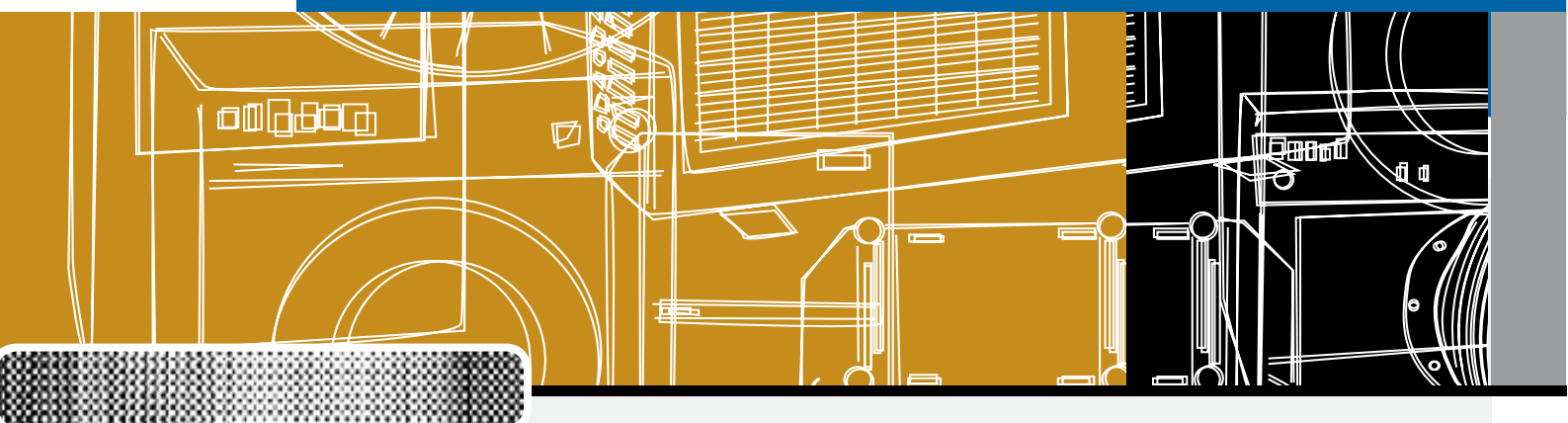


*NATIONAL APPLIANCE AND EQUIPMENT ENERGY EFFICIENCY PROGRAM*

*APPLIANCE STANDBY POWER CONSUMPTION  
STORE SURVEY 2005/2006 - FINAL REPORT*



**AUGUST 2006**

AN INITIATIVE OF THE MINISTERIAL COUNCIL ON ENERGY FORMING PART OF THE  
AUSTRALIAN NATIONAL FRAMEWORK FOR ENERGY EFFICIENCY AND  
THE NEW ZEALAND NATIONAL ENERGY EFFICIENCY AND CONSERVATION STRATEGY

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# Introduction

## Background

In 2000 the Australian Greenhouse Office (AGO) and the National Appliance & Equipment Energy Efficiency Committee (NAEEEC)<sup>1</sup> commissioned the report, *Quantification of Residential Standby Power Consumption in Australia* (Energy Efficient Strategies and EnergyConsult, 2001). This study provided results of an intrusive survey where measurements on 2,500 appliances were undertaken in 64 houses in Melbourne, Sydney and Brisbane. This report also included results of measurements on 531 new appliances in retail outlets and results of a telephone survey of 801 households in Australia, which documented information on appliance ownership, age and usage patterns. This research revealed that 11.6% of Australia's household electricity consumption is attributed to energy used by appliances and electronic equipment when not performing their primary function (this figure includes some small continuous loads not traditionally classified as "standby"). This "standby" consumption was estimated in 2000 to be costing Australians more than \$500 million per year and generating more than 5 million tonnes of carbon dioxide per annum. A more recent intrusive survey conducted under the E3 programme found that residential standby energy usage has increased by 3% per annum for the last five years and is now generating 6.2 million tonnes of carbon dioxide per annum (EES 2005).

Following the 2000 study, five follow-up store surveys of new appliances have been conducted. The reports titled *Appliance Standby Power Consumption: Store Survey* (Energy Efficient Strategies & Energy Consult), measured energy consumption of 635 in 2002, 573 in 2003, 1431 in 2004, and 1313 in 2004/05, and 946 appliances in 2005/06. This data was compared with the information recorded in the 2001 report; a large proportion of products still consumed more than 1 W in standby and off modes and off modes.

The results presented in this report provide details of in-store standby measurements for 946 new household appliances that were undertaken in November 2005 and June 2006. This report represents a continuation of the ongoing monitoring of appliance standby power usage, which began with the store survey conducted in late 2000. A summary of the findings from this report can be found in the report titled – *Executive Summary* (EnergyConsult 2006).

## Definition of "Standby"

Appliances and equipment with a "standby mode" may include any household product that consumes power while not performing its primary function. A simple definition of "standby" is when an appliance is at its lowest power consumption when connected to mains power, even if the appliance is turned off (lowest power mode that can be

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<sup>1</sup> Now known as the Equipment Energy Efficiency (E3) Committee.

influenced by the user). However, “standby” is better defined under various modes and for the purpose of this research, standby modes were defined as follows:

### **Off**

When a product or appliance is connected to a power source but does not produce any sound or picture, transmit or receive information or is waiting to be switched “on” by the consumer. If the product has a remote control, it cannot be woken by the remote control from off mode. While the product may be doing some internal functions in off mode (e.g. memory functions, EMC filters) these are not obvious to the user.

### **Passive Standby**

When a product or appliance is not performing its main function but it is ready to be switched on (in most cases with a remote control) or is performing some secondary function (e.g. has a display or clock). This mode also applies to power supplies for battery operated equipment (portable appliances which are intended to be used when disconnected from the base station) when the appliance is not being charged.

### **Active Standby:**

Active standby is mostly applicable to VCRs and some stereo equipment where operating involves some mechanical drive (such as DVD and CD players). Active standby is when the appliance is on but not performing its main function. For example, the VCR may be on but is not playing or recording. This mode also applies to power supplies for battery operated equipment (portable appliances) when the appliance is being charged (various sub-modes).

### **Delay Start:**

Delay start mode was measured for the first time in the 2003/04 survey. This feature is fast becoming common place on many major appliances. Essentially the appliance can be programmed to begin functioning at a later time; in some cases up to 24 hours later. Appliances left in this mode are in neither active nor passive standby and therefore it was decided to measure this mode as a separate category. The effect this mode will have on consumption will largely be determined by consumer behaviour. The recent EES (2005) intrusive survey found between 20 to 25% of consumers used this function when it is available.

## ***Aims & objectives***

The Equipment Energy Efficiency Committee commissioned this research as part of its program to reduce the standby consumption of all electronic appliances to less than 1W. This research was primarily undertaken to monitor changes in standby power consumption with the results of previous annual surveys undertaken since 2001. The main objectives of this survey were to:

- Quantify the magnitude of electricity used in standby mode by new appliances offered for sale in the Australian market in November 2005 and June 2006
- Compare the results of this study with those from the five previous in store surveys in order to track the industry's progress in reducing standby power consumption.

This survey was done in two separate time blocks to ensure a broader range of appliances were included. This enabled the survey to include seasonal products such as heaters and air conditioners.

During the survey, additional information is collected regarding the features of each appliance, i.e. screen size of monitors and TVs, style of appliance, i.e. wall mount vs portable air conditioner etc., price etc. This information assists in the analysis of the data and identifying any trends in appliances. For example if a group of appliances with the same features are all found to be high consuming products then the presence of that feature could explain the extra power.

The survey also records the presence of an Energy Rating label or an ENERGY STAR label on appliances. Products that displayed an ENERGY STAR label were cross examined to reveal if the ENERGY STAR requirements to display the label for that product type were met. For white goods, only the presence or absence of the Energy Rating label has been noted in the analysis as a more complex and rigorous testing procedure (that includes factors other than standby performance) is used when labelling such products.

## *Research Methods*

### *Equipment and Preparation*

The majority of appliances were measured using a portable meter, (Sparmeter Model NZR 230). The meter used for measuring TVs energy usage was a Yokogawa<sup>2</sup> digital power analyser Model WT200.

Seven Melbourne retail stores participated in the 2005/06 study. This allowed measurements of a large range of appliances, across a number of manufacturers to be taken. The metering device was systematically plugged into the floor stock across 40 appliances categories. This year some appliance categories were excluded from the survey, i.e. cooking appliances such as cook tops & stoves as their impact on the standby energy usage was deemed to be minimal from previous surveys. Some new appliances were added for the first time, e.g. toasters. Where products have been redefined these details are included in the results section of the report. Appliance brand and model number were recorded to prevent duplication of measurements. There was no selection

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<sup>2</sup> Calibrated in February 2002. Fundamental power accuracy of 0.25%.

process, with most of the available stock on display in the store being measured. The reasons for some appliances not being measured as part of this survey were as follows:

- Appliance power cord missing or damaged;
- European or US power cord;
- Appliance difficult to access without disturbing the store display;
- Shop Fixture design does not allow access to power cords without removing shelving and panels. (This seems to be more common with stores seeing this as an anti theft solution)
- No display model available at the time or only appliance casing displayed (not a working model);
- Appliance locked in cabinets for security reasons.
- Display appliances are hard wired or built in. (this was the case particularly for air conditioning appliances).

For each appliance, power consumption was measured while the appliance was in use, in standby (passive and/or active) and off, where applicable. Clearly for many appliances such as washing machines and dishwashers, it was impractical to measure the appliance in use. For most of these products there is an Australian Standard that adequately covers the 'in use' mode consumption.

A new test procedure was used for measuring Televisions this year. As a new international test method for televisions is currently being developed, in-use mode while measured is not discussed in the results section. These measurements will again be included in the future once the test method is established. Additionally as the appropriate test method was not available during the November store survey a smaller number of televisions have been recorded this year. Power factor was only recorded for passive standby and crest factor was not included at all this survey.

Power factor traditionally means any phase shift between a sinusoidal voltage supply waveform and a sinusoidal current waveform (power factor is 1.0 when these are perfectly aligned). However, in the case of standby measurements where the current waveform is often distorted and non-sinusoidal in shape, the power factor is the ratio of the active power (Watts) to the average VA (volt-amps). The power factor is a measure of how much of the current is performing useful work (contributing to active power use). Values for power factor are low <0.5, moderate 0.5-0.8, high >0.8-1.0.

Table 1 documents which appliances were measured in the 2005/06 survey. It also shows the various mode combinations measured, namely in-use, in standby (passive or active, where applicable) and off mode. As previously mentioned it was not always practical to measure appliances in normal use during an in store survey. The modes measured for each product type reflect the design and operation of the product. While some product types will have passive or active standby modes (e.g. a dishwasher can be switched on

prior to the start of a program – this would be passive standby), not all of these modes were measured or are relevant to this study.

**Table 1 – A summary of modes tested by appliance**

Appliance List	In Use	Active Standby	Passive Standby	Delay Start	Off	EPS* (likely)
Air Conditioner			✓	✓	✓	
AV Receiver		✓	✓		✓	
Breadmaker		✓			✓	
Computers – Box					✓	
Computers – Home Theatre Box	✓		✓		✓	
Computers - Laptop					✓	✓
Computers - Monitor	✓		✓		✓	✓
Computers - Speakers		✓			✓	✓
Computers - Other		✓	✓		✓	
Cordless Phone		✓	✓			✓
Dishwasher		✓		✓	✓	
Dryer		✓		✓	✓	
DVD Player		✓	✓		✓	
DVD Recorder		✓	✓		✓	
Espresso Machine					✓	
Facsimile		✓			✓	
Fan			✓	✓	✓	
Game Console		✓			✓	
Gas Water Heaters			✓			
Hand-held Vacuum		✓	✓			✓
Hard Disk Recorder	✓	✓	✓		✓	
Heater - Electric Portable			✓	✓	✓	
Heater - Gas			✓	✓	✓	
Home Entertainment Other		✓	✓		✓	✓
Home Theatre Systems		✓	✓		✓	
Juicer					✓	
Microwave			✓			
Mobile Phone		✓				✓
Modem		✓	✓		✓	✓
Multi Function Device		✓			✓	✓
Printer – Inkjet			✓		✓	✓
Printer – Laser			✓		✓	
Set Top Box	✓	✓	✓		✓	✓
Stereo - Integrated		✓	✓		✓	
Stereo – Portable		✓	✓		✓	
Stereo - Component		✓	✓		✓	
Subwoofer		✓	✓		✓	
Toaster					✓	
TV – LCD	✓		✓		✓	
TV – Plasma	✓		✓		✓	
TV – Projection	✓		✓		✓	
TV – CRT	✓		✓		✓	
TV/VCR	✓	✓	✓		✓	

Appliance List	In Use	Active Standby	Passive Standby	Delay Start	Off	EPS* (likely)
VCR		✓	✓		✓	
Washer/Dryer		✓		✓	✓	
Washing Machines (all types)		✓		✓	✓	

Mode tested ✓

\*Note: All appliances with an EPS will have the EPS measured in a separate EPS column that also records the brand and model of the EPS.

In total 946 products were measured, resulting in 1625 measurements being recorded during the survey. These results were analysed and compared with outcomes from the in-store surveys carried out between 2001 and 2005 where possible.

### *Problems encountered during data collection*

Not all products could be measured in all of the desired modes. For example, security reasons prevented some remote controls being displayed with items. This year most appliances reliant on remote controls for operation were able to be tested in all desired modes as a universal remote control was used where device remote controls were not available.

In some cases products had changed or were no longer available. Multi function devices have replaced some single function devices. For example no facsimiles were found in stores but rather the fax function was included in multi function devices which often incorporated printing, copying and faxing functions.

Some devices previously included in the survey have not been included in this year's survey as the results from previous years indicate that the devices were not contributing significantly to the standby energy consumption. For example stoves, range hoods and cook tops. Additionally VCRs were included but were not reported in detail as only 3 units were found and it has been concluded that this product is about to become obsolete. Some new devices were measured for the first time such as toasters.

Washing machines were divided into two categories, front loading and top loading. The historical data was resorted to allow comparisons to be made with the data collected this year.

Other problematic appliances included stereo units, such as integrated stereo equipment, where active standby power varied depending on the part of the unit "waiting to be used". For example, active standby could be higher for some units when a CD was present (but not playing) within the unit. To overcome the variation in standby measurements for integrated stereo equipment, measurements were taken in CD mode when the unit had finished searching for the disc. In most units a "No Disc" message was displayed. For integrated stereo equipment without a CD player, measurements were taken with the unit set to aux. Many appliances are no longer being made with an off mode.

## *Acknowledgements*

EnergyConsult undertook this study for the Equipment Energy Efficiency (E<sub>3</sub>) Committee.

A number of organisations assisted with this project and their cooperation and assistance is gratefully acknowledged. We would like to particularly thank management and staff of the following Melbourne stores:

1. Clive Peters Moorabbin
2. Custom Sound & Vision Brunswick
3. Harvey Norman Hoppers Crossing
4. JB HiFi East Keilor
5. Just Electrical Sunshine
6. Origin Energy Shop Camberwell
7. Origin Energy Shop Maribyrnong

Melissa Damnic of EnergyConsult coordinated the study with support from Lloyd Harrington of Energy Efficient Strategies. Melissa Damnic, Debra Frey and Michelle Leeder of EnergyConsult were responsible for undertaking field measurements on appliances and the recording of data. Paul Ryan of EnergyConsult was responsible for the definition and providing of the TV measurement test procedure and tools and subsequent data analysis software. Melissa Damnic and Michelle Leeder of EnergyConsult and were responsible for the preparation of the main report.

Notwithstanding the many individuals and organisations that have assisted during this project, the content and form of this report, and all of the views, conclusions and recommendations expressed in it, are those of EnergyConsult.

## Results

### Overview

The following 40 appliance types were tested during the 2005/06 in store survey:

- Air Conditioner
- Breadmaker
- Computers – Home Theatre Box
- Computers - Monitor
- Dishwasher
- DVD Player
- Espresso Machine
- Gas Water Heater
- Hand-held Vacuum
- Heater - Electric Portable
- Home Entertainment Other
- Juicer
- Printer – Inkjet
- Stereo - Integrated
- Stereo - Component
- Toaster
- TV – Plasma
- TV – CRT
- VCR
- Washing Machine – Top Loading
- AV Receiver
- Computers – Box
- Computers - Laptop
- Computers - Speakers
- Dryer
- DVD Recorder
- Fan
- Hard Disk Recorder
- Heater - Gas
- Home Theatre Systems
- Microwave
- Multi Function Device
- Printer – Laser
- Set Top Box
- Stereo – Portable
- Subwoofer
- TV – LCD
- TV – Projection
- Washer/Dryer
- Washing Machine – Front Loading

The following section details the results by appliance type. All histograms included in this report use the same bin definitions for the first bin, which indicates the number of units with no power consumption in the mode specified (i.e. equal to 0.0 Watts or effectively less than 0.05 Watts in terms of metered data). Subsequent bins are labelled accordingly however it should be noted that some bin sizes are non linear. Additionally data has been analysed for statistical significance. In all instances significance has been tested at 95%.

## Product Profiles

### Major Appliances

#### Air Conditioners

In the 2005/06 store survey 39 air conditioner units were measured; 13 were window-wall models, and 22 were portable appliances. Only 4 split system units could be measured as most of the units found in stores were either hard wired or had 15 amp power plugs. Seventeen of the air conditioners found are required to display energy labels however only 8 air conditioners displayed an energy rating label. Nine of the twenty-two portable units used evaporative cooling.

Air conditioners were measured in off, passive and delay start mode.

The average power consumption in passive mode was 1.7W which is 0.5W lower than 2004/05 survey, with a high of 3.1W and a low of zero. In off mode average consumption was 0.2W with 3.0W being the highest and 0.0W the lowest. Delay start consumption was 3.0W average. The results for air conditioners are summarised in Table 2 below.

**Table 2 – A summary of air conditioner results**

<b>Appliance:</b>	<b>Air Conditioner</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
Delay Start	3	3.0	3.0	3.0
Active	0	NA	NA	NA
Passive	22	1.7	3.1	0.0
Off	19	0.2	3.0	0.0
<b>Total Number of Units</b>	39			

Figure 1 and Figure 2 presents the off mode data recorded for air conditioners during the annual surveys undertaken thus far. The 2005/06 data shows that an overwhelming majority of units still use less than 1W in off mode. Average energy consumption dropped to levels similar to the 2003/04 survey.

The type of air conditioner appears to have no affect on consumption in off mode, although the highest consuming models were all refrigerated units. Air conditioners were not measured in the 2001 survey.

Figure 1 – Power measurements for air conditioners: off mode

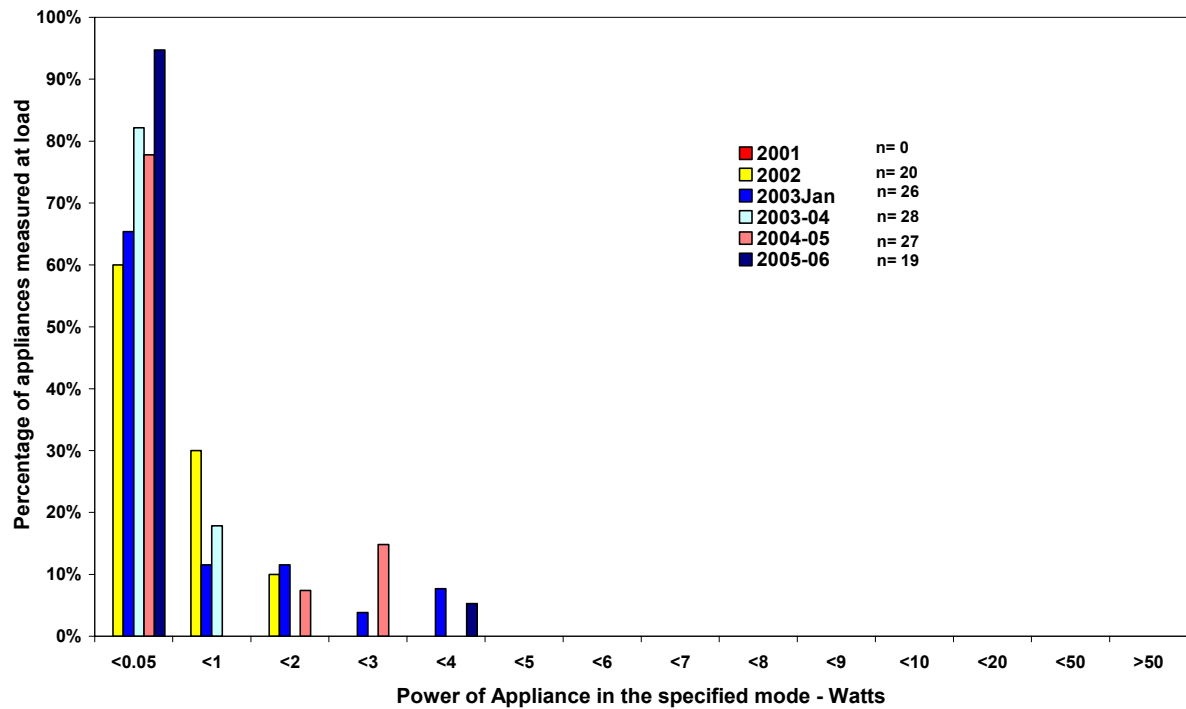
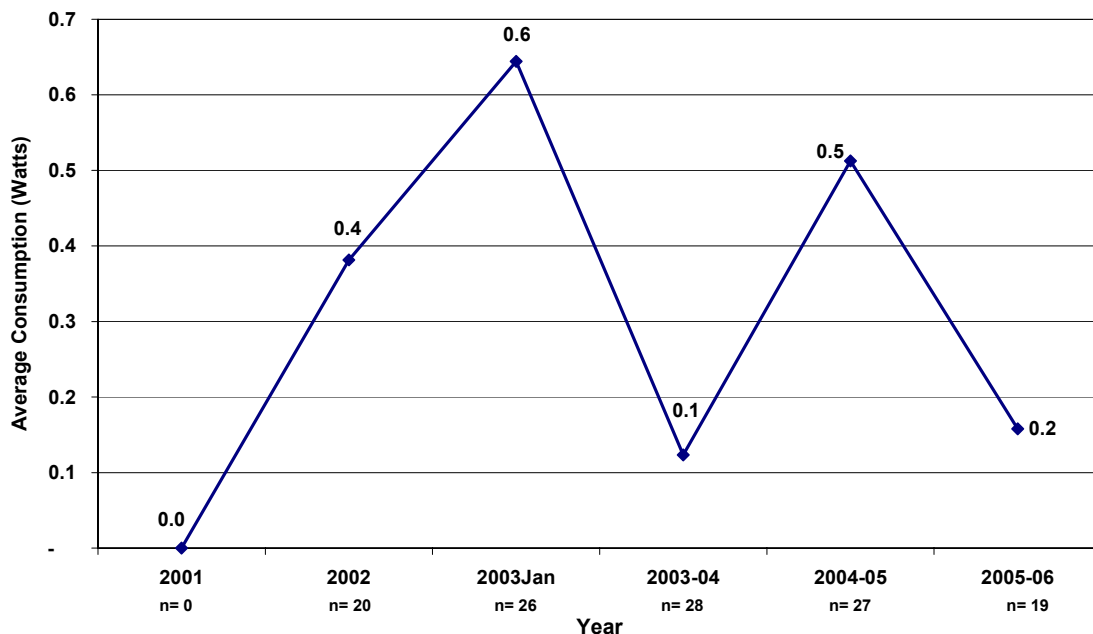


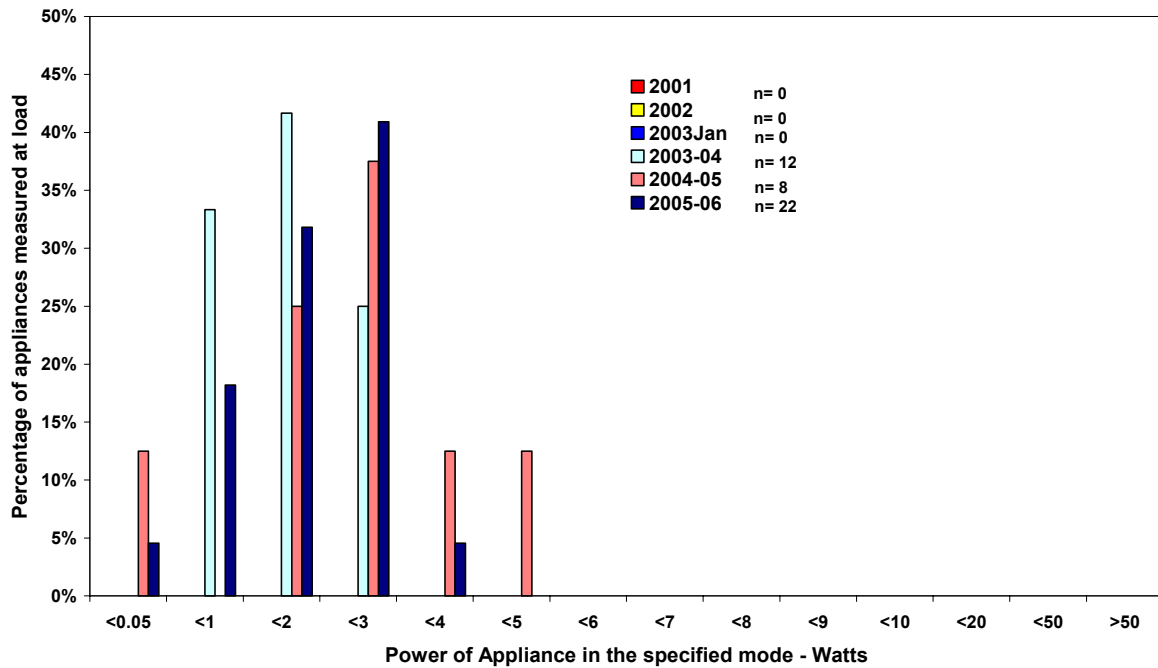
Figure 2 – Average power measurements for air conditioners: off mode



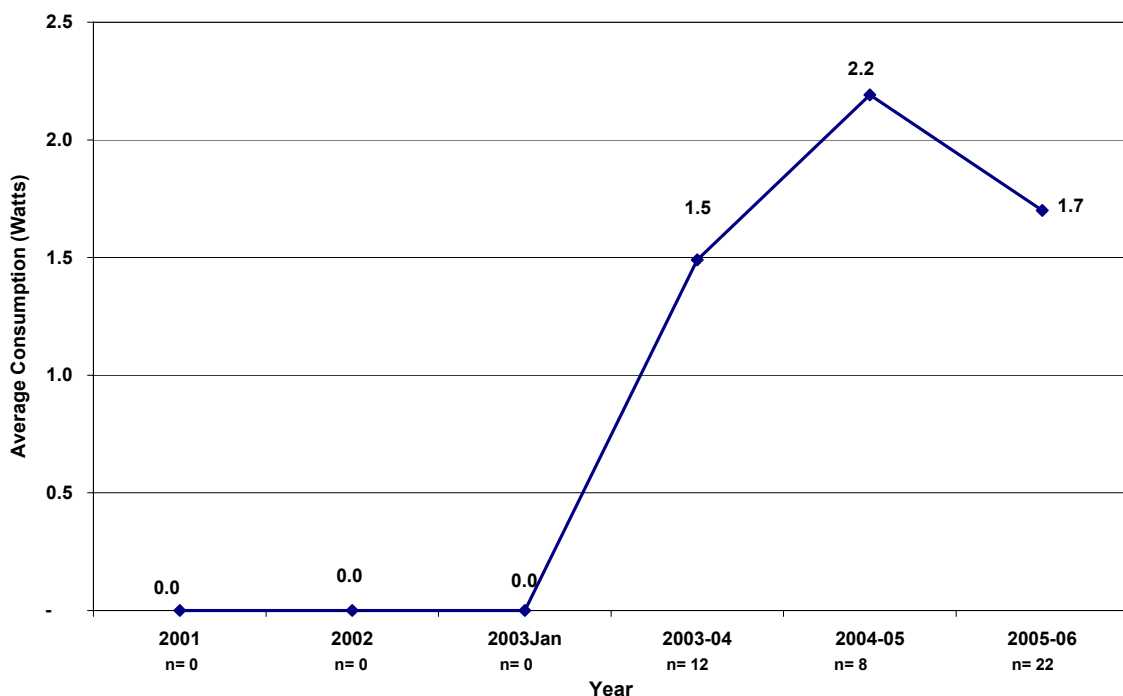
This year’s survey saw a large increase in the number of models with remote control, particularly in the portable air conditioner category. Passive standby was found in over 56% of models tested in this survey, compared to between 25 and 30% in previous years. Figure 3 shows the range of consumption in passive mode was relatively unchanged with

most models still consuming between 1 and 2 watts. As shown in Figure 4 average passive standby for 2005/06 usage has decreased from 2.2W to 1.7W. There is no statistical significance in this change, however if the large increase in models using remote control function continues there is likely to be an overall increase in the passive standby consumption in the air conditioner segment.

**Figure 3 – Power measurements for air conditioners: passive mode**

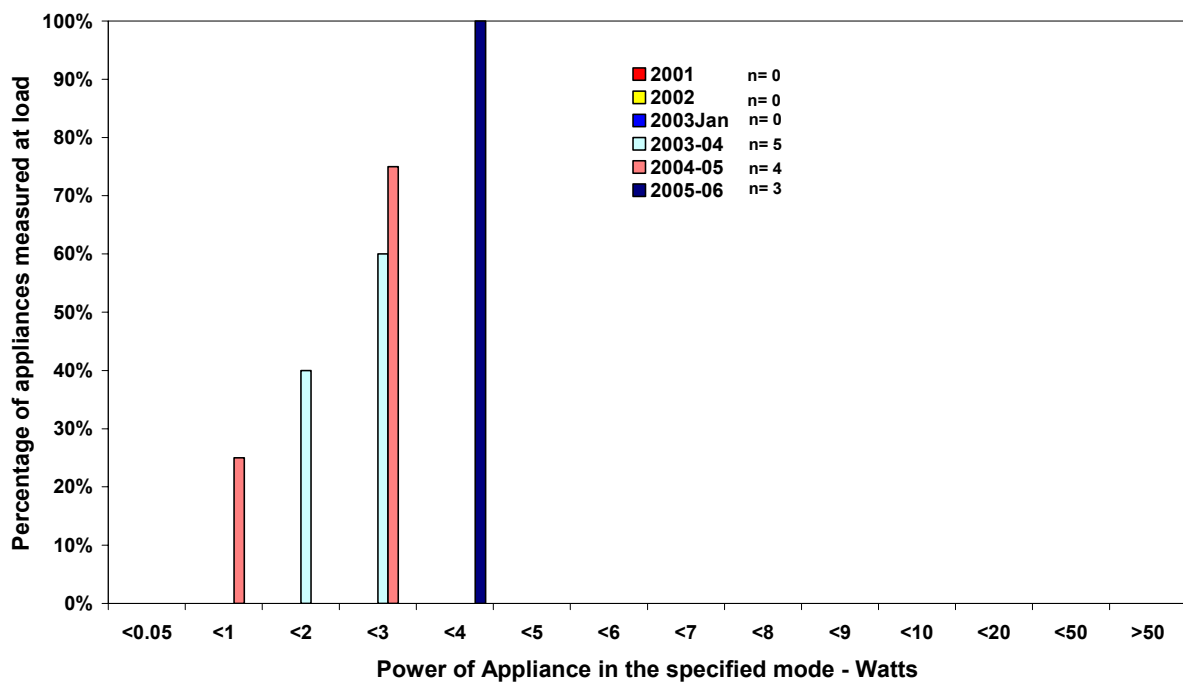


**Figure 4 – Average power measurements for air conditioners: passive mode**



Less than 8% of units measured in this survey had a delay start function. From the 2005 intrusive home survey no air conditioners were found to be in delay start mode. It appears that delay start function is not a significant contributing factor of power use in the air conditioner segment. Average consumption for delay start mode increased to 3.0W from the previous 2 years average of 2.1W. The very small sample numbers for the last 3 surveys (3, 4 and 5 respectively) make it difficult to draw conclusions. These results are shown in Figure 5 below.

**Figure 5 – Power measurements for air conditioners: delay start mode**



An important point to note regarding air conditioners is that the most popular type of air conditioners are split systems (many of this type use remote controls and will therefore have some standby) and almost all are “hard wired”, so in-store measurements were limited (4 in 2005/06). Lab measurements (e.g. during energy labelling and MEPS tests) will be necessary to collect data.

### Clothes Dryers

This year 13 clothes dryers were surveyed. All units displayed an energy rating label. Only 4 of the 13 (30%) models measured had an on/off switch allowing active standby to be measured. Only one model had a delay start function. Measurements were taken in active standby, off and delay start mode.

In active standby the average power consumption was 2.4W with a maximum of 3.6W and a low of 1.7W. The average power consumption in off mode was 0.2W with the maximum reading being 2.0W and the minimum zero. The unit with delay start function

recorded consumption of 3.8W in this mode. Table 3 below summarises the results for clothes dryers.

**Table 3 – A summary of clothes dryer results**

Appliance:	Dryer			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	1	3.8	3.8	3.8
Active	4	2.4	3.6	1.7
Passive	NA	-	-	-
Off	13	0.2	2.0	0
<b>Total Number of Units</b>	13	NA	-	-

The 2005/06 survey found 11 of the 13 (85%) models used zero energy in off mode. Of the remaining 2 units, one used below 1W and the other consumed 2W in off mode. Average off mode consumption has remained stable since 2002. This is demonstrated in Figure 6 and Figure 7 below. This result compared favourably to last years result of 67% of units measured consuming zero energy when in off mode. This is the third year in a row only one model consumed greater than 1W.

**Figure 6 – Power measurements for clothes dryers: off mode**

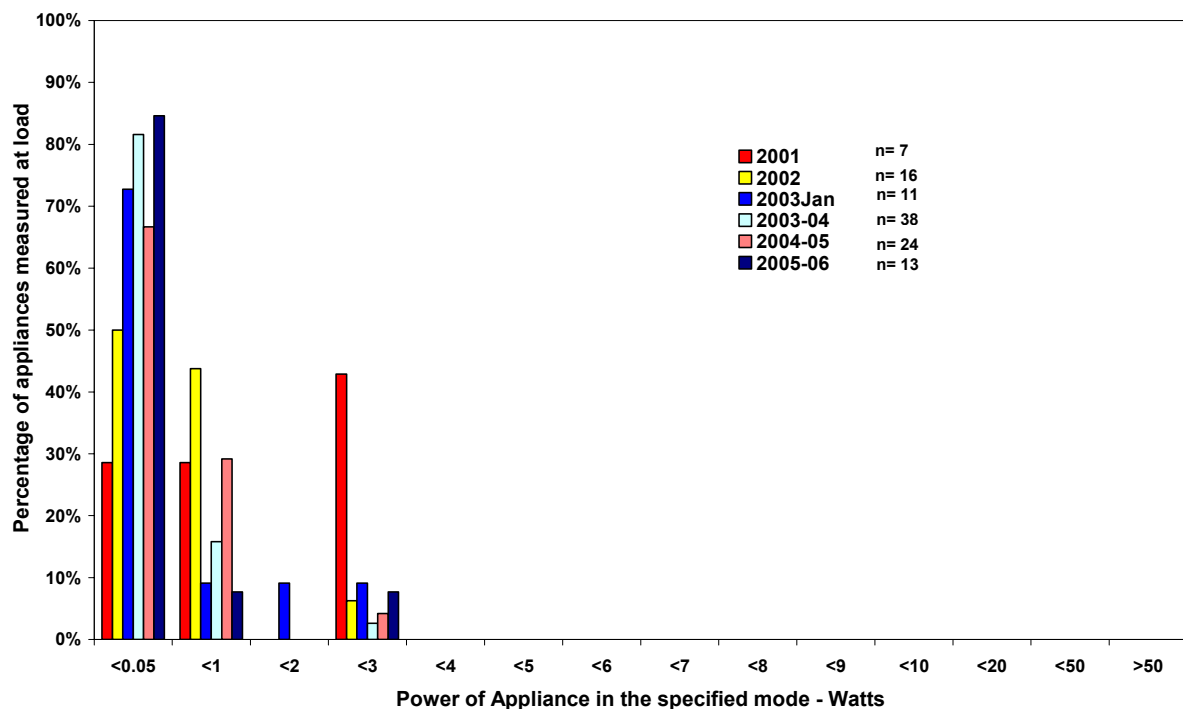


Figure 7 – Average power measurements for clothes dryers: off mode

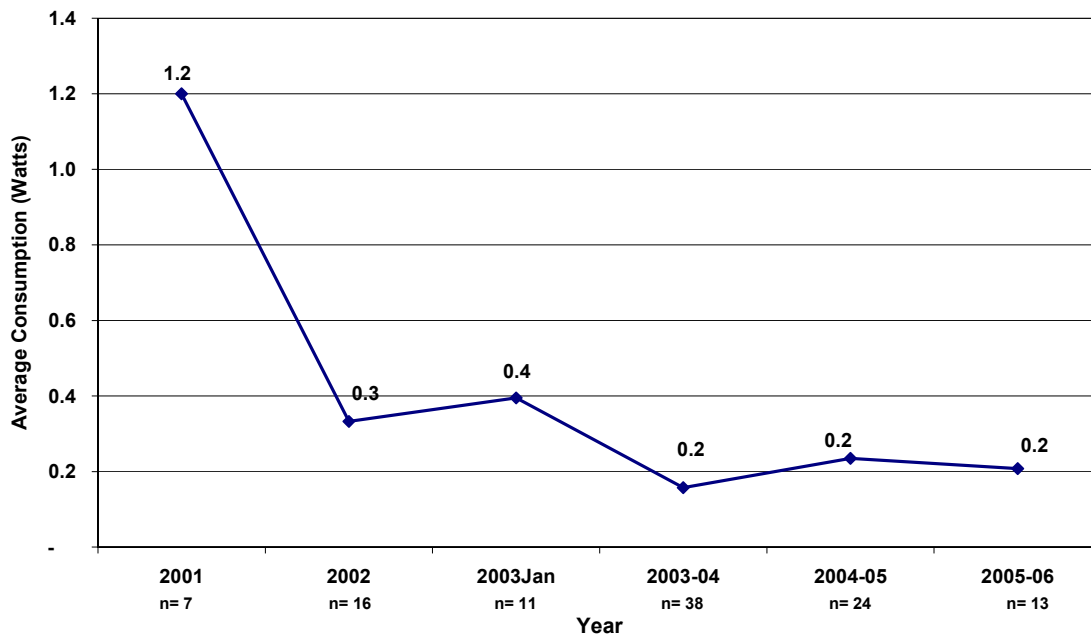
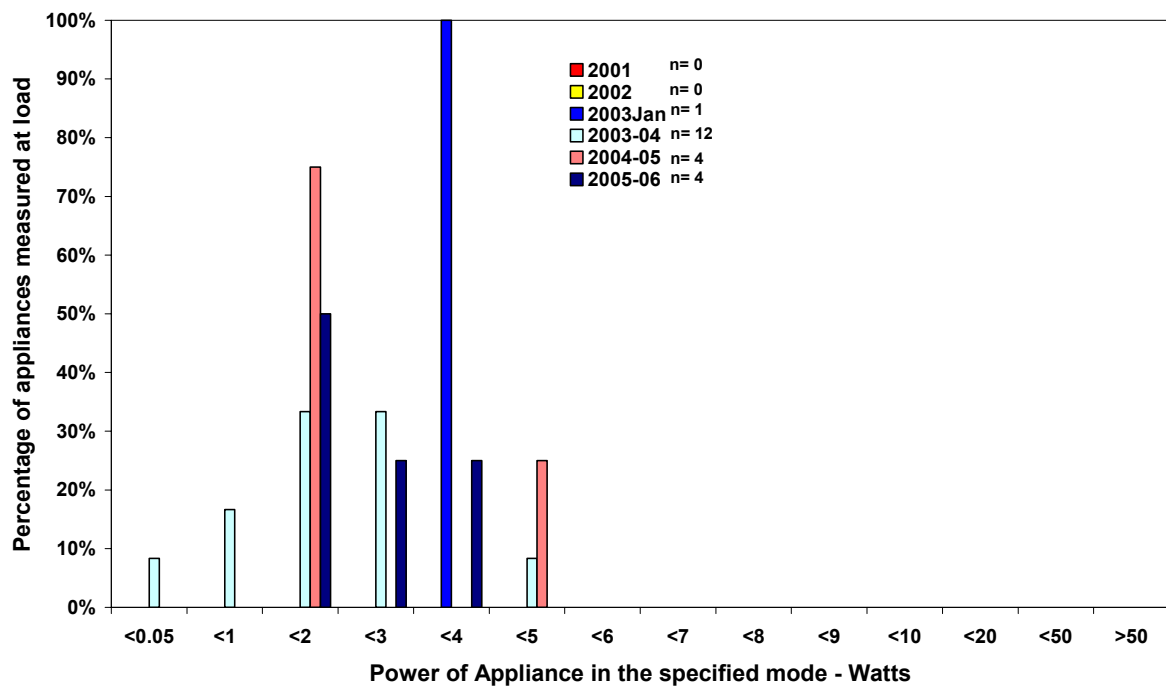


Figure 8 shows the distribution of clothes dryers in active standby. Whilst the small sample size limits comparison of active standby, all models fell within the upper and lower limits of previous surveys. With so few models incorporating an on/off switch, it would appear that active standby will have little consequence for consumption in the clothes dryer segment.

Figure 8 – Power measurements for clothes dryers: active standby mode



## Dishwashers

During the survey 25 dishwashers were measured. Only one machine was displayed without an energy rating label. The operating controls on the dishwashers varied; with some having mechanical dials while others had soft touch electronic controls. Fourteen of the twenty-five models (56%) measured had a delay start function.

These appliances were measured in delay start, active standby and off mode. Power consumption in delay start ranged from 1.3W to 7.9W with the average being 3.0W. The consumption range in active standby was quite wide again this year, with the minimum 0.4W and the maximum 7.4W averaging out at 2.7W. In off mode 18 of the models consumed 0W. The remaining 7 units consumption between 0.2 and 4.3W, resulting in the overall average consumption in off mode of 0.6W. Table 4, below summarises the in store results for dishwashers.

Table 4 – A summary of dishwasher results

Appliance:	Dishwasher			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	13	3.0	7.9	1.3
Active	24	2.7	7.4	0.4
Passive	0	NA	-	-
Off	25	0.6	4.3	0.0
<b>Total Number of Units</b>	<b>25</b>			

Figure 9 demonstrates that 80% of dishwashers in the 2005/06 survey consumed less than 1W maintaining the improvement gained over the last 2 years. Average consumption increased slightly from 0.4W in 2004/05 to 0.6W in 2005/06. Average consumption data is presented in Figure 10

**Figure 9 – Power measurements for dishwashers: off mode**

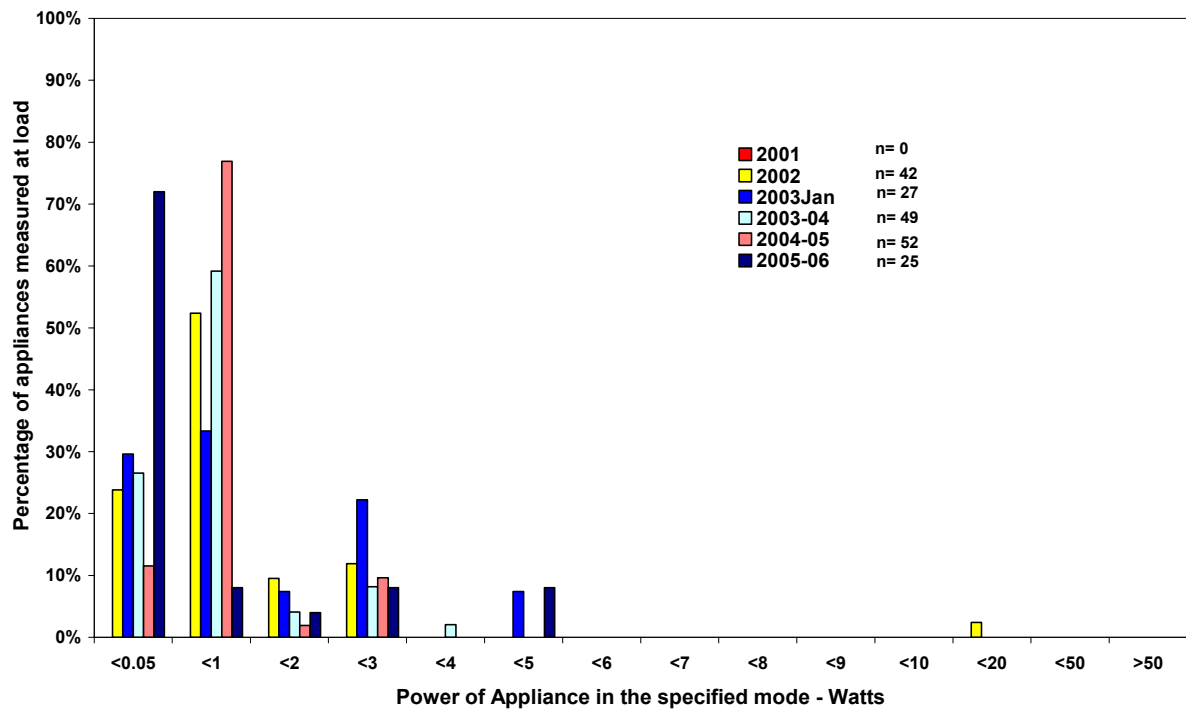
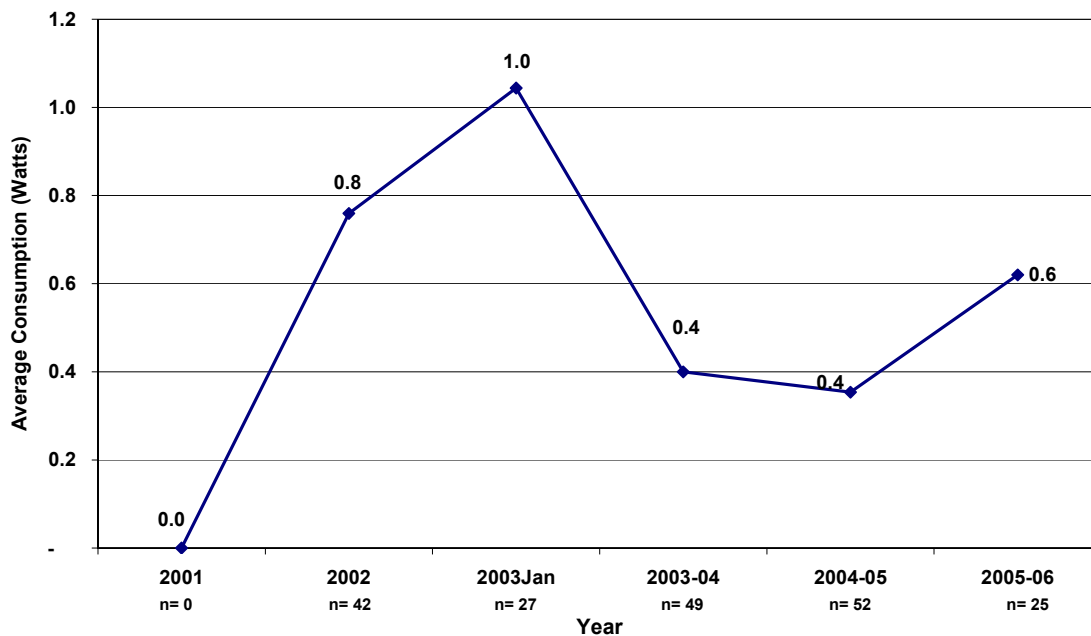


Figure 10 – Average power measurements for dishwashers: off mode



Active standby for dishwashers remained relatively stable again in 2005/06 with average active standby at 2.7W compared to 2.6W last year. However the number of models using less than 1W has decreased every year with the majority (70%) now consuming between 1 and 3 watts. Additionally there has been no reduction in the proportion of dishwashers consuming more than 5W, which still sits at around 18% of units. These results are presented in Figure 11 and Figure 12. Almost a quarter of users leave their dishwashers in active standby mode (EES 2005).

