

Quantification of Standby in Australia and Trends in Standby for New Products

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Abstract

Standby power consumption of household products in a range of low power modes has been on the policy agenda for around 10 years and is an area of growing concern. Australia has been active in both national policy development issues and in the development of an international test method for the measurement of standby power.

To support the development of sound long term policies, a range of data collection efforts have been commissioned, including the measurement of all products present in a sample of Australian households in 2000 and 2005. The low power attributes of a wide range of products have also been measured in retail outlets.

Data from a range of sources suggests that the trend in standby power consumption for some products is improving over time. However, there are a number of products that have very poor standby attributes such as set-top boxes and hard drive DVD recorders, integrated stereos computers and telephony equipment. Major appliances of course are of interest but their total contribution to household standby is only very modest.

One of the most alarming findings was that the number of devices connected to the mains and which used some power when not performing its main function climbed from 21 in 2000 to 27 in 2005 – this is an increase of 35%.

Background

The issue of standby power has been discussed in energy policy circles now for nearly 10 years. Interestingly, the power consumption of appliances and equipment when not in use (i.e. while NOT performing a primary function¹) was not a policy consideration in the early 1990s, probably in part because few products used power in these modes at the time, but also due to ignorance. It was not until some laboratories noticed in the mid 1990's that some products were in fact using small amounts of power when off or in "standby mode" that the issue was canvassed more widely and further investigations were undertaken. Through the late 1990's the issue was raised within the IEA and a series of three international workshops were held up to 2001. This culminated with the publication of the report Things That Go Blip In The Night [1].

In the late 1990's only anecdotal information was available on the likely magnitude of standby power – almost no data from the wide range of equipment installed in households had been collected in any country. Theoretical estimates ranged from a few percent of household electricity consumption to 10% or more. There were growing concerns about the issue but there was little data on which to base firm policy actions.

Policy Development in Australia

In order to provide a sound basis for future policy decisions, Australian state and federal governments commissioned a survey in 2000 of some 64 households to establish the magnitude of standby power in Australia and to help identify key products and potential problems. The survey measured every plug load present and documented the attributes of some 2400 products actually installed in these homes. The report, which was published in early 2001 [2], found that "standby" (in a very broad sense) accounted for around 11% of residential electricity consumption in Australia or an average of about 90

¹ Many products, particularly those with electronic controls, have a number of possible states other than the primary function and some have several primary functions.

Watts. While this figure included a number of end uses and low power modes that were not traditionally regarded as “standby” by some commentators, it was clear that the issue was of significant concern and required a coordinated government response.

In August 2000, the Council of Commonwealth, State and Territory Ministers in charge of energy matters, endorsed a program of work to lead Australia towards achieving the goal of “One Watt” for all consumer appliances and office equipment². They agreed to develop policies designed to ensure the maximum standby power of all household products manufactured in or imported into Australia is One Watt. Australia was the first national government to agree to this formal target. This statement of principle sent a clear message to industry and provided a coherent structure for a diverse range of policies designed to combat excessive standby energy consumption. In 2005 Korea also announced mandatory 1 Watt targets for a wide range of products [3]. 1 Watt targets are now common in many programs that cover standby like the Energy Star program.

The Commonwealth Government in Australia went further and announced in October 2001 a policy to purchase only equipment that complies with the US Environmental Protection “ENERGY STAR” standard, where it is available and fit for the purpose.

International work on a test method for the measurement of standby power progressed within the IEC which culminated in the publication of the test procedure IEC 62301 Household electrical appliances - Measurement of standby power in mid 2005 [4]. This test method provides general approaches, methodology and equipment required to measure power consumption for a range of low power modes for most product types. Australia contributed to this work through the provision of the Convener of the IEC TC59 working group and active participation at all stages of the project. The IEC test procedure does not define relevant low power modes for any equipment types – this is a task for the relevant product committees. While there has been some progress in this area, some manufacturers are resisting further developments at the product level which will hamper the development of uniform product mode definitions into the future.

The development of a ten-year strategy is another key element of the 2000 commitment by the Australian Government to stamp out unnecessary standby power. The document titled Money isn’t all you’re Saving – Australia’s standby power strategy 2002 – 2012 [5] is the culmination of considerable industry and community consultation and the plan:

- sets out a long-term plan for the measures to combat excessive standby consumption;
- identifies some 40 product types initially targeted in period 2003 and 2004 and the process for identifying future products;
- develops the procedures for setting standby targets; and
- outlines the potential sanctions that could be applied should suppliers not meet targets.

Some 30 product profiles have now been publicly released. These profiles identify a range of potential standby program measures for each product type and set voluntary standby targets. Many product types are to be assessed against their voluntary standby target in the period 2006 to 2008. The profiles can be found on www.energyrating.gov.au

The balance of this paper documents the efforts to date to quantify standby energy consumption of products already installed in residential homes as well as the attributes of new products offered for sale in Australia. This data is crucial in the assessment of whether products have achieved the voluntary targets set by government and whether more stringent actions (such as regulation) are warranted for some products.

Data Collection Efforts in Australia

As noted above, the first intrusive survey of Australian homes was conducted in 2000. The survey covered 64 homes and involved direct power measurements of some 2,400 products in a range of modes using a power meter that was accurate down to 0.1 Watt. A second intrusive survey was conducted in late 2005 and the sample was expanded to cover 120 houses and data on 8,000 individual products in various modes was recorded and measured [6].

