cords, double adaptors/power board – an extension cord of some length (minimum 10 metres) is usually necessary as an available power outlet may be some distance from where the appliance is situated. This enables a large number of products to be measured from a single power outlet (only the end of the power cord needs to be moved to the next product). Double adaptors or a power board (power strip) are also useful devices – power is required for the laptop as well as the product being measured (some power meters also require a separate power supply to the metered product). Two power cords are useful: one for the laptop which can remain in the same place for all measurements and one for the power meter/product being measured which has to be moved from product to product.
- Safety switch – a safety switch of some kind is strongly recommended. Safety switches are also called earth leakage circuit breakers or residual current devices. They disconnect the power supply if there is any significant current flow from active to earth. Safety switches protect equipment and possibly prevent serious injury from electrocution if any of the appliances that are measured have electrical safety problems. Given that a very large number of appliances are measured, there is a small chance of encountering a faulty product from time to time. A portable safety switch for use with an extension power cord can be obtained. Some extension power cords have safety switches built in which are recommended for this task.

Involvement of the retail store

Any survey will require liaison, cooperation and agreement of the store manager or owner. This should be arranged well in advance of the planned survey date(s) for data collection. If the project is being conducted on behalf of or with the auspices of the government, a letter of introduction from the relevant agency is often helpful in securing agreement of the owner or manager. It is advisable to get agreement from the owner or manager in writing. Without some form of authority, managers and employees may regard any actions as suspicious and will certainly ask questions. It is also advisable to have documentation from the project supervisor at hand when the survey is being undertaken to show to any interested parties, in case questions are asked.

In Australia, we have explored whether a small gift or some other incentive should be offered to secure support from the retail outlet. We do not offer such incentives now but do offer to provide a copy of the results to the store. Many stores regularly participate in surveys because they are interested in results. Similarly, offering to measure products at non-crucial selling times can help secure store support.

Measuring the core products

Australia has found a standardised data collection instrument (on the computer) ensures that data is entered in a consistent format. This is crucial not only so all data can be pooled and shared but so that future surveys in that region can be compared.

The following information and background has been provided for the 12 key or “core” products proposed for inclusion in the basket of goods. The primary modes of interest are **bolded in blue**.

Clothes Washers



Top Loading Clothes Washer

Some products may sit in a higher state for some period after power is initially connected – this can be difficult to detect in the field without wasting a lot of time. The main mode of interest is off as most products will automatically revert to off when they have completed their program. European products also have a mode that is of interest which is when the program is completed (and left on), but this cannot be measured in the field as the unit cannot be operated. A suitable proxy measurement is the active standby mode where the product is turned on prior to commencing a program. In some cases the power consumption in active standby and delay start mode when first activated can be affected by lights and displays which may turn off after a short period.

Modes: **Off: unit is off (no lights or activity)**
 Active standby: unit ready to start wash program
 Delay Start: unit programmed to start wash sequence with a selected time delay (currently ‘on hold’).

Microwave ovens – electronic



While electronically controlled microwave ovens (microwave or combination microwave/convection) are the most common products, some microwave ovens have electro-mechanical controls (usually a manual rotary timer and no clock display). Both products are of interest, but each is recorded as a separate product type.

Most electronically controlled microwave ovens will have a clock display which is illuminated at all times. Some more recent models have the option of turning the clock display off – if this is the case, with and without the display should be recorded.

Modes: **Passive standby: waiting for user command with clock display**
Off: no clock display present (option to turn display off or electro-mechanical control).

Televisions – All types



Most televisions have a remote control. Many televisions have will also have an off switch (except in the USA where these are rare). Care is required to correctly record the correct mode for each measurement. Main types are CRT (cathode ray tube), LCD (liquid crystal display) and plasma and each is recorded as a separate product type. Front or rear projection models can also be recorded. It is important to record screen size (diagonal measurement) and aspect ratio (usually 16:9 = widescreen or 4:3 = standard) and whether tuner is analogue or digital.

Modes: **Off: unit is off using hard or soft off switch (remote not active)**
Passive standby: unit turned off with remote control (remote control can turn TV on)
On: unit on and set to either bluescreen or snow (picture will affect power consumption of CRT types).

Digital Video Disc Players (DVDs)



This product type covers only simple DVD players. These products do not have a tuner, cannot burn DVDs nor do they have a hard drive (these other types are becoming common but are more complex and care is required to correctly classify the product type). Most DVDs have a remote control. A few will also have an off switch. Some products have an automatic power down from active standby to passive standby after 15 or 20 minutes – it is normally not practical to measure this in the field. Care is required to correctly record the mode for each measurement.

Modes: **Passive standby: unit is switched off with remote control (remote control is active)**
 Off: unit is off using hard or soft off switch (remote not active or no remote with this model)
 Active standby: power is on, unit is waiting for user, no disc.

Computer Monitors – All Types



Computer monitors can usually be easily measured in off, passive standby and on mode. LCD and CRT are the two types and each is recorded as a separate product type. Passive standby is usually only reached when the screen receives a DPMS (display power management system) signal from the computer which tells the monitor to enter sleep. This can be activated through monitor power management settings or by shutting the computer down (which is connected to the monitor). If measuring on mode, the image on display will affect the on mode power reading for CRT monitors. Information on whether the power supply is internal (most common for CRT) or external (most common for LCD).