Figure 11 – Power measurements for dishwashers: active standby mode

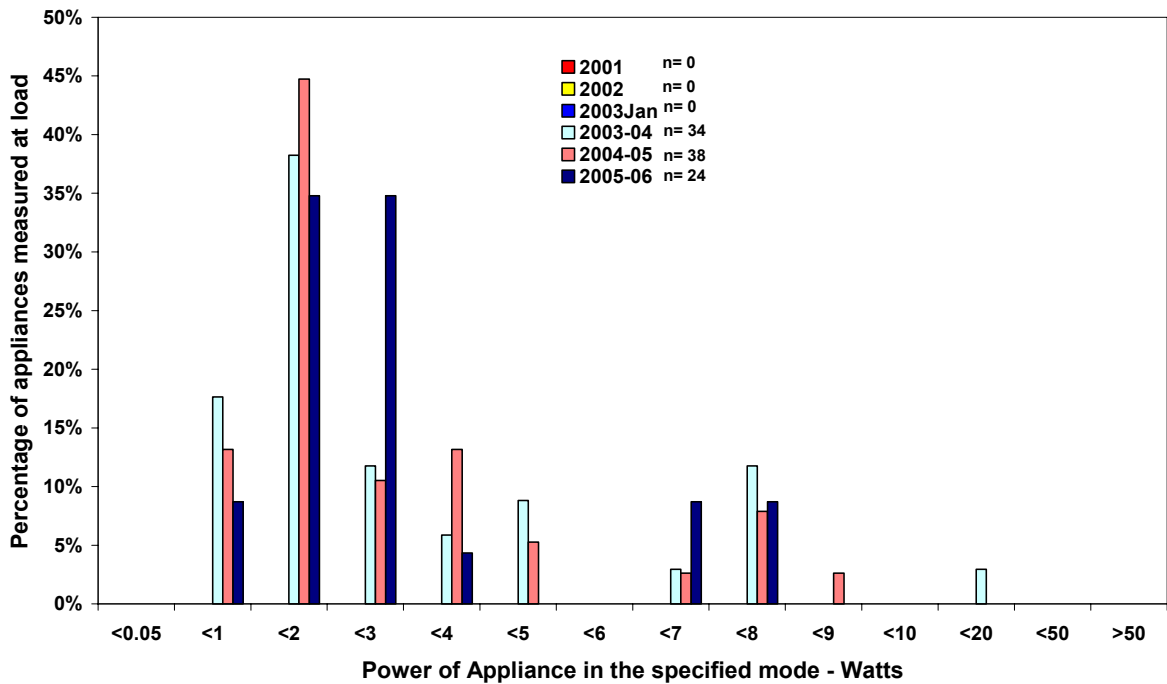
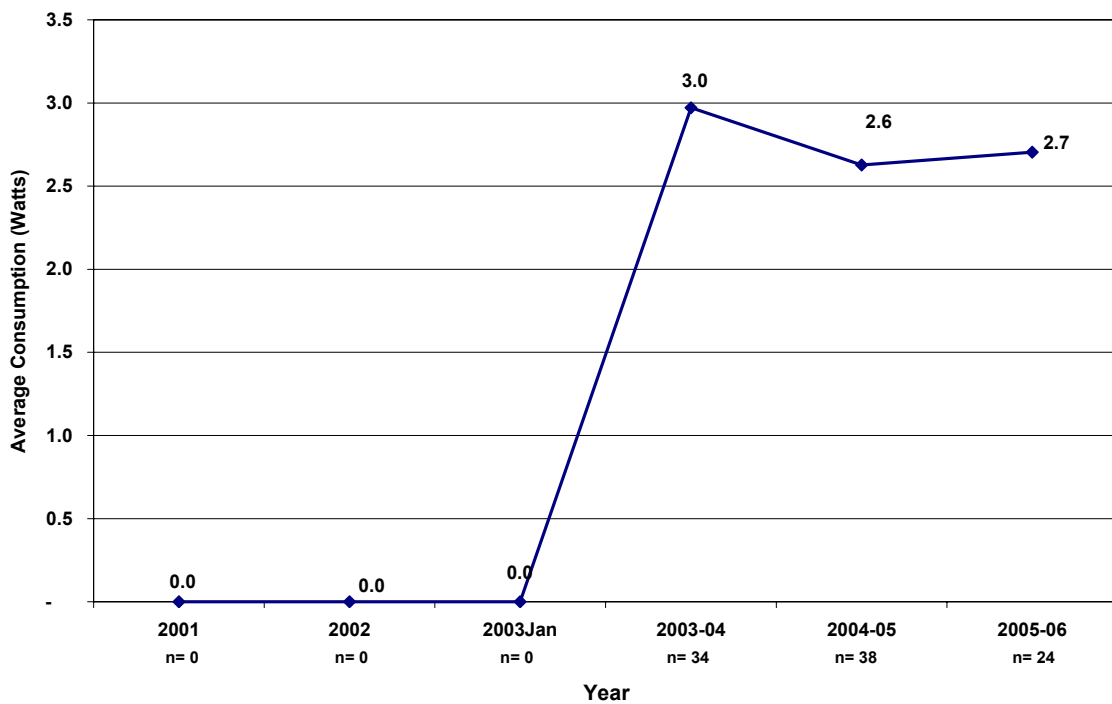


Figure 12 – Average power measurements for dishwashers: active standby mode



Average delay start consumption also remained constant at 3.0W compared to 2.9W in 2004/05 and the distribution of results has been similar for the last 3 years. These results are presented in Figure 13 and Figure 14. The recent intrusive survey (EES 2005) found 20% of consumers use the delay start function on their dishwasher however there is no

indication of what length of operation in this mode as this function can vary from a 1 to 23 hour delay.

Figure 13 – Power measurements for dishwashers: delay start mode

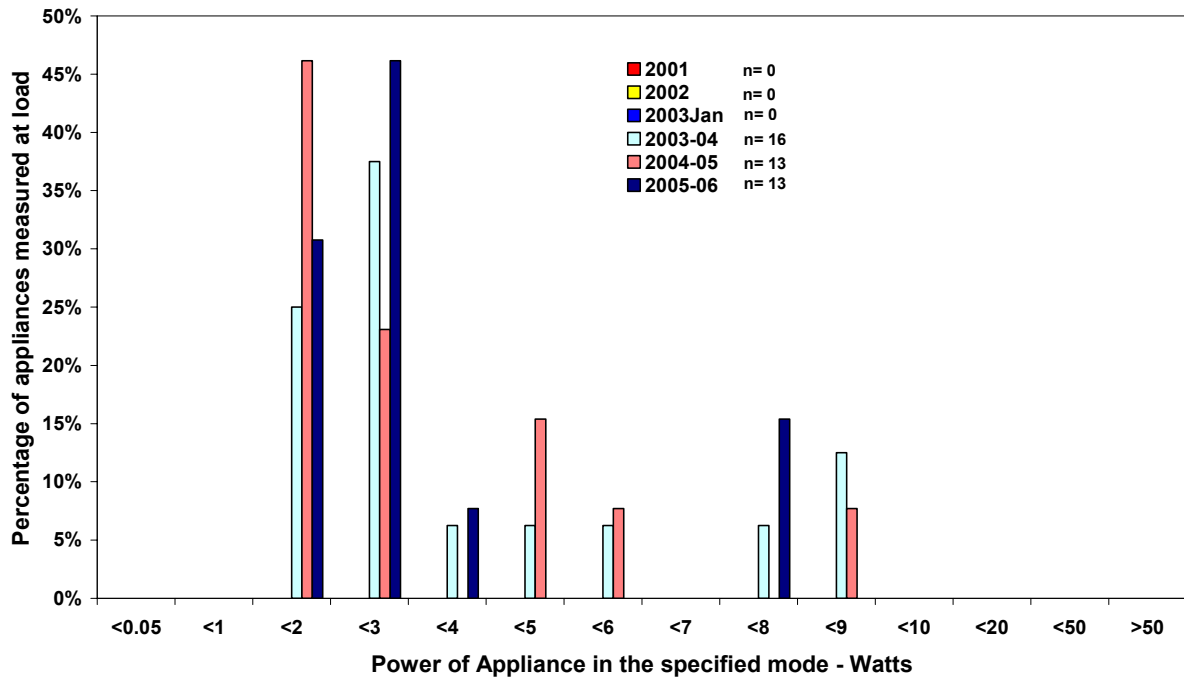
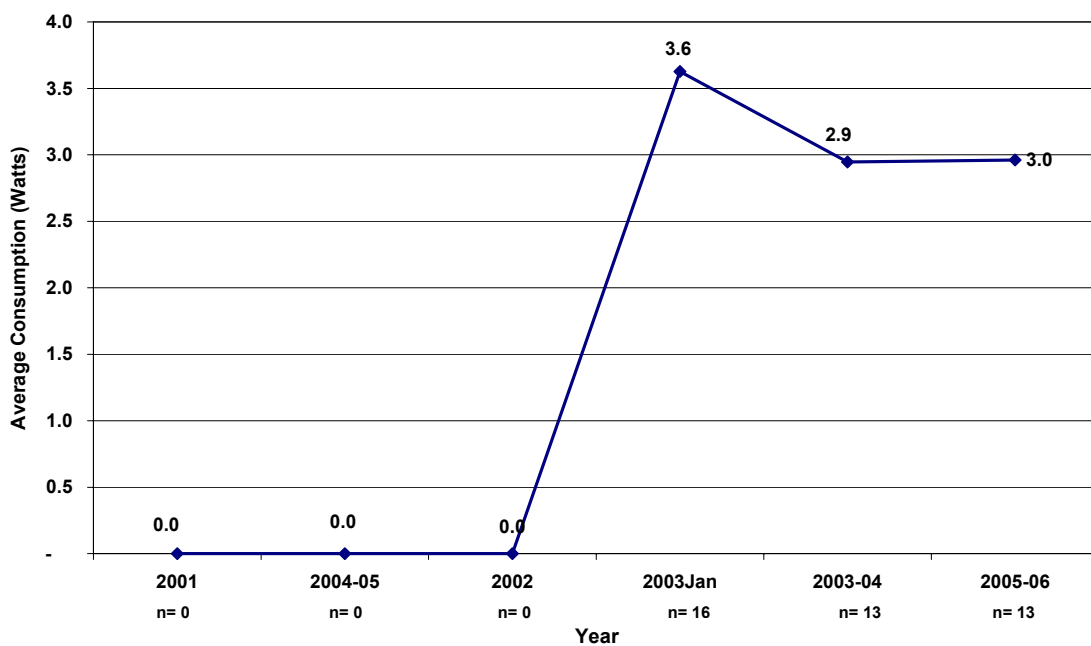


Figure 14 – Average power measurements for dishwashers: delay start mode



## Washing Machines

It was decided for the 2005/06 survey to divide washing machines into two categories: Top Loading and Front Loading. Historical data was sorted into these two categories to enable comparisons to be made.

### Front Loading Washing Machines

A total of 25 models were measured in 2005/06. The machines varied in their rated capacity and all machines had power on/off switches. Thirteen of the twenty-five units surveyed offered delay start mode. All models displayed an Energy Rating label.

Those models with an on/off switch and delay start function were measured in active standby and delay start mode as well. In active mode the average consumption was 3.5W. Eight models recorded measurements above 4W in active mode. Again most machines (68%) consumed below 4W, which is similar to the last survey. In off mode the range of consumption was 0W to 4.5W with an average consumption of 0.9W. This is the same as last survey. Delay Start consumption ranged from 0.9W to 8.7W with an average of 4.0W. For a summary of these results see Table 6.

**Table 5 – A summary of front loading washing machine results**

<b>Appliance:</b>	<b>Washing machine</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
Delay Start	13	4.0	8.7	0.9
Active	25	3.5	11.8	0.4
Passive	NA	-	-	-
Off	25	0.9	4.5	0.0
<b>Total Number of Units</b>	25			

2005/06 saw the number of units consuming less than 1W in active standby decrease. There were also two units found to consume more than 10W for the first time. One of these units included a large visual display screen with detailed options and instructions. Despite this average active standby has remained stable with no statistical evidence supporting a trend of increasing consumption across this segment. In Australia around 25% of front loaders are left in active standby mode (EES 2005). Results from the survey are presented in Figure 15 and Figure 16.

Figure 15 – Power measurements for front loading washing machines: active standby mode

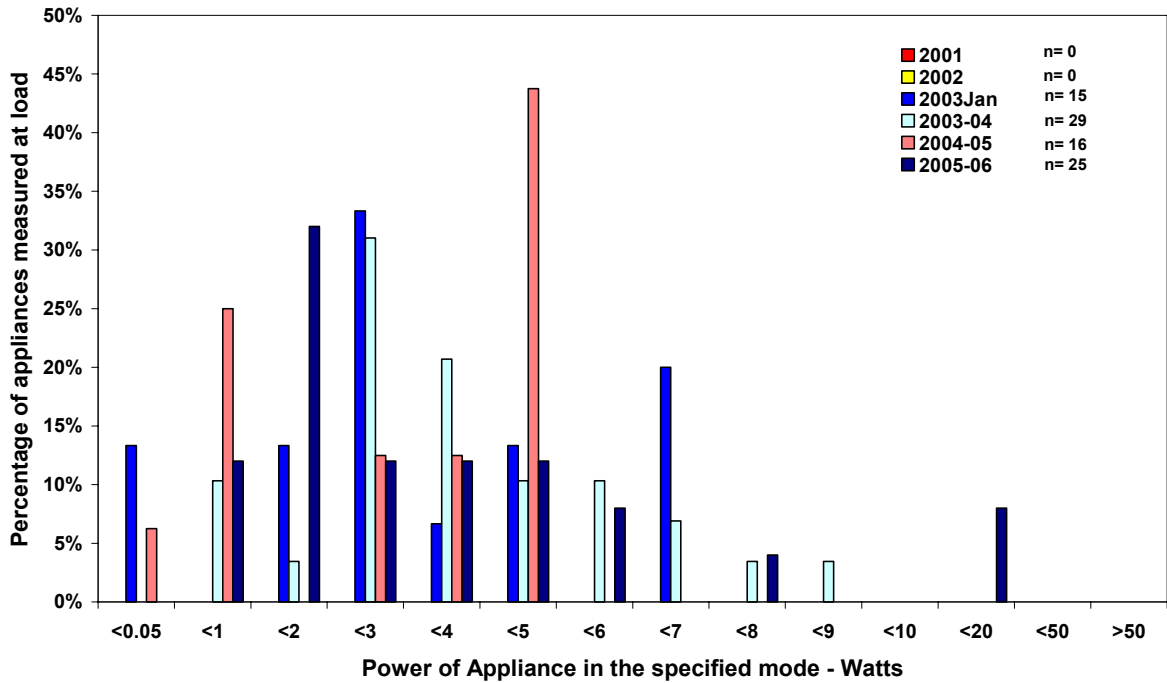
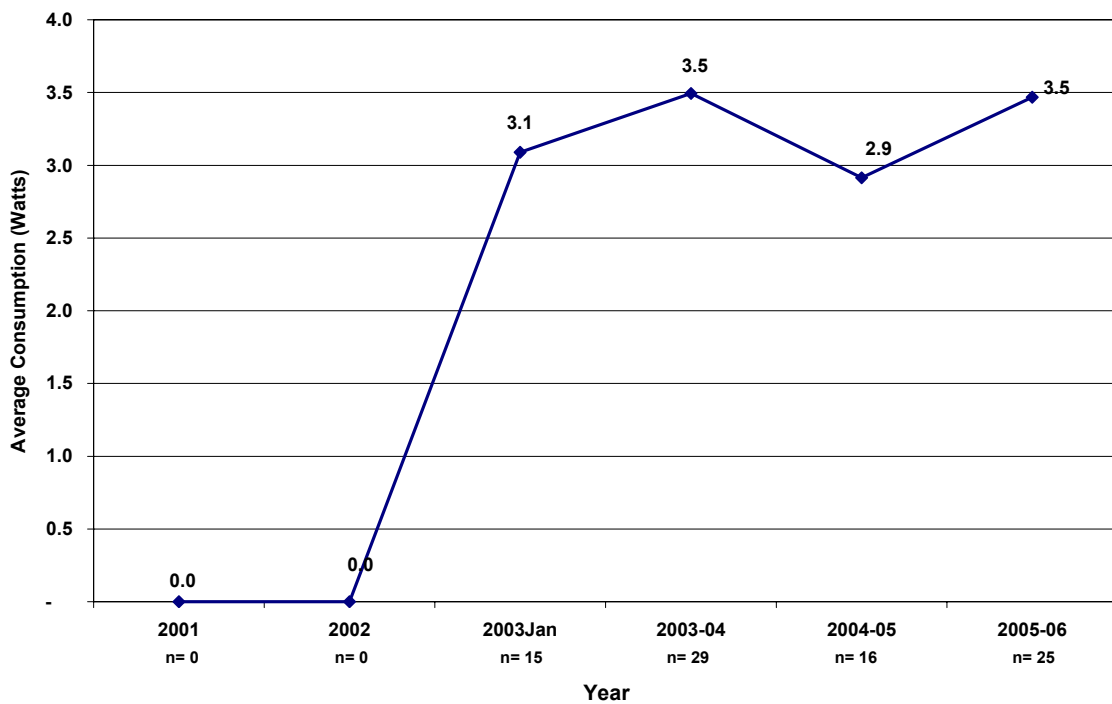


Figure 16 – Average power measurements for front loading washing machines: active standby mode



Most front loading washing machines have zero consumption in off mode. While the proportion of machines consuming zero in this mode rose to the highest level ever (64%) in 2005/06, average off mode consumption rose slightly to 0.9W. Given that this remains below 1W and has been variable from survey to survey it would seem that off mode consumption levels are fairly stable. It would also indicate that those models consuming at the high end of the range (3W-4W) have ample room to improve off mode consumption. For more details see Figure17 and Figure 18

**Figure17 – Power measurements for front loading washing machines: off mode**

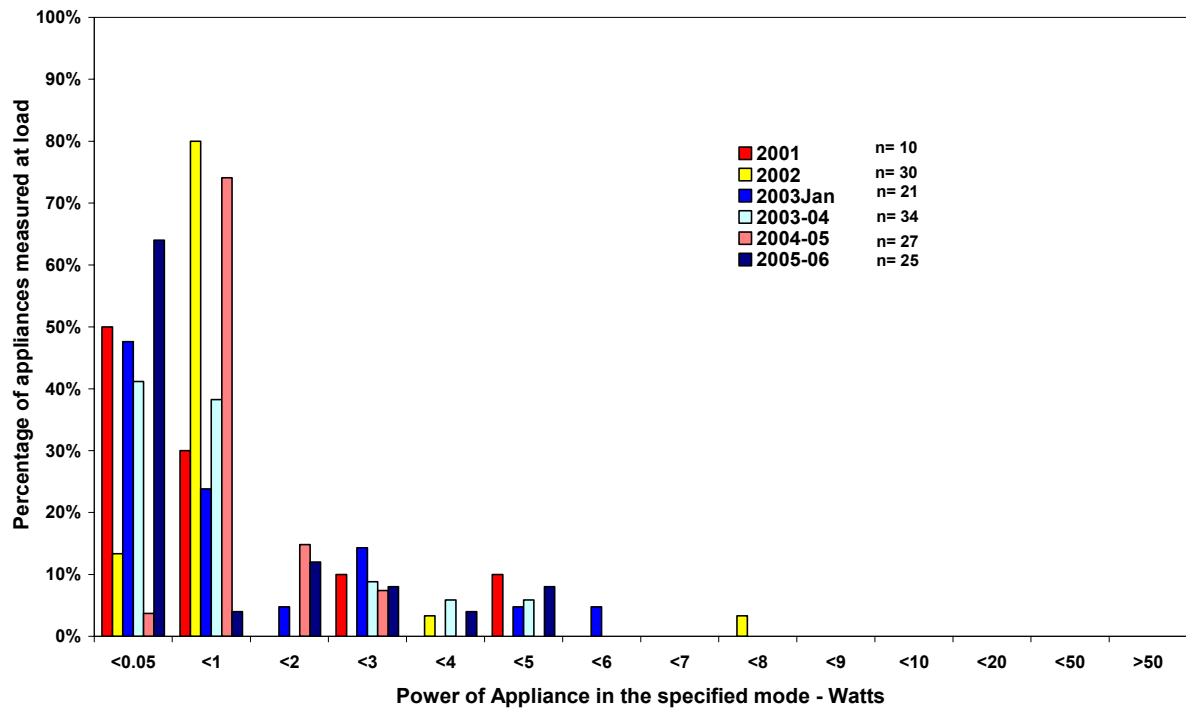
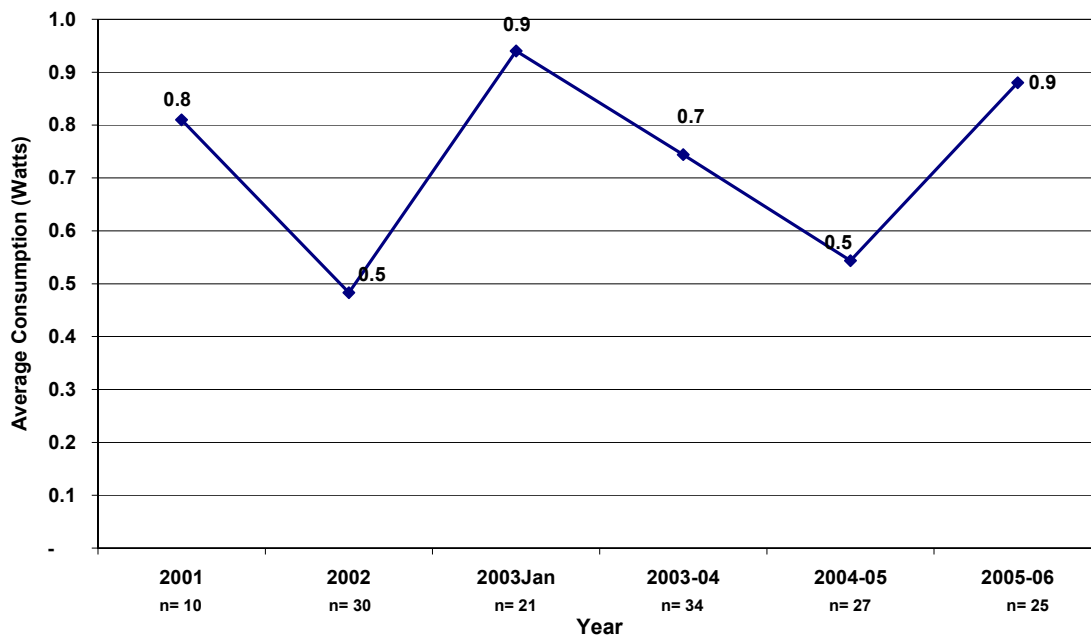


Figure 18 – Average power measurements for front loading washing machines: off mode



Delay start mode is used by nearly a quarter of all consumers with this function (EES 2005). The distribution range for front loading machines in this mode has changed little over the past 3 years, however there was a sharp rise in the number of machine using less than 3W in the 2005/06 survey. Average consumption in this mode has experienced a small decline each year however the change is not large enough to be considered a statistically valid trend. Figure 19 and Figure 20 show the results delay start mode.

Figure 19 – Power measurements for front loading washing machines: delay start mode

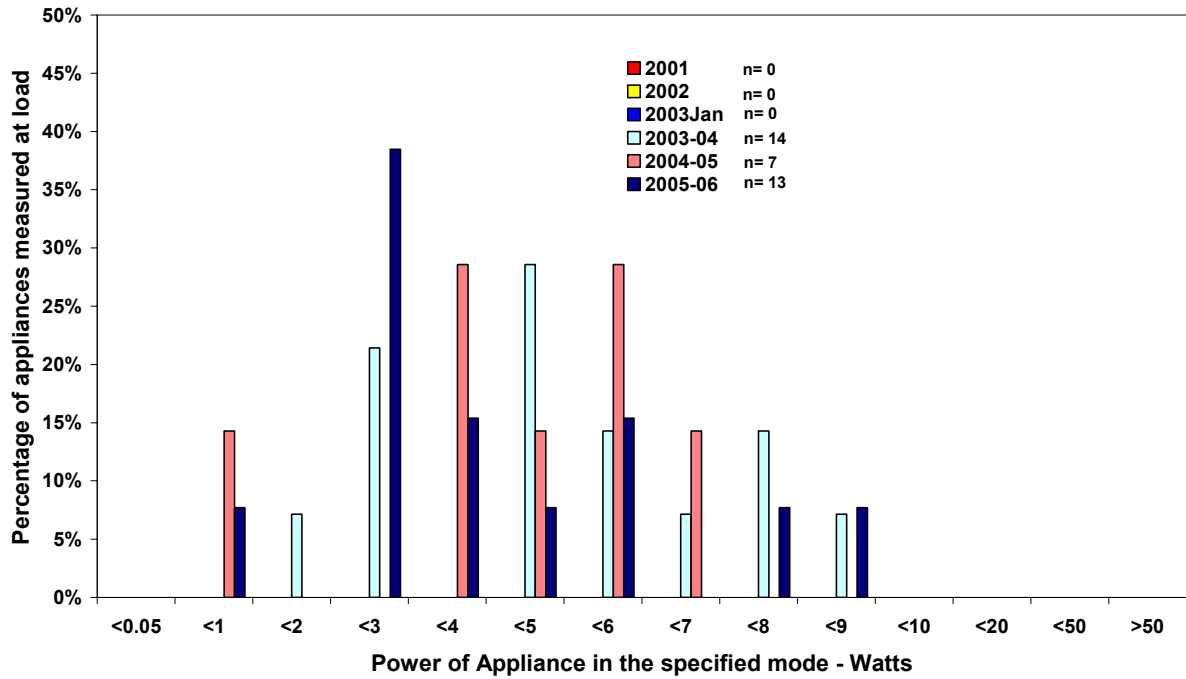
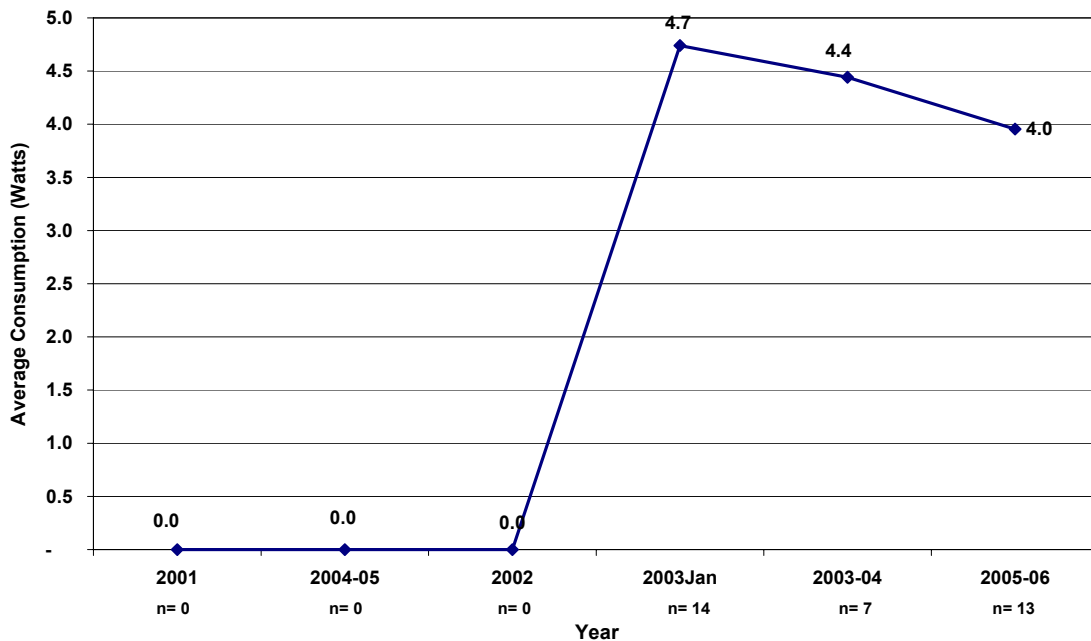


Figure 20 – Average power measurements for front loading washing machines: delay start mode



## Top Loading Washing Machines

A total of 36 top loading washing machines were measured in the 2005/06 survey. Sixteen units surveyed offered the delay start mode. All models except one, displayed an Energy Rating label. Thirty-five of the 36 models were measured in off mode. Those models with an on/off switch and delay start function were measured in active standby and delay start mode as well.

In active mode the average consumption was 3.2W with most machines (76%) consuming between 0.8W and 3.8W. In off mode the range of consumption was 0W to 4.9W with an average consumption of 1.2W which is slightly higher than previous years (2004/05 1.1W and 2003/04 0.7W). While there was no common link between consumption and electronic controls in this mode, all the highest consuming models did have electronic rather than manual dials. Delay Start consumption ranged from 0.9W to 5.2W with an average of 3.5W. For a summary of these results see Table 6 below.

**Table 6 – A summary of top loading washing machine results**

<b>Appliance:</b>	<b>Washing machine</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
Delay Start	16	3.5	5.2	0.9
Active	29	3.2	5.2	0.8
Passive	NA	-	-	-
Off	35	1.2	4.9	0.0
<b>Total Number of Units</b>	36			

The distribution range for top loading washing machines in active standby has shifted slightly in 2005/2006. For the first time no models were found to consume more than 6W and one unit consumed less than 1W in this mode. Once again most machines used between 3 and 4 watts in this mode. Despite the downward shift in distribution average consumption remained stable at 3.2W. These results can be viewed in Figure 21 and Figure 22.

Figure 21 – Power measurements for top loading washing machines: active standby mode

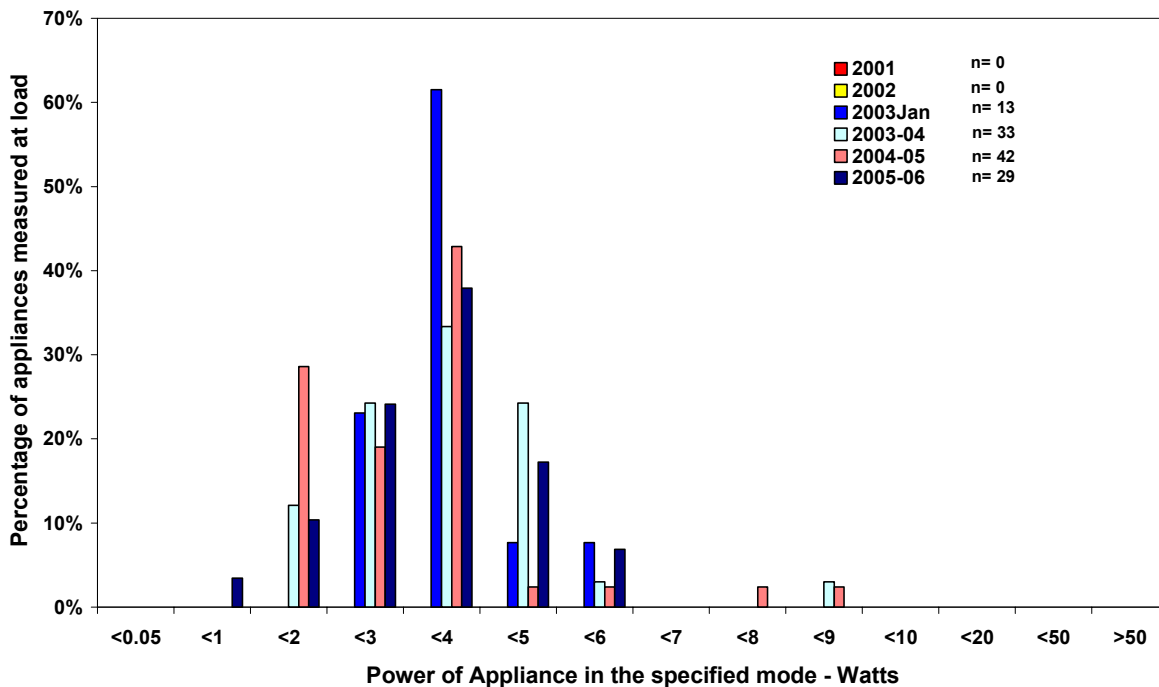
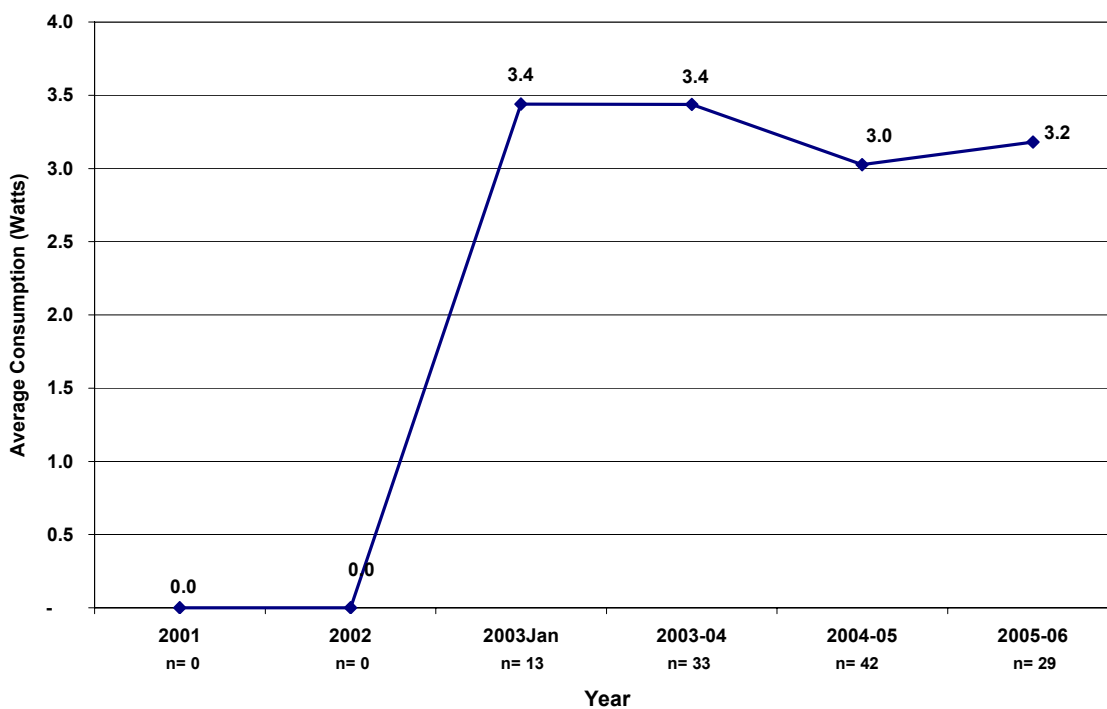


Figure 22 – Average power measurements for top loading washing machines: active standby mode



As demonstrated in Figure 23 below, the proportion of models recording zero consumption in off mode has been over 50% for the last 3 years. There has been no change in the range of consumption in off mode. A comparison of the average power consumption of top loading washing machines indicates that average off mode consumption has remained stable over time (see Figure 24).

**Figure 23 – Power measurements for top loading washing machines: off mode**

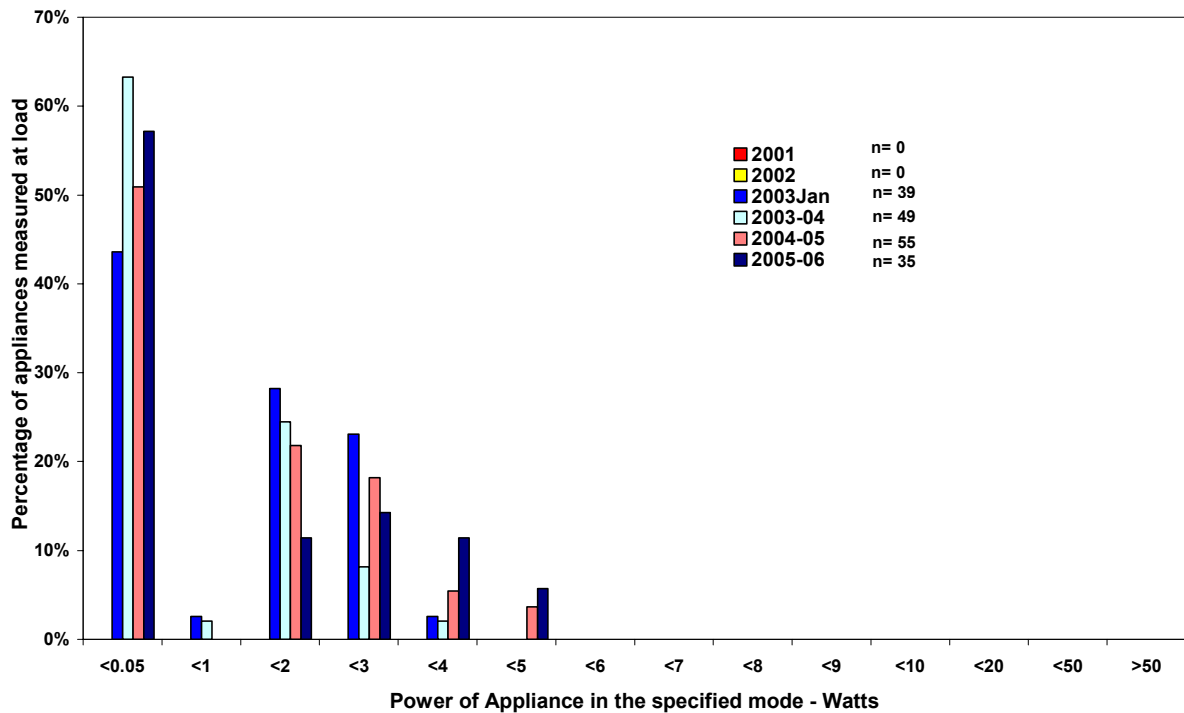
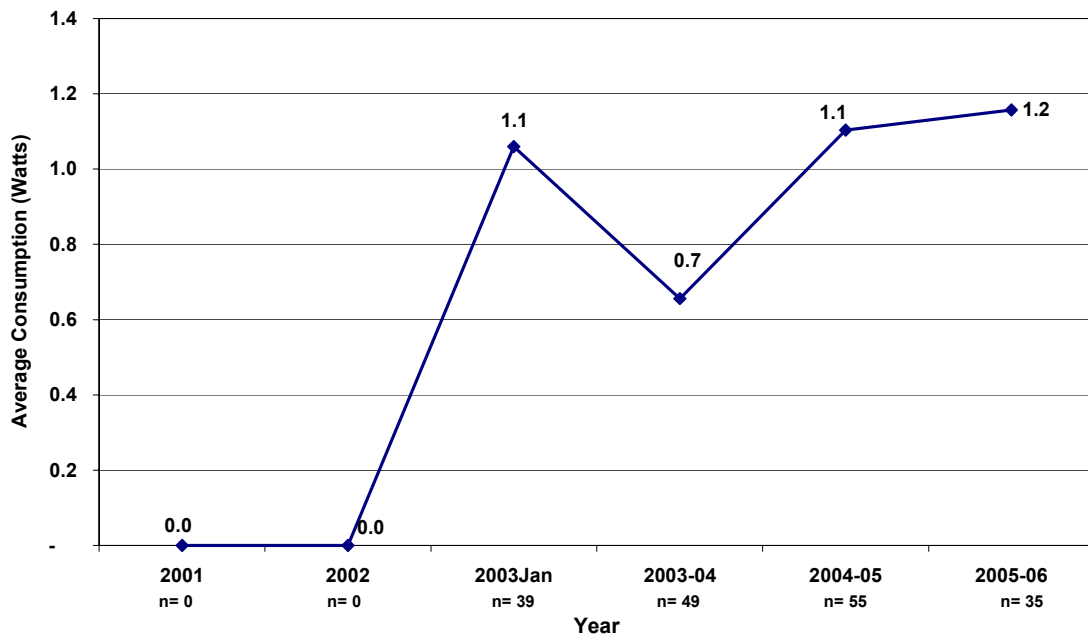


Figure 24 –Average power measurements for top loading washing machines: off mode



As seen in Figure 25, the distribution of machines in delay start mode has diminished with no units consuming more than 6W and several models (19%) now using less than 2W. The average power measurements for top loading washing machines in delay start mode has also decreased from 4.2W in 2003/04 to 3.5 W in 2005/06 (see Figure 26). Whilst average delay start consumption has decreased each year, it can not be statistically validated as a trend. However combined with the downward shift in the distribution graph it should be viewed as positive and if these results continue validation should occur in the near future. Around a quarter of consumers use this mode (EES 2005).

Figure 25 – Power measurements for top loading washing machines: delay start mode

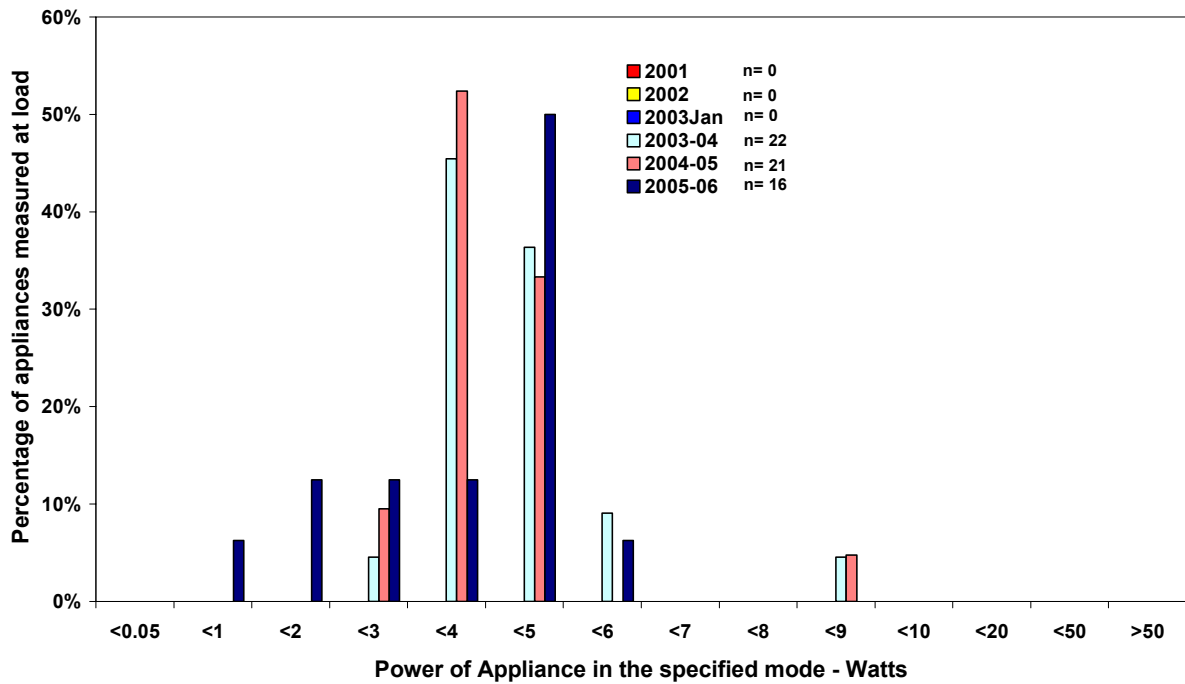
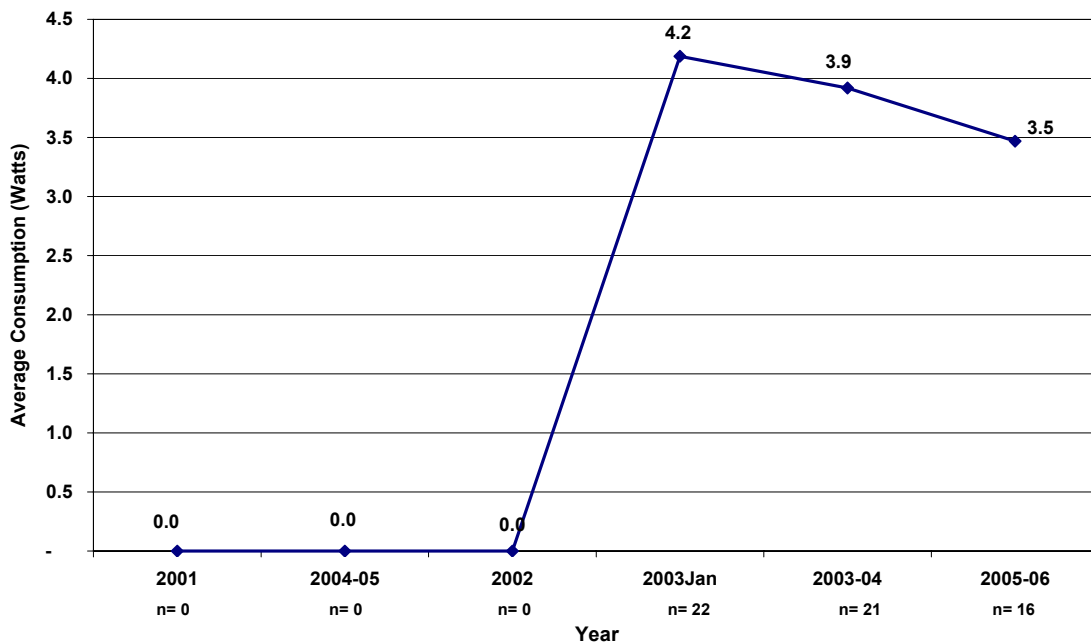


Figure 26 – Average power measurements for top loading washing machines: delay start mode



## Clothes Washer/Dryer

The 2005/06 survey tested 7 clothes washer-dryers. However 6 of the 7 washer-dryers were from the same manufacturer. All models displayed Energy Rating labels. Four machines had both manual and electronic controls and the other three models had manual controls only.