From 2001, Australia has been tracking the low power mode power consumption of new products on display in retailers. The aim of this work is to benchmark standby performance and trend for each of the major product types which can be used to assess progress by manufacturers towards voluntary standby targets that have been set by governments in Australia. A database of some 5,500 products

² While a notional target of 1 Watt across the board has been adopted, actual targets vary by product and mode, depending on what is technically feasible based on good design practices.

has been accumulated over the years, with measurements in up to 4 different modes for some product types. This dataset now one of the most comprehensive sets of standby measurements in the world [7].

The key results from these two data collection methodologies is presented below. In the context of this paper, the term standby power is intended to be very broad and covers the energy consumption of a wide range of products in a wide range of low power modes.

Intrusive Surveys 2000 & 2005

The intrusive residential surveys were undertaken to quantify the standby power of products in Australian households. Several modes were measured for most products. This survey was primarily concerned with quantification of the stock of products currently installed in households. The general objective was to quantify the magnitude of standby power used by all appliances and equipment found in Australian residential households in 2000 & 2005, in their applicable low power modes. The average standby consumption for 2005 was found to be 92.2 Watts per household, or some 807 kWh per year. This is around 10.7% of Australia's residential electricity consumption in 2005. This level of residential standby power consumption was estimated to cost Australian consumers approximately AU \$950 million (at an average retail tariff of 15c/kWh) which will result in nearly 6.5 million tonnes of carbon dioxide in 2005.

The total number of products that run on mains power in a typical house in 2005 was found to be 67 (although this ranged from as few as 16 to as many as 136 items per house). During the survey, about 28% (19) of all products were in fact found to be unplugged at the time of the survey. These products were assumed to contribute no power to the total average standby power estimated for all households.

Of the 48 or so products that were found to be plugged in at the time of the survey in 2005, on average around 56% (27) used some low mode power when plugged in and not performing their main function. This is an increase from 21 in 2000. More discussion on usage is included below.

The figure of 92.2 Watts per house could be seen as alarming. However, this is comparable to a study of homes in California which found 108 Watts (but used a different methodology) [8]. However, if all products were in fact plugged in and left in their highest recorded non operating mode, then this power consumption would be as high as 178.3 Watts per household. If all products found had a maximum non operating mode power consumption of 1 Watt or less, then this power consumption would fall to 32.3 Watts per household.

The most important product groups in terms of their total contribution to standby are computers and peripherals, home entertainment equipment (including televisions and set-top boxes), major appliances and other office equipment. An important issue not addressed by this study is the need for a consistent classification of modes and product types to enable comparison between different studies in different countries. This issue is discussed by Nordman et al. [9].

Table 1: Contribution to Total Household Standby from Major Product Groups

Product Group	Contribution to Total Standby W	Number of Items per Household	Average Watts per Item
Major Appliances	11.8	8.5	1.4
Telephones other office equipment	7.1	2.0	3.6
Other home entertainment	19.6	5.0	3.9
Set-top boxes	3.5	0.3	12.1
Televisions	6.2	1.7	3.6
Computer and peripherals	28.1	5.4	5.2
Monitoring and continuous appliances	8.7	7.6	1.1
External power supplies	3.4	4.7	0.7
Other items with a standby mode	3.9	9.7	0.4
Products unplugged	0	18.7	N/A
Products with no standby mode	0	3.1	N/A
Total	92.2	67.7	

Source: [6]. In this context, total standby takes into account the number of products and the modes in which these products were found or are normally left. 20% of computers are left on continuously. The expected contribution to the total standby power for each of the major product groups is illustrated in Table 1. Other important parameters such as the number of items per household for each of the main product groups and the average standby power consumption per item within the product groups is also shown. When these parameters are considered, the power consumed per item and the number of items is quite critical for computers and home entertainment equipment. Set-top boxes also have a large power consumption per item, even though the total contribution to overall standby is still low due to their low penetration. This is a product that is likely to have a rapid growth penetration over the next 5 years. The average power per item is also reasonably high for televisions and telephones and other office equipment.

More detail is shown in Table 2 including ownership data and age of selected items. The mode in which the product was found is not reported here as this can be one of several modes (see below). Based on current information, the growth of standby is of the order of 3% per annum, although there is some uncertainty surrounding this estimate.

Assumed Usage Patterns

The intrusive surveys assumed a simplistic usage pattern for standby modes – the mode in which the product was actually found was recorded and used for analysis purposes and this was confirmed with the house owner whether this was the normal state in which the product was left. Where a product was found in “on mode” at the time of the survey, the householder was questioned on the normal state or mode when not in use. The detailed survey report gives information about each product and the modes in which products were found. About 28% of products were found to be off at the mains³ or unplugged.

Many products have several possible non use modes and these are fully documented in the study. A simplistic assumption is that the hours of active use for most products is relatively small. One of the main exceptions is televisions, where viewing hours range from 20 to 40 hours per week and computers – many appear to be left on for very long hours even if not in active use (about 20% are left running continuously). Many home entertainment products were left in active standby mode in the 2005 survey, indicating the potential value of power management or auto-off functions for these products.

Table 2: Summary of Key Standby Attributes – 2005 Intrusive Survey, Australia

Product Type	On Mode (Watts)	Active Standby (Watts)	Passive Standby (Watts)	Off Mode (Watts)	Ownership (items/ household)	Age (Years)
Amplifiers	NA	22.4	3.4	0.2	0.36	8.7
Answering Machines	NA	3.1	NA	NA	0.17	NA
AV Receivers	NA	65.3	3.1	0.3	0.13	3.2
Breadmakers	NA	1.7	NA	NA	0.18	NA
Clock Radios	NA	2.1	NA	NA	1.33	NA
Clothes Dryers	NA	3.3	NA	0.2	0.63	10.3
Clothes Washers	NA	5.8	NA	1.9	0.95	7.0
Computer Speakers	NA	4.1	6.0	2.2	0.83	3.9
Computers	82.2	NA	35.5	3.5	1.25	3.5
Cordless Phone Base Stations	NA	3.3	2.4	NA	0.98	NA
CRT Monitors	61.7	NA	8.2	1.9	0.86	4.6
CRT Televisions	66.9	NA	7.4	0.1	2.07	7.7
Set-Top Boxes	13.3	NA	10.7	0.0	0.32	1.8
Dishwashers	NA	2.8	NA	0.8	0.57	6.6

³ Unlike the USA and Europe, Australian power outlets have a switch which controls power to each product which is plugged in.