Modes: **Off: unit is off using hard or soft off switch.**
 Passive standby: monitor enters sleep mode with DPMS signal
 In Use: unit is on and set to windows default screen (login screen or default desktop).

Computer printers – inkjet and black and white laser



Computer printers can be measured in off mode and in passive standby mode (turned on and left to reach a stable mode with no signal from the computer or disconnected). Generally inkjet printers will reach a stable passive standby level fairly quickly but some laser printers may take some time to reach this mode (several and up to 10 minutes).

Modes: **Off: unit is off using hard or soft off switch.**
 Passive standby: unit is set to power down using power management settings.

Multi-function devices (MFDs – combination scanner, printer and fax)



Multifunction devices usually have several modes. Measurements should include off mode and fax ready mode. Other functions (scan and print) should be inactive where possible. Other modes including these functions could be measured if of interest. Care is required as some secondary functions (printer and scanner) may have time delayed power management settings.

Modes: **Off: unit is off using hard or soft off switch.**
 Active standby (fax ready): unit is ready to receive fax.

Portable Stereos



Portable stereos are smaller self contained stereo systems that typically have a CD player, radio and possibly a cassette player. They are designed to be moved around and generally have a handle and weigh less than 2kg. Many are designed to run off batteries or mains power. Normally the speakers are integrated into the unit. Portable stereos usually have several modes. Measurements should include both passive and active standby mode. When measuring active standby make sure there is no CD in the tray and that no other program types have been initiated. Generally, in passive standby, the unit will appear to be off (ie no lights etc or perhaps a single LED), but generally there will be still some power draw to keep the remote control circuit active. True off switches are rare.

Modes: Off: unit is off using hard or soft off switch (rare)
Passive standby: unit is switched off with remote control (remote control is active) or put into cassette mode with an on-unit switch.
Active standby: unit is ready to play a CD or awaiting user instructions.

Integrated Stereos



Integrated stereos are larger self contained stereo systems that typically have a CD player, radio and possibly a cassette player. They remain in the one location and speakers are normally the speakers are separate. Integrated stereos usually have several modes. Measurements should include both passive and active standby mode. When measuring active standby make sure there is no CD in the tray and that no other program types have been initiated. Generally, in passive standby, the unit will appear to be off (ie no lights etc), there will be still some power draw though.

Modes: Off: unit is off using hard or soft off switch
 Passive standby: unit is switched off with remote control (remote control is active) or put into cassette mode with an on-unit switch.
 Active standby: unit is ready to play a CD or awaiting user instructions.

External Power Supplies



External power supplies generally have one mode when no load is attached, which is passive standby. Usually external power supplies are connected to another device when found. For most surveys, the parent device is measured and the fact that an external power supply is present is noted. Then the external power supply is disconnected from the parent device and measured separately. It is rare for a unit to have an off switch.

Modes: Off: unit is off using hard or soft off switch (unit not connected to parent device).
Passive standby: unit is not connected to any parent device.

Applicable Appliance Modes

Appliance List (core products)	In Use	Active Standby	Passive Standby	Delay Start	Off	EPS* (likely)
Air Conditioner			✓	✓	✓	
AV Receiver		✓	✓		✓	
Clothes Dryer		✓		✓	✓	
Computers – Box					✓	
Computers – Monitor	✓		✓		✓	✓ (LCD)
Computers – Speakers		✓			✓	✓
Cordless Phone		✓	✓			✓
Dishwasher		✓		✓	✓	
DVD Player		✓	✓		✓	
DVD Recorder		✓	✓		✓	
DVD/VCR Combination		✓	✓		✓	
External Power Supply (EPS)			✓ (no load)			
Facsimile		✓			✓	
Hard Disk Recorder		✓	✓		✓	
Instantaneous Gas Water Heaters			✓			
Microwave			✓			
Modem		✓	✓		✓	✓
Multi Function Device		✓			✓	✓
Network Switch (incl Hubs)		✓			✓	✓
Photocopier (black and white)		✓	✓		✓	
Photocopier (colour)		✓	✓		✓	
Printer – Inkjet			✓		✓	✓
Printer – Laser			✓		✓	
Router		✓			✓	✓
Scanner		✓			✓	✓
Set Top Box	✓	✓	✓		✓	✓
Stereo – Integrated		✓	✓		✓	
Stereo – Portable		✓	✓		✓	
Subwoofer		✓	✓		✓	
Telephone Answering Machine		✓				✓
TV – LCD	✓		✓		✓	
TV – Plasma	✓		✓		✓	
TV – Projection	✓		✓		✓	
TV – CRT	✓		✓		✓	
VCR		✓	✓		✓	
Washer/Dryer (combination)		✓		✓	✓	
Washing Machine – Front Loader		✓		✓	✓	
Washing Machine – Top Loader		✓		✓	✓	

Mode to test ✓

*All appliances with an EPS should have the EPS measured for the no load condition in a separate EPS column that also records the brand and model of the EPS.