All models had a power on/off switch; five had a delay start function. This was many more than last year's survey which recorded only one model with a delay start function. They were tested in off, active standby and delay start mode.

A summary of these results can be found in Table 4 below.

**Table 7 – A summary of clothes washer/dryer results**

<b>Appliance:</b>	<b>Washer/Dryer</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
Delay Start	5	5.5	9.6	2
Active	7	4.5	8.6	2
Passive	0	NA		
Off	7	2.3	3.9	
<b>Total Number of Units</b>	7			

## Cooking Appliances

**Cook Tops, Ovens, Stoves & Range hoods.** These products were found to have low standby energy consumption in previous studies and therefore have minimal impact on overall energy consumption in the Residential sector; consequently it was decided not to measure these appliances in the 2005/06 survey.

## Heaters – Electric Portable

The 2005/06 survey measured 52 portable electric heaters. It is the third year that these devices have been included in the survey. A portable electric heater is an appliance that is plugged in rather than hard wired and therefore can be easily moved. Appliances in this category included fan or blow heaters, radiant heaters and fan assisted radiant heaters. Heaters were measured in delay start mode where applicable, passive standby and off mode. Of the 52 heaters measured 38 had off mode. While over 63% of heaters had zero consumption in off mode, the maximum recorded was 2.1W. The seven models with passive standby readings all had remote control function and only 1 model measured had delay start function. Results for portable electric heaters are summarised in Table 8 below.

Table 8 – A summary of heaters – electric portable results

Appliance:	Heaters – electric portable			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	1	1.4	1.4	1.4
Active	NA	-	-	-
Passive	7	1.7	3.0	0.7
Off	48	0.3	2.1	0.0
<b>Total Number of Units</b>	52			

Figure 27 below shows that the majority (69%) of portable electric heaters have no consumption in off mode. This is similar to the previous survey results. As shown in Figure 28 the average off mode consumption has remained stable for the past 3 years.

Figure 27 – Power measurements for portable electric heaters: off mode

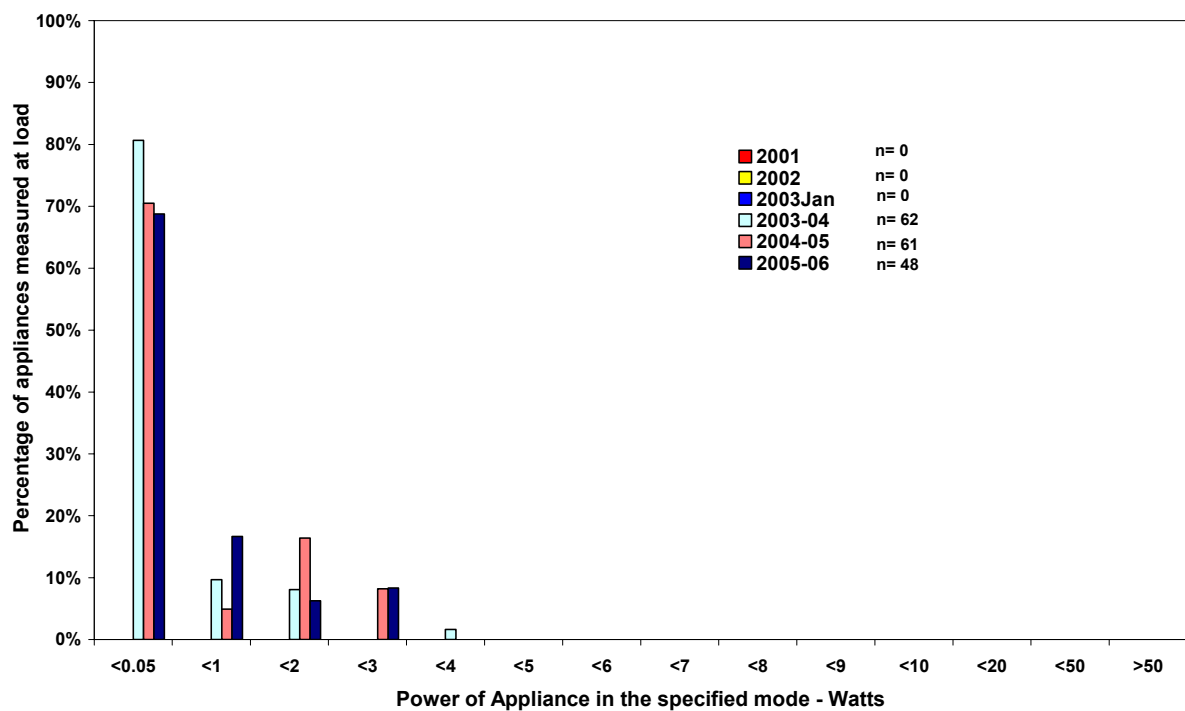
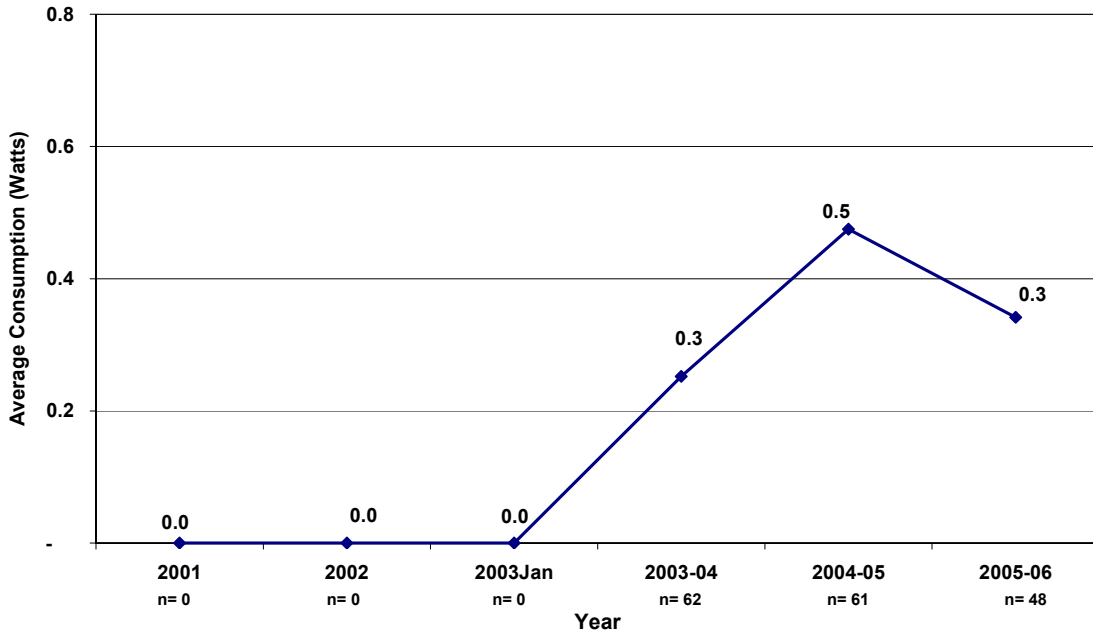
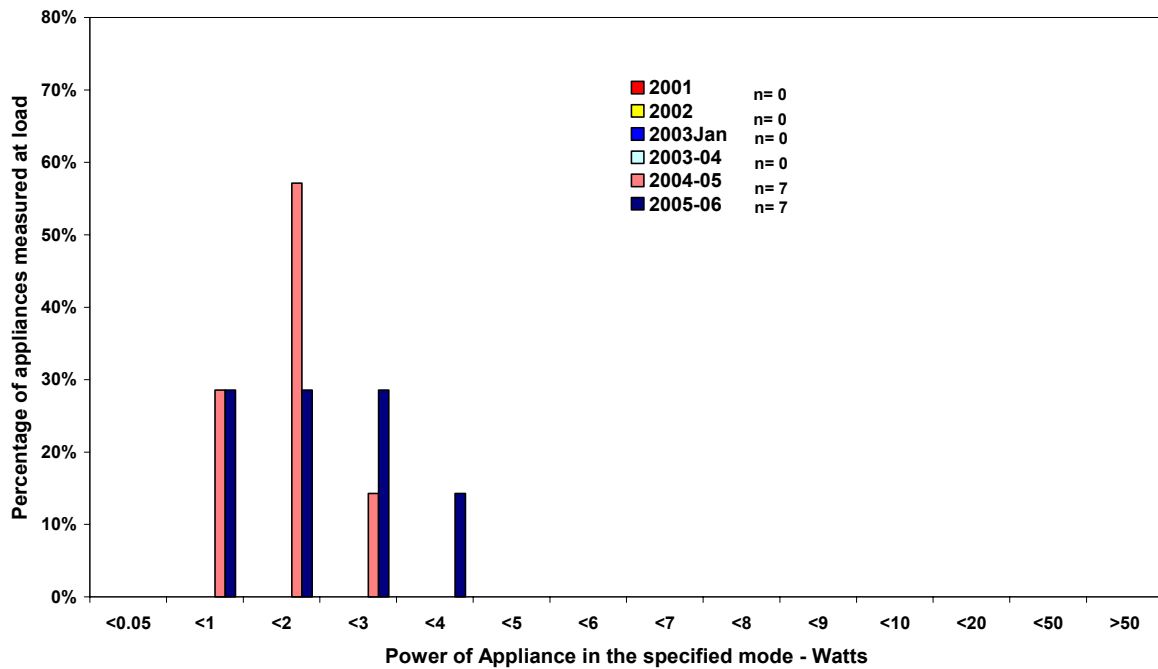


Figure 28 – Average power measurements for portable electric heaters: off mode



Seven portable electric heaters were found to have remote controls and so were also measured in passive standby during this survey. The extremely small sample size makes it difficult to draw any conclusions for these devices in this mode. See Figure 29 below.

Figure 29 – Power measurements for portable electric heaters: passive standby mode



## Heaters - Gas

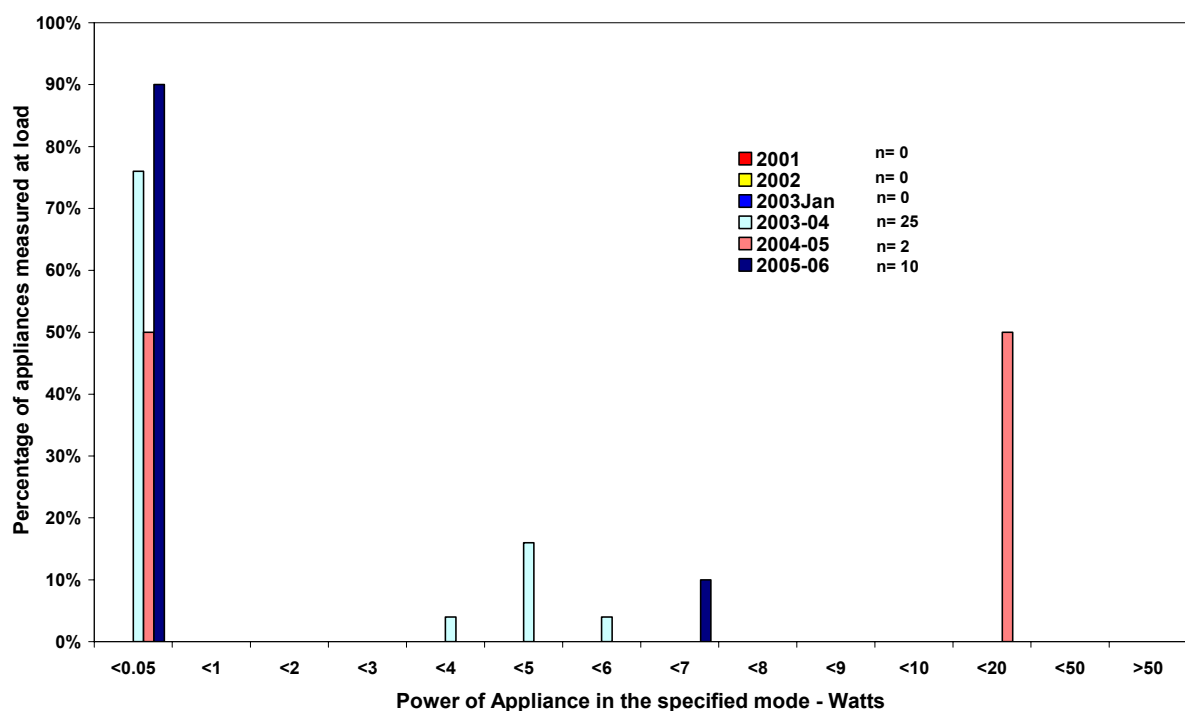
Fourteen gas heaters were surveyed in 2005/06. Electricity is used in gas heaters for the operation of fans and/or ignition and/or electronic controls. Heaters were measured in passive standby, delay start and off mode. Four heaters measured this year had a delay start function. The same manufacturer made all four heaters. Of the ten units measured in off mode one model had a maximum of 6.3W, while the other 9 models recorded 0W in off mode. Gas heater results are summarised in Table 9 below.

**Table 9 – A summary of heaters – gas results**

Appliance:	Heaters – gas			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	4	8.2	8.2	8.1
Active	NA	-	-	-
Passive	4	6.9	7.0	6.8
Off	10	0.6	6.3	0.0
<b>Total Number of Units</b>	14			

Four units were measured in delay start and 4 units were measured in passive standby. Due to the very small sample size no graphs have been included for gas heaters in either passive standby or delay start modes. Off mode results are comparable with previous years as can be seen in Figure 30.

**Figure 30 – Power measurements for gas heaters: off mode**



## Gas Water Heaters

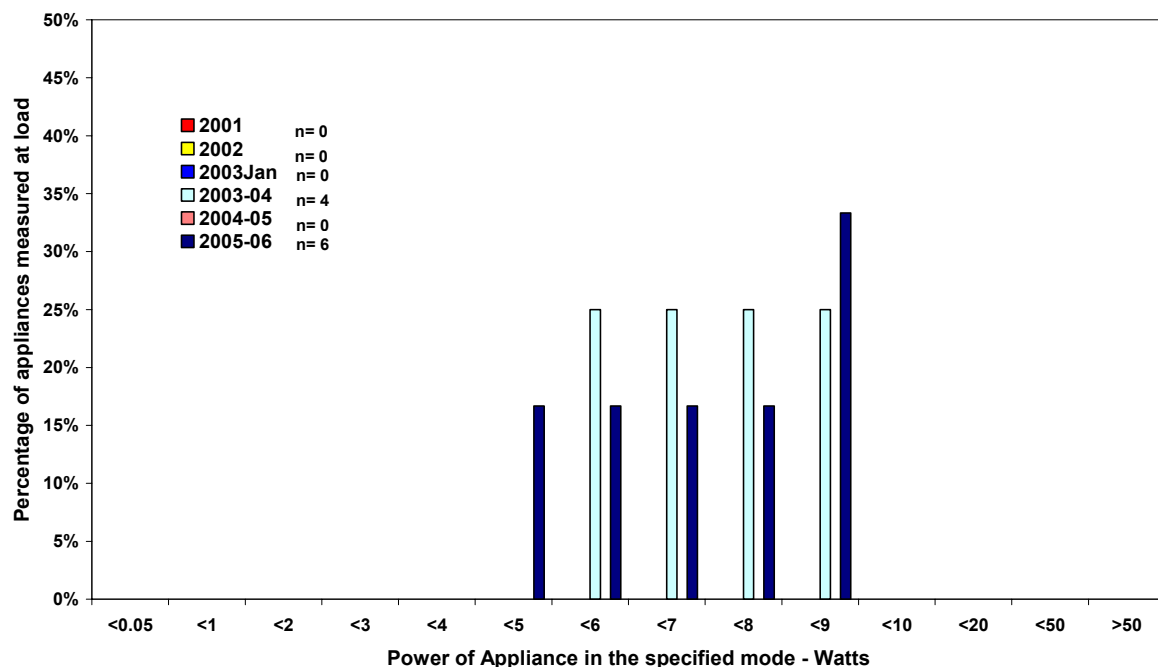
The 2005/06 survey measured 6 gas hot water units. This was only the second time that these devices have been included in the survey. Electricity is used in gas water heaters for ignition and/or electronic controls. Gas heater results are summarised in Table 10.

**Table 10 – A summary of gas water heaters**

Appliance:	Gas Water Heaters			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	0	-	-	-
Active	NA	-	-	-
Passive	6	6.9	8.4	4.5
Off	0	-	-	-
<b>Total Number of Units</b>	6			

The results for gas water heaters in this survey are very similar to the previous survey where these devices were measured, i.e. 2003/04, with the average passive standby mode being 6.9W with a low of 4.5W and a high of 8.4W. The small sample size makes it difficult to draw conclusions. Results are shown in Figure 31

**Figure 31 – Power measurements for gas water heaters: off mode**



## Small Appliances

### Breadmakers

In the 2005/06 store survey, 13 breadmakers were measured. When switched on breadmakers are in active standby as a display is lit up and the machine is awaiting instructions from the user. As in previous surveys no units were found to have a power on/off button and as such the units were measured in active standby mode only. Results were similar to last year's survey with the average active standby reading of 1.8W with a low of 1.1 W and a high of 2.5W. Table 11 below summarises the results for breadmakers.

**Table 11 – A summary of breadmaker results**

<b>Appliance:</b>	<b>Breadmaker</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	0	NA	-	-
Active	13	1.8	2.5	1.1
Passive	0	NA	-	-
Off	0	NA	-	-
<b>Total Number of Units</b>	13			

It has been noticed that there are less breadmakers on display in stores now, with only one unit being measured in the second half of this survey. As noted in the 2004/05 survey the power consumption for breadmakers in active standby appears to be relatively stable with most consuming less than 2W. Results are presented in Figure 32 and Figure 33.

Figure 32 – Power measurements for breadmakers: active standby mode

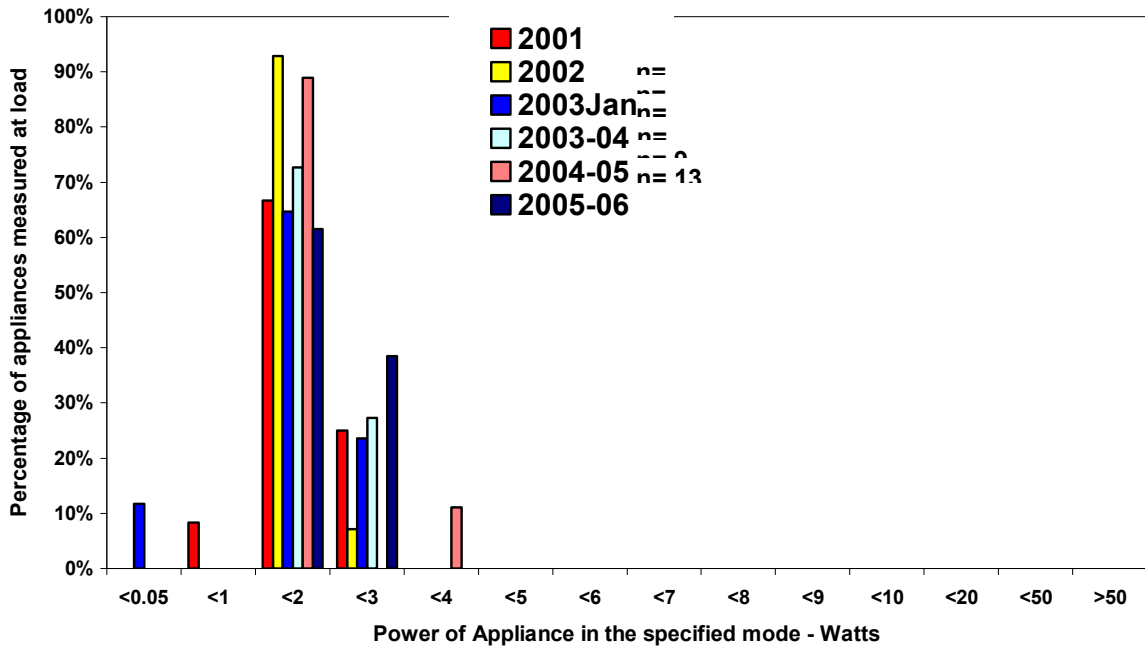
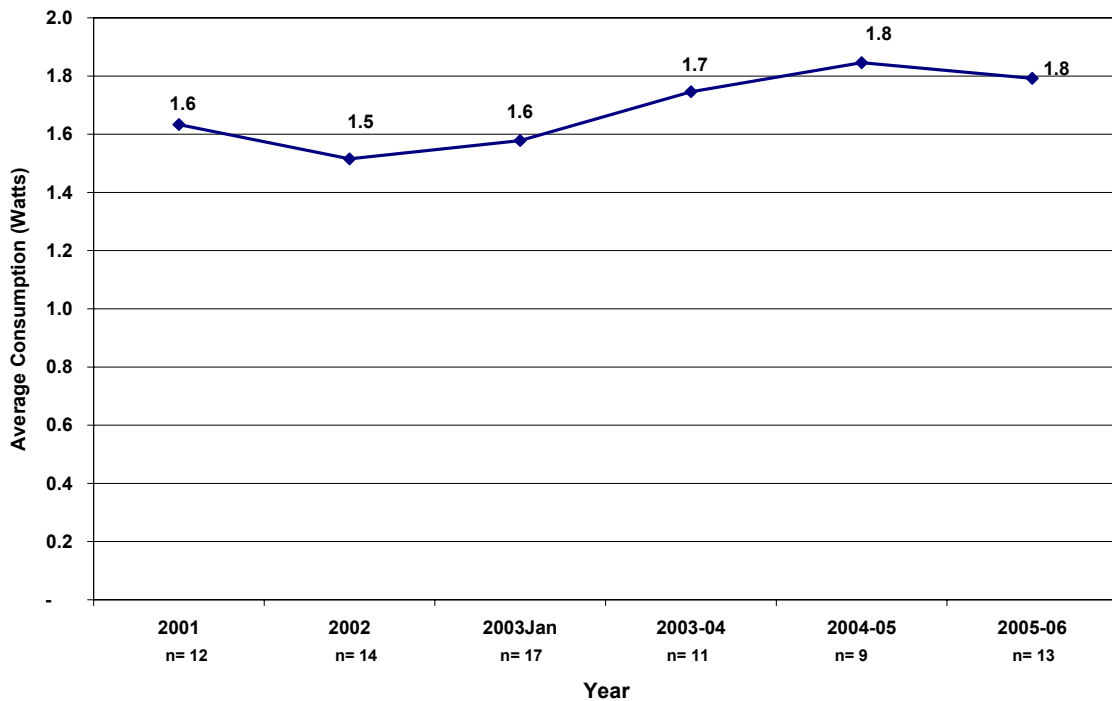


Figure 33 – Average power measurements for breadmakers: active standby mode



## Hand-held Vacuum cleaners

The 2005/06 in-store survey measured 12 hand-held vacuum cleaners. Eleven were conventional hand held devices, 1 was a new robotic device that operated automatically without an operator. This single device had a very high active standby measurement of 31.5W. Two conventional units measured 9W & 10.1W and the remaining 75% of devices had active standby measurements of 6 W or less.

The hand-held vacuum cleaners were measured in active standby, that is, plugged in and charging, and in passive standby, with the base station plugged in but not charging the portable unit. When in passive standby the units recorded an average power consumption of 1.1W with a low of 0.9W and a high of 2.0W (standing losses of the low voltage power supply – typically a transformer). These results are summarised below in Table 12.

**Table 12 – A summary of hand-held vacuum cleaner results**

<b>Appliance:</b>	<b>Hand-held Vac</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	0	NA	-	-
Active	12	7.4	31.5	1.5
Passive	12	1.1	2.0	0.9
Off	0	NA	-	-
<b>Total Number of Units</b>	12			

Figure 34 below shows the distribution of measurements for hand-held vacuum cleaners in active standby mode for the past 6 surveys. The graph demonstrates that there is a fairly large variation in active standby measurements for the majority of hand-held vacuums from around 1W to 8W and this distribution has been noted over the past 6 years. Future surveys should monitor if more of the “robotic” style of vacs become popular on the market as the single model measured for this survey shows a very high power usage in active standby mode.

As shown in Figure 35 average active standby for handheld vacs has increased slightly for the last 3 years. The average standby is shown as 5.2W due to the removal of the excessively high consuming robotic model which gives a distorted impression of active standby. These increases while consistent have no statistical significance and therefore a trend can not be verified yet. If robotic models are found to become more common then this will be reviewed.

Figure 34 – Power measurements for hand-held vacuum cleaners: active standby mode

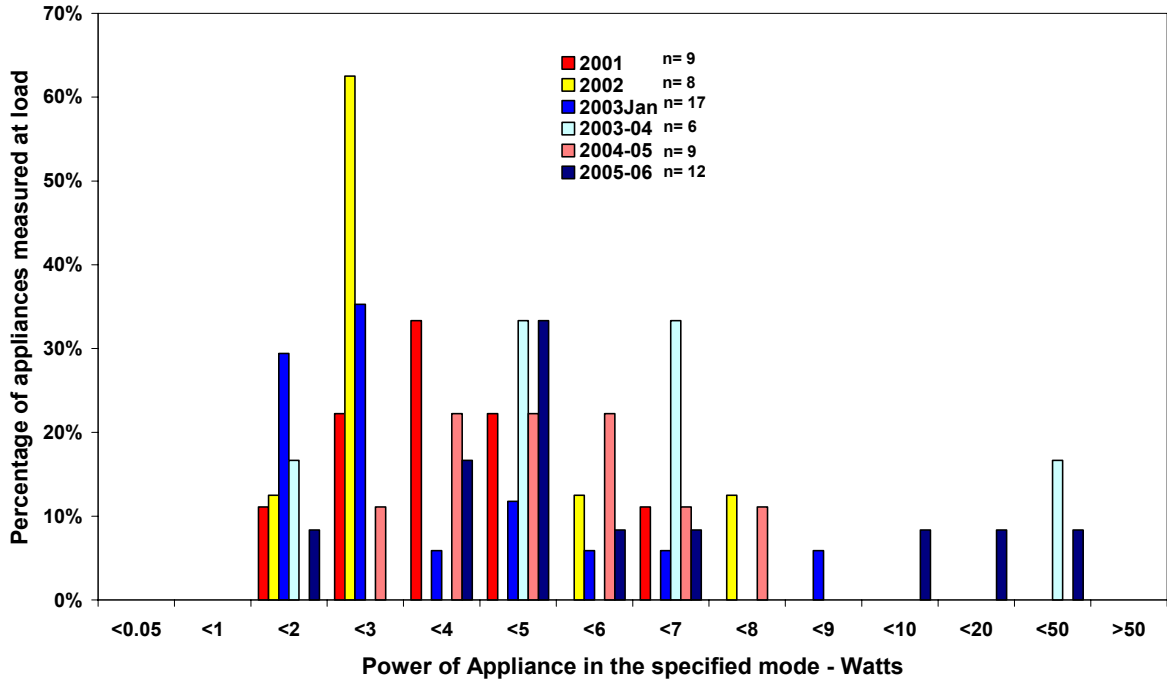
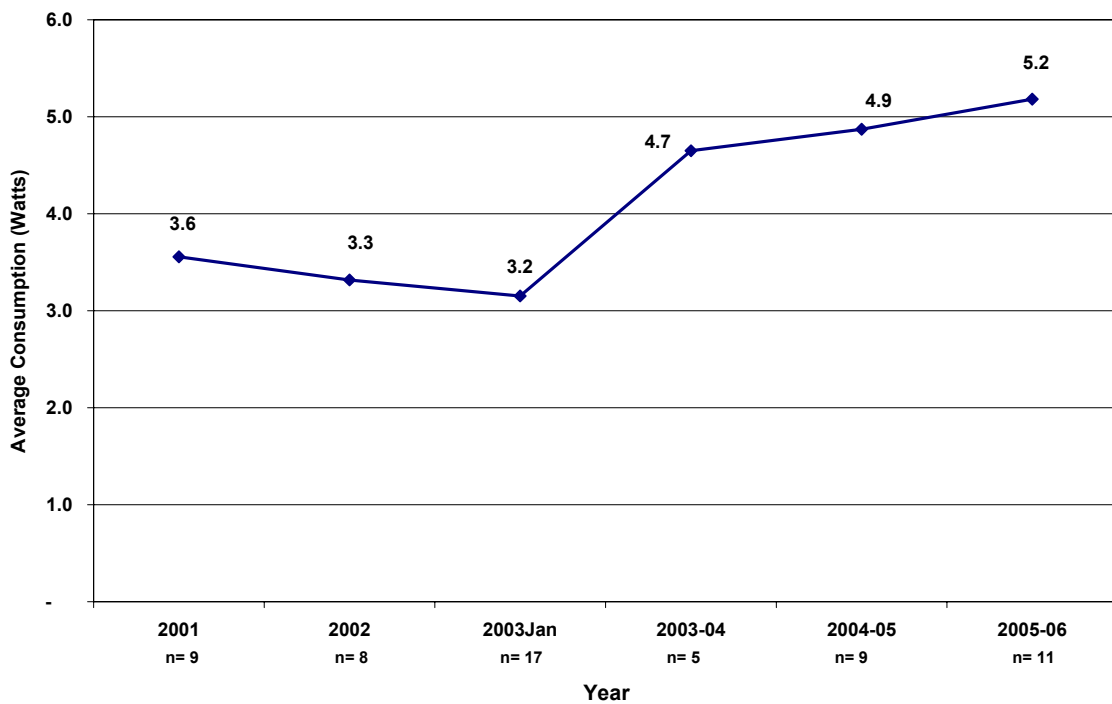


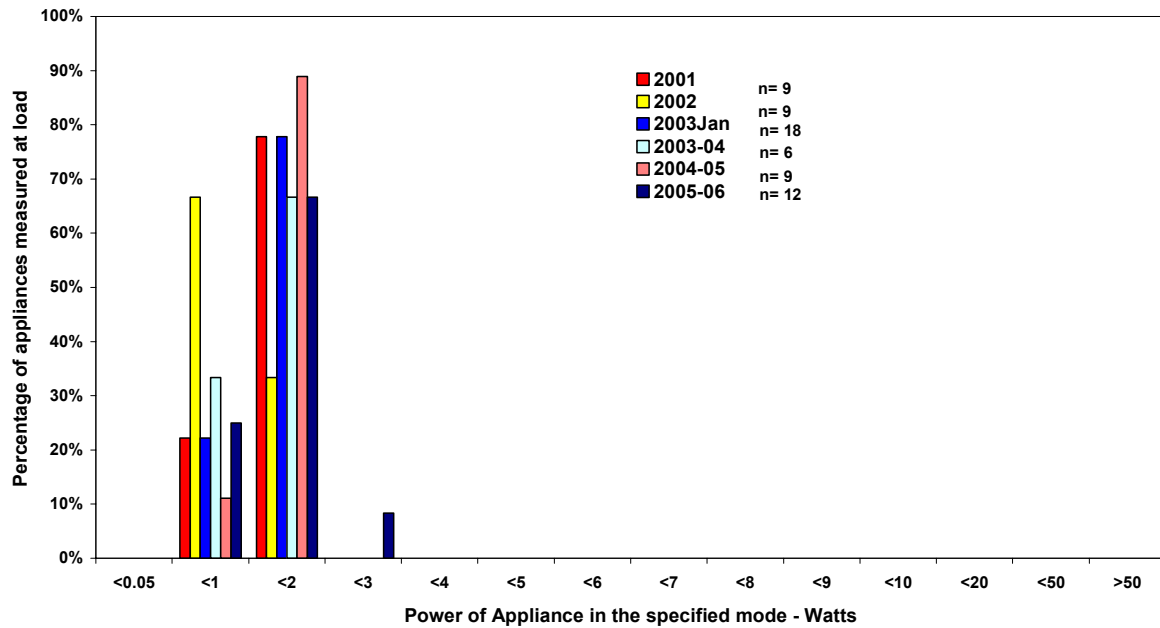
Figure 35 – Average power measurements for hand-held vacuum cleaners: active standby mode



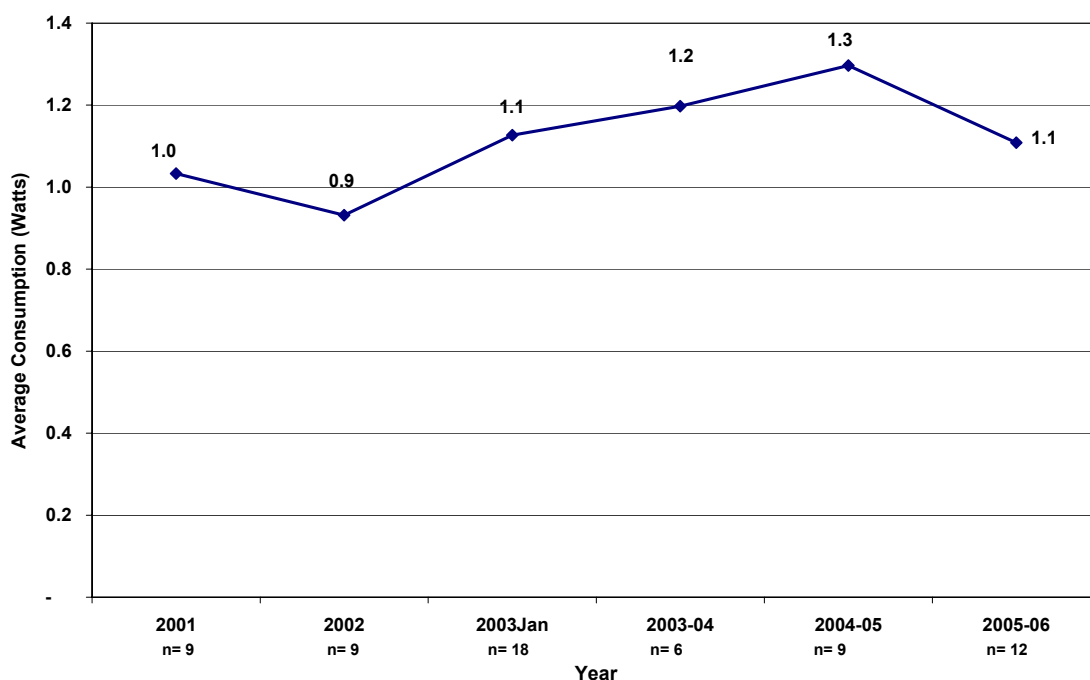
Note: This average chart has had one unit removed from the 2003-04 data and one from the 2005-06 data due to extraordinarily high readings skewing the average results.

In passive standby mode, all hand-held vacuum cleaners consumed 2W or less and this is consistent over the years as shown below. Average passive standby for each of the years has also remained stable at around 1W. These results are shown in Figure 36 and Figure 37.

**Figure 36 – Power measurements for hand-held vacuum cleaners: passive standby mode**



**Figure 37 – Average power measurements for hand-held vacuum cleaners: passive standby mode**



## Microwave Ovens

In the 2005/06 52 microwaves were measured. The majority (90%) had electronic controls and digital clock displays; only 2 units had manual controls, with 3 units having manual and electronic controls.

The microwaves varied in size and included both combined convection/microwave and microwave only models. Microwave ovens were measured in passive mode only (even though strictly models with mechanical controls should be classified as off mode). Table 13 below shows the average power measured for microwaves was 3.0W with a minimum of 0W and a maximum of 5.5W.

**Table 13 – A summary of microwave results**

<b>Appliance:</b>	<b>Microwave</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	52	3.0	5.5	0
Off	NA	-	-	-
<b>Total Number of Units</b>	52			

Figure 38 shows the distribution of passive standby power measurements taken over the past five surveys. Some slight improvement in the number of measurements at the higher end (more than 5W) is visible. Average power consumption for microwaves in passive standby mode is shown in Figure 39 below. The last four surveys show that passive standby for microwaves is reasonably constant. While the average passive standby was 3.5W in 2001, in 2004/2005 and 2005/06 it was 3.0W. The difference is not statistically significant indicating that passive standby consumption has not improved for this product.

Figure 38 – Power measurements for microwaves: passive standby mode

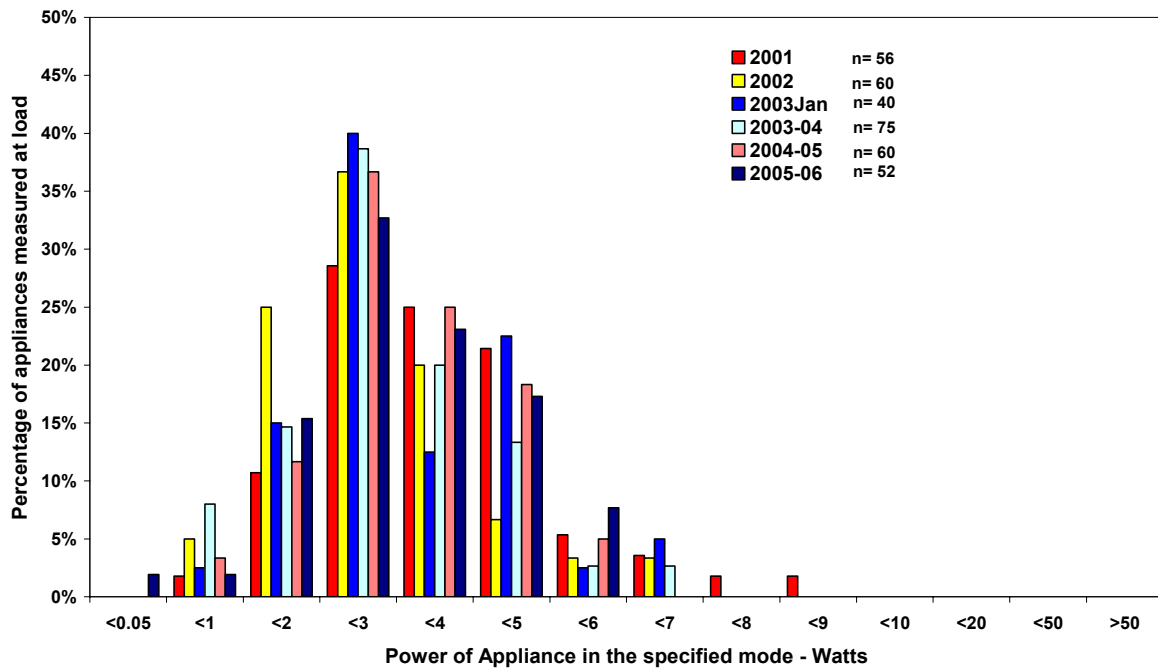
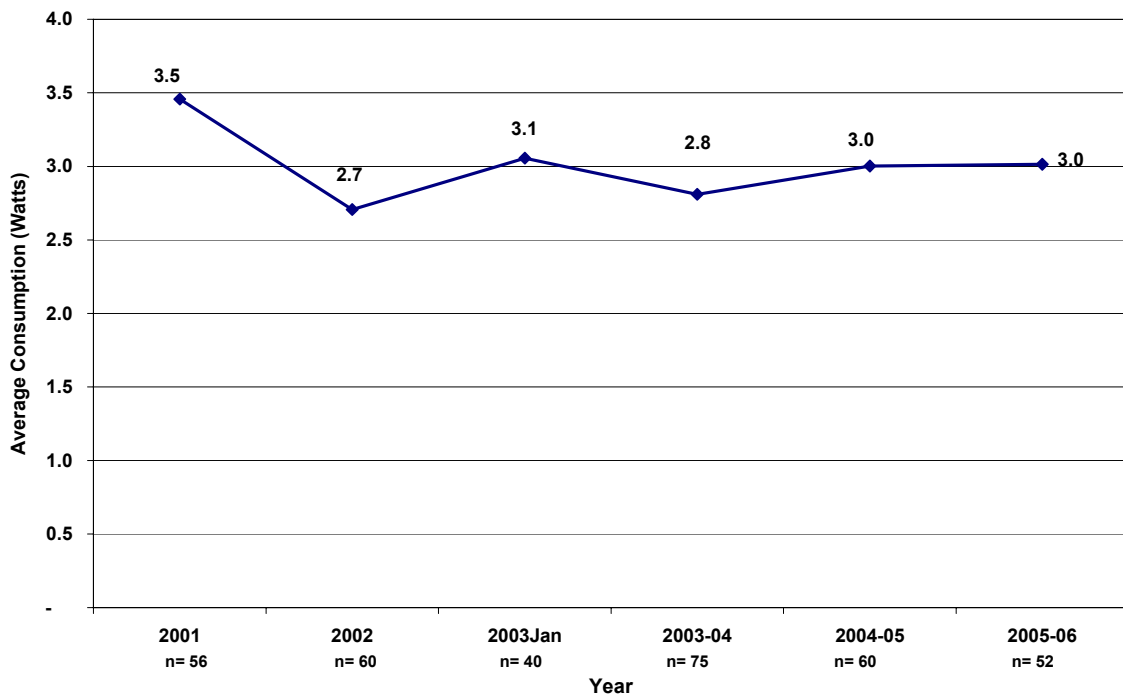


Figure 39 – Average power measurements for microwaves: passive standby mode



## Espresso Machines

The 2005/06 survey is the fourth year that Espresso machines have been measured. A combination of manual, portion controlled and fully automatic machines were included with a total of thirty-two espresso machines tested in 2005/06. The units ranged from zero consumption to 6.1W averaging around 0.9W. Three units were measured in passive standby with the average being 3.6W. Two of these units had both an off and a standby button while the other had no off switch and was in standby ready to begin as soon as it was plugged in. Table 14 presents these results.

Machines were not measured in active standby due to the cyclic nature of the machines in this mode. In active standby, all machines consume a great deal of energy. Most machines use this mode to heat the machine to its optimum operating temperature and then perform a power on, power down cycle to maintain the temperature. As the length of the cycle varies for each machine, measuring this mode in stores cannot provide a reliable indication of the active power consumption of this product. .

**Table 14 – A summary of espresso machine results**

<b>Appliance:</b>	<b>Espresso Machine</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	0	NA	-	-
Active	0	NA	-	-
Passive	3	3.6	4.1	2.9
Off	31	0.9	6.1	0.0
<b>Total Number of Units</b>	32			

Figure 40 below demonstrates that the overwhelming majority of machines (69%) have no consumption in off mode. There was a greater range of measurements this year with a minimum of zero and a maximum of 6.1W. There appears to be no correlation between features and those models with high consumption in off mode. Average power usage results were similar to last survey with the average of 0.9W in off mode (see Figure 41).