DVD Players	NA	9.0	2.6	0.0	0.82	1.8
DVD Recorders	NA	26.5	4.9	NA	0.08	0.7
External Power Supplies	NA	NA	1.2	NA	6.86	NA
Facsimiles	NA	5.9	NA	NA	0.26	NA
Game Consoles	NA	26.7	1.9	1.4	0.33	3.7
Inkjet Printers	NA	4.6	NA	1.9	0.89	4.4
Integrated Stereos	NA	18.1	6.5	1.8	0.97	5.9
Laptops	34.1	NA	16.5	9.2	0.54	2.8
LCD Monitors	29.3	NA	2.6	1.0	0.37	1.4
Modems	NA	5.9	4.4	2.4	0.68	NA
Multifunction Devices	NA	11.2	NA	5.5	0.23	2.3
Non Convection Microwaves	NA	NA	3.0	NA	0.77	NA
Portable Stereos	NA	5.8	2.2	2.3	0.63	5.3
Radios	NA	NA	1.5	NA	0.46	NA
Remote Garage Door Openers	NA	4.1	NA	NA	0.30	NA
Scanners	NA	8.3	NA	0.9	0.25	4.5
Smoke Alarms	NA	0.4	NA	NA	1.23	NA
VCRs	NA	10.5	5.1	1.7	1.11	6.7

Source: [6]

If total annual energy consumption was to be accurately estimated, much more detail on the possible modes and length of time in these modes would need to be collected for each product. Surveys using diaries are notoriously unreliable and there is likely to be limited value in this approach (it is also very onerous on the participant). A more valuable approach would be to use individual end use meters to track mode usage for different products. If this approach is adopted, it is important to measure the power consumption of each mode prior to monitoring as it can be difficult to surmise behaviour from power data where information is not known about the product or its possible modes. Special meters which are capable of measuring low power modes also need to be used in this case.

Store Surveys 2001-2006

The methodology used has been to visit a number of large retail outlets and measure the relevant modes for all products that are on display for sale. Measurements are made on 500 to 1,000 new products during each survey. Data is recorded on brand, model, price, details of any energy labels or markings, features, product type and any other relevant features. Power consumption in defined modes is recorded, mostly passive standby and off modes, but also active standby and on mode in some cases.

Initially, the surveys were conducted once annually, but since 2003, two to three surveys have been conducted per year. This has resulted in a database of more than 5,500 new products offered for sale in the period.

When all products considered together, each of the modes measured has remained fairly stable over the period. The results are summarised in Table 3. It should be noted that the number and mix of products measured in each year of the survey were somewhat different so the results need to be taken as indicative and trends within each product need to be examined separately. So while this is a very coarse measure, it does show some interesting overall trends.

Table 3: Summary of average consumption across all products

Mode/Survey	2001	2002	Jan 2003	2003/04	2004/05	Nov 2005
Total readings off	258	380	330	925	782	296
Average off	1.3W	0.8W	0.9W	0.8W	0.7W	1.1W
Total readings passive	440	397	325	682	737	295
Average passive	5.8W	4.1W	3.4W	3.6W	3.7W	3.9W
Total readings active	101	210	216	527	665	333
Average active	11.4W	15.6W	13.9W	14.3W	15.2W	14.7W
Total readings delay start				71	51	28
Average delay start				4.1W	3.5W	4.1W

Source: [7]

Figure 1 shows the distribution of measurements taken for all products in passive standby mode. All six years of data are presented on the graph. The graph clearly shows that the distribution of measurements since 2001 has shifted from the higher end (greater than 3W) to measurements less than 3W. In 2001, 35% of all measurements taken in passive standby were less than 3W, while in November 2005, 55% of measurements were recorded under 3W. The latest results show 23% of products are now less than 1W in passive standby compared with only 8% in 2001. The change in distribution further supports that passive standby has declined in the products measured since 2001. The other findings of interest were that off mode power consumption continues to persist at a significant level (of the order of 1 Watt) and that fewer and fewer products appear to have an off mode present over time.

Results indicate that there is an opportunity for many products to improve energy consumption in low power modes within product groups. For the products measured, there was generally a wide variance in power consumption in off mode and passive standby mode without any difference in performance or functionality between these products. This tends to suggest that there are substantial opportunities for manufacturers to reduce low power mode consumption, probably at low marginal cost. Details on the findings of the surveys can be found in EnergyConsult 2005 [7].