Figure 40 – Power measurements for espresso machines: off mode

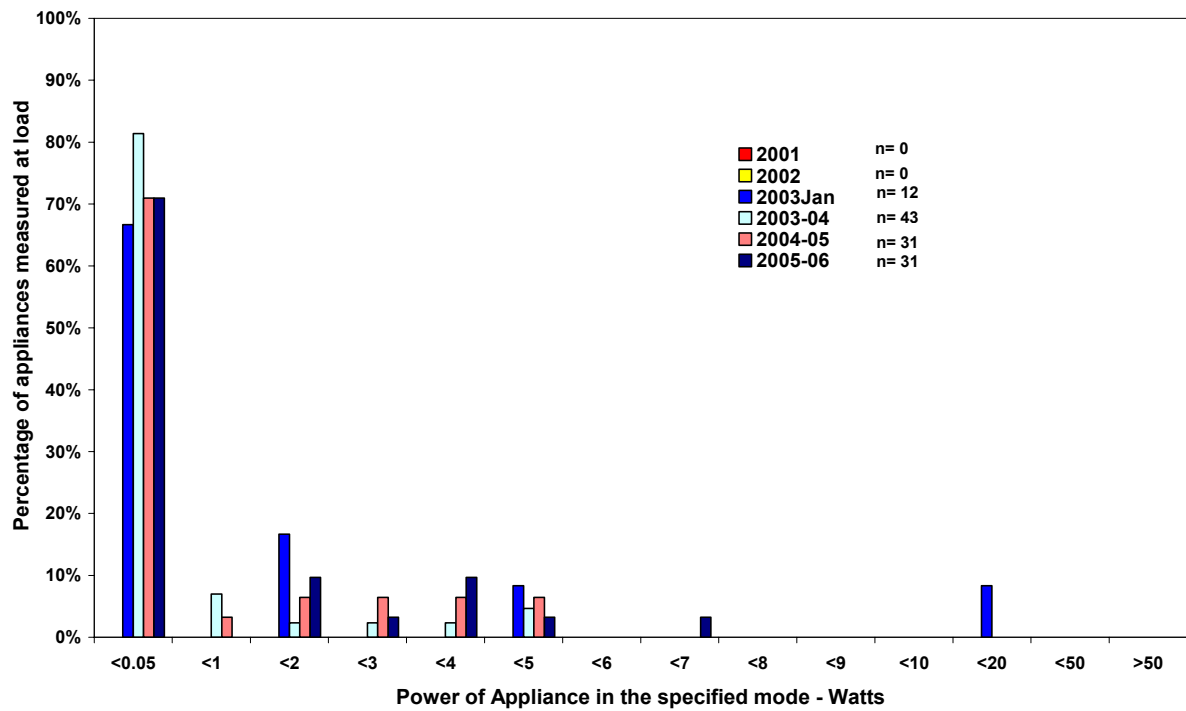
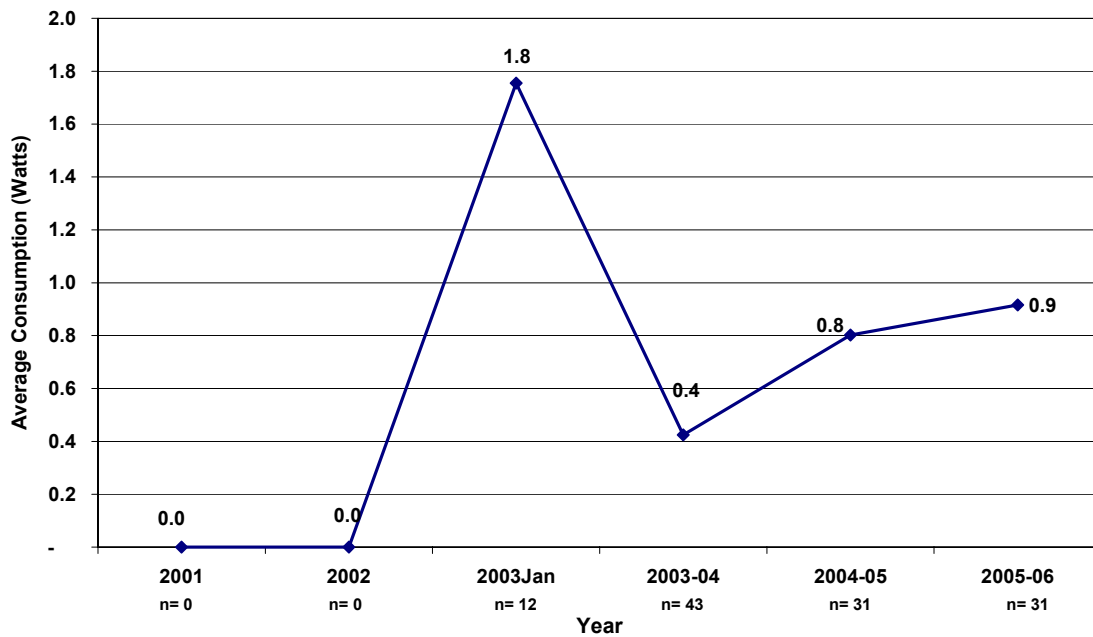


Figure 41 – Average power measurements for espresso machines: off mode



## Fans

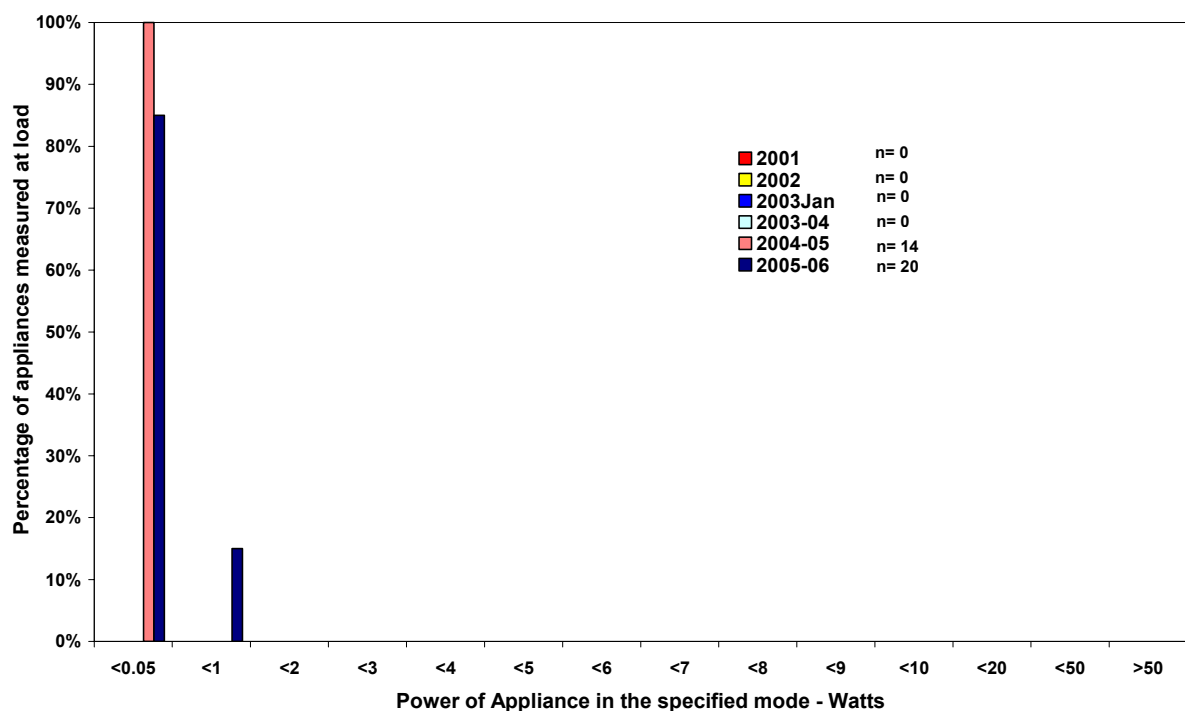
In the 2005/06 survey 22 portable fans were measured. This is the second survey to include measurement of these devices. Three units had a remote control. One had a visual display. Fifteen of the fans measured were pedestal models, with a small number of floor, wall and tower also measured in this survey. The majority of fans were measured at 0W in off mode. Three measured less than 1W in off mode and the two units with remote controls measured 0.4 W in passive standby mode. Results are presented in Table 15 and Figure 42.

The fans measured over the last 2 surveys indicate that fans are not a significant consuming device when it comes to standby power and it is recommended that they are not included in future surveys.

**Table 15 – A summary of portable fans**

Appliance:	Fans			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	0	NA	NA	NA
Passive	2	0.4	0.4	0.4
Off	20	0.1	0.9	0.0
<b>Total Number of Units</b>	22			

**Figure 42 – Power measurements for fans: off mode**



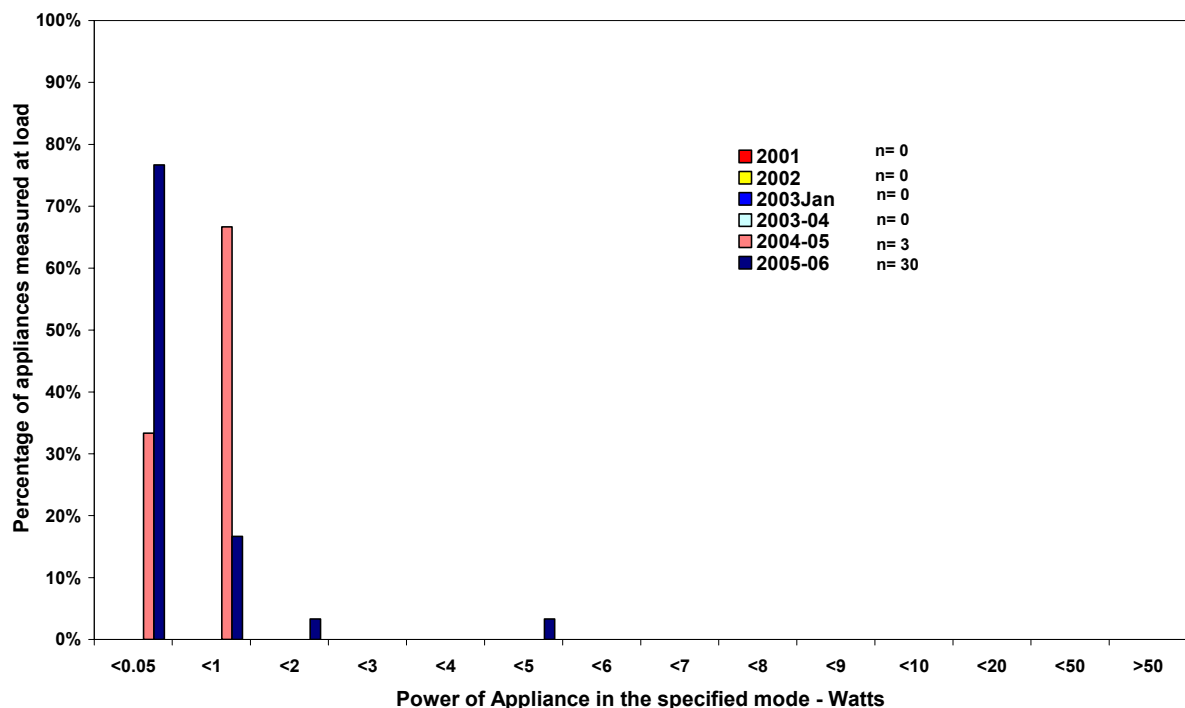
## Juicers

In the 2005/06 survey 30 juicers were measured. This is the second survey to include measurement of these devices. The majority of units had manual controls. Both extractor & blender juicer types were measured. Most units (76%) consumed 0W in off mode. Of the remaining 7 devices, one consumed 4.8W in off mode while the others used 1.2W or less. See Table 16 and Figure 43 below for a summary of juicers.

**Table 16 – A summary of juicers**

Appliance:	Juicers			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	0	-	-	-
Active	0	-	-	-
Passive	0	-	-	-
Off	30	0.3	4.8	0.0
<b>Total Number of Units</b>	30			

**Figure 43 – Power measurements for juicers: off mode**



## Toasters

In the 2005/06 survey toasters were measured for the first time after the intrusive survey (EES 2005) discovered that several models were consuming energy in off mode. Twenty models were included in the survey. Three toasters had electronic displays or led indicators and these devices consumed power in the off mode. The average power used

for these 3 devices in off mode was 1.7W. All other toasters (85%) recorded 0W in off mode. If electronic displays become more popular on toasters then these devices should continue to be monitored in future surveys. See Table 17 below for summary of Toasters.

**Table 17– A summary of toasters**

<b>Appliance:</b>	<b>Juicers</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	0	-	-	-
Active	0	-	-	-
Passive	0	-	-	-
Off	20	0.3	2.3	0.0
<b>Total Number of Units</b>	<b>20</b>			

### EPS (External Power Supply)

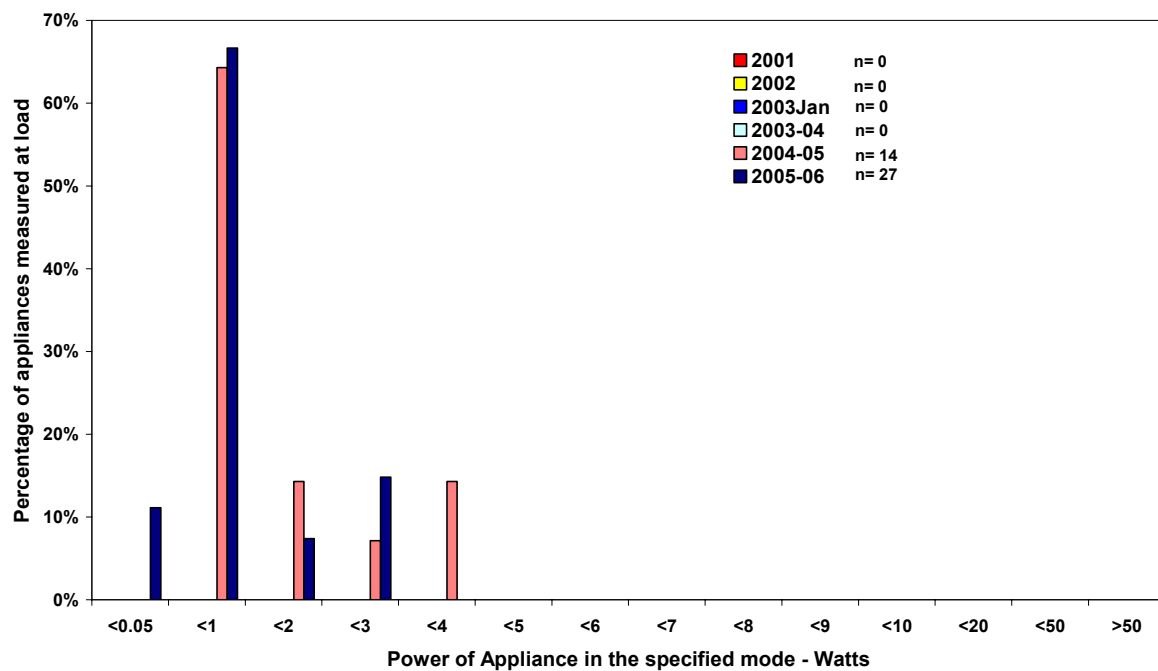
In the 2005/06 survey 27 EPS', were measured. These devices are fundamentally transformers that provided a lower supply voltage to equipment. The type of equipment found using EPS' this year include: computer monitors, computer speakers, laptop computers, home entertainment products, multi function devices, set top boxes and LCD TVs.

Of the 27 devices measured the average passive standby power was 0.7W with a maximum of 2.8 and a minimum of 0W. Last year 14 EPS' were measured with an average passive standby power measurement of 1.2W. While this is almost half this year's average it is too early to draw conclusions for this product. This is only the second time these devices have been included in the survey so it is not yet possible to determine any trend in standby power consumption. See Table 18 below for summary of EPS' and Figure 44 for the distribution of readings.

**Table 18– A summary of EPS (External Power Supply)**

<b>Appliance:</b>	<b>EPS</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	0	-	-	-
Active	0	-	-	-
Passive	27	0.7	2.8	0
Off	0			
<b>Total Number of Units</b>	<b>27</b>			

Figure 44 – Power measurements for EPS': passive standby mode



## Computers and Peripherals

### Multi Function Device

The 2005/06 survey is the third time these devices have been measured. A multi function device (MFD) is a piece of equipment that can perform a variety of office tasks. These may include any combination of the following: telephone, facsimile, printer, photocopier, email, scanner, and answering machine. These appliances were measured in active mode, as this is the lowest possible state for most models (especially those with telephone function). If appropriate the units were also measured in off mode.

Twenty-nine MFD's were measured in the 2005/06 survey. They consisted of six different combinations of functions with copier, printer fax the most common. However function appeared to have no impact on consumption. In active mode the average consumption was 8.6W with a minimum of 3.2W and a maximum of 19.3W. Table 19 below, shows nineteen units were measured in off mode with an average consumption of 3.1W.

Table 19 – A summary of multi function device results

Appliance:	Multi Function Device			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	27	8.6	19.3	3.2
Passive	1	5.3	5.3	5.3
Off	19	3.1	9.2	0.0
<b>Total Number of Units</b>	29			

Figure 45 below shows the distribution of measurements for multi function devices over the last 3 years that they have been included in the store survey. This year's results are similar to previous surveys in that a large percentage of units measured (approximately 30%) had active standby readings of between 10W and 20W, although this year no readings of greater than 20W were recorded. As shown in Figure 46 there was a decline in the average active standby compared to the previous 2 surveys. This is not a statistically significant reduction.

Figure 45 – Power measurements for multi-function devices: active standby

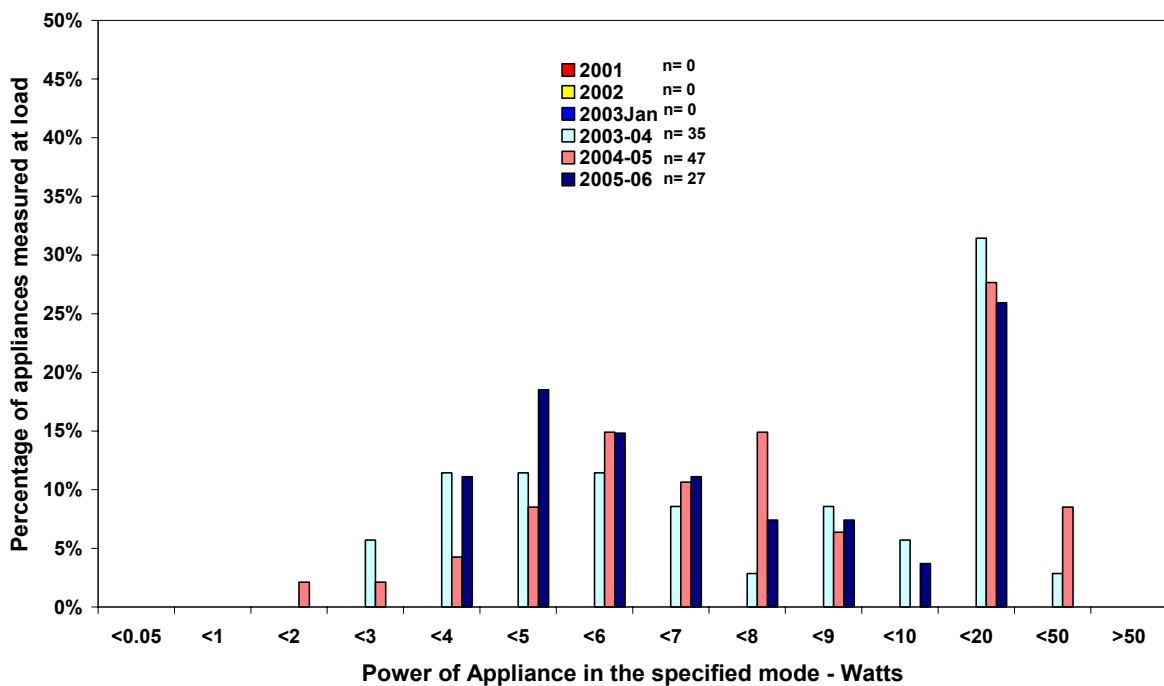
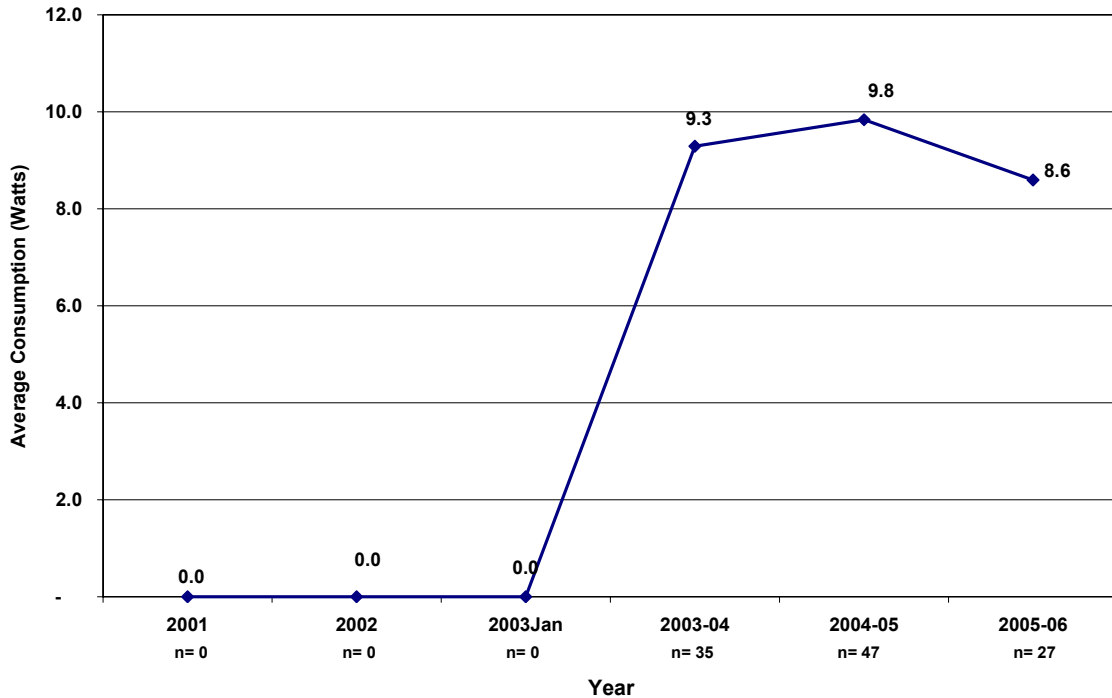


Figure 46 – Average power measurements for multi-function devices: active standby



Both Figure 47 and Figure 48 seen below, indicate that there has been a reduction in the power used by MFDs in off mode. This represents a statistically significant reduction for power usage, over the 3 year period that MFDs have been included in the survey, indicating a downward trend in off mode power.

Figure 47 – Power measurements for multi-function devices: off mode

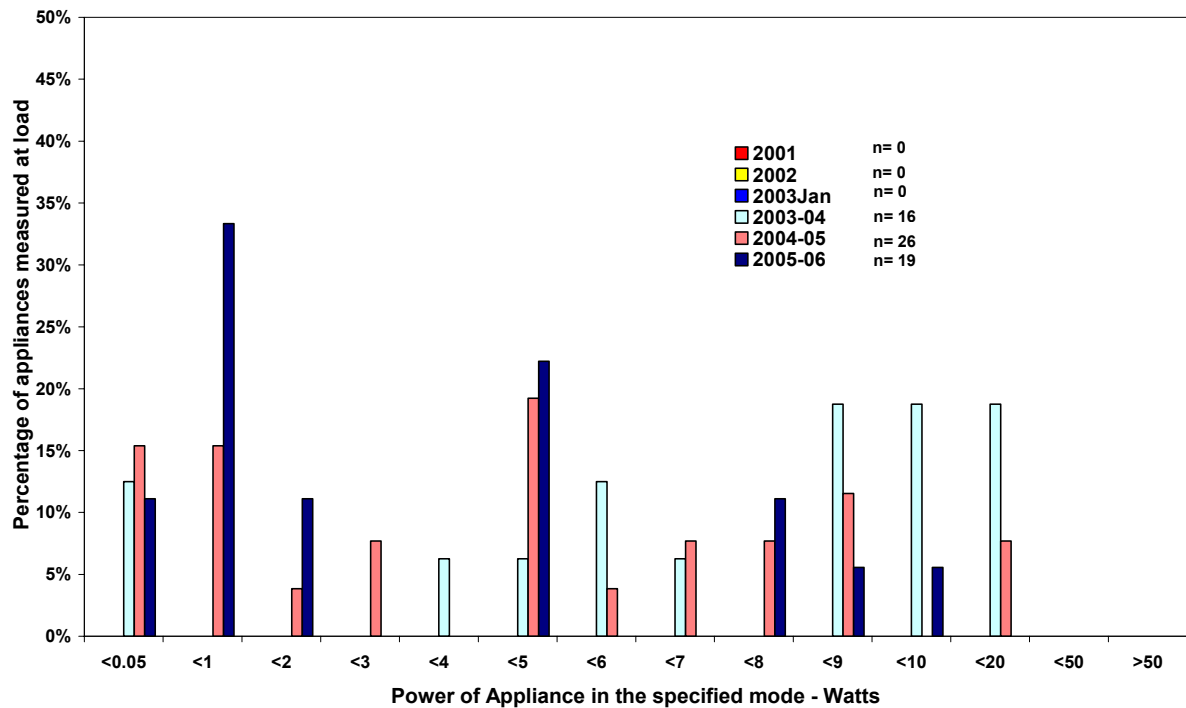
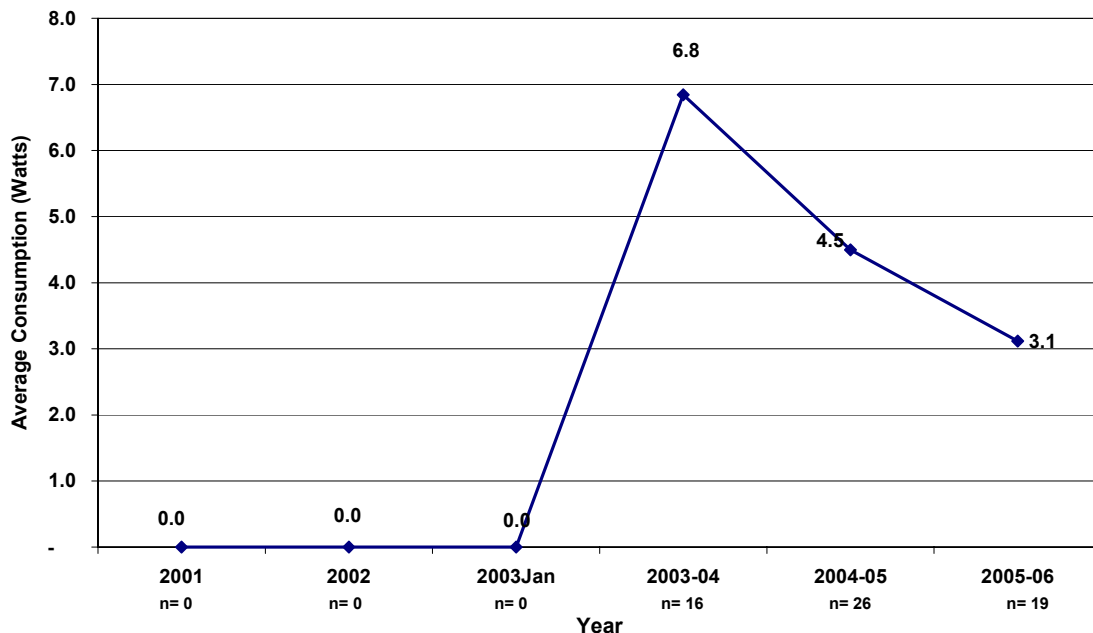


Figure 48 – Average Power measurements for Multi-function Devices in Off Mode



Computers - Hard Drive/CPU Box

The measurements included the hard drive/CPU box only, with peripherals such as monitors and printers measured separately. As in the previous surveys, no products

measured displayed an ENERGY STAR label. A total of 12 computers were measured in the 2005/06 store survey. Computers were measured in off mode. Generally active and passive operating modes are not recorded for computers as they are complex and are dependent on hardware and software settings. In addition, these modes are adequately covered by existing standby related programs such as ENERGY STAR. However, two models were also recorded in passive because they had a hard off switch. This was located at the rear of the device hence these units are unlikely to be ever turned off in practice. The two units measured in passive standby recorded an average power usage of 4.2W. The average off mode power consumption was 1.5W with the highest consuming unit using 3.2W and the lowest using 0.0W. These results are summarised in Table 20 below.

**Table 20 – A summary of hard drive/cpu box results**

<b>Appliance:</b>	<b>Computers - Box</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	2	4.2	4.3	4.1
Off	12	1.5	3.2	0.0
<b>Total Number of Units</b>	12			

As illustrated in Figure 49, the majority of computers consume between 2W and 3W in off mode, which is a reduction, compared to the last survey results. For the second year in a row no models were found to consume more than 4W. Figure 50 shows the average measurements for computers in off mode. The results also show a decline in power usage compared to all previous survey years. Average results indicate a positive trend of declining off mode. This is a statistically significant reduction from the 2003 survey with average consumption falling from 2.9W to 1.5W. It should be noted that only 12 units were included in this year's survey.

Figure 49 – Power measurements for computers: off mode

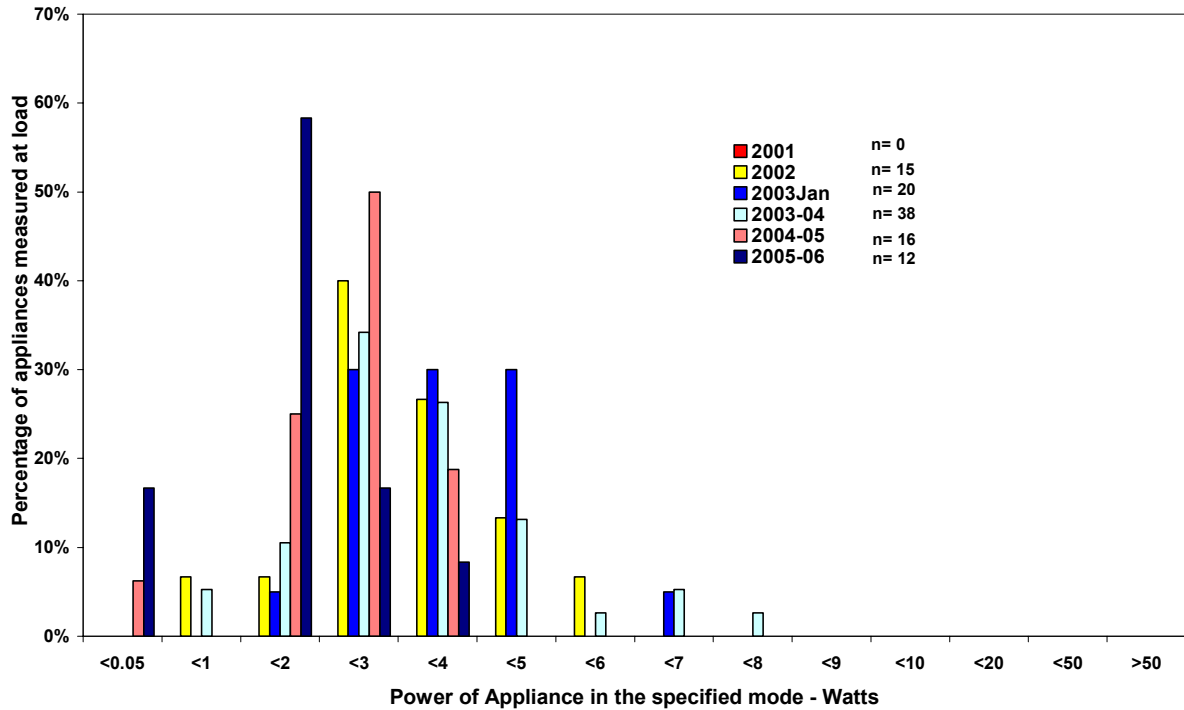
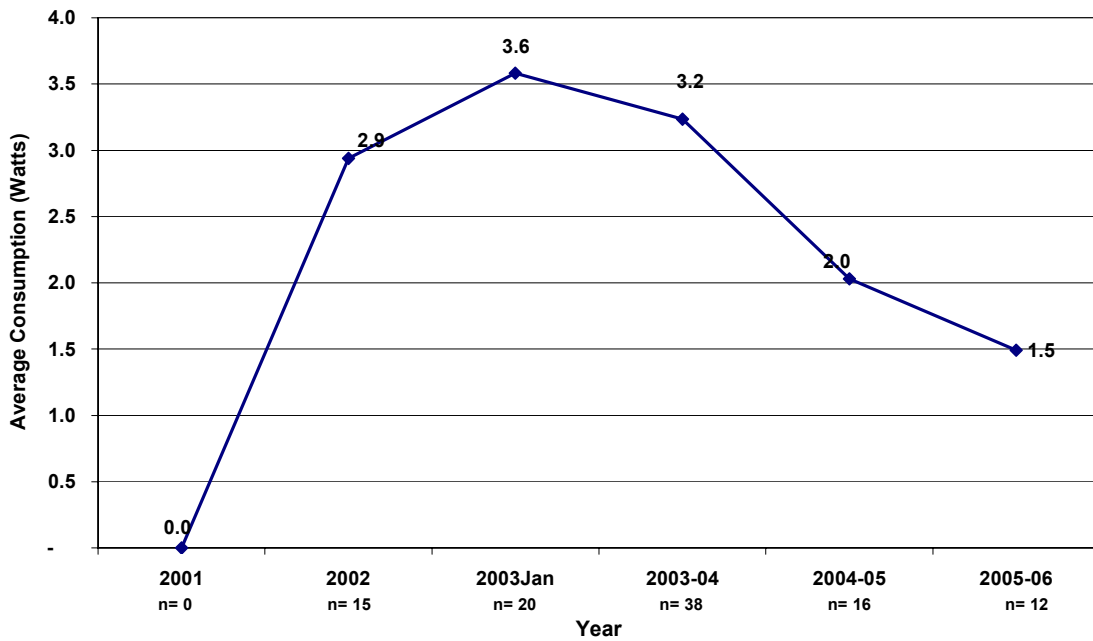


Figure 50 – Average power measurements for computers: off mode



## Computers- Portable/Laptop

Eight portable computers were measured in this store survey. As was found last year, none of these computers displayed an ENERGY STAR label. The units were measured in off mode only. A minimum power consumption of 0.8W was recorded with an average consumption of 1.2W. All units were powered using external power supply units none of which used more than 0.5W. The results are summarised in Table 21 below.

**Table 21 – A summary of laptop computer results**

Appliance:	Computers - Laptop			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	0	NA	-	-
Active	0	NA	-	-
Passive	0	NA	-	-
Off	8	1.4	2.3	0.8
<b>Total Number of Units</b>	8			

Figure 51 below shows the distribution of off mode consumption for portable computers from the last four surveys. The average power use shown in Figure 52 has been reasonably constant over all 4 surveys. There is little difference between the results especially when taking into account the large difference in sample sizes.

**Figure 51 – Power measurements for portable computers: off mode**

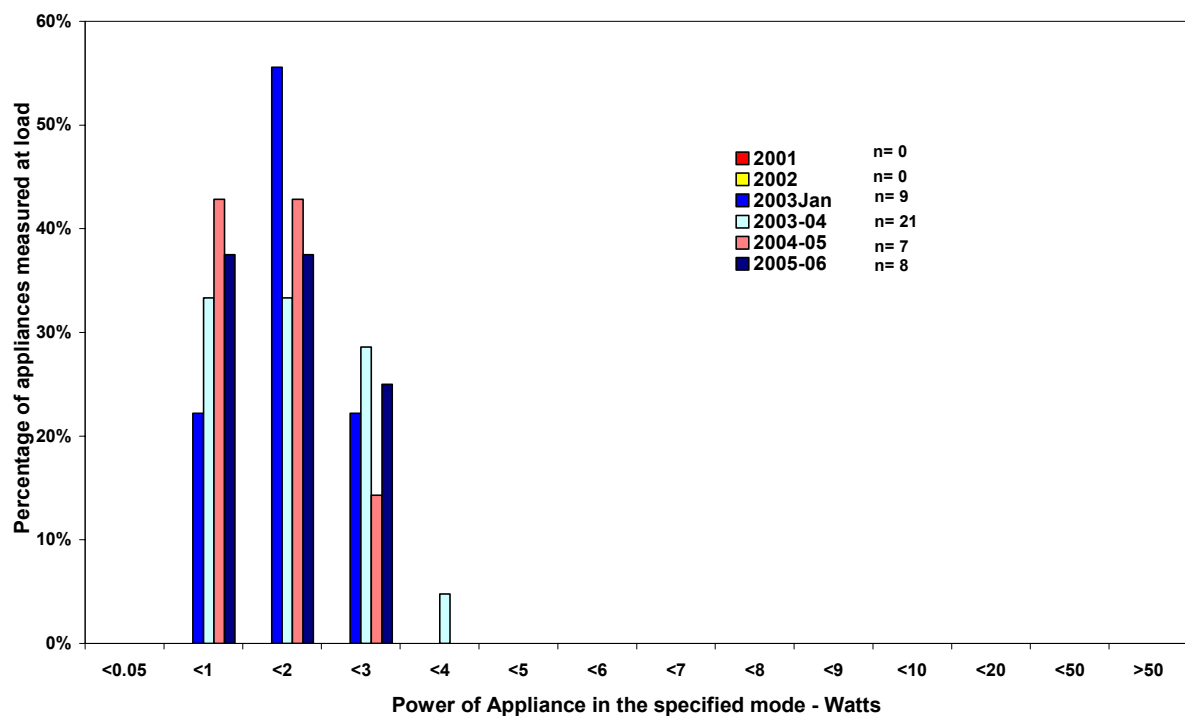
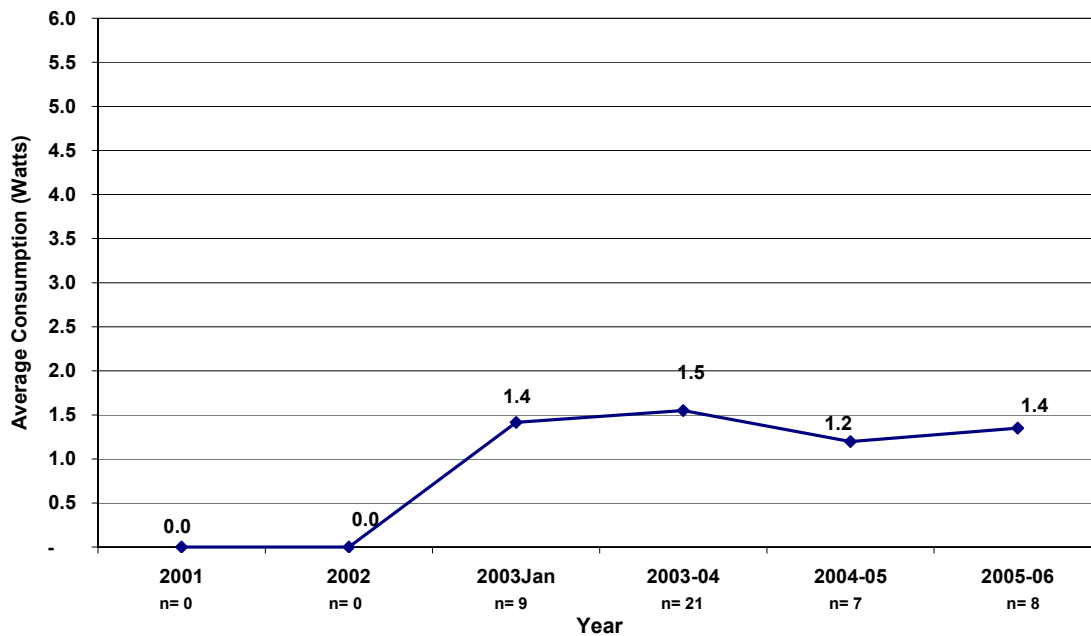


Figure 52 – Average power measurements for portable computers: off mode



### Computer Monitors

The 2005/06 survey measured forty one computer monitors. They ranged in size from 15 inch to 20 inch screens and included both LCD (78%) and CRT (28%) monitors. Twenty four percent of monitors were recorded as having an external power supply as their power source. All were measured in off mode and 39 monitors were measured while in use. Only one unit measured displayed an ENERGY STAR label. The average off mode power consumption was 0.9W with a minimum of 0.0W and a maximum of 3.1W. The results for computer monitors are summarised in Table 22 below.

Table 22 – A summary of computer monitor results

Appliance:	Computers - Monitor			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	39	36.4	60.9	14.8
Active	0	NA	-	-
Passive	0	1.9	4.7	0.8
Off	41	0.9	3.1	0.0
<b>Total Number of Units</b>	41			

The overwhelming majority of monitors consume energy in off mode. As shown in Figure 53 only 3 monitors in the past three years have had zero off mode consumption. There has been a downward shift in the distribution of consumption with 66% of monitors now consuming less than 1W and a small minority consuming more than 2W.

Additionally the distribution of measurement values has shrunk from a maximum in 2003 of 6.3W to 3.1W in 2005/06. This is also reflected in the average power consumption for computer monitors which has been decreasing in recent surveys, as can be seen in Figure 54. For the last 3 surveys where comparable percentages of LCD & CRT monitors have been surveyed, there has been a steady decline. This represents a statistically significant reduction in power use for computer monitors while in off mode.

**Figure 53 – Power measurements for monitors: off mode**

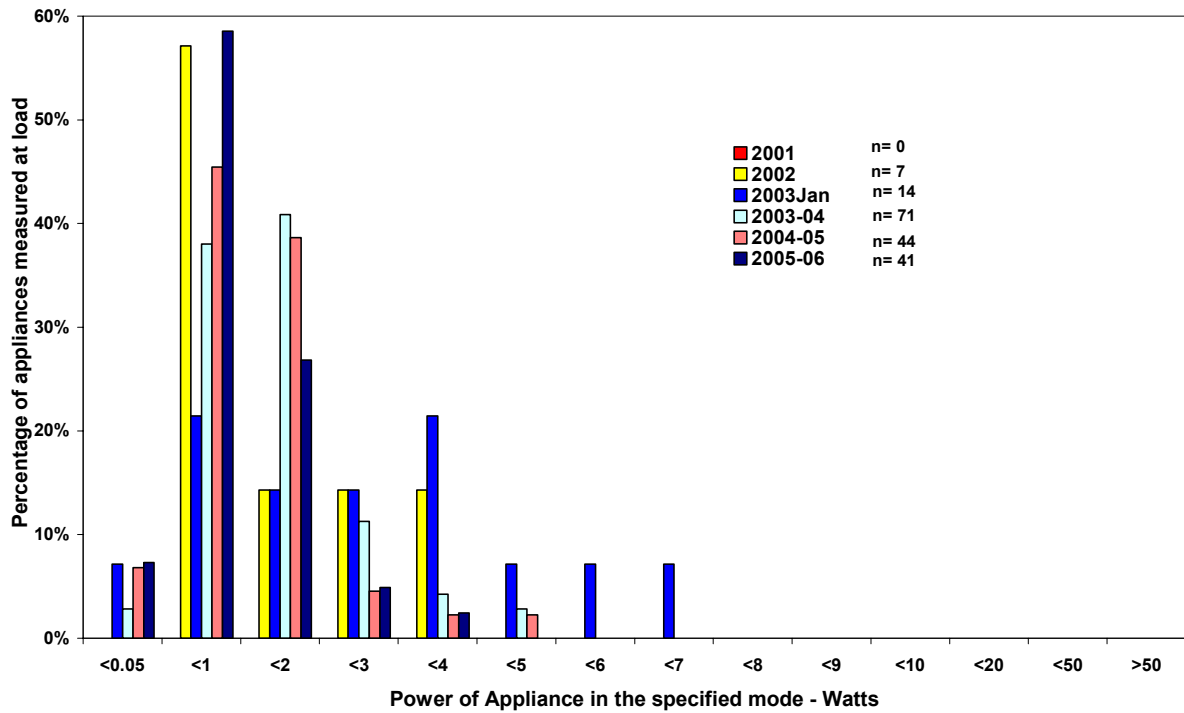
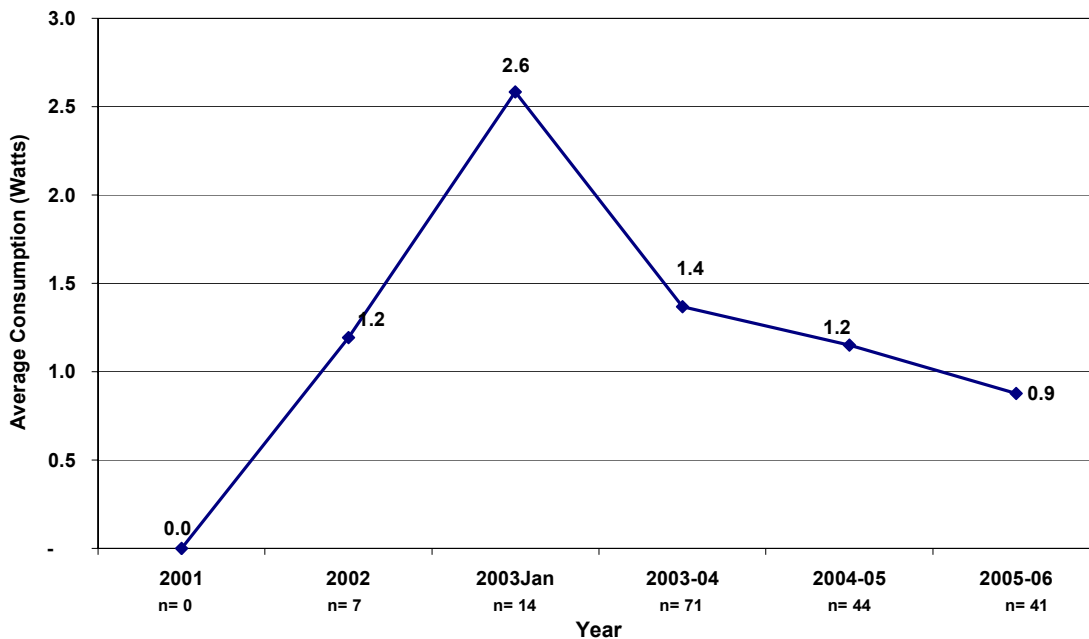


Figure 54 – Average power measurements for monitors: off mode



### Computer – Speakers

Prior to the 2003/04 survey only two computer speakers had been measured. This resulted largely from the fact that many speakers are powered directly from the computer box and that most products were packaged rather than displayed. With the emergence of the computer as a home entertainment unit the sound quality and type of computer speakers are of more interest to consumers and may include sub woofer and surround sound packages. This would suggest that this product is likely to have increasing consumption in the future.

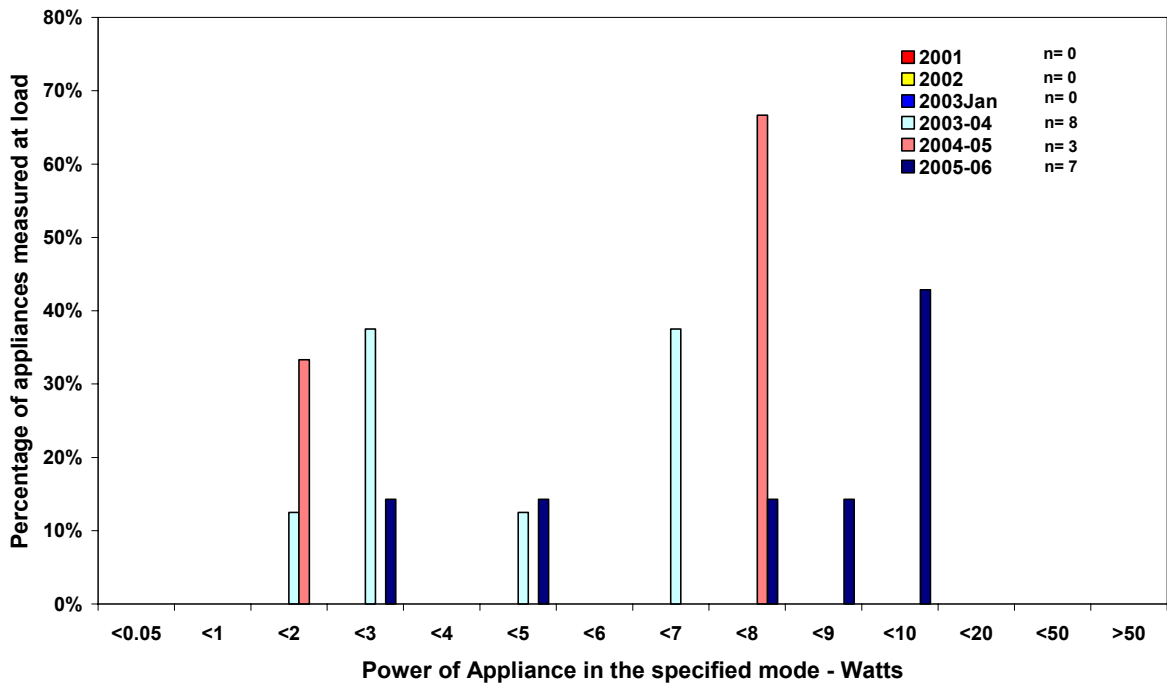
The 2005/06 survey tested 7 units, 6 in off mode and all 7 units in active standby that is turned on with no sound being produced. Average active standby consumption was 7.5W with a minimum of 2.4W and a maximum of 9.9. The average consumption in off mode was 4.2W with a minimum of 1.5W and a maximum of 9.7W. The results are summarised in Table 23 below.

Table 23 – A summary of computer speaker results

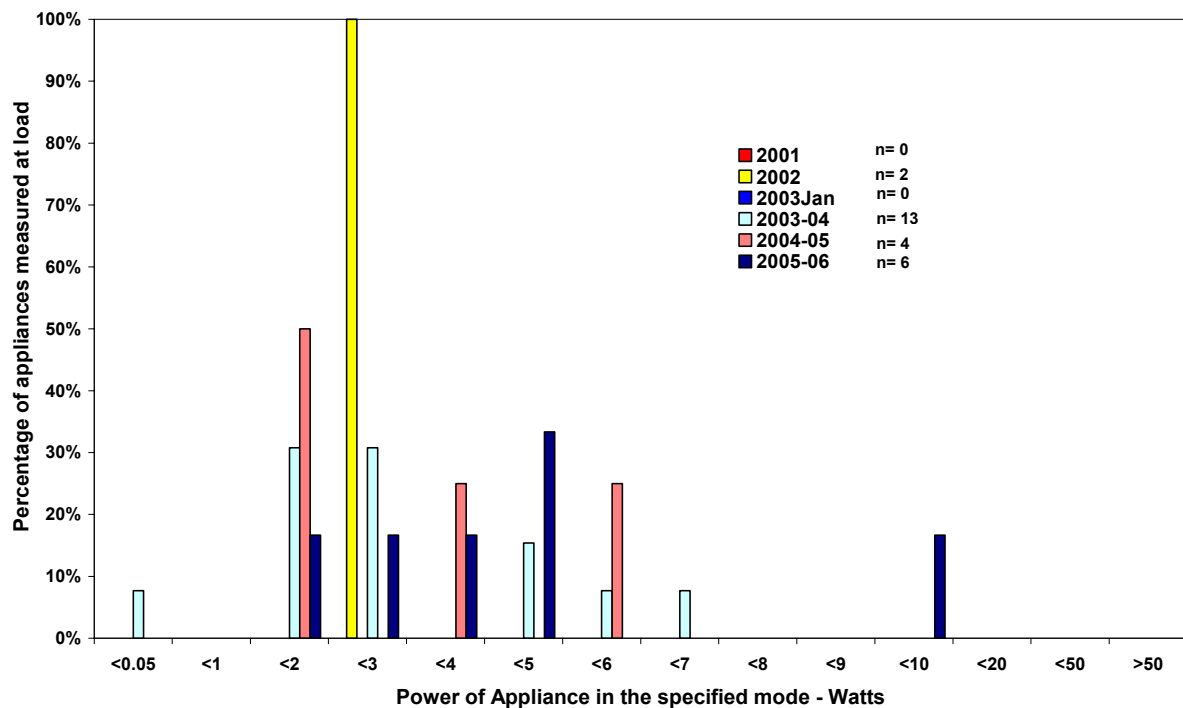
Appliance:	Computer speakers			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	0	-	-	-
Active	7	7.5	9.9	2.4
Passive	0	-	-	-
Off	6	4.2	9.7	1.5
<b>Total Number of Units</b>	7			

The 2005 intrusive survey found that about 30% of consumers leave their computer speakers in active standby with 56% using the off button. As seen in Figure 55 and Figure 56 the distribution range for both modes has increased since speakers were first measured in 2003/04. However given the small sample sizes it is difficult to draw any conclusions about these devices.

**Figure 55 – Power measurements for computer speakers: active standby mode**



**Figure 56 – Power measurements for computer speakers: off mode**



## Computers - Home Theatre Box

This product was measured for the first time in 2003/04. A home theatre box is a PC box that has the ability to receive TV transmission and usually incorporates an am/fm tuner as well. These units are marketed as home theatre packages and can record TV directly onto the hard disk.

Only 2 units were measured during the survey. Both were measured in off mode, in use and passive standby modes. In off mode consumption ranged from 2.9W up to 6.7W averaging out at 4.8W. While in use the maximum consumption was 111.9W and the minimum was 61.9W. During passive standby the average power usage was 5.4W with a maximum of 6.7W and a minimum of 4W. The extremely small sample size makes it impossible to draw any conclusions for these devices.

**Table 24 – A summary of home theatre box results**

<b>Appliance:</b>	<b>Computers - Home Theatre Box</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	2	86.9	111.9	61.9
Active	NA	-	-	-
Passive	2	5.4	6.7	4.0
Off	2	4.8	6.7	2.9
<b>Total Number of Units</b>	2			

## Printers – Inkjet

A total of 21 inkjet printers were tested, of which five displayed an ENERGY STAR label. The units were differentiated by the quality of print they were able to produce and the speed at which they could print. These results also incorporate small photo type printers that use inkjet technology.

During the survey inkjet printers were measured in passive standby mode and off mode. One device could not be measured in passive standby mode due to the display configuration. Seven of the units measured had a standby switch only. The remaining 14 models had a power on/off switch.

When in passive standby mode the average power consumption was 3.8W. The highest power consumption was 8.5W and the lowest was 1.0W. In off mode the average power was 0.8W, with a maximum of 3.4W and a minimum of 0.2W. Eleven of the 21 printers measured were capable of printing photos directly from a camera or memory card. Table 25 summarises these findings.

Table 25 – A summary of inkjet printer results

Appliance:	Printer - Inkjet			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active				
Passive	20	3.8	8.5	1.0
Off	21	0.8	3.4	0.2
<b>Total Number of Units</b>	21			

The power measurements for inkjet printers in passive mode are displayed in Figure 57. The graph shows last years downwards shift was not maintained to the same extent in 2005/06. However, the distribution is still much lower than previous years with only one model consuming more than 5W. When considering average passive standby power Figure 58 shows inkjet printer consumption has been declining since 2002 and although there has been a slight increase in average passive standby figure from last survey, the statistically significant decline from 2002 has been maintained. This suggests that passive standby for inkjet printers is currently stable.

Figure 57 – Power measurements for inkjet printers: passive standby mode

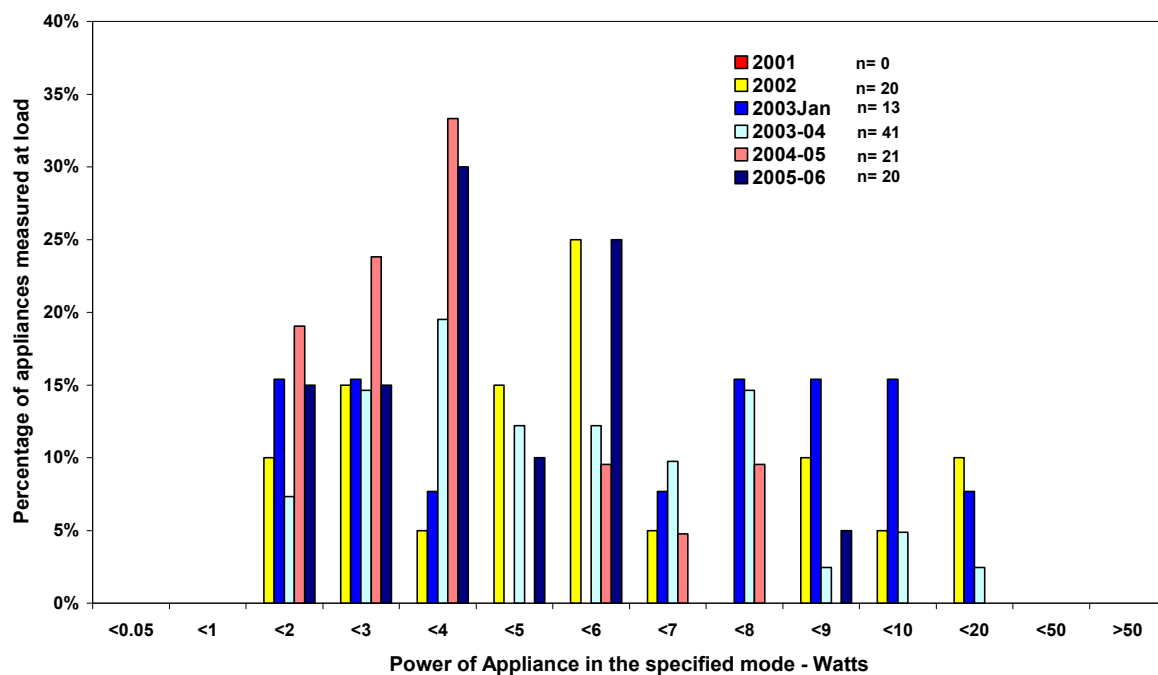


Figure 58 – Average power measurements for inkjet printers: passive standby mode

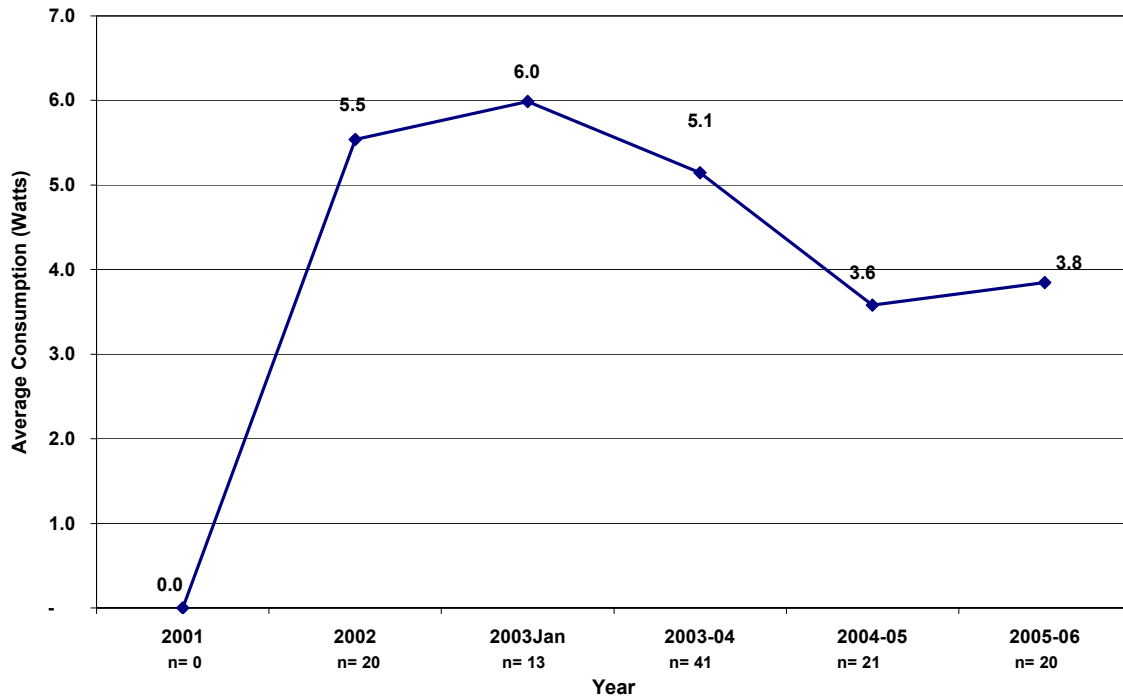


Figure 59 presents the power consumption results for inkjet printers in off mode. As was found in the 2004/05 survey, the majority of inkjet printers (81% this year), are using less than 1W in off mode. This year's result for average off mode consumption is stable at 0.8W compared to last survey. Average power consumption has been lower or steady for each survey undertaken over the past 5 years. Figure 60 below illustrates the results.

Figure 59 – Power measurements for inkjet printers: off mode

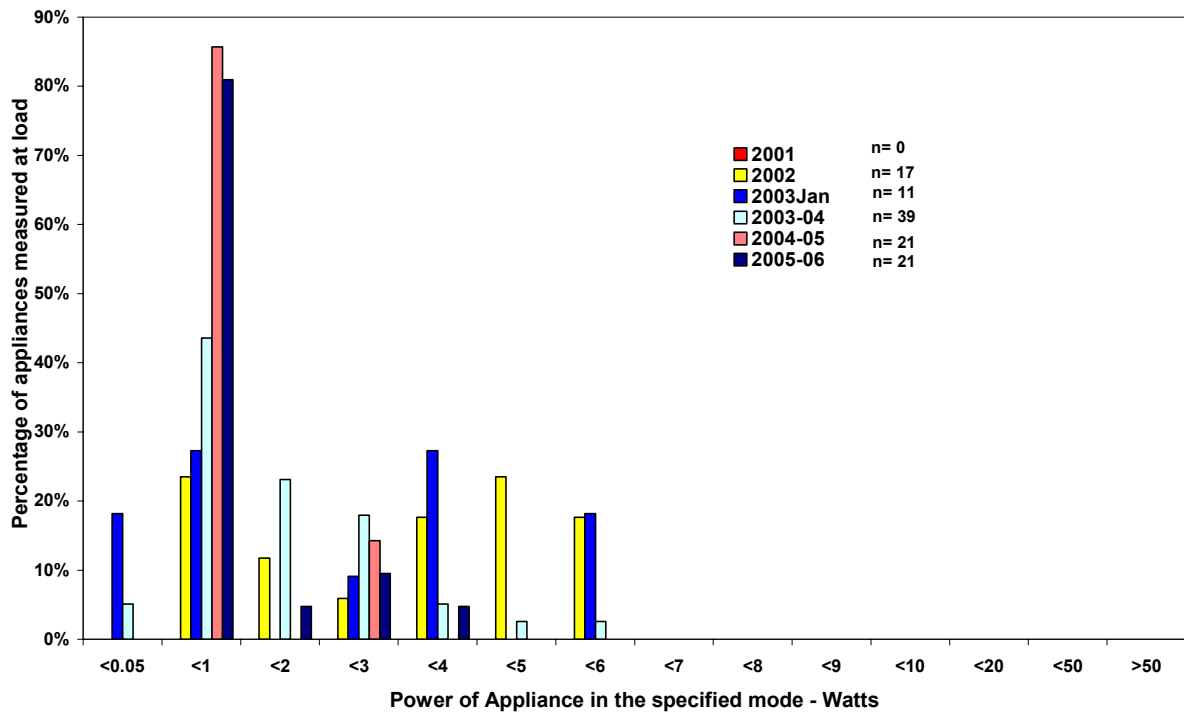
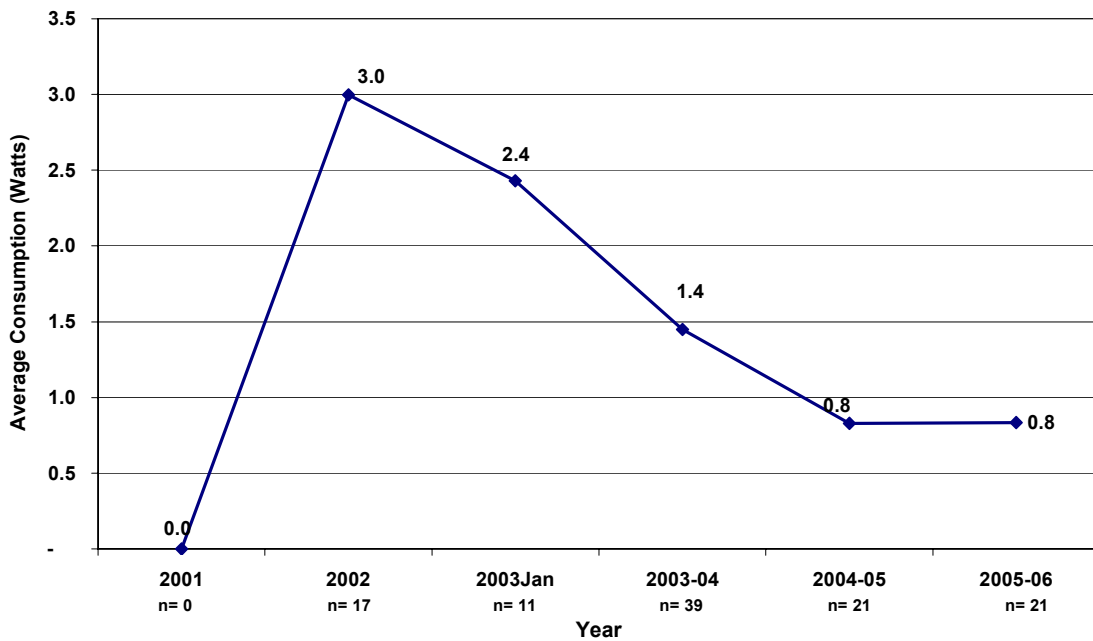


Figure 60 – Average power measurements for inkjet printers: off mode



## Printers – Lasers

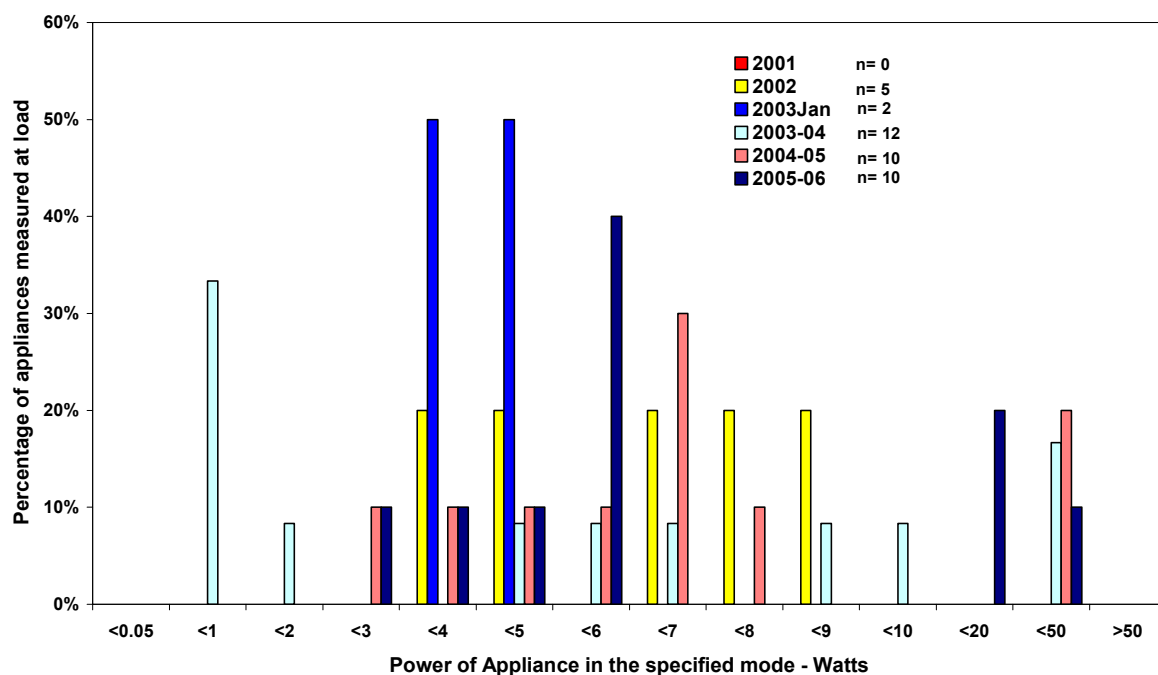
Ten laser printers were measured in passive standby and in off mode. Four models measured were colour laser printers with the remainder black and white printers. Once again no models displayed an ENERGY STAR label. The average power consumption in passive standby mode was 8.2W with a maximum of 22.4W and a minimum of 2.3W. In off mode laser printers recorded an average of 0W (see Table 26).

**Table 26 – A summary of laser printer results**

Appliance:	Printer - Laser			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	10	8.2	22.4	2.3
Off	10	0.0	0.0	0.0
<b>Total Number of Units</b>	10			

Figure 61 presents the distribution of passive standby measurements over the past five surveys. With such a small sample it is difficult to determine if any trends are appearing. However colour printers appear to consume significantly more power in passive standby mode than black and white models. This has been noted in previous surveys and was again observed in 2005/06, with the only 3 readings for passive standby above 6W being attributed to colour printers. Across all survey's only one printer has ever been found to consume power in off mode.

**Figure 61 – Power measurements for laser printers: passive standby mode**



## ***Home Entertainment Equipment***

The 2005/06 survey attempted to look at whether home entertainment products powered down from active standby to passive mode after a predetermined period of time. Given that the audio reminder that a product is still active is not present for many home entertainment products there is an assumption that for this product group active standby may be operational for lengthy periods of time. Measuring power down in the store setting proved quite difficult, as it required the unit to be easily plugged into a meter for up to 30 minutes without interfering with staff or customers. As result only 20 products were tested. Of these only 2 DVD players were found to power down to their passive state. One did so after 10 minutes, the other after 20 minutes. Products tested included 7 integrated stereos, 7 DVD players, 2 hard disk recorders, 1 portable stereo and 3 home theatre systems.

### **Televisions**

This report provides an analysis of televisions in off and passive standby modes only. As a new international test method for televisions is currently being developed, in-use mode, which, has previously been included, will not be discussed. The store survey did undertake these measurements as part of the development trial process. These measurements will again be included in the future once the test method is established. Additionally as the appropriate test method was not available during the November store survey a smaller number of televisions have been recorded this year. Power factor was only recorded for passive standby and crest factor was not included at all due to the significant amount of data collected in previous surveys and the minimal influence the results have had on outcomes. A discussion of televisions by television type can be found below.

### **CRT Televisions**

This category covers standard cathode ray tube (CRT) models for UHF and VHF reception and excludes those models with LCD, plasma or rear projection screens as well as those with in built VCRs. While all models had remote control operation it was not possible to access this for all models. The proportion of CRT models present in the store visited was significantly smaller than previous surveys. In the past CRT models have made up the overwhelming majority of televisions on sale in the stores, however this year only 21% (14) of models were of this type. It is unclear whether this is due to an overall consumer trend of phasing out CRT's or whether that it is particular to the area where the survey was conducted. The store chosen was in the heart of one of Melbourne's growth corridors which contains mostly new homes and a younger than average population. This situation will be monitored in future surveys. The televisions ranged in size from 33cm to 79cm, with the average size on display being 62cm (down from 66cm in 2004/05 survey).

For the purposes of this report televisions were tested in 2 modes: passive standby and off. Fourteen televisions were measured in passive standby mode with the average power consumption being 3.4W with a maximum of 9.2W and a minimum of 0.5W. Low

average power factor was recorded at 0.29. The average off power consumption recorded was zero. The highest reading was 0.1W. Table 27 summarises these results.

**Table 27 – A summary of CRT television results**

Appliance:	TV - standard				
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Power Max	Power Min
In Use	NA	-	-	-	-
Active	NA	-	-	-	-
Passive	14	3.4	0.29	9.2	0.5
Off	14	0.0	-	0.1	0.0
<b>Total Number of Units</b>	14				

Three televisions from the sample displayed an ENERGY STAR label. Two models recorded a passive standby reading of less than 1W, which is the minimum criteria required to display the label. The third model was recorded as 3.3W in passive standby.

Figure 62 shows the proportion of CRT TV's among the categories less than 5W continues to grow and has improved greatly since the surveys undertaken in 2001 and 2002. This is the first year all televisions consumed less than 10W in passive mode. However it must be noted that the sample size is significantly smaller than previous years.

**Figure 62 – Power measurements for CRT televisions: passive standby mode**

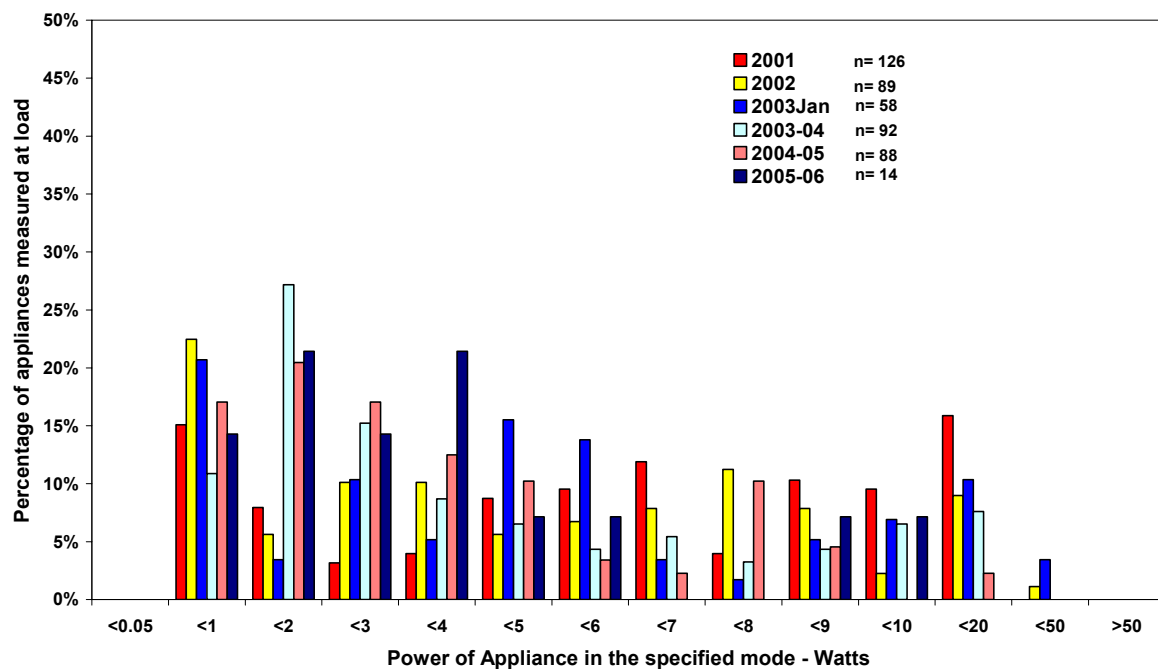
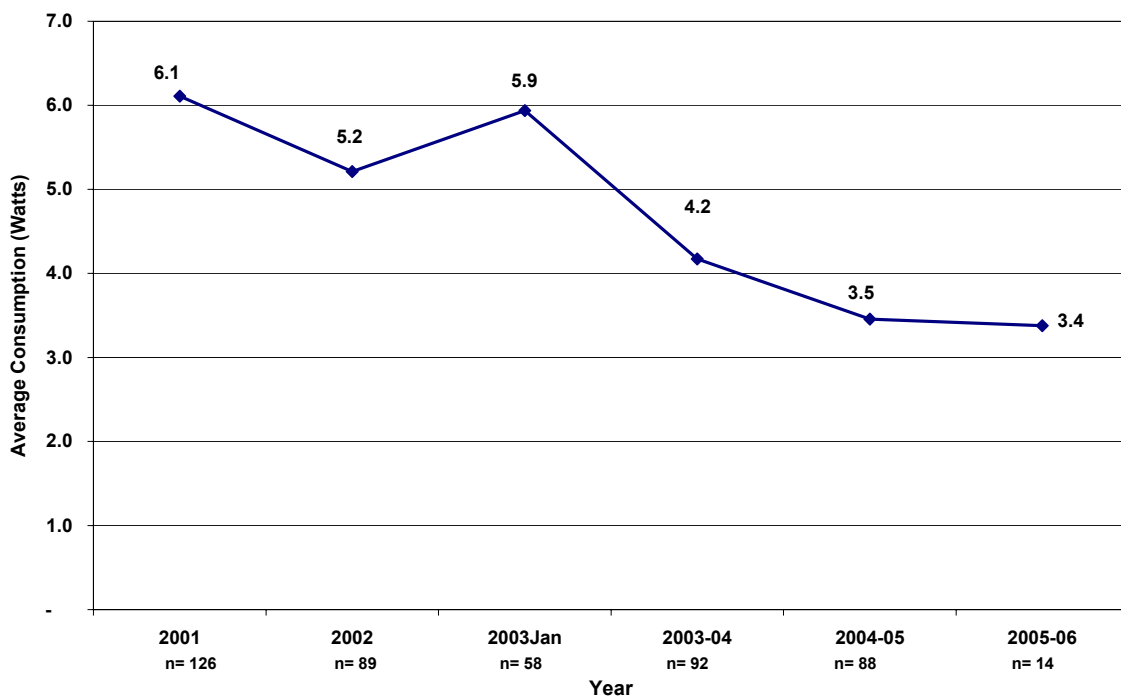


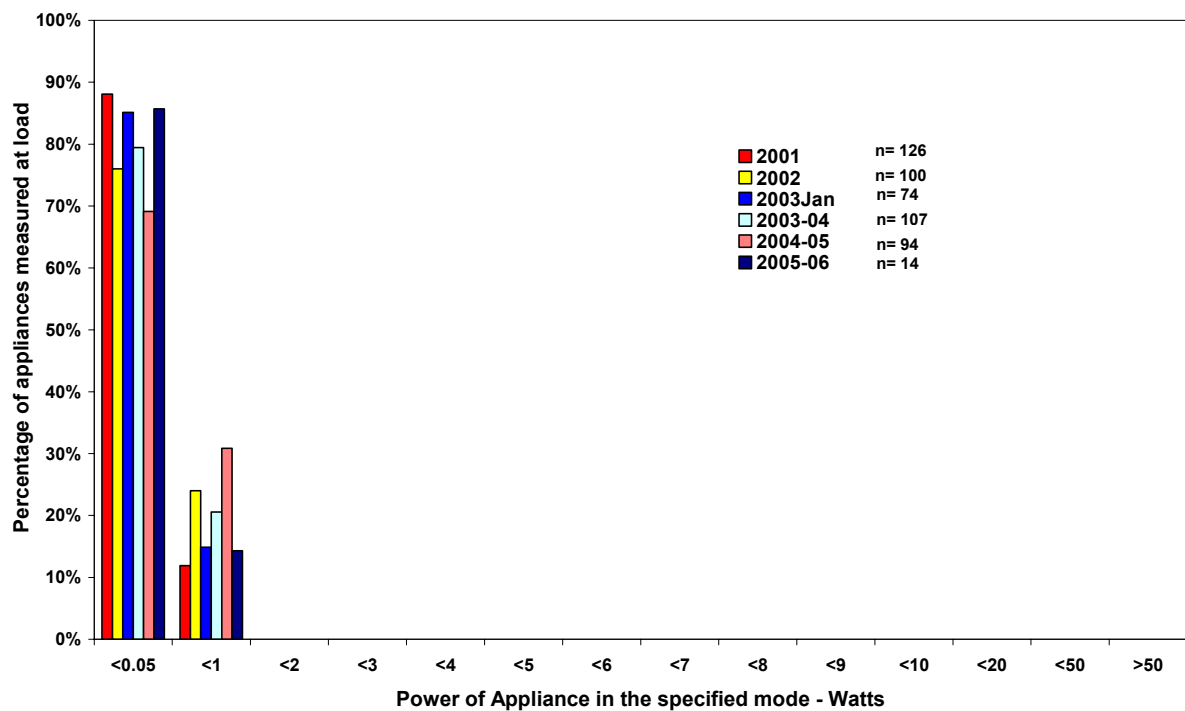
Figure 63 illustrates that the downward trend in passive standby mode appears to be stabilising with only 0.1W difference between the averages for the last two surveys and no statistical significance in the change since 2003/04.

**Figure 63 – Average power measurements for CRT televisions: passive standby mode**



In off mode all televisions consume less than 1W with zero consumption recorded for the vast majority. This is illustrated in Figure 64.

Figure 64 – Power measurements for CRT televisions: off mode



## LCD Televisions

In the 2005/06 survey, 40 LCD (liquid crystal display) televisions were measured. LCD televisions made up the highest proportion of television types for the first time. It is unclear whether this is an indication of the future trend in TV's (see discussion under CRT Televisions). The units were measured in passive standby and off modes. Two units were energy star labelled and both met the Phase III 2006 criteria of less than 1W. The screen size ranged from 43cm to 107 cm with the average being 76cm. This again represents an increase in average screen size from previous surveys up from 63cm in 2004/05.

In passive standby average consumption was 1.6W reaching a maximum of 18.4W and a minimum of 0.2W. The high maximum was the result of one model having a built in digital tuner. This result was not included in the average and the next highest consumption was only 5W. Average off mode consumption for LCD televisions was 1.6W with a maximum of 18.4W and a minimum of zero. Again the high maximum was the result of the model with a built in digital tuner. The next highest consumption was only 1.7W. Only four models recorded zero consumption in off mode. For 66% (27) of models passive standby was the lowest possible state. It would appear that the off button is becoming obsolete on LCD televisions, with the proportion of models being sold with this function declining each year. Table 28 summarises these results.

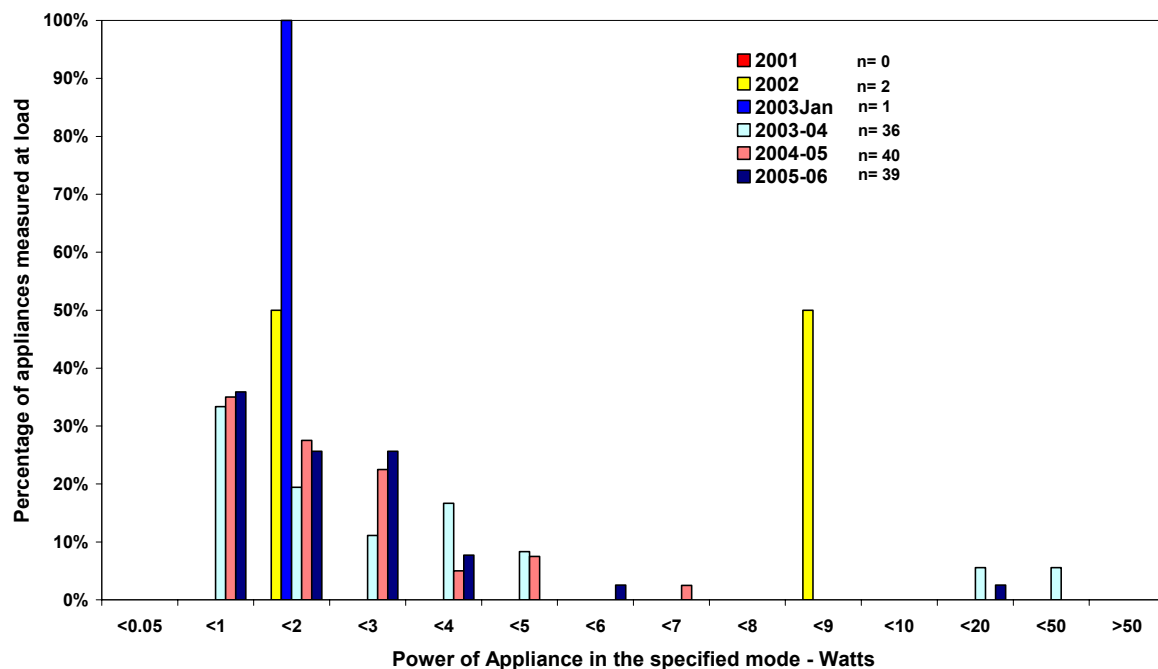
Table 28 – A summary of LCD TV results

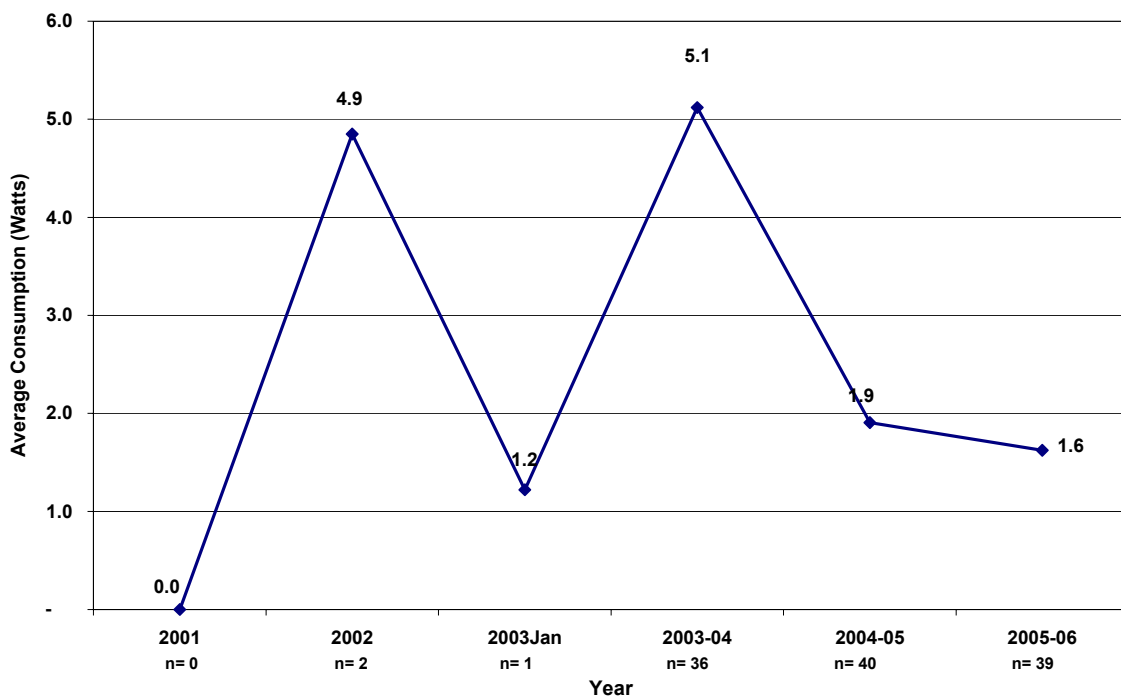
Appliance:	TV - LCD				
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Power Max	Power Min
In Use	NA	-	-	-	-
Active	NA	-	-	-	-
Passive	39	1.6	0.14	18.4	0.2
Off	14	0.5	-	18.4	0.0
<b>Total Number of Units</b>	41				

Note: One LCD television was measured with a passive and off mode consumption of 18.4W. This has been removed from the average as the high reading is likely to be caused by the built in digital tuner and will distort the average. The next highest results were 5W in passive mode and 1.7W in off mode.

Once again more than one third (36%) of LCD televisions recorded consumption less than 1W in passive standby mode, with 88% of models using less than 3W. Average consumption was maintained with the decrease found in the previous survey being supported. This reduction from 5.1W in 2003/04 to 1.6W in 2005/06 now has statistical significance and can be considered a positive trend. Given that the presence of off mode is declining, the importance of attaining low passive standby is increased. Passive standby mode results are presented in Figure 65 and Figure 66.

Figure 65 – Power measurements for LCD televisions: passive mode



**Figure 66 – Average power measurements for LCD televisions: passive mode**

Note: One model with a built in digital tuner was removed from the average as the high reading will distort any average trends

Off mode consumption for LCD televisions was recorded at less than 1W for most units with little change in the distribution pattern from previous years. There average off mode consumption decreased from 1.0W in 2004/05 to 0.5W in 2005/06, however there is no statistical significance in the changes to average consumption over the surveys. Off mode results are presented in Figure 67 and Figure 68 below.

Figure 67 – Power measurements for LCD televisions: off mode

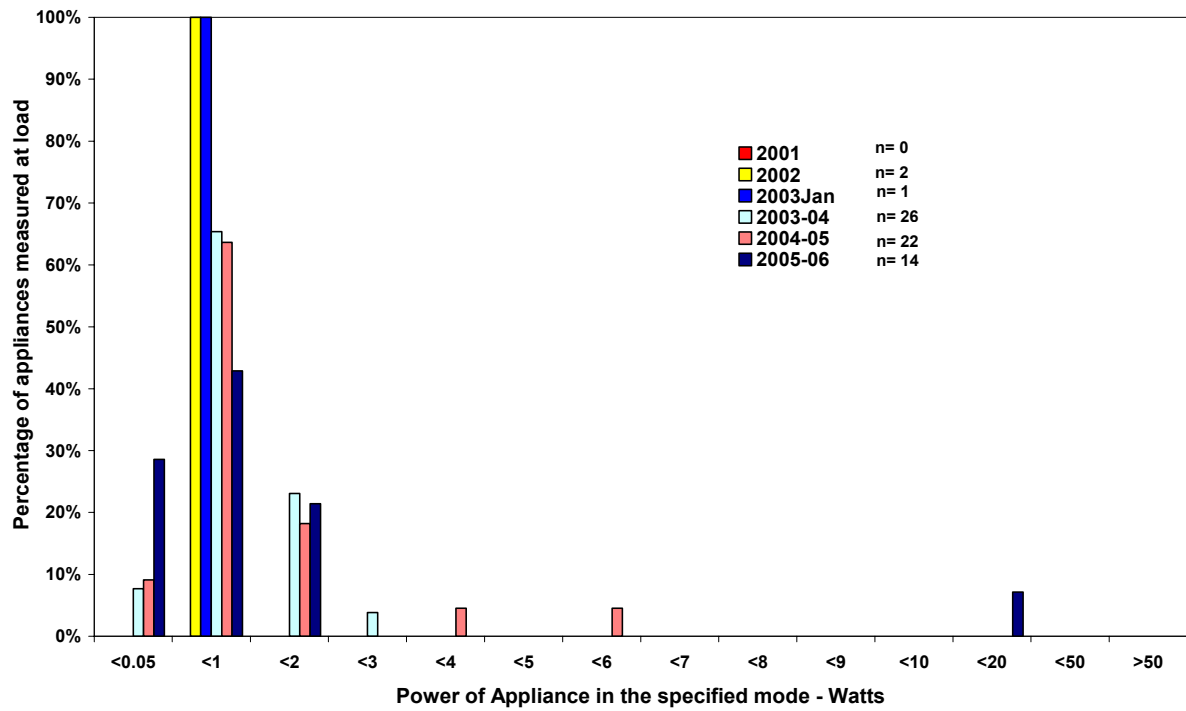
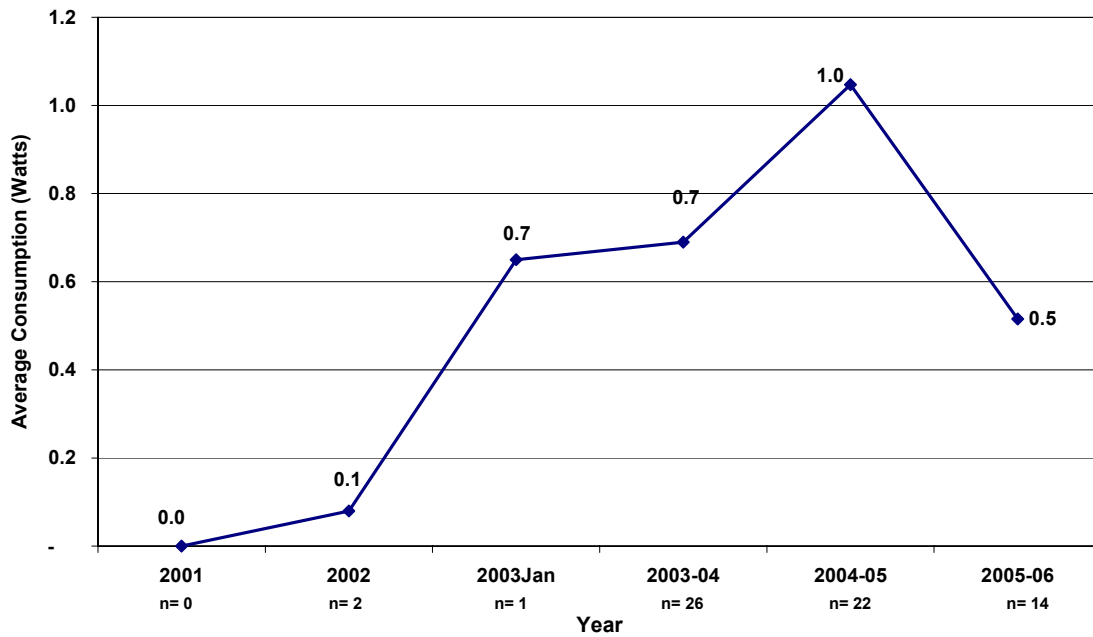


Figure 68 – Average power measurements for LCD televisions: off mode



Note: One model with a built in digital tuner was removed from the average as the high reading will distort any average trends

## Projection Televisions

Projection televisions are made as either a front or rear projection type and may have an LCD display. Only three models were found in the store survey and all were rear projectors. The models in the survey ranged in size from 157cm to 182cm. One model displayed an ENERGY STAR label and was found to comply with the specifications required (passive consumption was <3W). There were 10 ceiling mounted projector units present in the store but these could not be tested.

Projection televisions were measured when in passive standby. When in passive standby the range of consumption in 2005/06 extended from 0.8W to 2.8W to 90.5W producing an average of 31.4W. Only one unit had an off mode, recording a power consumption of 0.1W. This is consistent with data recorded in previous years where off mode has always been less than 1W and each year averaged 0.1W.