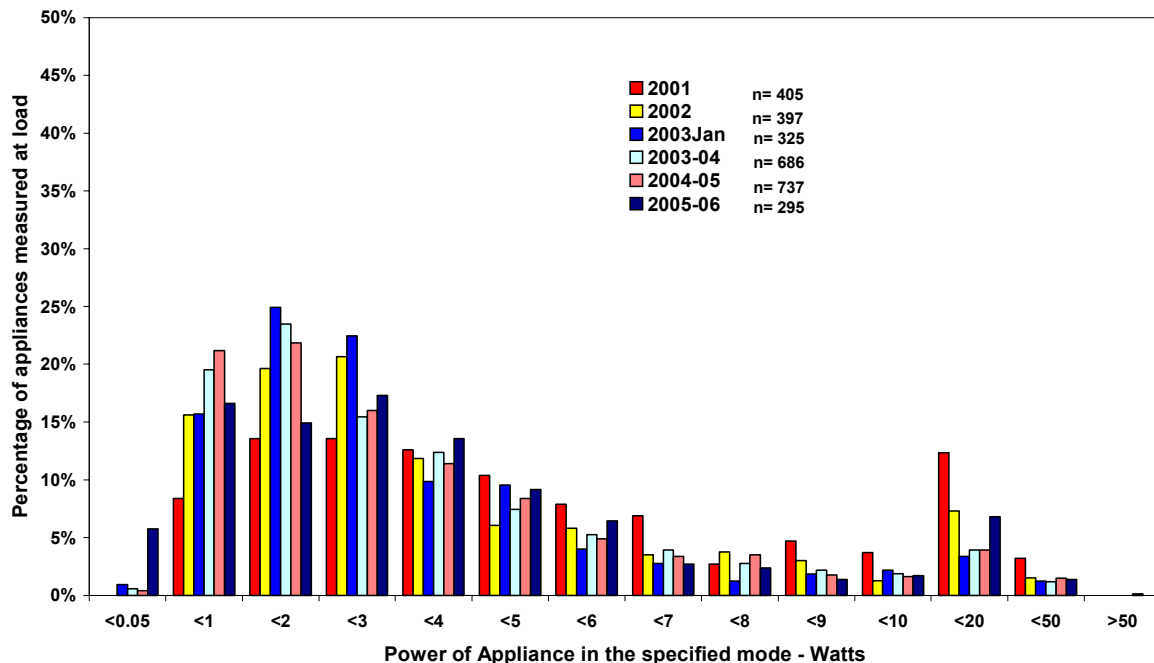


Figure 1: Distribution of “passive standby mode” power – all products

Source: [7]

Trends in Standby for Key Products

The following section analyses the data trends on standby for selected products and modes combining data from the 2000 [2] and 2005 [6] intrusive surveys and the store surveys conducted from 2001 to 2005 [7]. This draws on a database of more than 16,000 products. It is important to note that the attributes of the older stock (say pre 1995) as recorded in 2000 may be different to the attributes recorded in 2005. For some product types, the sample is quite small so these need to be seen as indicative. Generally, data from the store survey is the most reliable trend line as each point consists of a large number of readings taken in store for that year.

Desktop Computers – Off Mode

Personal computers primarily had what appeared to be hard off switches installed in most products up until the mid 1990's so they had effectively zero energy consumption when off. By 2001 virtually no computers had zero power consumption in off mode. Data suggests that power consumption in off mode peaked at 4 Watts and is now declining to around 2 Watts in 2005. The sample of houses in the intrusive survey found 1.25 desktop computers per house. It is important to note that this trend is more a function of the design of the power supplies now commonly used in desktop computers than the computers themselves. The other issue is that in Australia, there are a large number of small companies that assemble computers using parts from a wide range of OEM suppliers. This makes dealing with this particular product difficult in terms of any voluntary or mandatory industry based commitments.

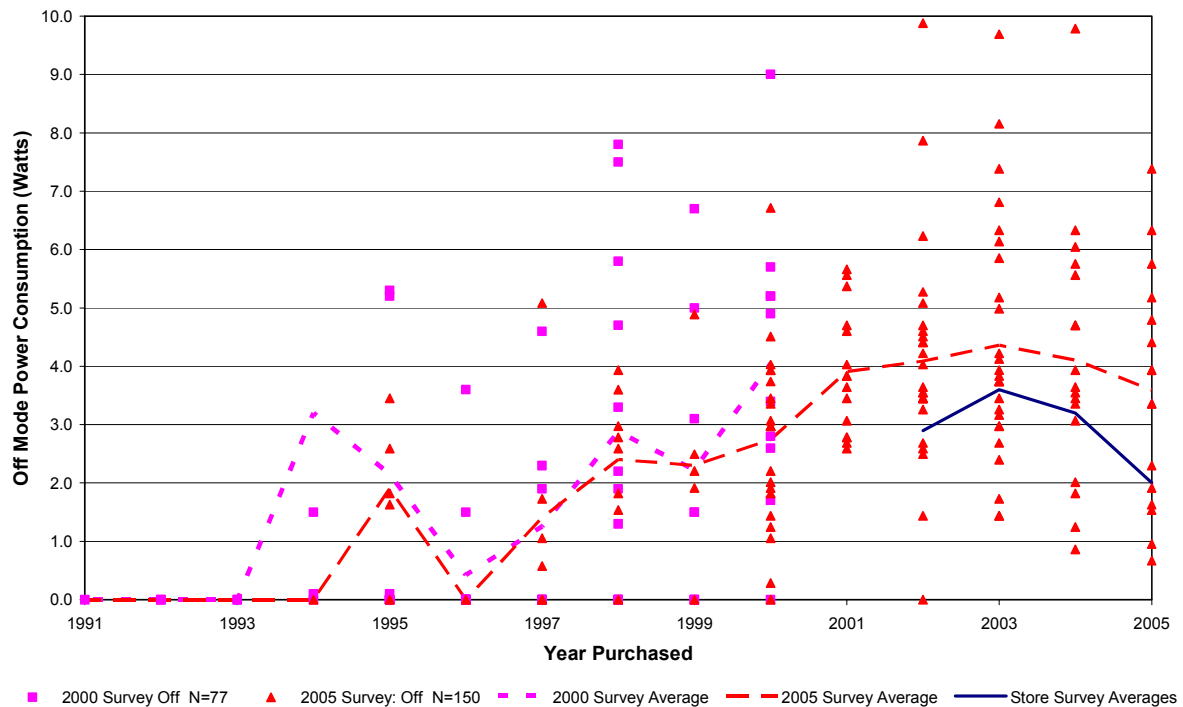


Figure 2: Trends in Computer Off Mode

VCRs – passive standby mode

While VCRs are perhaps an obsolete technology, they are ubiquitous and ownership levels in Australia are around 1.11 per household. Greatly reduced prices mean that the product is likely to linger for many years.