**Table 29 – A summary of projection TV results**

<b>Appliance:</b>	<b>TV - Projection</b>				
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Average Power Factor</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-	-
Active	NA	-	-	-	-
Passive	3	31.4	0.4	90.5	0.8
Off	1	0.1	-	0.1	0.1
<b>Total Number of Units</b>	3				

Given that only three units were present in the 2005/06 survey very little information of any significance can be drawn. However Figure 69 and Figure 70 have been included below to demonstrate that this category of appliance has been stable across all surveys. The change in average passive standby is due to one product that was 88W higher than the other models. However, each year a handful of models are recorded at these high levels and this has only distorted the average due to the small sample size in 2005/06.

Figure 69 – Power measurements for projection televisions: passive standby mode

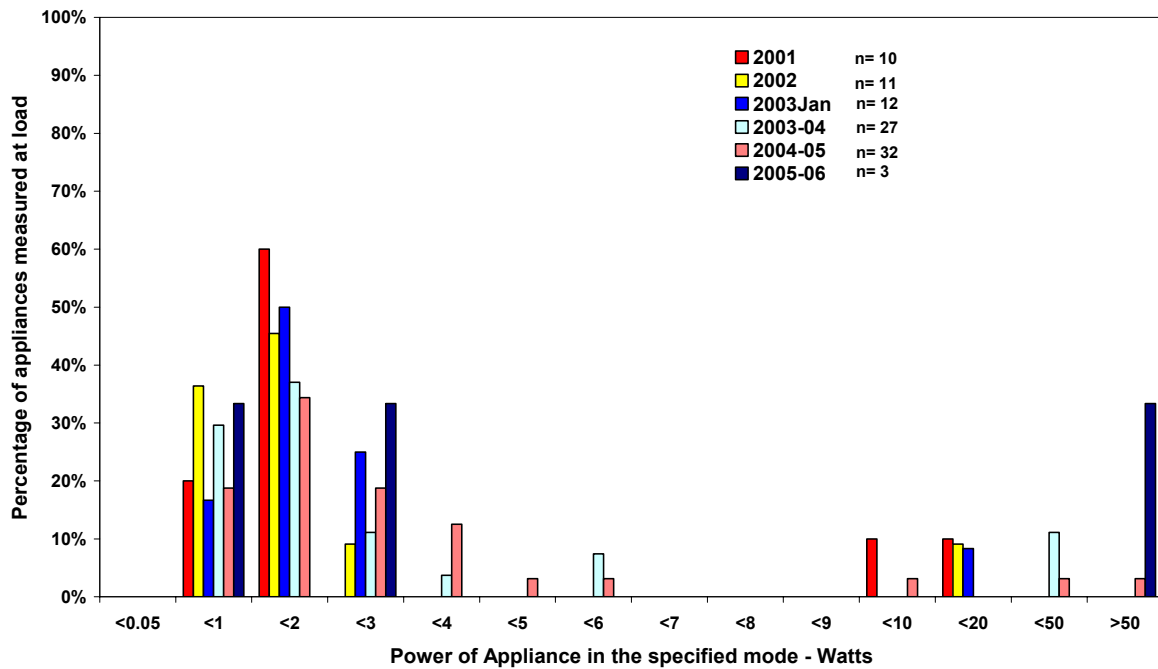
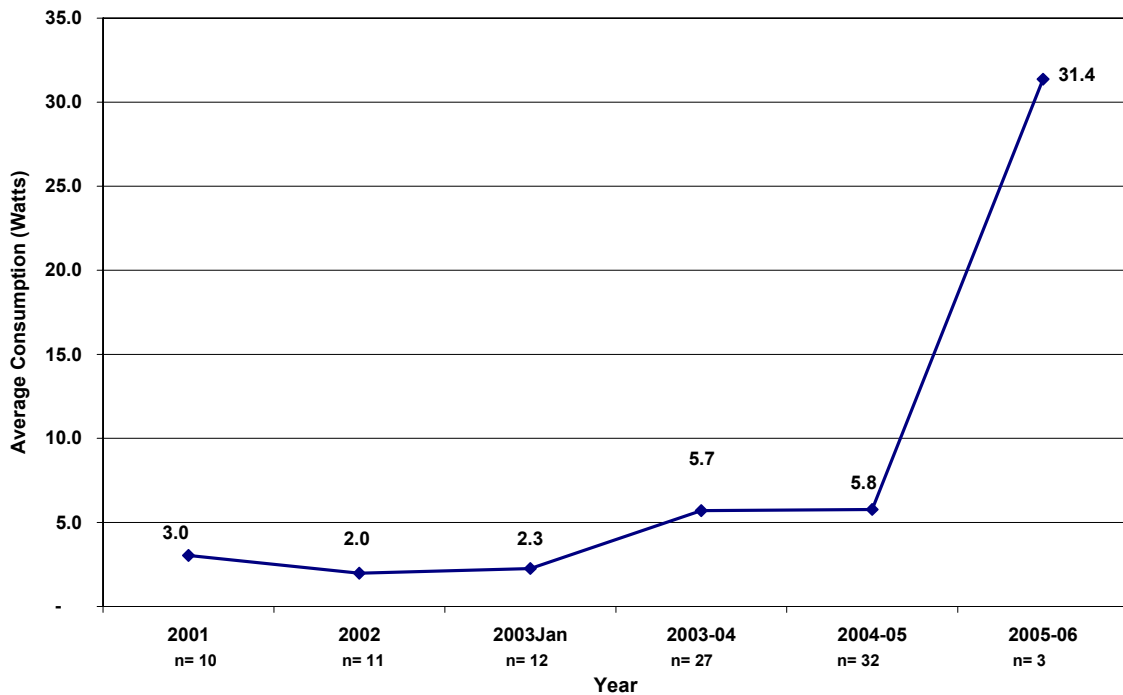


Figure 70 – Average power measurements for projection televisions: passive standby mode



Note: The small sample in 2005/06 has distorted the average. All 3 models were within the normal distribution range of previous projection television samples. See discussion.

## Plasma Televisions

This year 11 plasma televisions were measured. The plasma televisions in the survey were measured in passive standby and in off mode. None of the plasma televisions displayed an ENERGY STAR label.

Passive standby consumption for plasma televisions found a maximum at 3.2W and a minimum at 0.1W. The average consumption for this mode is 1.4W. One plasma television did not have passive mode recorded as the remote control could not be located. Only 2 units had an on/off switch allowing off mode to be measured. The average consumption for off was 0.6W with the maximum at 1.1W and minimum at 0.1W. Table 30 presents the results for the plasma televisions measured.

**Table 30 – A summary of plasma TV results**

<b>Appliance:</b>	<b>TV - Plasma</b>				
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Average Power Factor</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-	-
Active	NA	-	-	-	-
Passive	10	1.4	0.8	3.2	0.1
Off	2	0.6	-	1.1	0.1
<b>Total Number of Units</b>	11				

Figure 71 below shows the distribution of measurements for plasma televisions in passive standby. The 2005/06 results show an increase in the proportion of models consuming less than 1W, with 50% of models in this category compared with 15% or less in previous surveys. Additionally none of the models tested consumed more than 4W. While caution needs to be taken due to the small sample size, Figure 72 also demonstrates an improvement in passive standby levels with the average dropping from 2.3W to 1.4W. This change has statistical significance and would appear to be a positive result.

Figure 71 – Power measurements for plasma televisions: passive standby mode

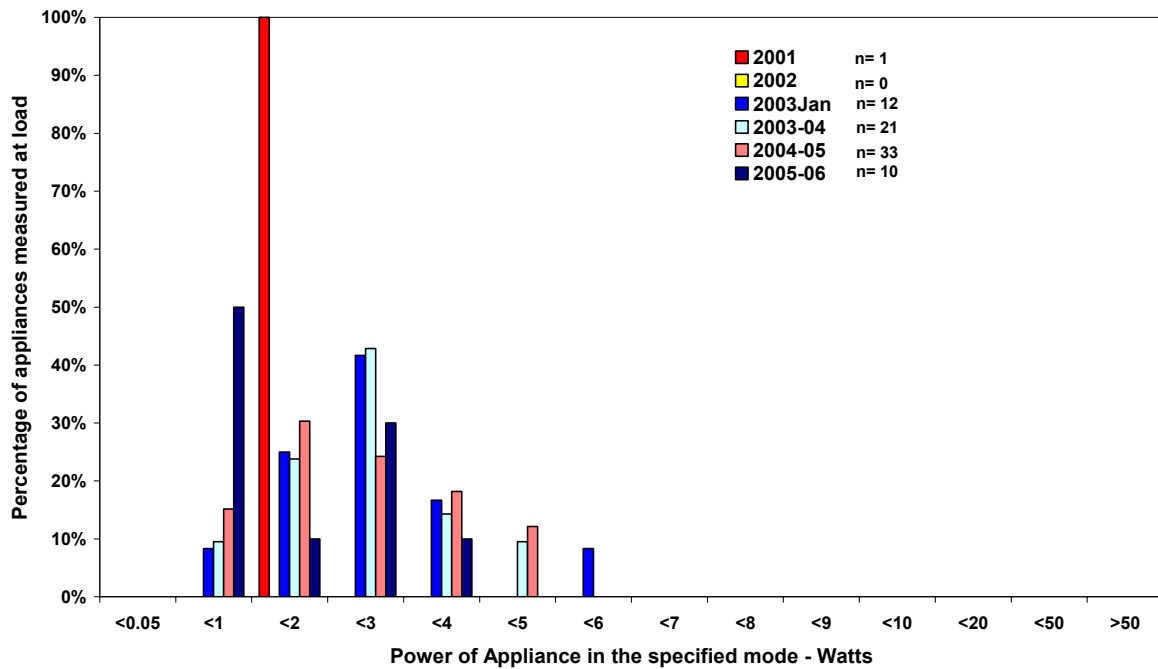


Figure 72 – Average power measurements for plasma televisions: passive standby mode

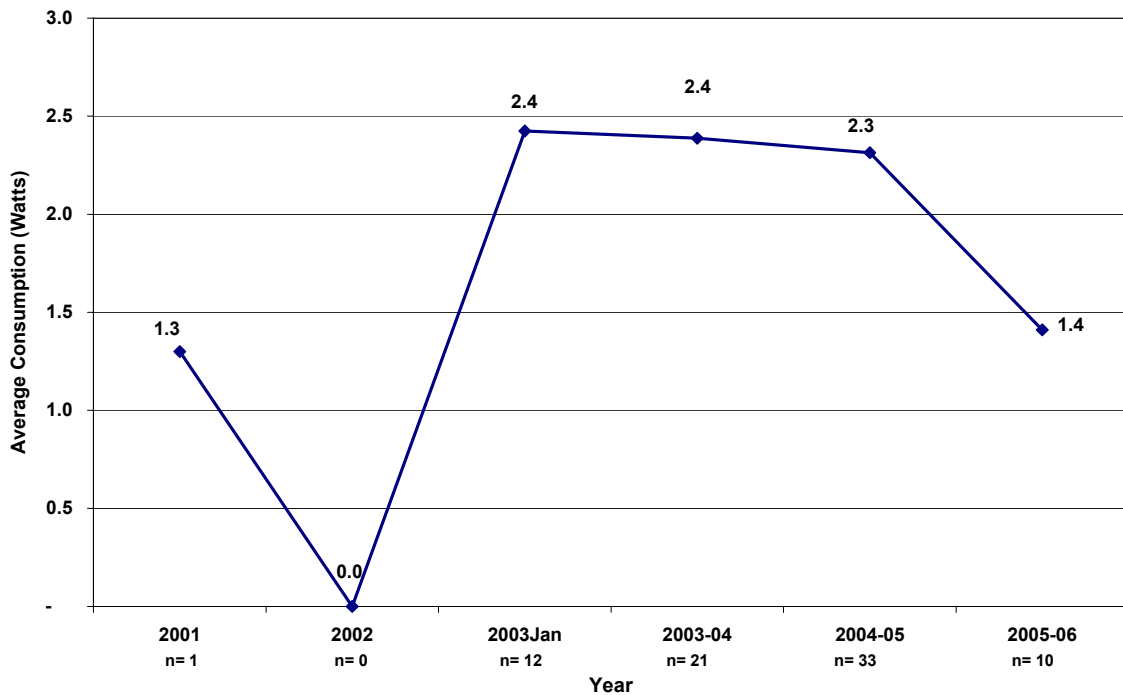
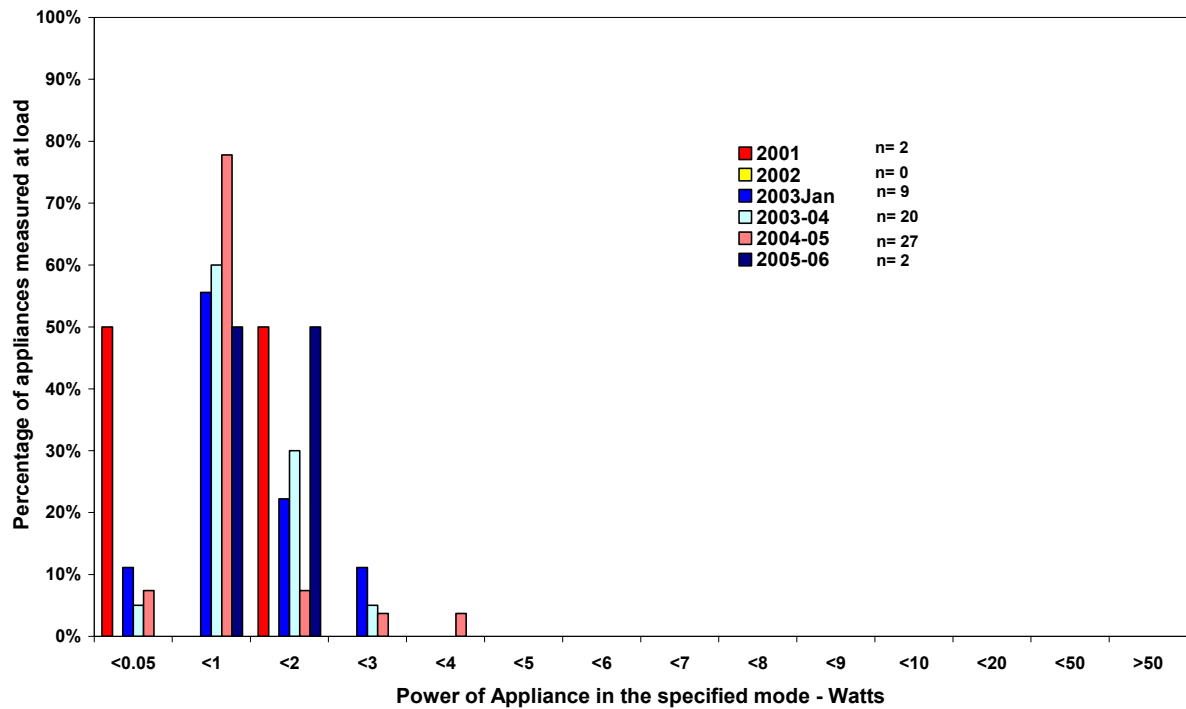


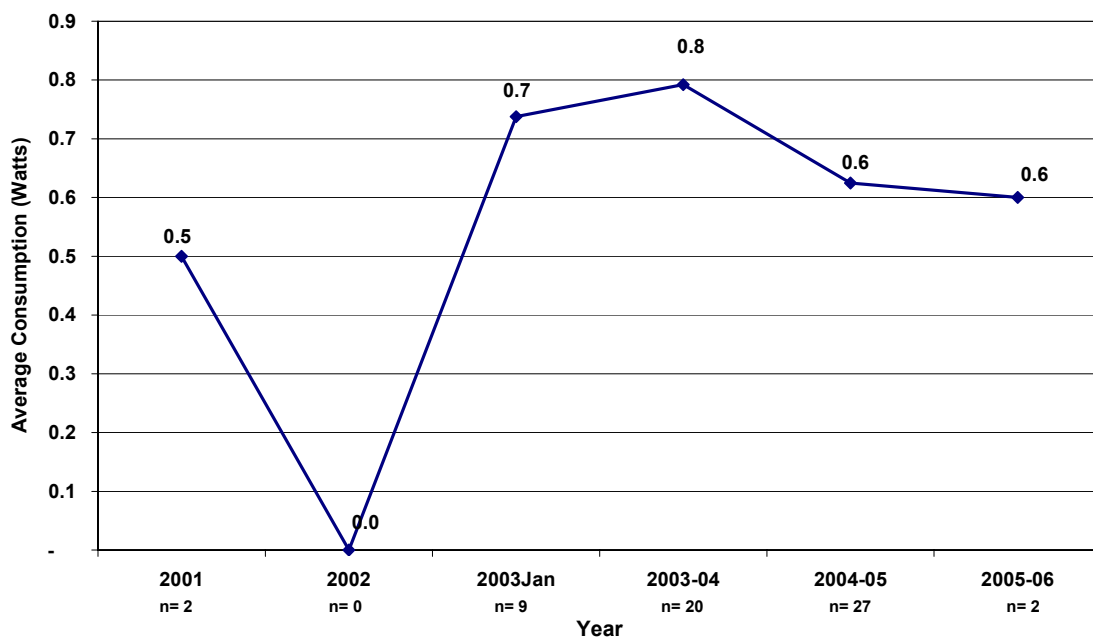
Figure 73 shows the distribution of readings for plasma televisions in off, while Figure 74 presents average consumption in off mode. In 2005/06 there were only 2 models found to have an off switch making any fresh analysis difficult. It is unclear whether, like LCD

televisions (see previous section), off mode is being phased out of the design or whether this absence is the product of a small sample. However, the 2 models tested clearly fit into the norm with the average being maintained from last year. Average consumption in this mode has never been greater than 1W with nearly all models consuming less than 2W in this state.

**Figure 73 – Power measurements for plasma televisions: off mode**



**Figure 74 – Average power measurements for plasma televisions: off mode**



## VCRs

In 2005/06 only 3 VCRs were found in all the stores visited. The anticipated decline of this product appears to have arrived as it is by DVD recorders. Given this result unless future surveys find a resurgence of this product, it will no longer be measured and will be considered obsolete.

## DVD Players

Digital Video Disk players are now commonplace in Australia, having been one of the fastest selling products in the last few years. For the purpose of this study the DVD player definition has been altered so that it may include a VCR component or provide a decoder (set top box) function for transmitting images but can not record to DVD disk. Additionally Portable DVD players are also included in this category. Past results have been altered to reflect this.

Fifty-eight units were tested and of those, 12 displayed an ENERGY STAR label. Four of these units did not meet the Phase II criteria of less than 1W; however they were all less than 1.5W

DVDs were measured in 3 modes: active standby, that is, ready to play a disc, passive standby, that is, ready to be activated and off (where present), that is, powered down but not able to be activated by a remote. All 58 units measured in 2005/06 could be tested in active standby with the average consumption being 8.8W. The range varied from a minimum of 3.8W to a maximum of 19.2W. Passive standby could be measured on 54 units as remote controls/standby buttons were not always present. The average power consumption was found to be 2.0W in passive standby with a minimum of 0.1W and a maximum of 9.1W. Only thirteen DVD players had a power on/off control. All of these models had less than 1W consumption in off mode. For a summary of these results see Table 31 below.

**Table 31 – A summary of DVD player results**

<b>Appliance:</b>	<b>DVD Player</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	58	8.8	19.2	3.8
Passive	54	2.0	9.1	0.1
Off	13	0.1	0.9	0.0
<b>Total Number of Units</b>	58			

DVD players have been showing improvements in active standby power consumption in the short time that they have become available. Figure 75 below shows how power consumption has continually declined since 2001. In 2005/06 this trend continued with 50% of models now consuming less than 8W and no models consuming more than 20W. As shown in Figure 76, average active standby has also continued to decrease. In 2005/06 average active standby reached a new low level of 8.8W. While not a statistically

significant decrease from 2004/05 it gives a strong indication that the downward trend in active standby is being maintained if not continuing.

Figure 75 – Power measurements for DVD players: active standby mode

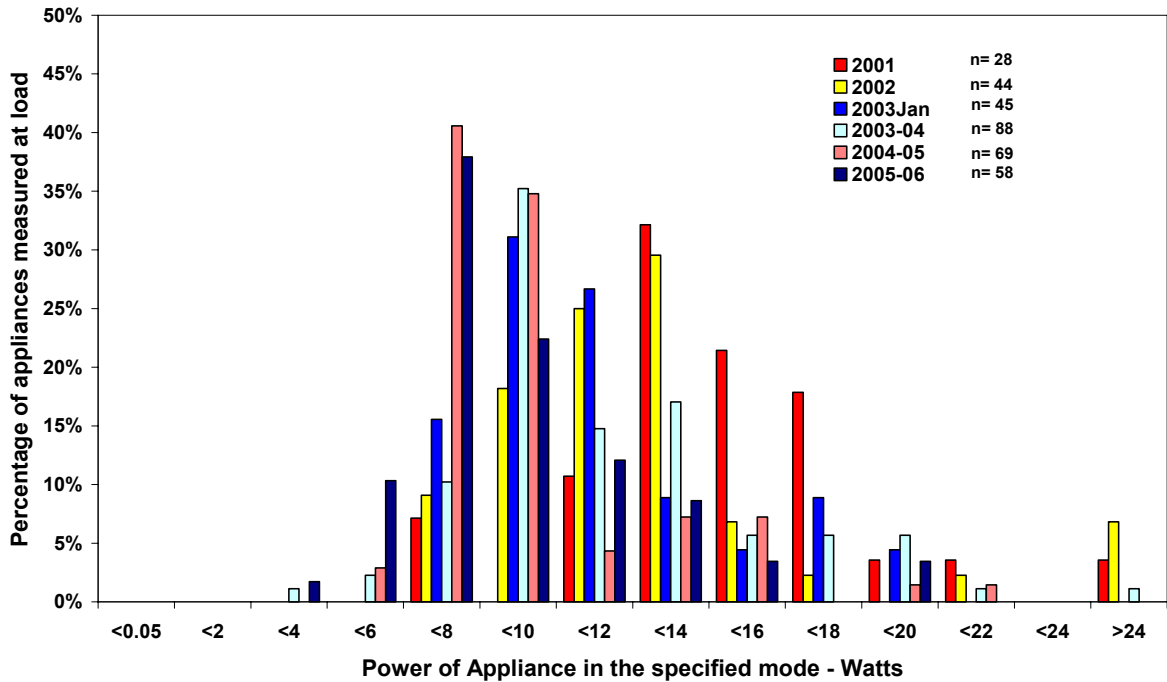


Figure 76 – Average power measurements for DVDs: active standby mode

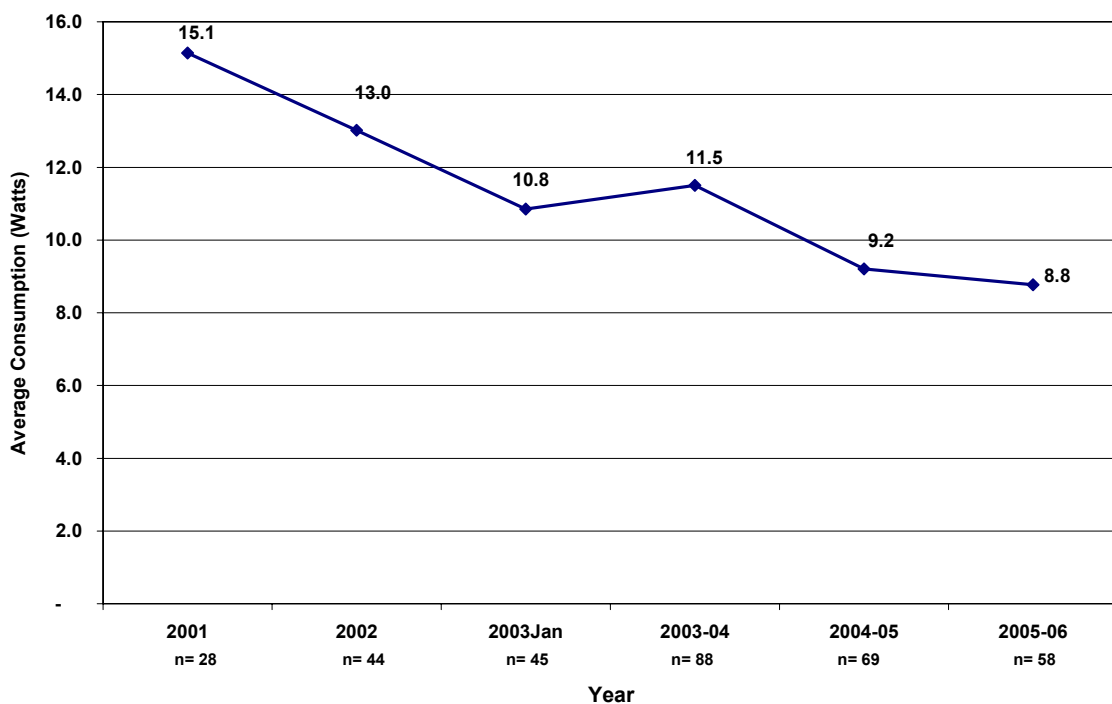


Figure 77 shows that the proportion of DVD players consuming less than 1W in passive standby mode has again increased in 2005/06 rising from 33% to 41%. There was also a decrease in the number of models registering passive standby greater than 4W, with only 16% of models recording high consumption compared with 28% last year. Figure 78 shows average power consumption in this mode has stabilised since the statistically significant decrease in 2002 with average passive standby consumption sitting at 2W.

**Figure 77 – Power measurements for DVD players: passive standby mode**

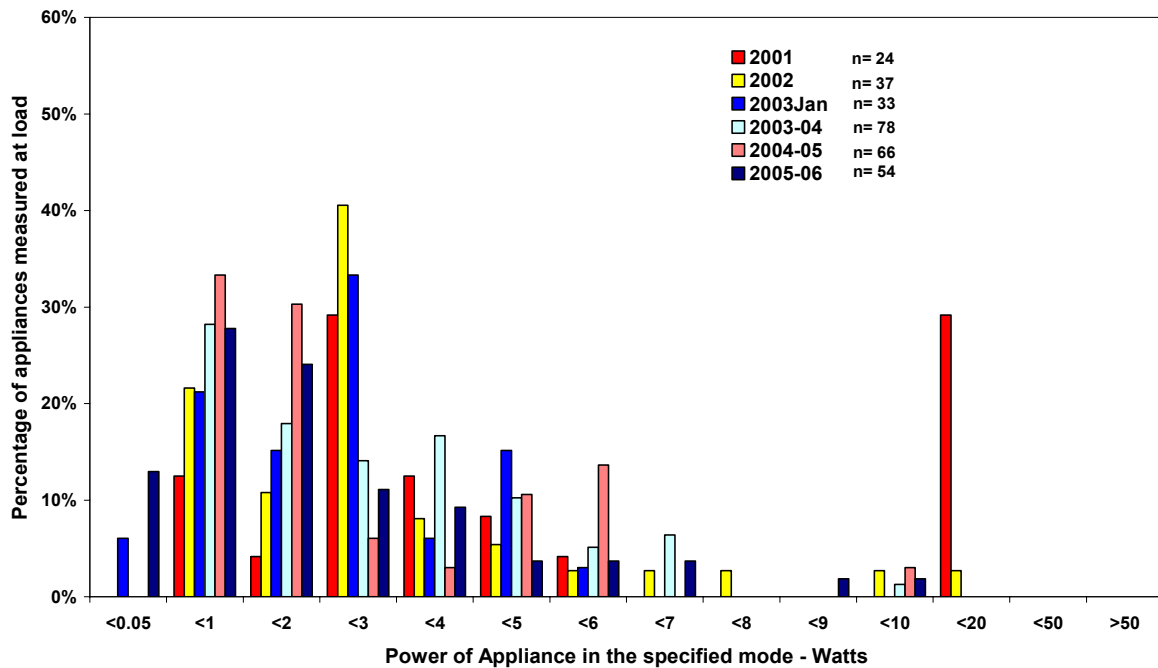
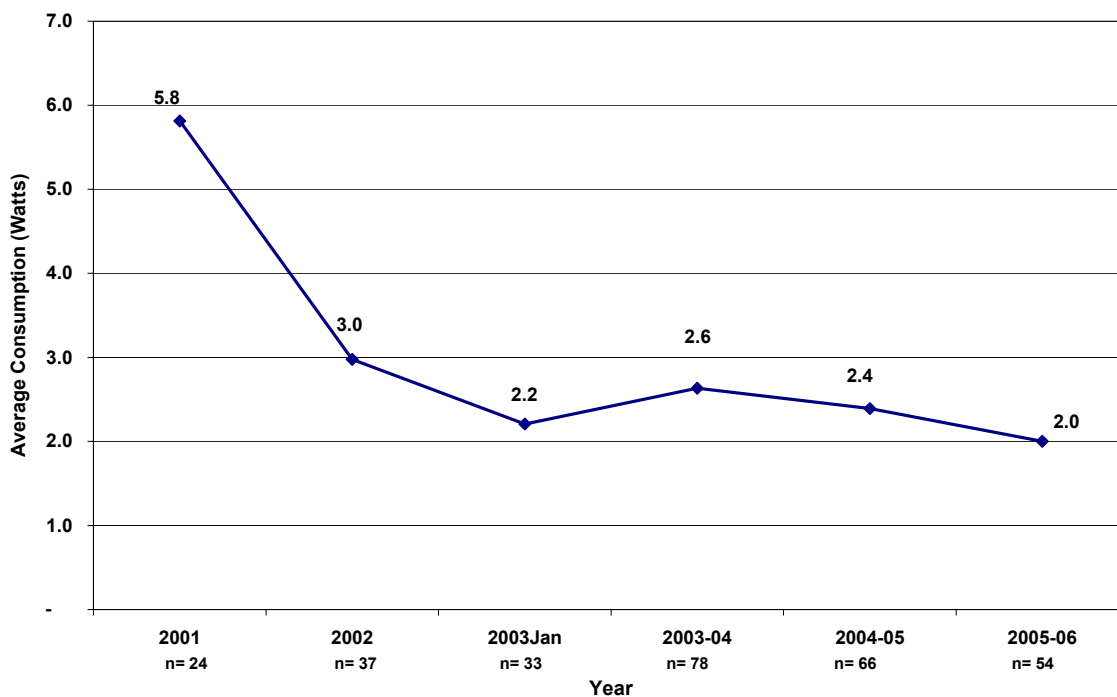


Figure 78 – Average power measurements for DVDs: passive standby mode



Thirteen units (22%) had an on/off switch. All units measured in off mode in 2005/06 registered consumption less than 1W with the overwhelming majority having zero consumption. Figure 79 and Figure 80 illustrate these results.

Figure 79 – Power measurements for DVD players: off mode

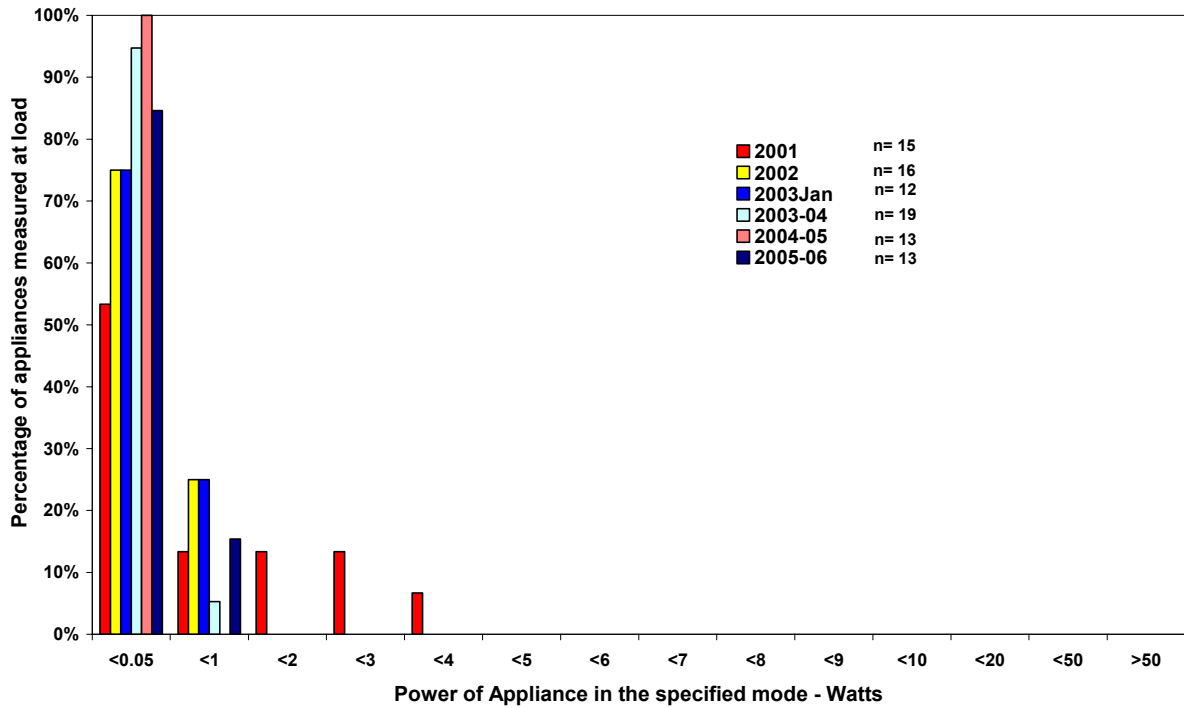
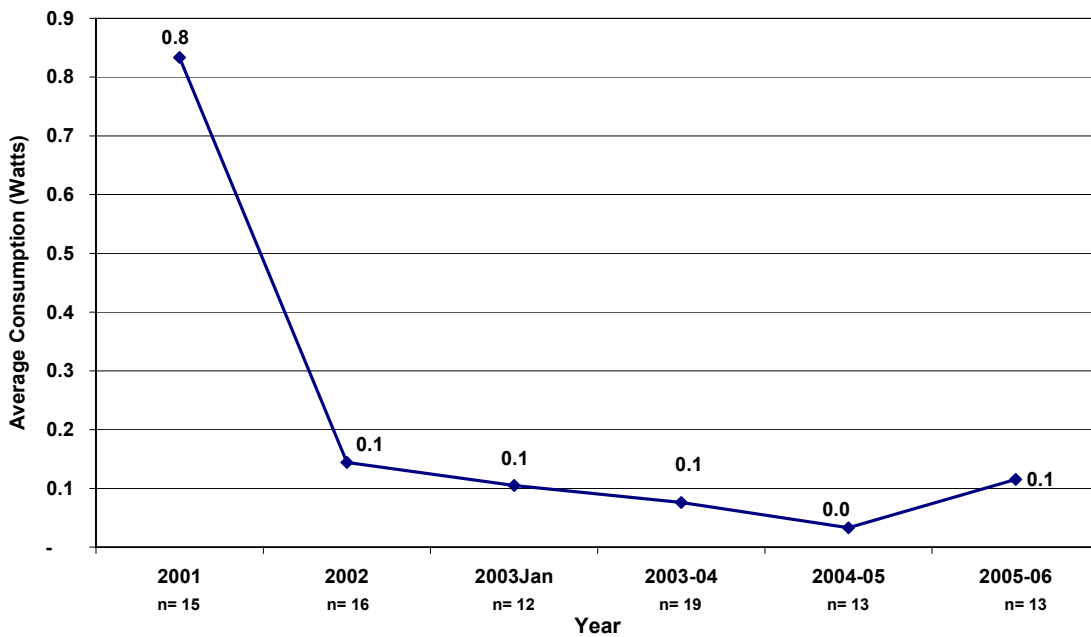


Figure 80 – Average power measurements for DVD players: off mode



These results indicate the downward trend continues to be evident for DVD players in active and passive standby and that off mode has stabilised at very low consumption levels.

**Note:** Portable DVD players are now readily available. These machines can be charged allowing a DVD to be viewed away from the power source. Most stores had these products securely locked in cabinets to prevent theft, making access for measurement during the store survey unlikely.

## DVD Recorders

DVD Recorders allow the user to play DVDs as well as record from television onto a DVD. Basic functions vary from unit to unit but essentially they are same as a VCR. For the purpose of this study DVD recorders now do not include models with a hard disk but may include other functions such as a VCR or a decoder (set top box) for transmitting images. Past results have been altered to reflect this.

Only twenty DVD recorders were measured in the survey this year as it appears the increase in popularity of hard disk recorders has seen the number of straight DVD recorders on display decline. These units were measured in active, passive standby and off mode. One of the units had an ENERGY STAR label however the recorded result of 2.5W did not meet phase II (1W) criteria. In active standby the average power consumed was 21.5W with a maximum of 33.9W and a minimum of 13.5W. Average passive standby was 7.3W with measurements ranging from 1.2W to 23.9W. The results are summarised in Table 32.

**Table 32 – A summary of DVD recorder results**

<b>Appliance:</b>	<b>DVD Recorder</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	20	21.5	33.9	13.5
Passive	20	7.3	23.9	1.2
Off	0	-	-	-
<b>Total Number of Units</b>	20			

In active standby the distribution range of DVD recorders has remained relatively stable. Once again average consumption in this mode decreased slightly, down from 23.0W last year to 21.5W this year with a further increase in the proportion of models consuming less than 24W in this mode. However there is no statistical significance in this result and further measurements will be needed to establish if there is a trend. Figure 81 and Figure 82 present these results.

Figure 81 – Power measurements for DVD recorders: active standby mode

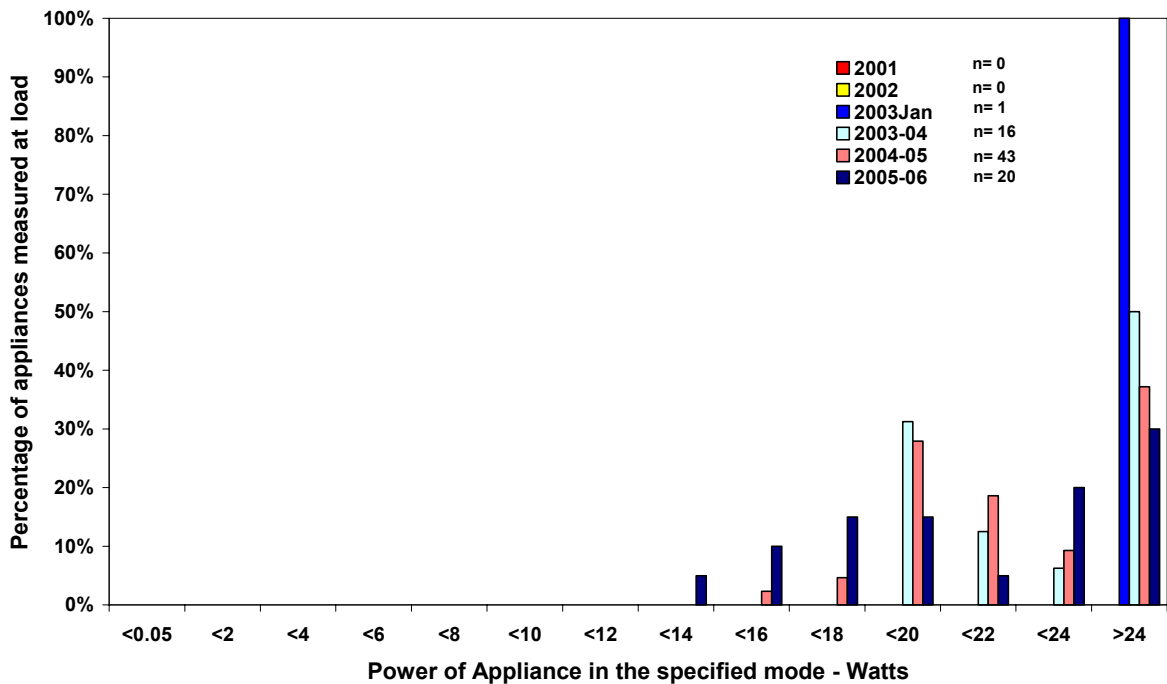
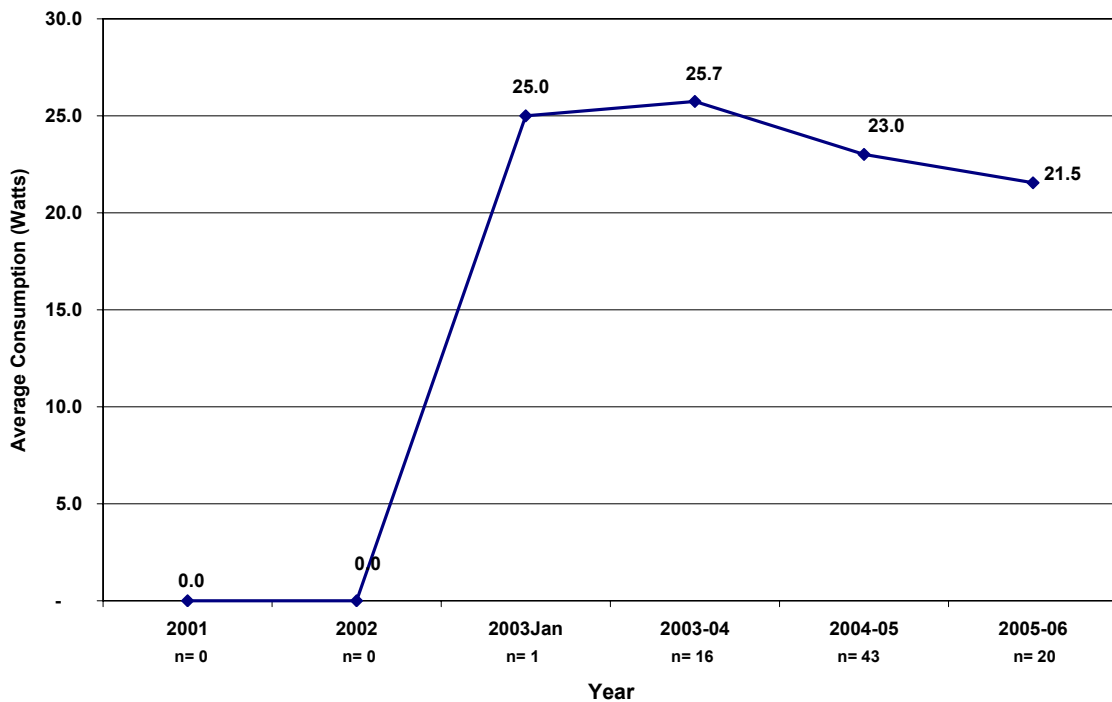


Figure 82 – Average power measurements for DVD recorders: active standby



Passive standby consumption is distributed over a large range with the worst performers using 23.9 watts. In 2005/06 the distribution was largely the same as last year with consumption concentrated between 3W and 8W and 15% of models consuming more

than 15W in passive. For the first year average passive standby was static being 7.3W compared to 7.5W in 2004/05. No statistical significance can be drawn from these figures. These results are presented in Figure 83 and Figure 84

Figure 83 - Power measurements for DVD recorders: passive standby

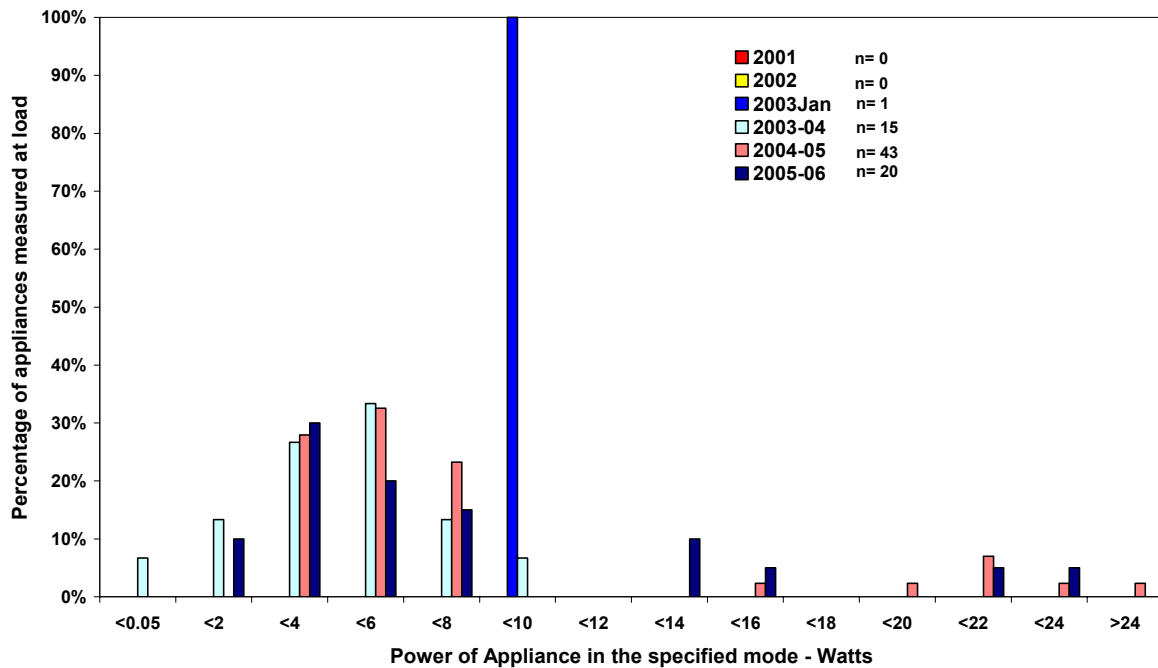
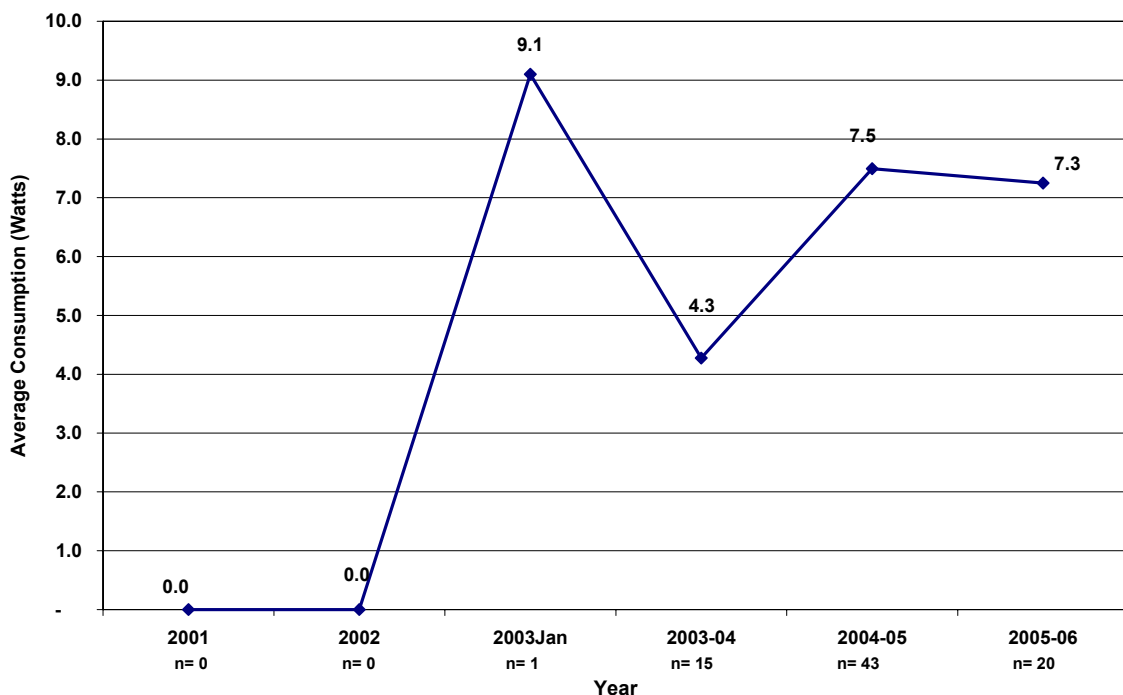


Figure 84 - Average power measurements for DVD recorders: passive standby



## Hard Disk Recorders

Hard disk recorders (HDR) also known as Personal Video Recorders, Digital Video Recorders or DVD hard disk recorders enable the user to record video images onto a hard disk from an external source such as a television, VCR or Video Camera. These units may include a DVD recorder/player, or a decoder (set top box) function for transmitting images. The popularity of this product is steadily increasing with this survey finding more HDR in the stores than DVD recorders.

Twenty-Eight units were measured in the 2005/06 store survey recording an average active standby of 27.8 watts with consumption ranging from 18.4 watts to 38.8 watts. Passive standby consumption was spread from 1.6 watts to 24.1 watts, averaging 5.6 watts. In use mode is measured only if the HDR is plugged in with an antenna; only one unit was found in this state using 2W less than when in active standby. No units had an off mode. Table 33 details these results.

**Table 33 – A summary of hard disk recorder results**

<b>Appliance:</b>	<b>Hard Disk Recorder</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	1	20.9	20.9	20.9
Active	28	27.8	38.8	18.4
Passive	26	5.6	24.1	1.6
Off	0	-	-	-
<b>Total Number of Units</b>	28			

There has been little change in the consumption patterns of hard disk recorders over the three surveys this item has been measured. However in 2005/06 two units were found to consume less than 20W, the lowest consumption across all surveys. Average consumption shows a minor decrease but there is no statistical significance to this result. All results are presented in Figure 85 and Figure 86.

Figure 85 – Power measurements for hard disk recorders: active standby mode

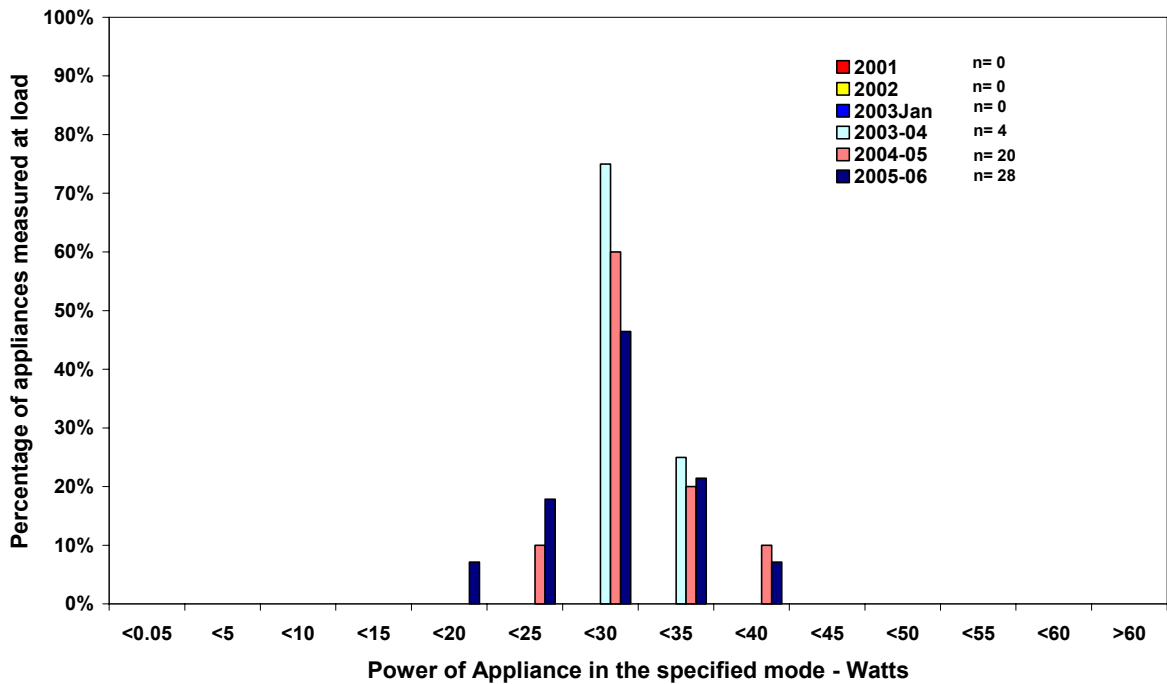
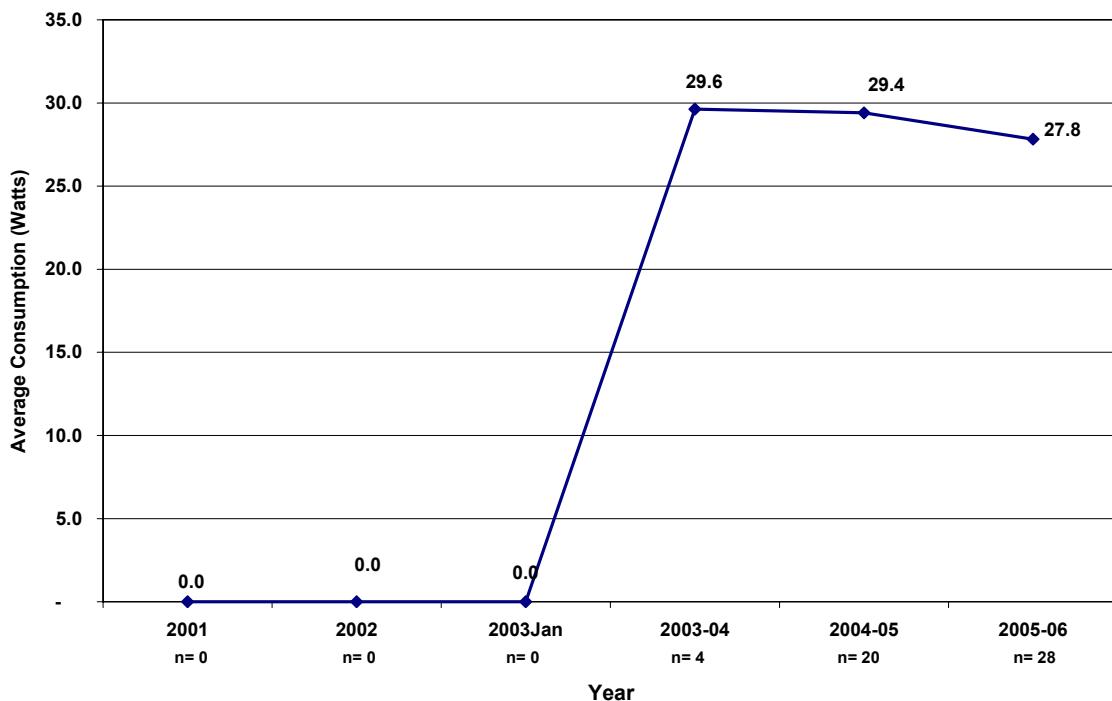


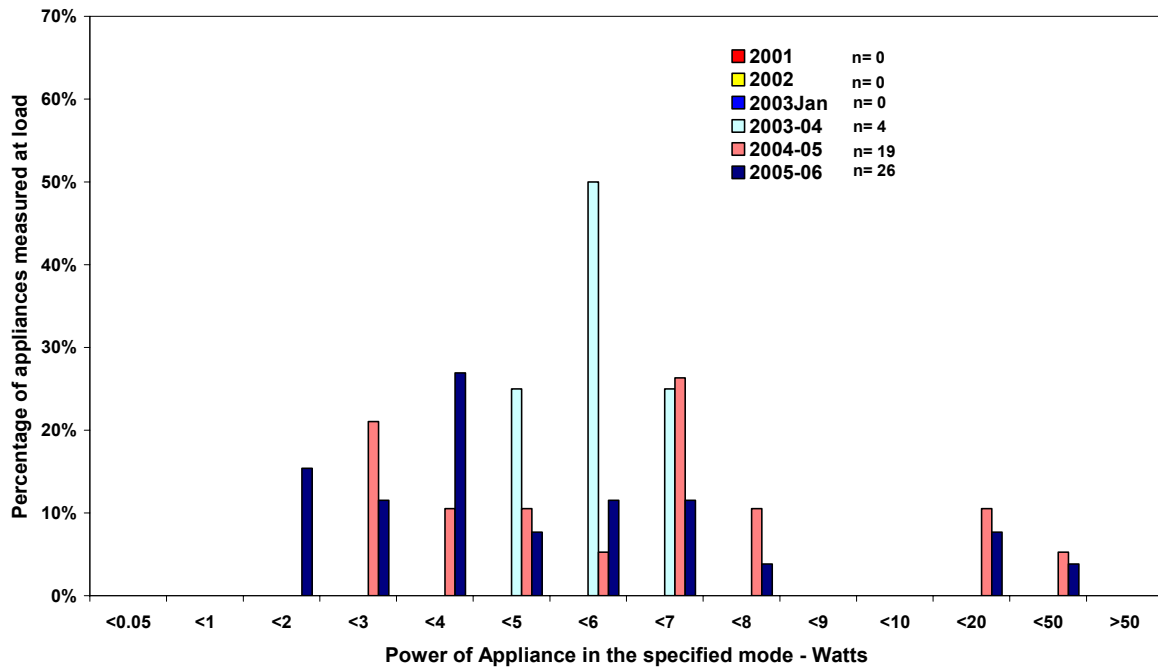
Figure 86 – Average power measurements for hard disk recorders: active standby



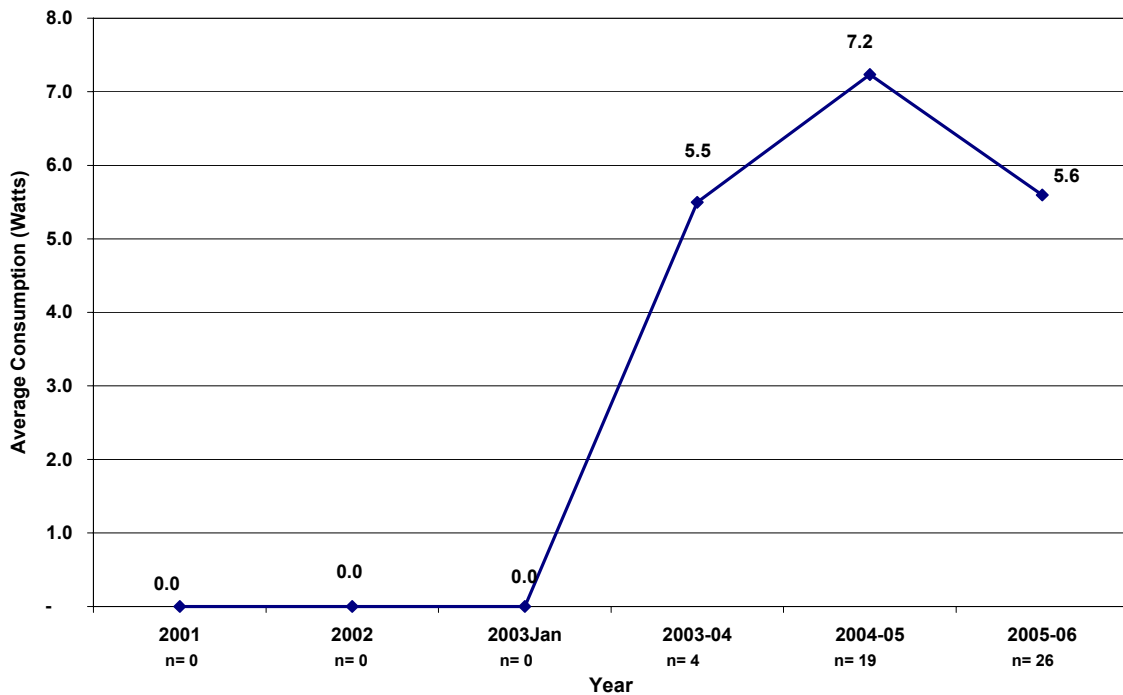
Hard disk recorders in passive standby mode consume across a large range from 1.6W to well over 20W. This has been constant across surveys. However, as with active standby 2005/06 found four units recording lower consumption (less than 2W) than in any

previous survey. This is reflected in a decrease in average consumption; however there is no statistical significance to this data. Results are displayed in Figure 87 and Figure 88.

**Figure 87 – Power measurements for hard disk recorders: passive standby mode**



**Figure 88 – Average power measurements for hard disk recorders: passive standby**



## Integrated Stereos

Integrated stereos are single units that perform more than one function such as CD player, tuner, tape deck, amplifier etc. Most units had remote control as well as manual operation. Variants included CD capacity, presence of a tape deck, and digital displays. The survey measured 37 of units in 2005/06. Seven displayed an ENERGY STAR label. Of the 7 units, six units complied with Phase II, where passive standby is required to be less than 1W. The non-compliant unit was recorded at a quite high level of 7.3W. One unit had an “eco” button which when activated allowed passive standby to be decreased from 11.2W to 0.6W. Similarly some units had clock display functions which when turned off reduced passive standby.

Integrated stereos were measured in 3 modes: active standby, that is, ready to play a disc and passive standby, that is, ready to be activated and off mode. The thirty-seven units measured in active mode showed a large variation in power consumption with an average of 16.5W and a maximum of 39.4W and a minimum of 3.5W. In passive mode 34 stereos could be measured with average power consumption for passive mode of 4.2W with a maximum of 20.7W and a minimum of 0.2W. Off mode was present on six stereos, with the consumption range being spread from zero to 11.5W. These results are summarised in Table 34.

**Table 34 – A summary of integrated stereo results**

<b>Appliance:</b>	<b>Stereo - Integrated</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	37	16.5	39.4	3.5
Passive	34	4.2	20.7	0.2
Off	6	3.6	11.5	0
<b>Total Number of Units</b>	38			

Figure 89 indicates that a high proportion of integrated stereos are still consuming more than 10W in active standby with little change over the five samples. Although there has been a drop in average active standby since 2001 from 19.1W to 16.5W in 2005/06 there has been no statistical significance with these results and this mode should be considered stable. Average consumption results are shown in Figure 90.

Figure 89 – Power measurements for integrated stereos: active standby mode

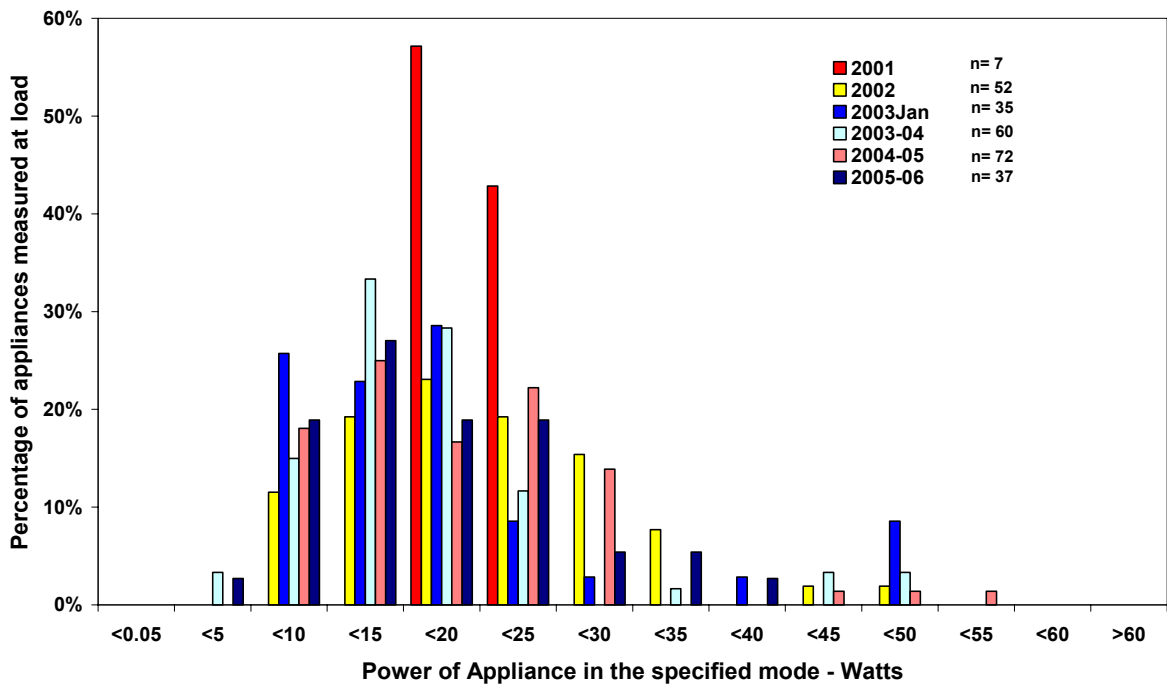


Figure 90 – Average power measurements for integrated stereos: active standby mode

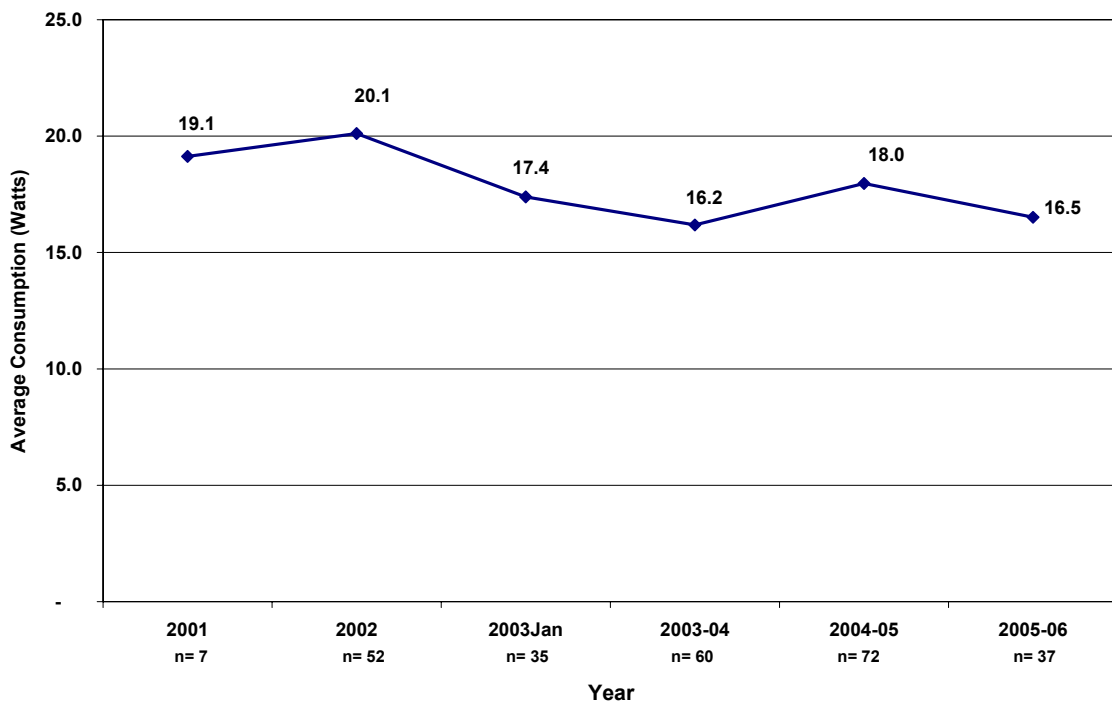


Figure 91 shows that for passive standby, some improvement can be seen in the distribution of measurements over time. A smaller proportion of units are registering passive standby of more than 10W and there has been a steady increase over the last five surveys in the units consuming less than 1W. The 2005/06 survey found 42% of models are now achieving passive standby readings of less than 1W. Based on average consumption there was a statistically significant improvement (i.e. decrease) in passive standby consumption from 2002 (7.8W) to 2003 (4.1W). Since this time consumption has been stable with average passive standby in 2005/06 recorded at 4.2W. Average passive standby results can be viewed in Figure 92.

Off mode is now present in such low sample sizes that comparison between years has no relevance.

**Figure 91 – Power measurements for integrated stereos: passive standby mode**

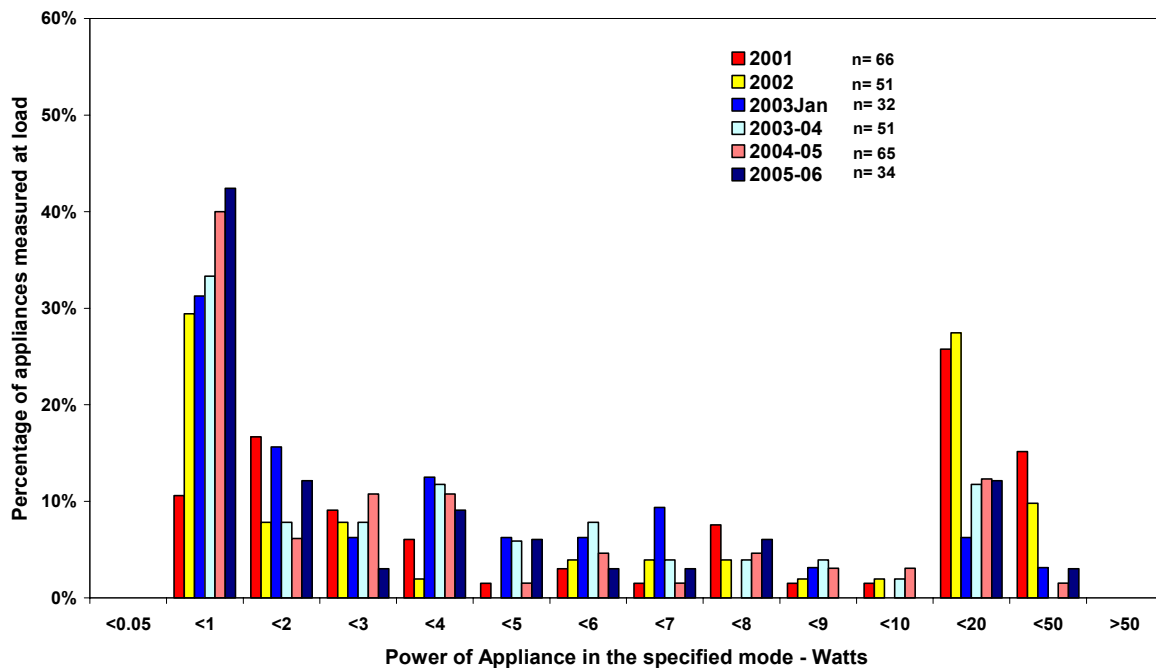
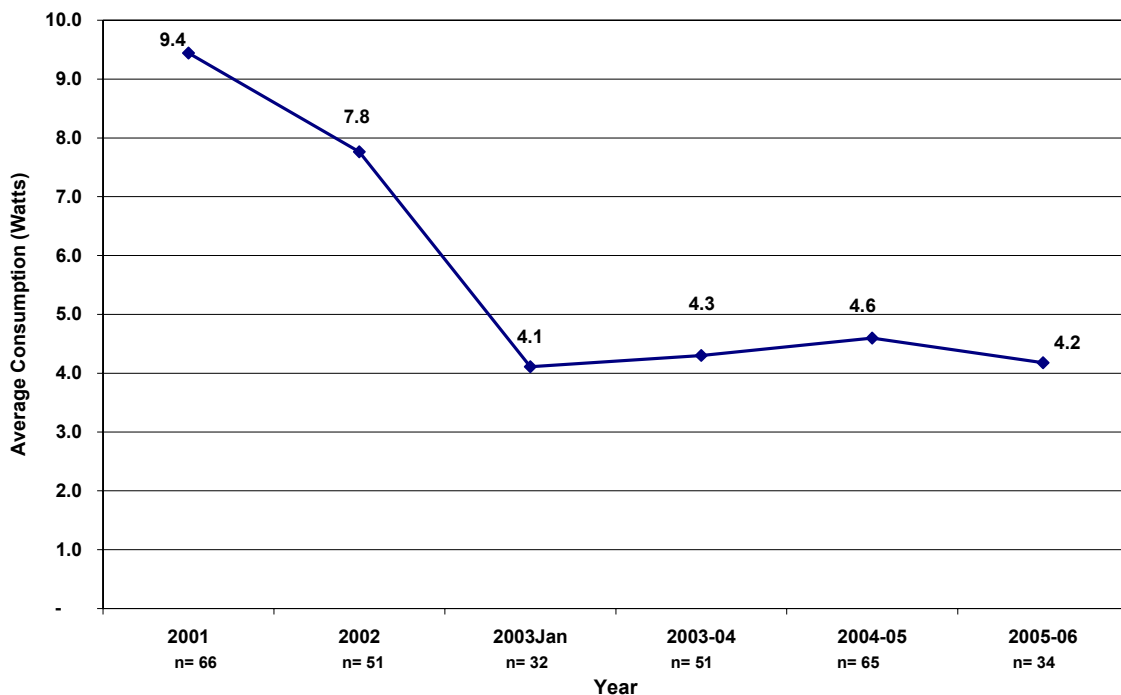


Figure 92 – Average power measurements for integrated stereos: passive standby



### Portable Stereos

Portable stereos can be operated using mains power or batteries. They are mobile single units that can perform more than one function such as CD player, tuner, tape deck, etc. The survey measured 30 of these appliances and none displayed an ENERGY STAR label. Some units had remote control as well as manual operation. Variants included CD capacity (multi-disk), presence of a tape deck, and digital displays.

These appliances were measured in active and passive standby and off mode. In active mode the average power was 6.4W with maximum power measured at 17.9W and minimum at 2.8W. Average power consumption in passive mode was 2.4W and the maximum power was 4.8W with a minimum of 0.9W. Eight units had an off mode resulting in an average consumption of 1.6W and ranging from zero consumption to 2.4W. Table 35 presents these results.

Table 35 – A summary of portable stereo results

Appliance:	Stereo - Portable			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	26	6.4	17.9	2.8
Passive	25	2.4	4.8	0.9
Off	8	1.6	2.4	0.0
<b>Total Number of Units</b>	30			

Figure 93 shows the distribution of measurements for portable stereos in active standby. The graph shows that there has been little change in the distribution over the sample with the majority of models using less than 6 watts. The average active standby measurements shown in Figure 94 indicate that this mode is stable at present with little change over occurring over the surveys.

Figure 93 – Power measurements for portable stereos: active standby mode

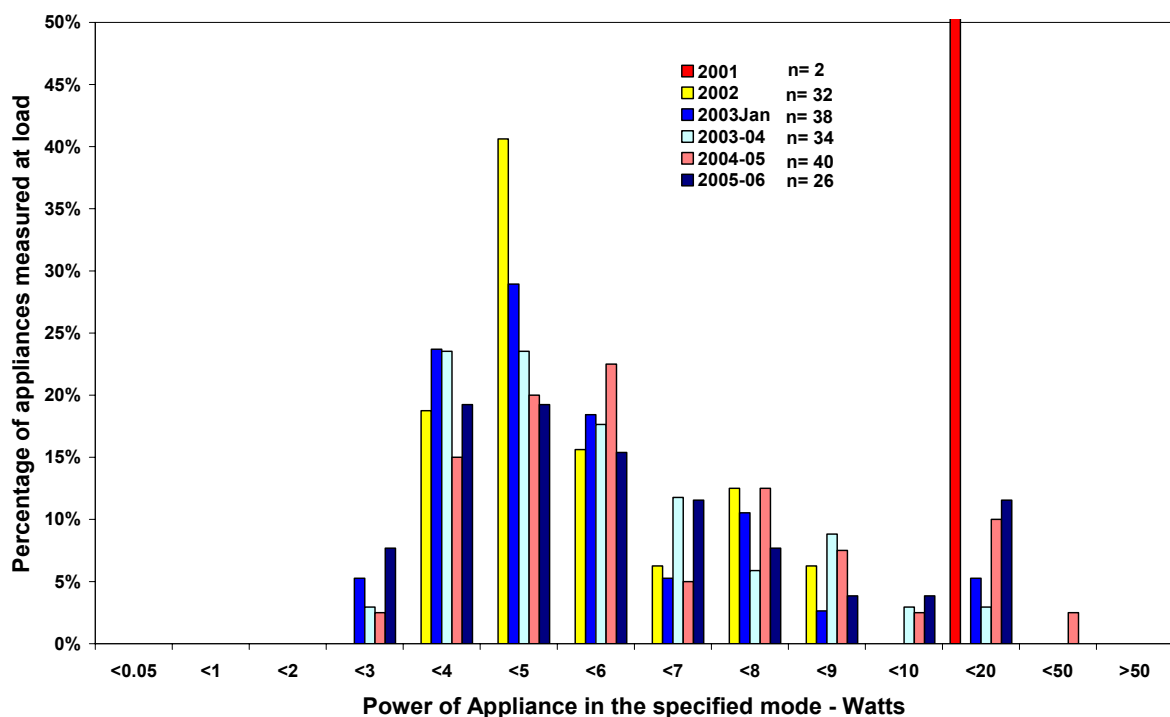


Figure 94 – Average Power measurements for portable stereos: active standby mode

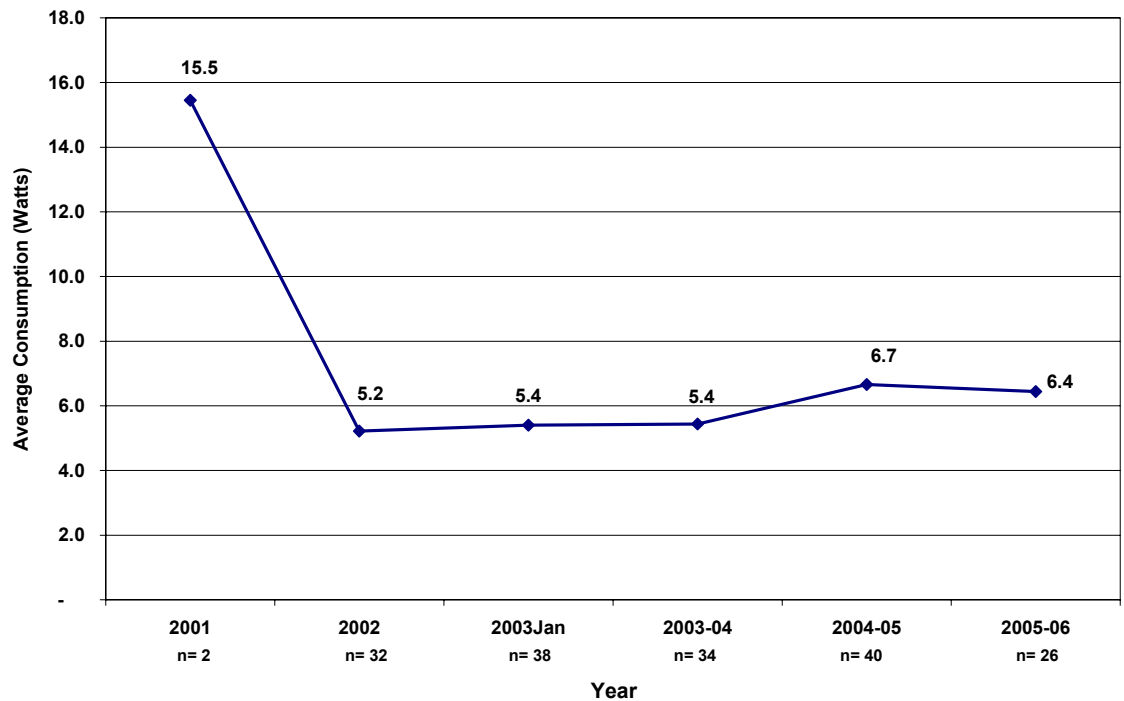


Figure 95 shows that in 2005/06 there was once again an increase in the proportion of units registering a passive standby greater than 3W. This year it rose to 28% compared with 23% in 2004/05. Overall average passive standby shown in Figure 96 indicates that there has been little change. For the last 4 years it has ranged from 1.8W to the current 2.4W. The graph does indicate average standby may be increase marginally over time but there is no statistical significance to this data at this stage. Too few models have off mode to allow a comparison. Overall it appears that portable stereo consumption is relatively stable for all modes.

Figure 95 – Power measurements for portable stereos: passive standby mode

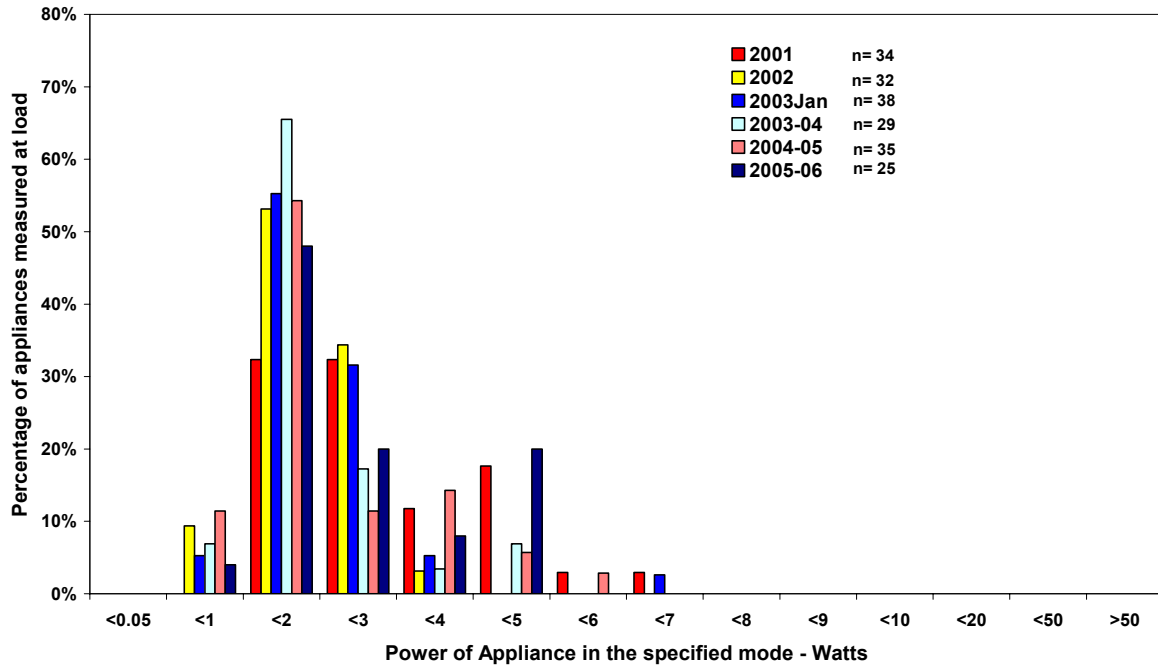
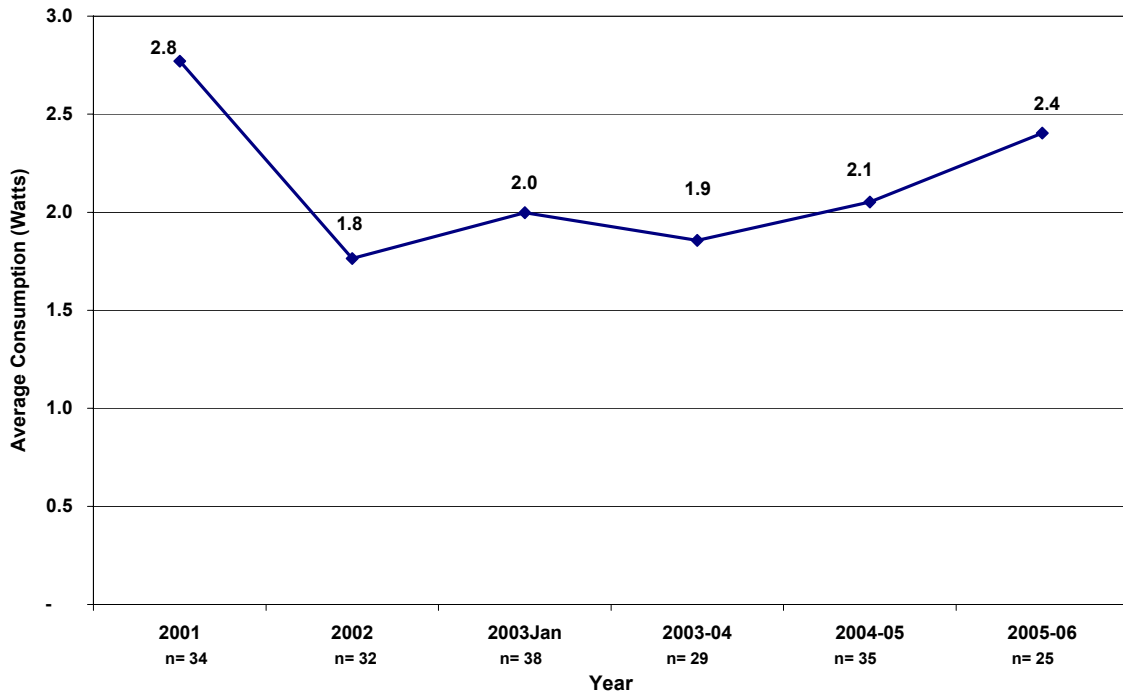


Figure 96 – Average Power measurements for portable stereos: passive standby mode



## Separate Component Stereo Equipment

Previous store surveys conducted in 2001 and 2002 collected data on separate stereo components such as tuners, tape decks, CD players, receivers and amplifiers. The advent of “Home Theatre Systems” and DVD player technology has rendered separate stereo components almost obsolete. Limited numbers of appliances were offered for sale the stores visited in this year’s survey (2 turntables, 2 Audio Amps). Due to the small numbers of these products and declining popularity they have not been reported on individually.

## Home Theatre – AV Receivers

AV Receivers or surround sound amplifiers<sup>3</sup>, consist of a number of output channels suitable for both audio and visual (VCRs and DVDs) equipment. Most of the models tested had inbuilt tuners while the others were purely amplification units. Most of the models had remote operation. This category also includes receivers that have built in DVD players and those with decoders for accessing digital television signals.

Forty-five AV Receivers were measured in active, passive standby and off modes. There were 4 AV receivers displaying an ENERGY STAR label, and all complied with Phase II passive standby criteria. When in active standby the average power consumption was 44.2W with a maximum of 87.4W and a minimum of 14.2W. A total of 43 units could be tested in passive mode with the average power being 1.8W. The highest consumption in the mode was recorded at 11.7W with the lowest zero. Off mode was present for 11 AV receivers. The average power consumption was 0.2W with a high of 1.8W and a low of 0.1W. Table 36 provides a summary of the results for AV receivers.

**Table 36 – A summary of AV Receiver results**

<b>Appliance:</b>	<b>Home Theatre - AV Receiver</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	44	44.2	87.4	14.2
Passive	43	1.8	11.7	0.1
Off	11	0.2	1.8	0.0
<b>Total Number of Units</b>	45			

Figure 97 shows that the distribution of measurements taken in active standby has remained relatively stable. The 2005/06 survey found that most units were consuming between 35W and 50W in active standby. Average active standby increased for the second year in a row from 41.2W to 44.2. There is no statistical significance to these numbers and active standby should be considered stable at this stage. The recent

<sup>3</sup> In the 2002 store survey, AV receivers were reported on as “surround sound systems”. As the technology is new for these products, the market definitions are also changing and establishing themselves. At the time of writing this report “AV receivers” were considered to be the standard name for this product type.

intrusive standby study conducted by EES (2005) showed that 13% of receivers were found to be left in active standby, indicating that these high levels of consumption are activated for lengthy periods of time.

Figure 97 – Power measurements for AV receivers: active standby mode

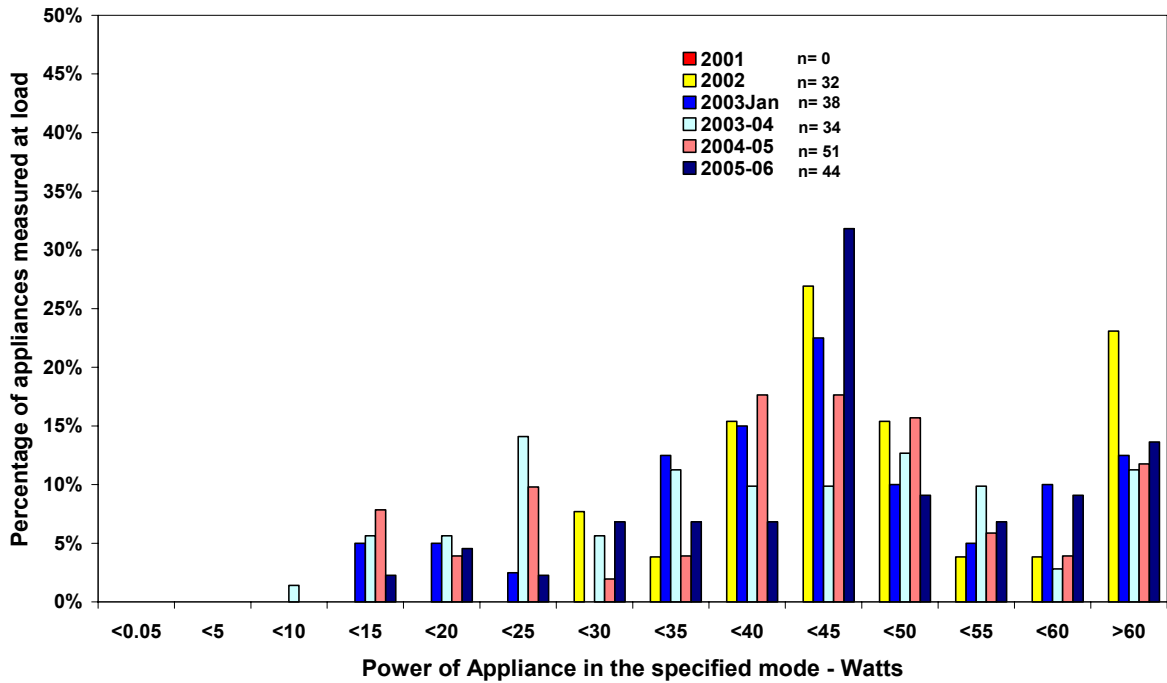


Figure 98 – Average Power measurements for AV receivers: active standby mode

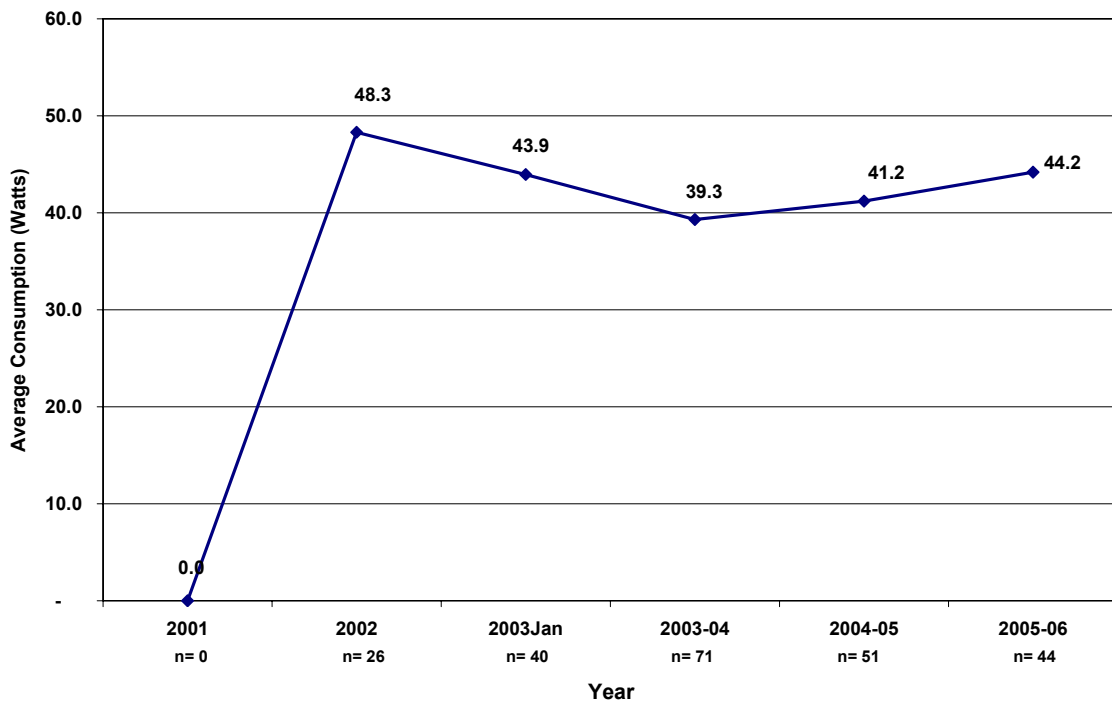


Figure 99 shows that the distribution of measurements taken in passive standby has remained relatively stable in 2005/06. There has been an increase in the number of appliances consuming less than 1W jumping to 63% this survey from below 50% in previous studies. Average passive standby measurements indicate that there has been no overall improvement standby consumption with the average rising for the first to 1.8W. This indicates that previous data which hinted at a possible trend towards declining standby can not be verified and that the statistically significant data indicates that passive standby for AV receivers is stable. These results are demonstrated in Figure 100.