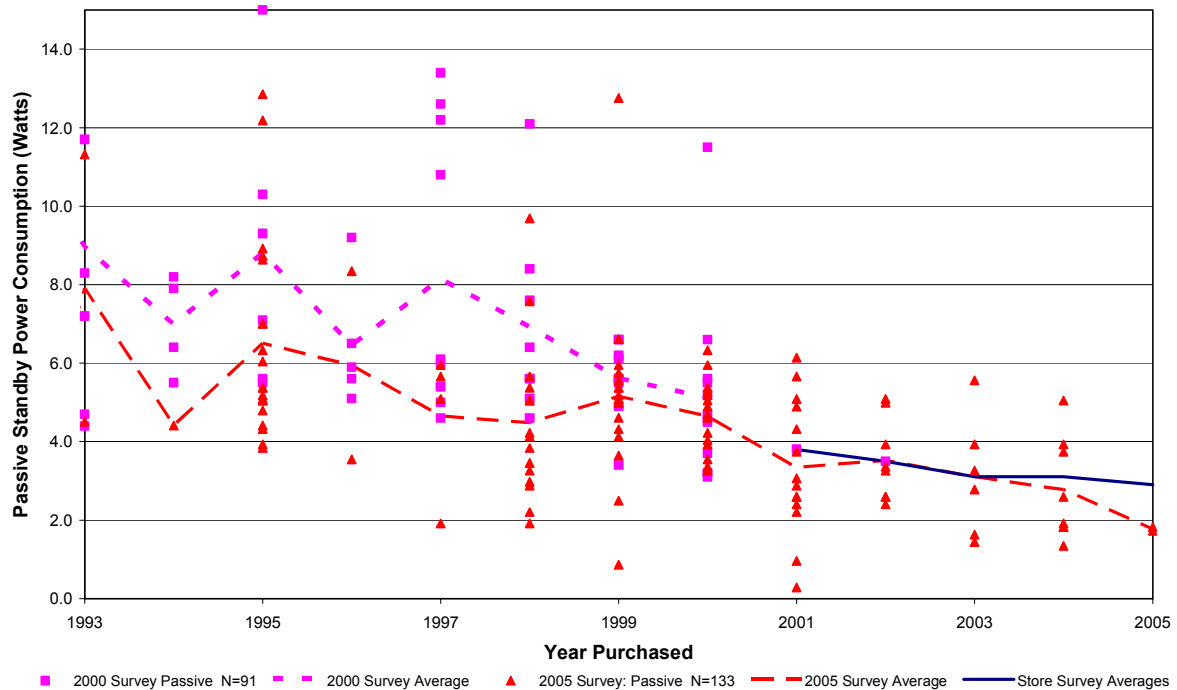


Figure 3: Trends in VCR Passive Standby Mode

Passive standby mode is the most important for a VCR – this allows activation by remote control and clock circuits are active. Virtually no models have an option for off mode. In the mid 1990's passive standby mode was around 8W and this has declined to about 3 Watts in 2005 (based on the store survey data).

Integrated Stereos – Passive Standby Mode

Integrated stereos are common devices with an ownership of around 0.97 per household in Australia. These are products with a single power cord that provide functions such as radio, tape player and CD player and are not designed to be portable. They usually have separate speakers. In the mid to late 1990's passive standby for many of these products averaged around 10 Watts. This has declined to around 4 Watts in 2005.

Despite improvements in the average passive standby mode power, there is still a very wide distribution on the power consumption in this mode – the distribution is almost bi-modal and split into high and low power products – the data below is from store surveys 2001 to 2005 for integrated stereos. The improvement in average power has been a result of an increase in products < 1 Watt and a decline in products over 10 Watts. So while the improvement over time is to be applauded, there are still many products on that have very poor passive standby attributes.