**Figure 99 – Power measurements for AV receivers: passive standby mode**

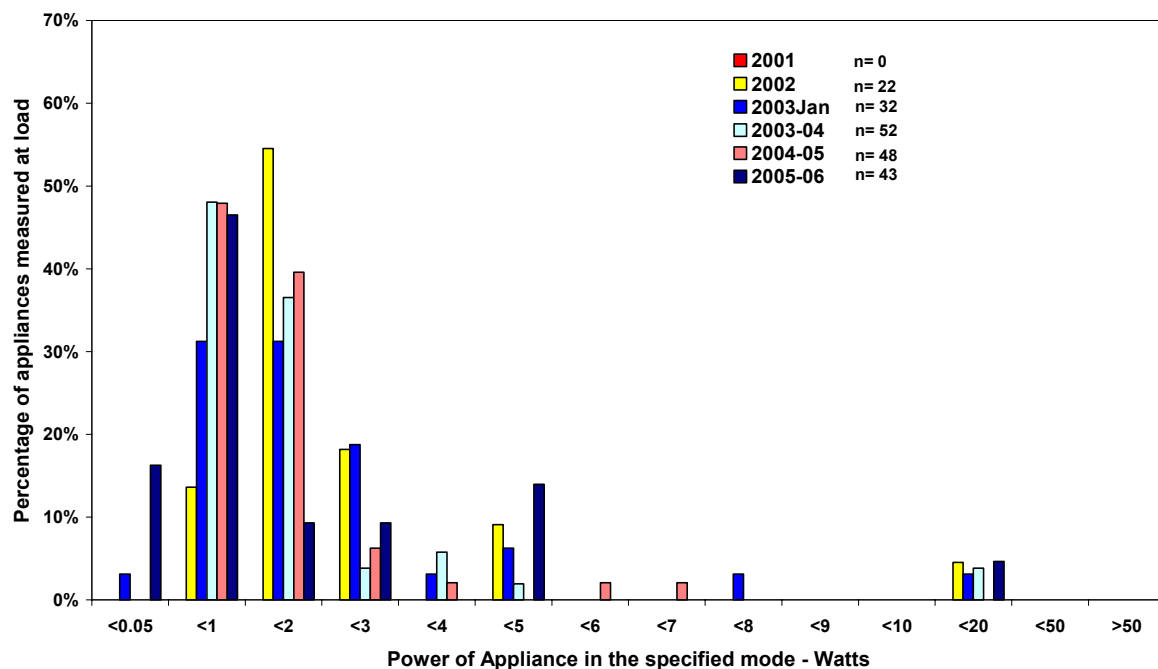
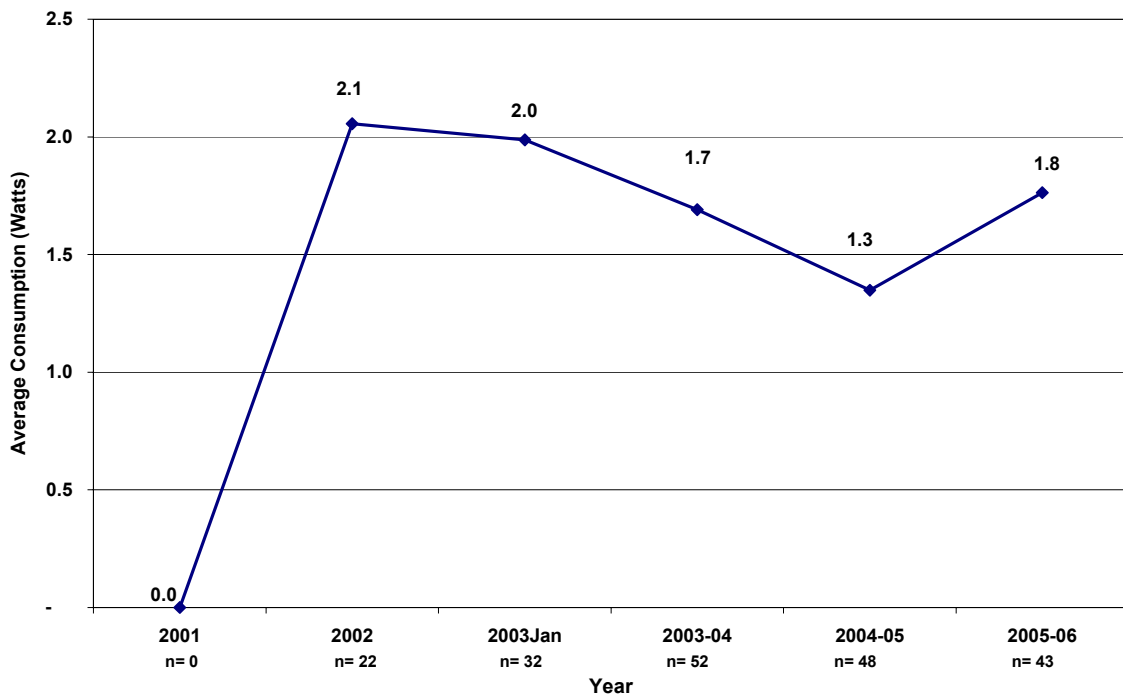
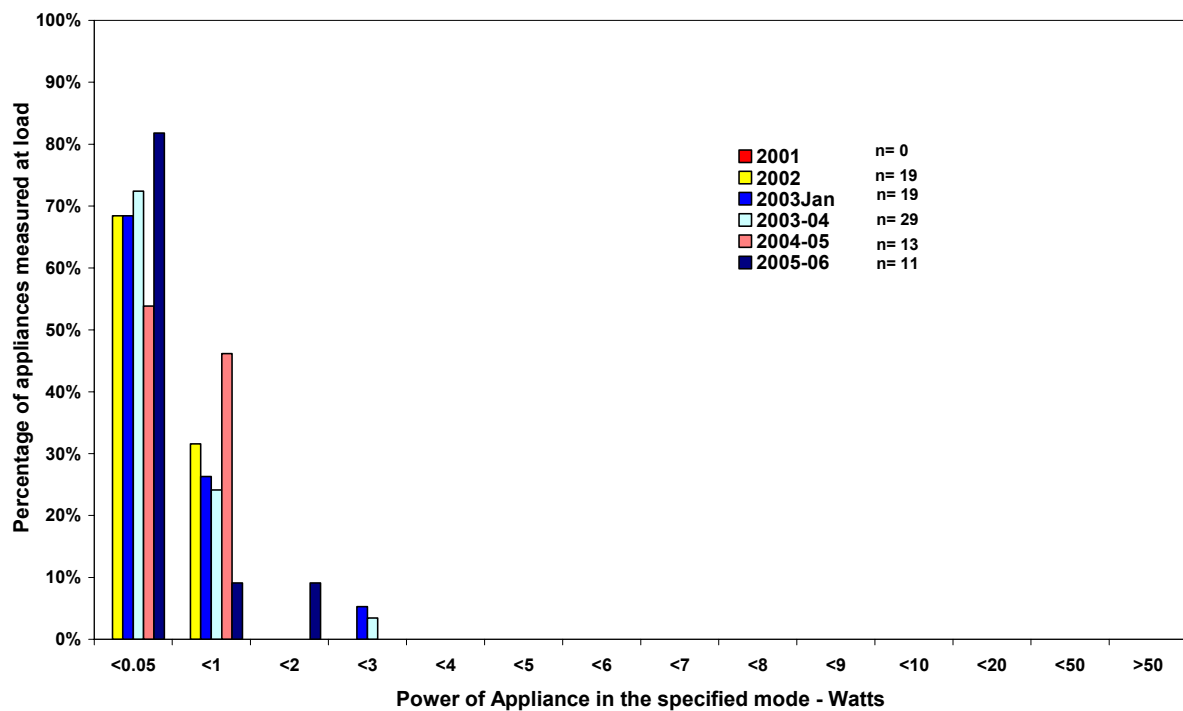


Figure 100 – Average power measurements for AV receivers: passive standby mode



The vast majority of AV receivers have no consumption when in off mode as demonstrated in Figure 101. In 2005/06 all bar one unit consumed less than 1W in this mode. Average off mode has remained constant at 0.2W for all 5 surveys.

Figure 101 – Power measurements for AV receivers: off mode



## Home Theatre Systems

Home Theatre Systems generally include various combinations of an AV receiver, a DVD player, an amplifier, built in digital decoder and six speakers including a subwoofer for bass sounds. The key defining feature for the purpose of this study is that all components are powered by one power lead. Home Theatre Systems can be made up of separate components or include several functions in one housing case. This category does not include separate components packaged together and sold as a system if each component has a separate lead. Those items were measured individually and recorded in the appropriate category. Two systems displayed an ENERGY STAR label and both complied with the Phase II criteria (<1W).

Home Theatre Systems were measured in active, passive standby and off mode. In total 28 units were measured. In active standby consumption ranged from 6.0W to 51.0W averaging out at 24.1W. Five units could not be measured in passive standby as the remote could not be located. The average consumption for passive standby was 2.5W with a minimum was 0.2W and the maximum was 17.4W. Five home theatre systems had an off mode. None of the units consumed energy in this mode. Table 37 summarises these results.

**Table 37 – A summary of home theatre system results**

<b>Appliance:</b>	<b>Home Theatre –Systems</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	NA	-	-	-
Active	28	24.1	51.0	6.0
Passive	23	2.5	17.4	0.2
Off	5	0.0	0.0	0.0
<b>Total Number of Units</b>	28			

In active standby mode the 2005/06 survey found the proportion of units consuming less than 25W in standby had almost doubled to 60%, compared with around 34% the previous year. The distribution range has remained largely unchanged as shown in Figure 102. Average active standby also dropped from 31.5 W. to 24.1W. This decrease in consumption has statistical significance and as shown in Figure 103 continues a decline that has been occurring since home theatre systems were first measured.

Figure 102 – Power measurements for home theatre systems: active standby mode

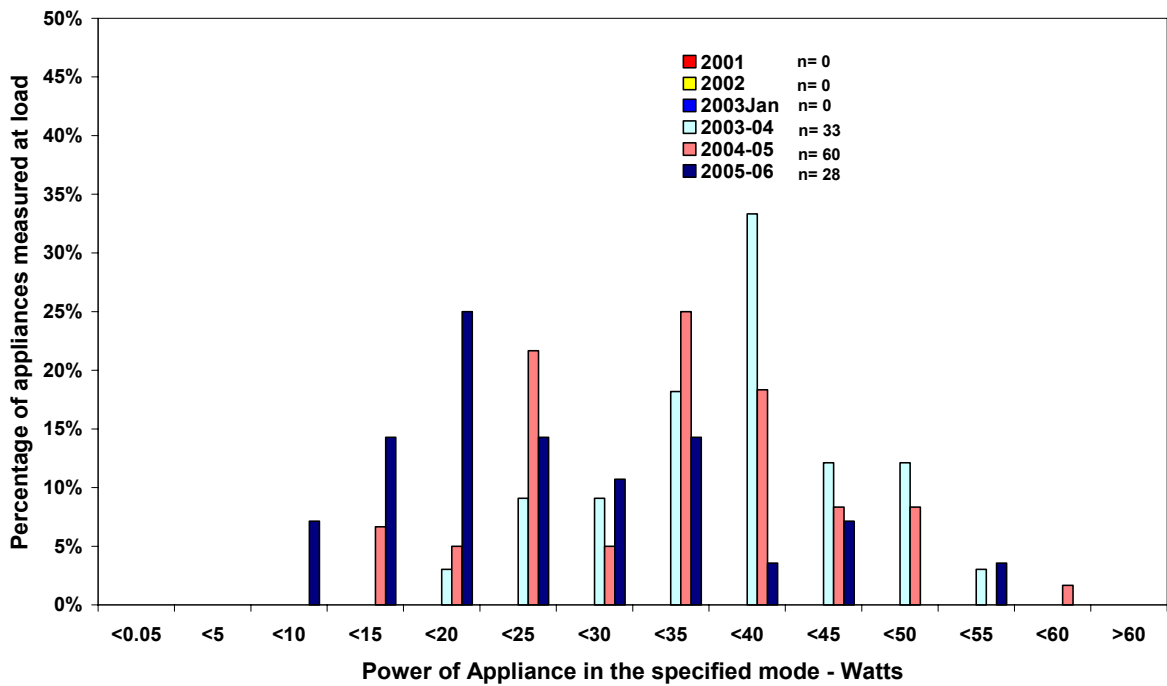
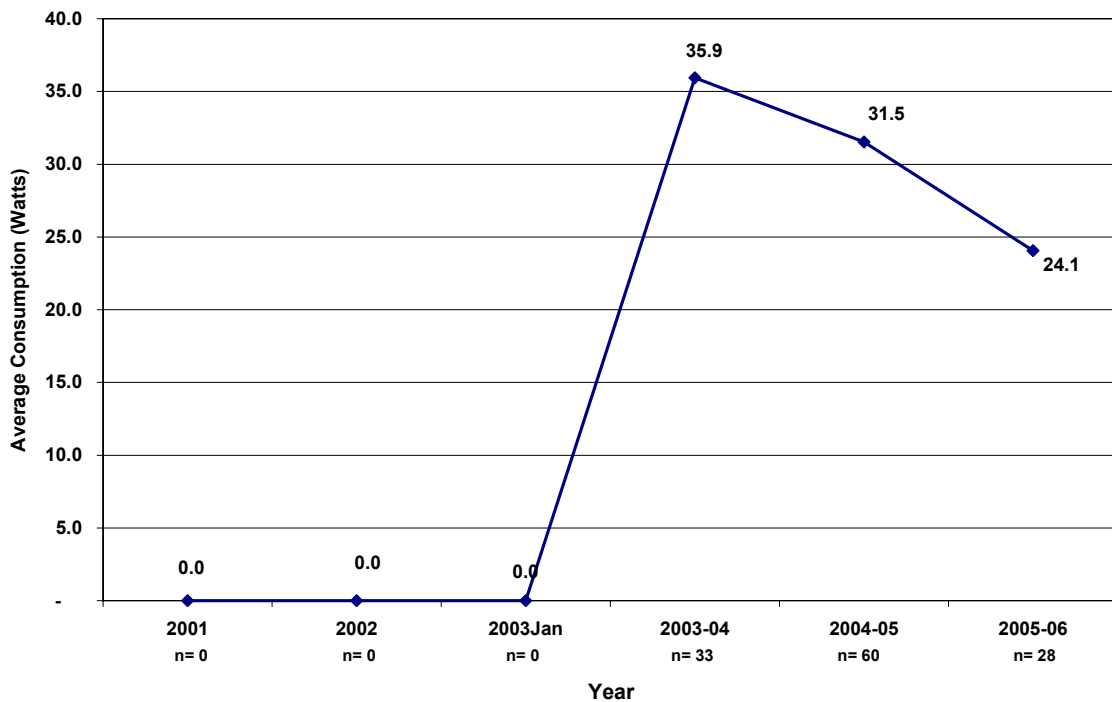
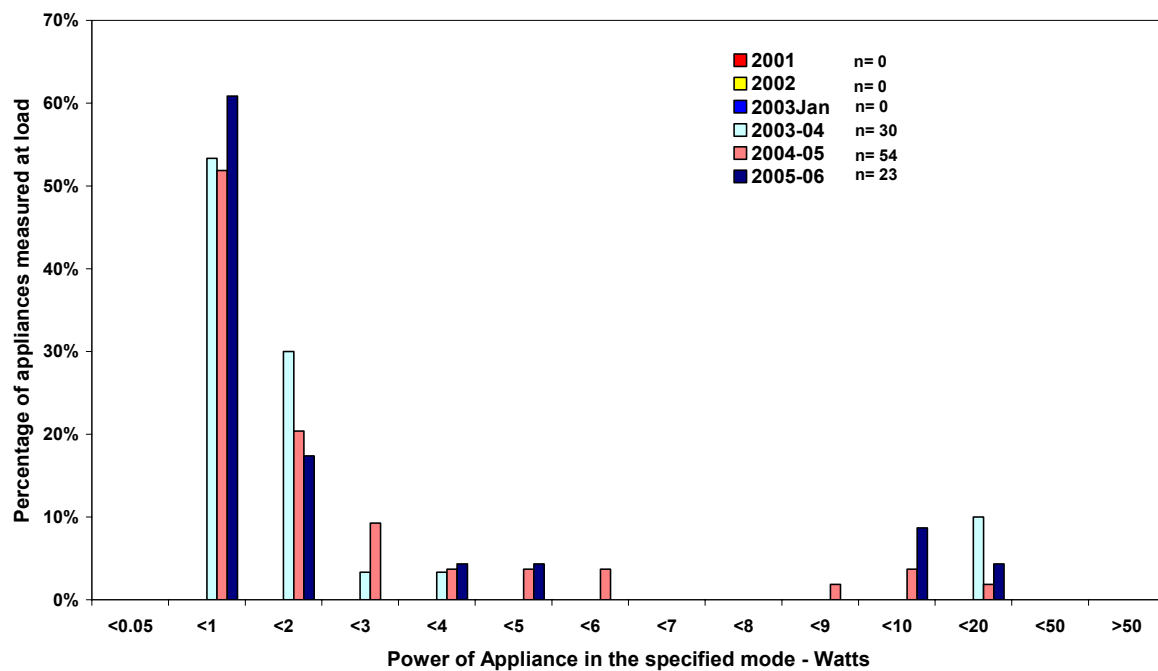


Figure 103 – Average power measurements for home theatre systems: active standby mode

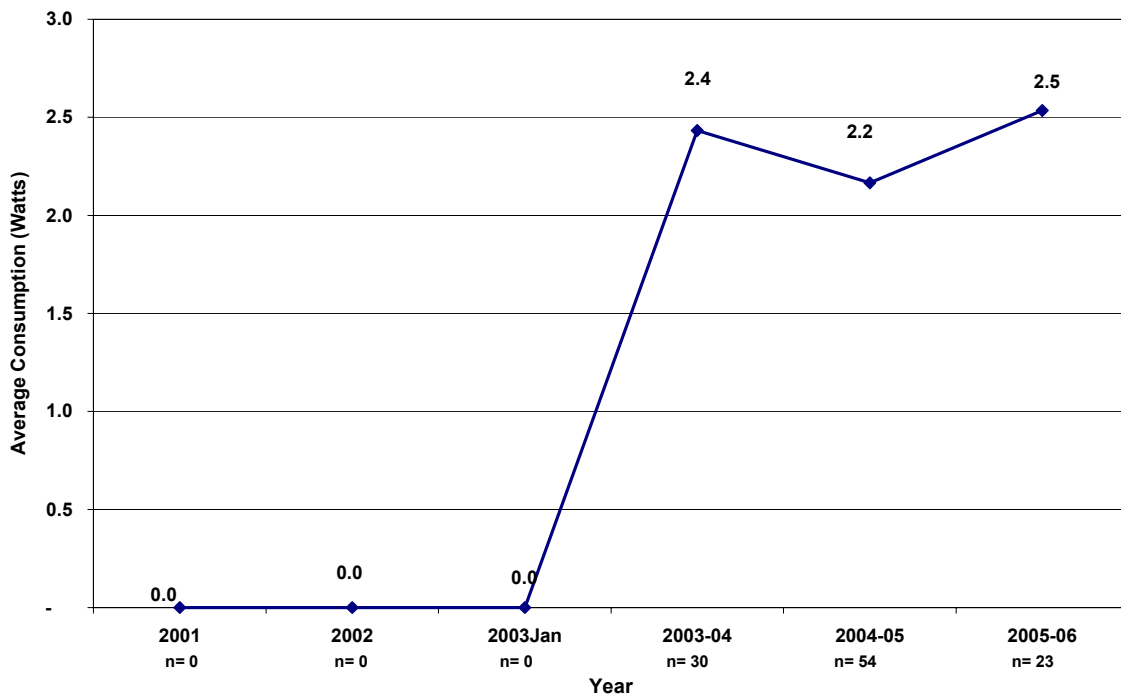


The distribution range of home theatre systems in passive standby has remained the same for all surveys. As shown in Figure 104 most products consume less than 1W in this mode. It is of concern that some products are using more than 8W in this mode. Average consumption in passive standby is stable with less than half a watt difference across the 3 surveys. This is demonstrated in Figure 105.

**Figure 104 – Power measurements for home theatre systems: passive standby mode**



**Figure 105 – Average power measurements for home theatre systems: passive standby mode**



Off mode is only present in a small number of units and over the 3 years only one unit has had any consumption in this mode. At this stage it would appear that the consumption patterns of the home theatre systems market are decreasing in active standby but stable for passive and off mode.

### Sub Woofers

Subwoofers are large speakers that produce low-frequency (bass) sounds. There are two types of subwoofers: passive subwoofers rely entirely on the main amplifier for power while active subwoofers have their own power source with a separate amplifier. A home theatre system will generally have five speakers and a subwoofer, although not all home theatre systems necessarily include subwoofers in the “package”.

The 2005/06 survey found 50 subwoofers that could be measured in stores. They were measured in active, passive standby and off as appropriate. In active mode 49 models were measured with average active standby calculated at 11W. The distribution of results was quite wide with the minimum recorded at 2.1W and the maximum at 24.7W. One unit could not be measured in active as it had no switch on the unit. Passive standby is not usually considered as subwoofers generally do not have remote control operation, however 7 units were found to have passive standby. Three units were controlled by the AV receiver i.e. when the AV was in standby so were the subwoofers and four units had a standby and a hard off button. In passive standby the units registered between 2.0W and 10.9W averaging 5.5W. In off mode 45 sub woofers were measured. The average was 2.0W with the vast majority having zero consumption and a total of 83% consuming less than 1W. The maximum consumption was 13.4W and the minimum was zero. It should

be noted that the off switch for one third of sub woofers was at the rear of the appliance and difficult to access. This may reduce the likelihood of consumers using this mode. This is backed up by the recent intrusive survey conducted by EES (2005) where it found 56% of consumers left their sub woofer in active standby. Table 38 summarises the results.

**Table 38 – A summary of subwoofer results**

Appliance:	Home Theatre - Subwoofer			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	49	11.0	24.7	2.1
Passive	7	5.5	10.9	2.0
Off	45	2.0	13.4	0.0
<b>Total Number of Units</b>	50			

The active standby results from the previous survey are similar to the 2005/06 results. Figure 106 shows an almost identical distribution pattern across the surveys which is further reinforced by the average active standby results of 10.9W in 2003/04, 10.4W in 2004/05 and 11.0W in 2005/06. Average active standby results are presented in Figure 107.

**Figure 106 – Power measurements for sub woofers: active standby mode**

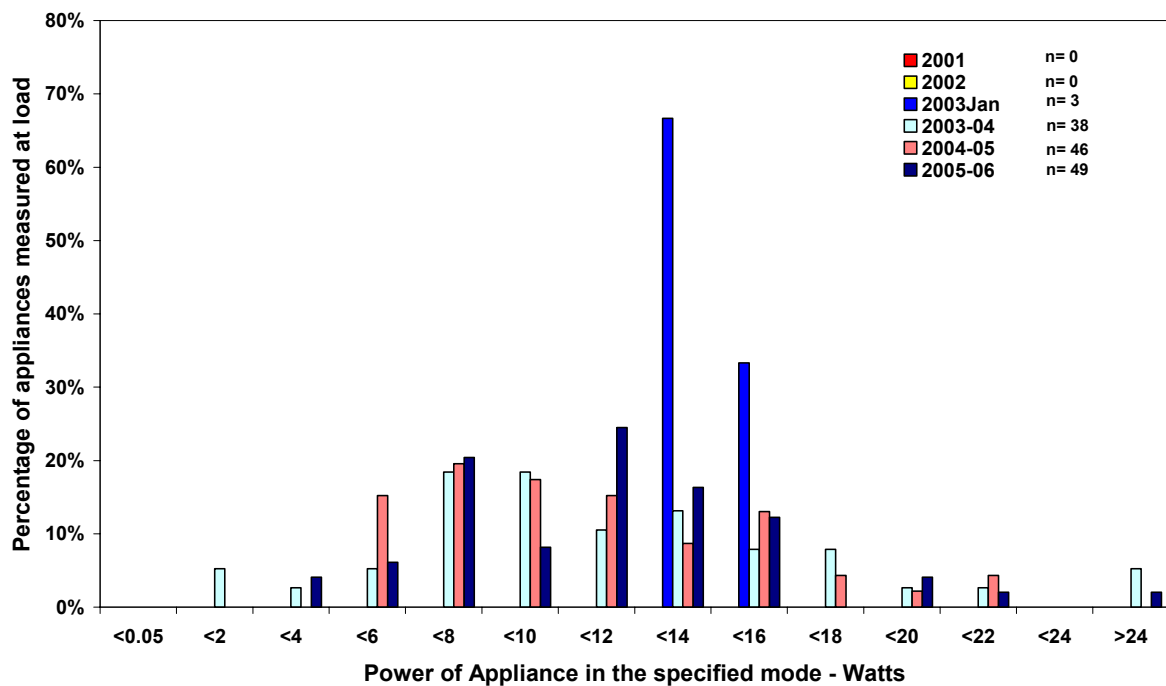


Figure 107 – Average power measurements for sub woofers: active standby mode

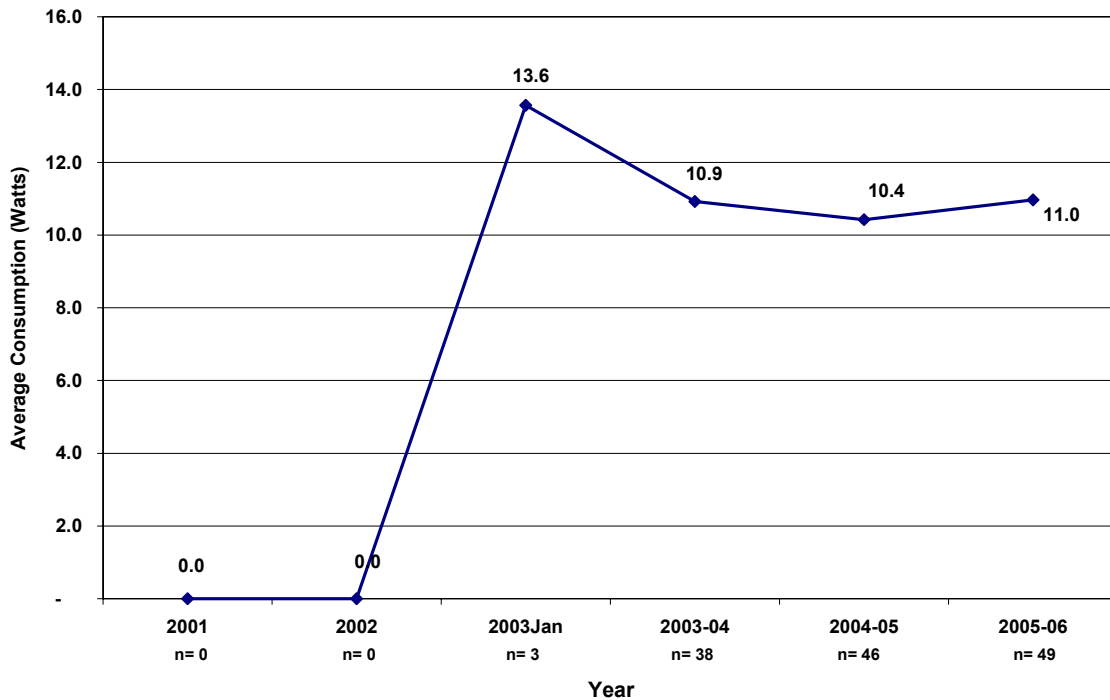


Figure 108 and Figure 109 present the results for sub woofers in off mode. The overwhelming majority of sub woofers in all surveys have no consumption in off mode. However in 2005/06 there was an increase in the number of units consuming more than 8W in off. Many of these had a light that remained illuminated to indicate they were in off mode. These high consuming units have brought the average up from less than 1.0W in previous years to 2.0W in 2005/06. There is no statistical significance in this as it is a distortion caused by a handful of relatively high consuming products. However it is worth watching if this design trend continues in the future. Due to the small number of subwoofers with Passive standby comparisons between years is impractical at this stage. It can be noted that all subwoofers with passive standby fell within the distribution range of previous years. The overall consumption pattern for subwoofers would appear to be stable.

Figure 108 – Power measurements for sub woofers: off mode

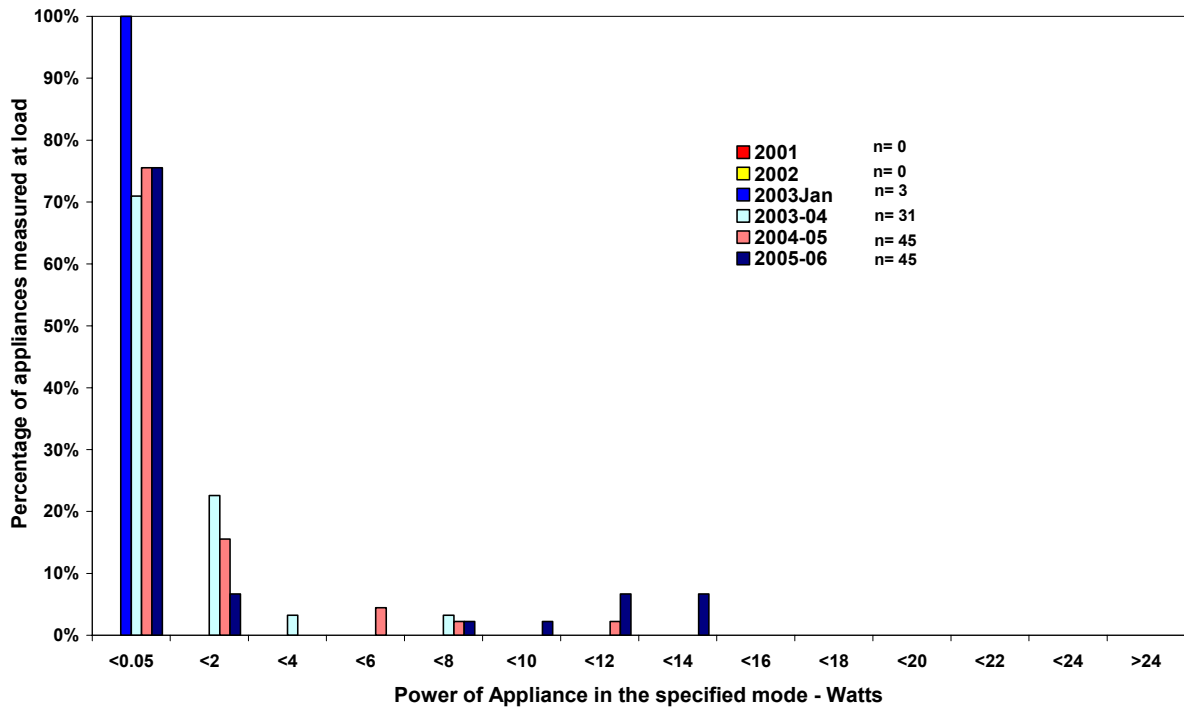
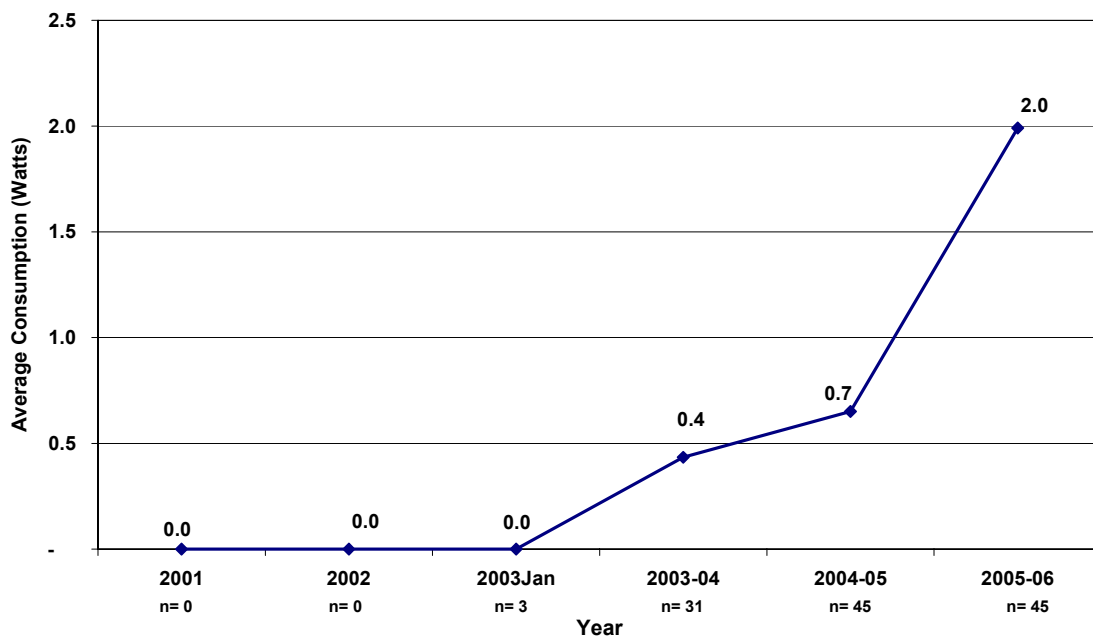


Figure 109 – Average power measurements for sub woofers: off mode



## Set Top Box

In simple terms, a digital set top box converts digital signals from TV stations into a signal that an analogue television or display screen can broadcast. From 2008 homes with analogue televisions will require a set top box in order to view free to air broadcasts, therefore this market is expected to grow rapidly. Set top boxes were measured active, passive standby and off modes. Previous studies have recorded in-use consumption for this product, however new definitions now view this state as active standby. As such past results have been redefined to reflect this and all future measurements will be recorded as active standby mode. In-use is now recorded for those units that have an antenna plugged in, while active standby is measured for those without an antenna.

In 2005/06 the survey found 35 different models in the stores. Only 8 units were measured in in-use mode. Consumption ranged from 14.5W to 22.2W with an average of 17.8W. The difference in consumption between active and in-use mode was minimal with 2.0W being the largest difference and most units around 1.0W. The average consumption when in active standby was 13.5W with a minimum of 6.4W and a maximum of 20.9W. In passive mode 32 units were measured ranging from 1.9W to 19.4W. The average passive standby consumption was 8.4W. Ten set top boxes had an off mode. All of these had zero consumption in this mode. Table 39 summarises these results.

**Table 39 – A summary of set top box results**

<b>Appliance:</b>	<b>Set Top Box</b>			
<b>Mode</b>	<b>Number of Measurements</b>	<b>Average Power (W)</b>	<b>Power Max</b>	<b>Power Min</b>
In Use	8	17.8	22.2	14.5
Active	35	13.5	20.9	6.4
Passive	32	8.4	19.4	1.9
Off	10	0.0	0.0	0.0
<b>Total Number of Units</b>	35			

The distribution range of set top boxes in active standby was reduced in 2005/06 with no units found to consume more than 22W in active mode. As can be observed in Figure 110, the number of models at the lower end of consumption continued to grow. This translated into a lower average standby of 13.5W which indicates a statistically significant decline in consumption when compared with results over the last three surveys. As can be seen in Figure 111 the reduction in active mode has been constant since the set top box was included in the store survey. This would suggest that active standby for this appliance is trending downwards. The intrusive survey (EES 2005) found 47% of units were left in this mode.

Figure 110 – Power measurements for set top boxes: active standby mode

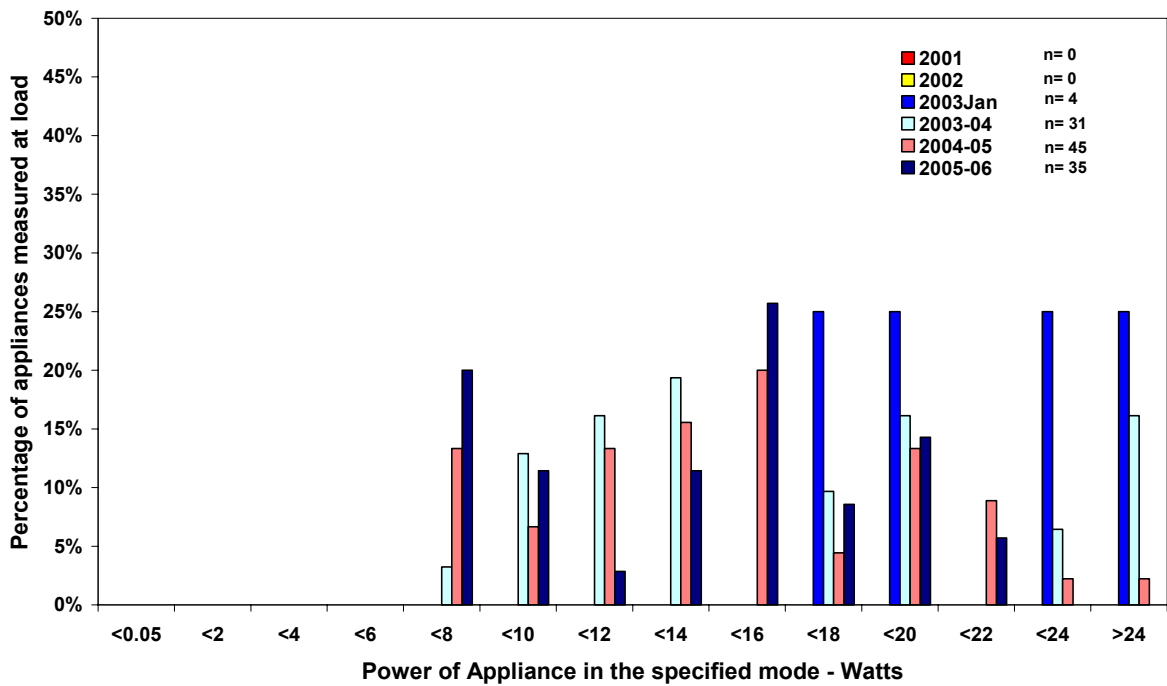


Figure 111 – Average power measurements for set top boxes: active standby mode

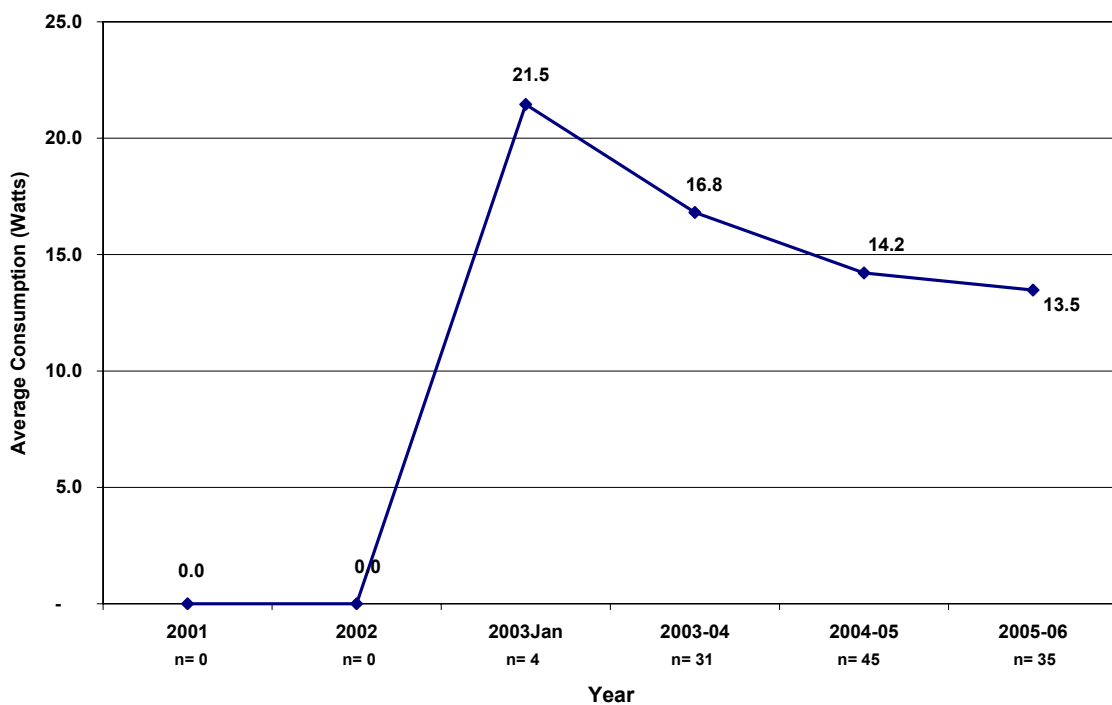


Figure 112 and Figure 113 presents the passive standby data for set top boxes. The spread of results are similar for all years. Average passive standby remained stable in 2005/06 recorded at 8.4W compared to 8.6W in 2004/05. In off mode most set top

boxes have no consumption. Over all the surveys only 3 set top boxes have been found to consume in off mode and all used less than 1W.

Figure 112 – Power measurements for set top boxes: passive standby mode

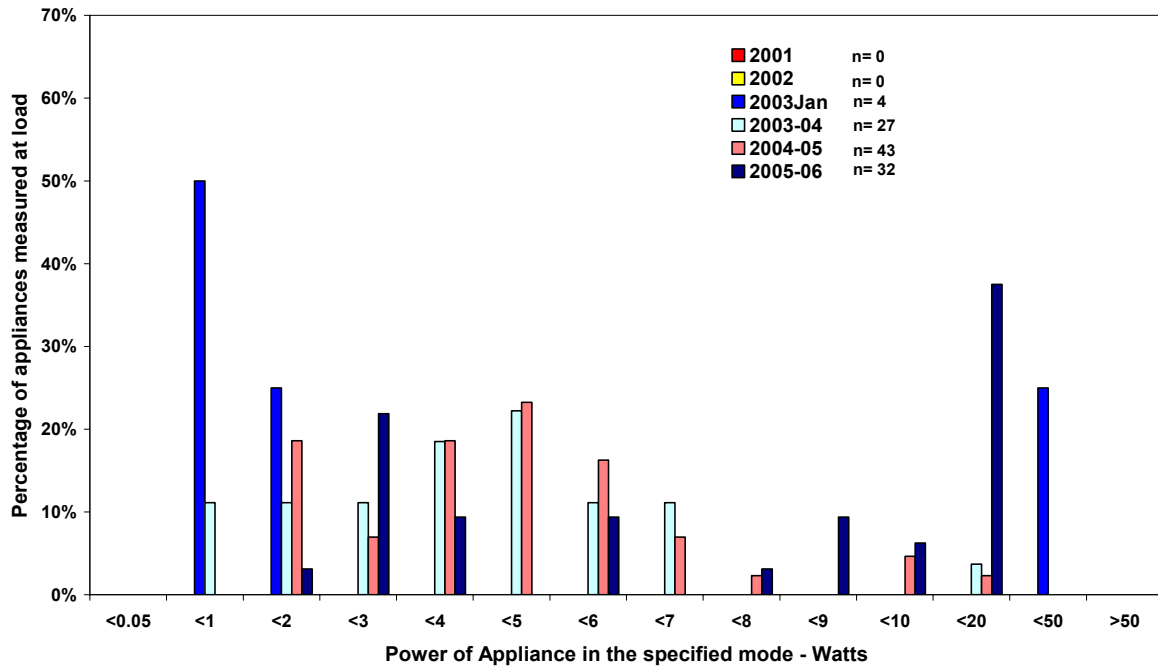
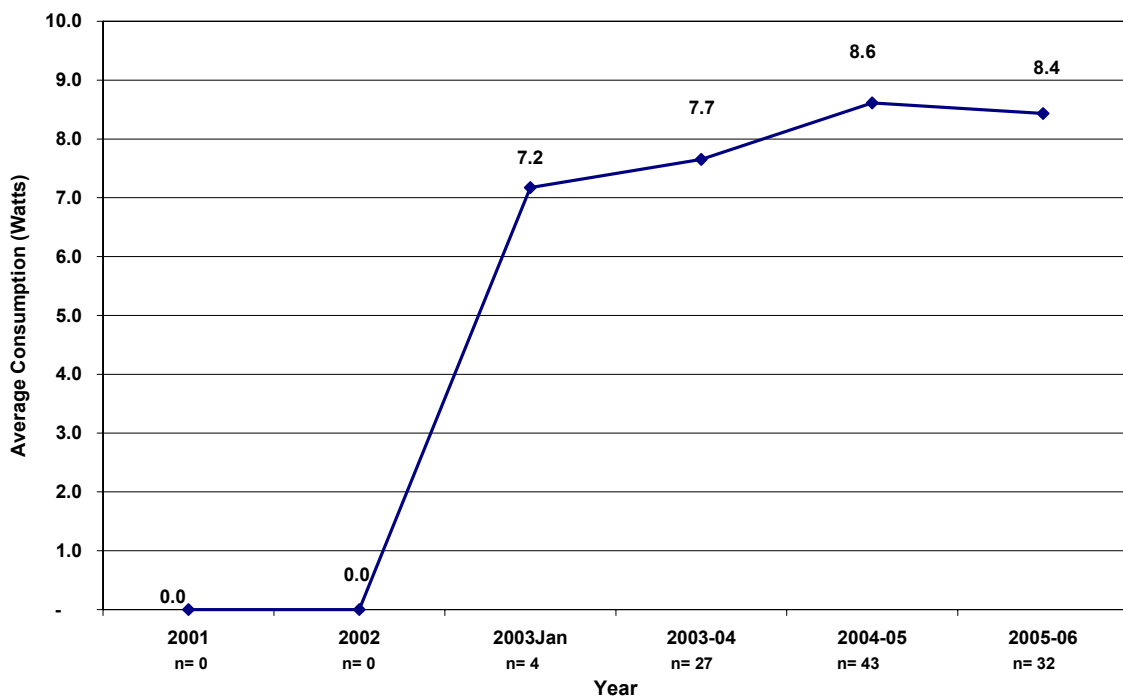


Figure 113 – Average power measurements for set top boxes: passive standby mode



## **Other Home Theatre Components**

A number of other home theatre components were measured however as each category contained less than five models they have not been reported individually. These included; wireless speaker components (2), Portable Stereo with built-in television (3), Turntable with built in Amp (1), Karaoke machine with built in camera (2), Jukebox with hard drive and CD Player (1), Subwoofer with built-in tuner (1) and Audio Amp with Sub woofer and speakers (1).

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