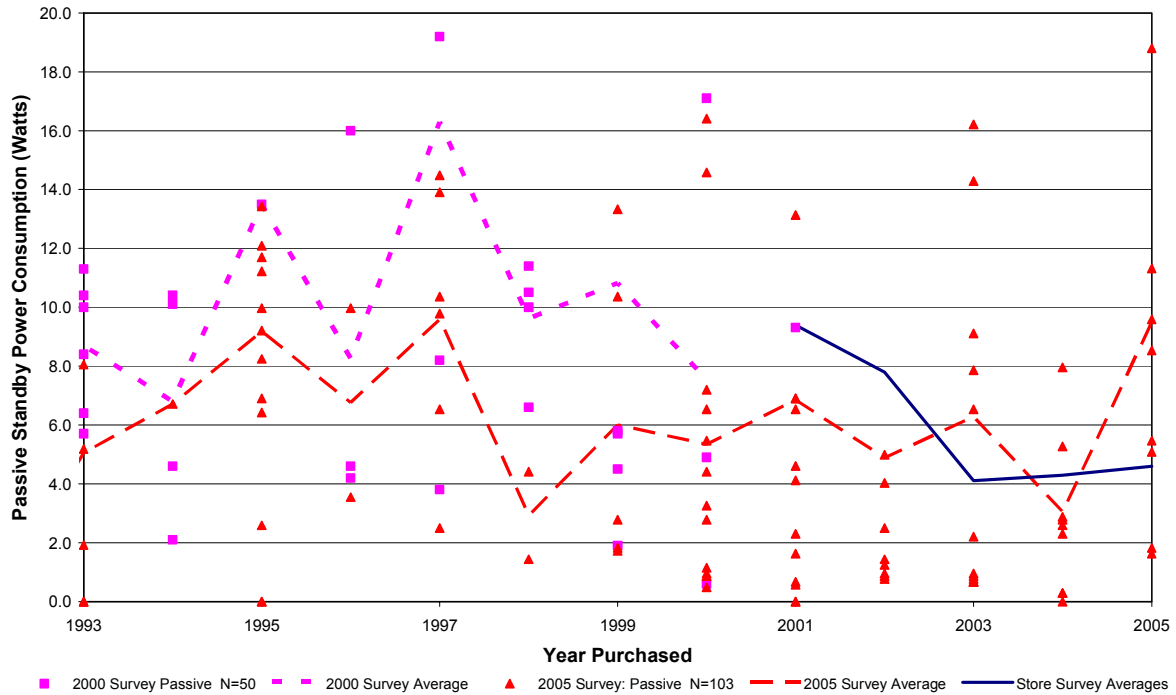


Figure 4: Trends in Integrated Stereo Passive Standby Mode

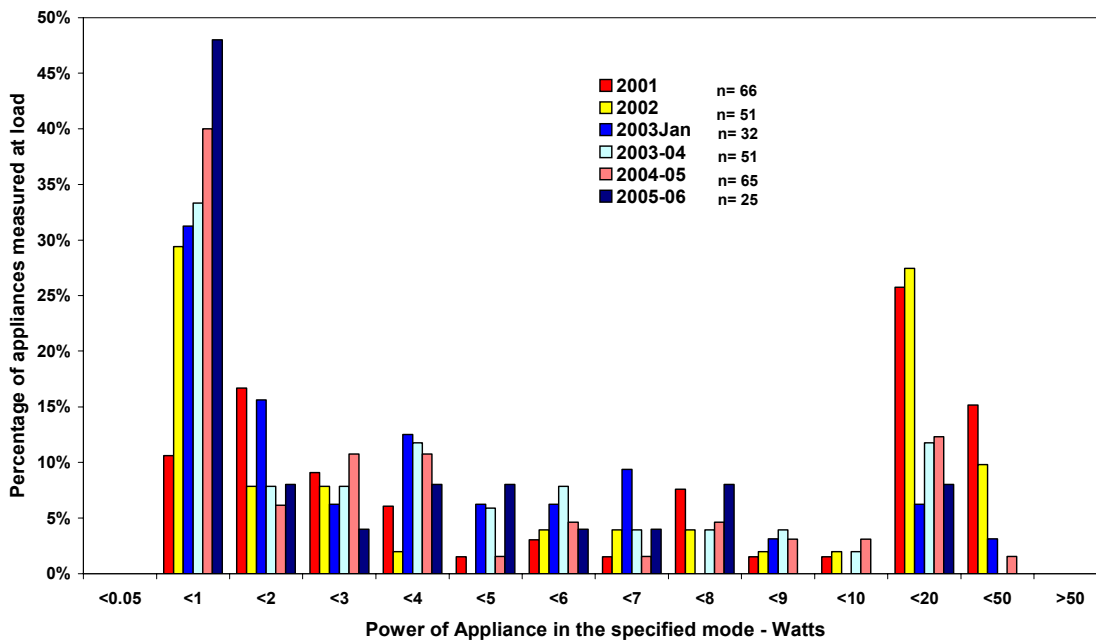


Figure 5: Distribution of Integrated Stereo Passive Standby Mode Power

Televisions – Passive Standby Mode

Televisions are common devices with an ownership of around 2.0 per household in Australia. In the mid to late 1990's passive standby for many products averaged around 14 Watts. This has declined to around 4 Watts in 2005. Average new products in Europe are somewhat better than this (less than 2 Watts). Many new products still consume more than 6 Watts in passive standby mode. Most televisions in Australia have an off switch and most use 0.0 Watts when off.

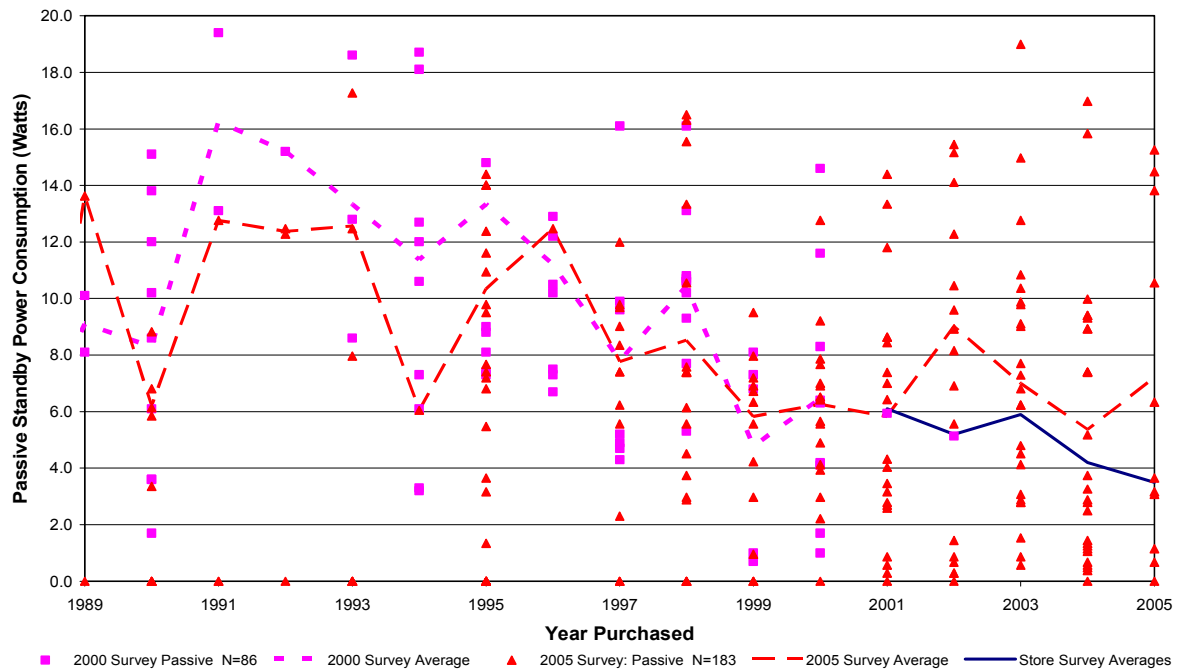


Figure 6: Trends in Television Passive Standby Mode

Clothes Washers – Off Mode

Prior to the mid 1990, few if any clothes washers used any power when off as most had electro-mechanical controls and switches. From the mid 1990's machines with electronic controls appeared in the stock. The average power consumed up to around 2001 was about 2.5 Watts in off mode. Since 2003 there has been a marked decline in average power to below 1 Watt in off mode. It is interesting to note that while the average off mode power from 1990 to 2002 was probably 2 to 3 Watts, there were a lot of machines that used 0.0 Watts and a lot of machines that used 5 to 10 Watts. The worst machines were removed in about 2002, possibly in response to the Australian government's targets for clothes washers that were announced in 2003.

There is an important issue regarding clothes washers and dishwashers. Most European products have an off switch, which usually disconnects power to most parts of the machines and drops the power consumption close to zero Watts. However to achieve this, the consumer must manually turn the machine off when the cycle has been completed and the load removed. Disturbingly, during the intrusive survey in 2005 around 40% of the European front loading machines were found left in active standby mode when not in use (ie the users did not manually turn the machines off when the washing cycle was completed). These machines persist in active standby mode indefinitely with the current machine designs. This means that the off mode power consumption for many European machines is probably not all that relevant. A more relevant figure is the active standby power consumption (which in many cases is likely to be similar to end of cycle mode). In 2005 this averaged about 4 Watts, although individual values varied from 1 Watt to 7 Watts in this mode. This is an example of a mode which is impossible to accurately determine from store or house measurements.

All non European machines automatically revert to off mode automatically at the end of the cycle, so only off mode measurements for these machines are relevant.

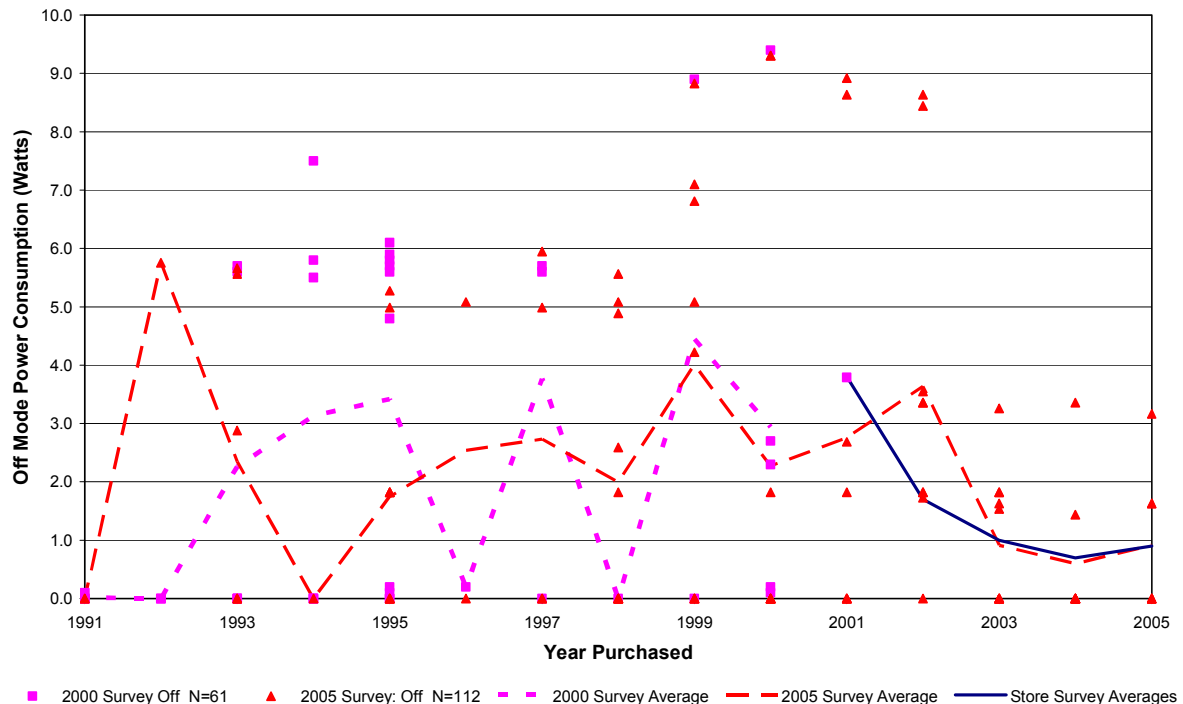


Figure 7: Trends in Clothes Washer Off Mode

Other Products of Particular Concern

The 2005 intrusive survey identified a number of other products that are of concern with respect to standby. The are summarised below:

- Clock radios: 2.1 Watts, ownership 1.33, trend: no changes expected.
- Computer peripherals: range from 2 Watts to 6 Watts, multiple items per house (printers modems, speakers, switches/hubs, scanners etc.).
- Digital set-top boxes: 13.3 Watts, ownership 0.32, trend: ownership likely to soar.
- DVD recorders: 4.9 Watts, ownership 0.08, trend: ownership increasing as they replace VCRs, much higher power with hard drives (more common) – blurred divide with set-top boxes and DVD burners as digital tuners become available.
- External power supplies: 1.2 Watts (no load), ownership around 7 per house (3 as separate devices not always connected to a product – usually battery charging – e.g. mobile phone).
- Laptop computers: unclear standby measurements (measurements confounded by battery charge state, probably in the range 2 Watts to 6 Watts when fully charged), ownership 0.54 and set to increase.
- Multi-function devices: 11.2 Watts (active mode), ownership 0.23 and increasing.
- Remote control garage door openers: 4.1 Watts, ownership 0.30 and increasing.
- Smoke alarms: 0.4 Watts, ownership 1.23 and increasing rapidly.

Conclusions and Lessons Learned

Data from a range of sources suggests that the trend in standby power consumption for some products is improving over time. This partly due to natural improvements in technology (availability of low power components and modules) but also in part due to increasing pressure from a range of government programs around the world. Many of the products with standby attributes can be considered global commodities and as such, pressure in one or markets will have impacts elsewhere. So there is some good news.

Australia has initiated a multi-pronged strategy for data collection. This is necessary given the diverse range of products found in homes. Store surveys provide a record of the types of new products offered for sale over time and the distribution of standby attributes for these products. It also allows accurate estimates of year to year trends in standby attributes which are important for modeling and impact evaluation. However, store surveys have some limitations – there are some products which cannot be measured in store (most notably devices which are hard wired) and some modes which

cannot be reached in a store environment (eg end of cycle mode for clothes washers or dishwashers or modes that take some time to reach – eg auto power-down modes). Consequently, an alternative data collection approach needs to be adopted for such products and modes where these are important. Typically laboratory measurements are necessary, which can be slow and expensive. For ubiquitous products, an alternative strategy is to mandate declaration of the relevant standby values as part of the regulation of products for energy labelling and/or MEPS.

The inclusion of surveys of real houses from time to time is seen as a critical part of the data collection process as it provides information on the range and type of equipment actually installed and used in typical houses. Importantly, it can provide warning of products with high standby power that have not identified in other processes. Household surveys also provide the opportunity to record the age distribution of products (this is usually only indicative) and the modes in which products are left when not in use. However, household surveys also have limitations on the measurement of hard wired devices. Also, there are always some devices that are hidden or inaccessible, so while the data collection for household surveys can be comprehensive, it is rarely complete. Such surveys are also quite an imposition on the household owners (it can take more than 3 hours per house), so good communication with potential survey households with regard to expectations is important.

The data from Australia data suggests that there are a number of products that have very poor standby attributes (particularly in the home entertainment area). Some devices such as set-top boxes and hard drive DVD recorders with a digital tuner have quite high power consumption in most modes and ownership for these products are set to grow rapidly (particularly as analogue television broadcasts are phased out and VCRs disappear). Some integrated stereos have also been very poor, but the worst products are being removed from the market. There also a multiplicity of other devices in the home entertainment area (around 5 per house) which contribute on average 4 Watts each.

The other product of some concern are computers. The increase in ownership is extraordinary (with about than 1.8 per house in the 2005 survey sample, although recent national surveys suggest a lower figure) and this is set to increase. Presumably similar trends are being experienced in other countries. There are several aspects of concern. Firstly, the survey participants indicated that around 20% of the desktop computers included in the survey were never switched off (they were operating as home servers or network points). This has a substantial energy impact as the on mode energy consumption for an average desktop computer is more than 80 Watts (compared to an average of 3.5 Watts in off mode), assuming the screen goes into passive standby mode (2.6 Watts for LCD screen, 8.2 Watts for CRT monitors). The second issue of concern is the number of associated computer peripherals. Items such as modems, routers, switches/hubs, inkjet and laser printers, scanners and speakers are all common (average of 5.4 devices per house, at an average of 5.2 Watts per device). There is also an increasing blur between computers and entertainment devices.

Telephony equipment is also of some concern – cordless phones are now found in nearly every home and the power consumption of this equipment is typically 3 Watts per device (average of 2 devices per house).

Major appliances of course have some standby attributes of concern but their total contribution to household standby is generally only very modest. The user behaviour with respect to European dishwashers and clothes washers will have an impact on the household standby (whether or not the user manually switches the products off when not in use). Also, there is very little data on air conditioners available from the surveys in Australia – the most common products are split systems which are hard wired in the household supply so standby measurements are not possible in most situations. Australia has recently regulated to mandate the supply of data on power consumption in passive standby and off modes and crankcase heaters for air conditioners as part of the energy labelling and MEPS program, so more data should be available in the coming years.

One of the most alarming findings was that the number of devices connected to the mains and which used some power when not performing its main function climbed from 21 in 2000 to 27 in 2005 – this is an increase of 35%.

Some countries have undertaken limited surveys of households to determine standby power consumption. Many of these have concluded that standby is lower than the values determined for Australia (around 11% of residential electricity consumption). Perhaps this is because there are fewer device installed in such countries or their standby attributes are better. However a more likely explanation is that such surveys have concentrated on major appliances which are the obvious initial focus for standby power while ignoring the rapid increase in products that are associated with digital age. Appliances and home entertainment are only part of the total standby story, so it is important to recognize contributions from a wide range of products.

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