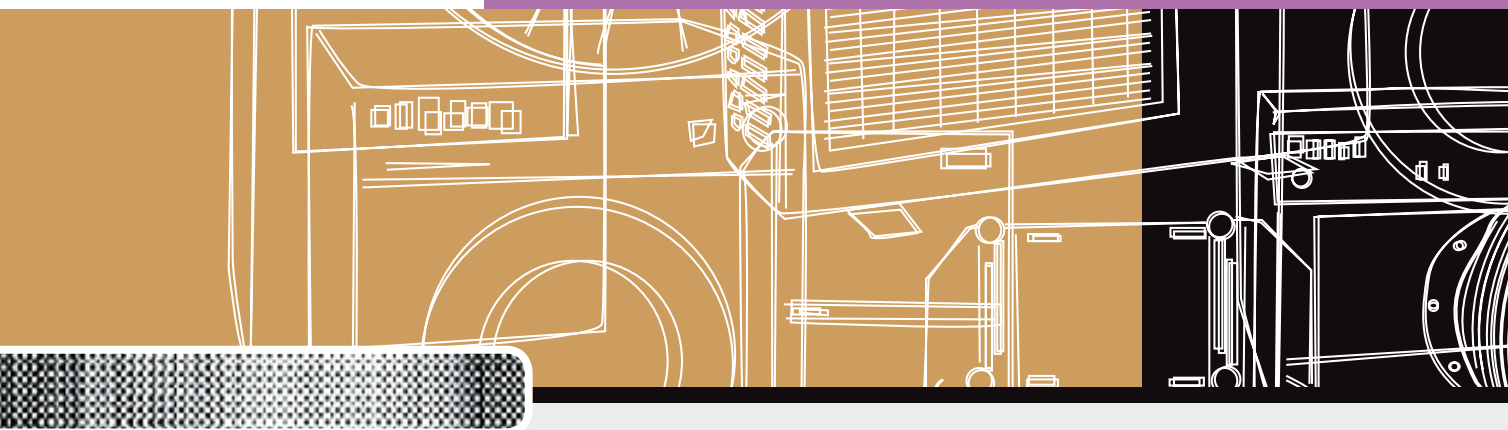


*NATIONAL APPLIANCE AND EQUIPMENT
ENERGY EFFICIENCY PROGRAM*

***APPLIANCE STANDBY POWER CONSUMPTION:
STORE SURVEY 2003/04***



August 2004

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

INTRODUCTION

Overview

This report summarises the results of in-store standby measurements for some 1431 new household appliances that were undertaken in November 2003 and June 2004. The results are summarised by product group and are compared with readings undertaken in similar surveys in early 2001, 2002 and 2003. These in-store surveys are the beginning of a longer term benchmarking program and results need to be viewed in this light. NAEEEEC propose to undertake similar surveys in future to assess industry progress in reducing standby consumption of appliances. This report was prepared by EnergyConsult with assistance from Energy Efficient Strategies on contract to NAEEEEC.

Background

In 2000, the Australian Greenhouse Office (AGO) and the National Appliance & Equipment Energy Efficiency Committee (NAEEEC) commissioned the report, *Quantification of Residential Standby Power Consumption in Australia* (EES and EnergyConsult, 2001). This study provides results of an intrusive survey where measurements on 2,500 appliances were undertaken in 64 houses in Melbourne, Sydney and Brisbane. The 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 documents information on appliance ownership, age and usage patterns. This research revealed that 11.6% of Australia's household electricity consumption can be attributed to energy used by appliances and electronic equipment when not performing their primary function (this figure also 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.

Following the 2000 study, two follow-up store surveys of new appliances have been conducted. The report titled *Appliance Standby Power Consumption: Store Survey 2002* (Energy Efficient Strategies & Energy Consult), measured energy consumption of

635 appliances while, *Appliance Standby Power Consumption: Store Survey 2003* (Energy Efficient Strategies and EnergyConsult) measured 573 appliances. This data was compared with the information recorded in the 2001 report, finding that while there appeared to be a slight decrease in standby power consumption overall, a large proportion of products still consumed more than 1 W in standby and off modes.

This executive summary outlines results which are detailed in the main report titled *Appliance Standby Power Consumption: Store Survey 2003/04* (EnergyConsult and EES, 2004) and which is attached to this executive summary.

Objectives of this Study

The AGO and the NAEEEEC commissioned this survey as part of the monitoring of its program to reduce the standby consumption of all electronic appliances to less than 1W. 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 late 2003 and mid 2004.
- Compare the results from this study with the results of similar studies undertaken in early 2001, 2002 and 2003 in order to track the industry's progress in reducing standby power consumption.

Similar studies are proposed in future years to assess industry progress towards the government's 1 Watt target.

Research Methods

Eleven major Melbourne retail stores were approached to take part in the study, along with three suburban computer stores. The survey covered by this report was conducted in two parts (winter and summer) to broaden the range of appliance types on display and available for measurement. Some stores were specifically visited in order to capture the following appliances: air conditioners; home



theatre products; cooking appliances; heaters and computer peripherals. The metering device used was systematically plugged into the floor stock across 58 appliance categories. Power consumption was measured in Watts for a range of modes including “in use”, “passive and/or active standby”, “off” and “delay start” where applicable (only certain modes were measured for each appliance group). Other information recorded included brand, model, price, features, and supply voltage. These results were analysed and compared with outcomes from the three previous in-store surveys. Details of any labels displayed on the product were also recorded (star rating label or Energy Star as applicable).

For the purposes of this report, “standby” is a general term which refers to the power consumption of a product or appliance that 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 a direct or indirect signal from the consumer. This includes the “off” mode, even where there is no remote control. Unqualified use of the term standby generally means the lowest power consumption when connected to the mains.

Key Findings

The significant decline in passive standby since early 2001 appears to have stabilised.

When all products measured are analysed as one group and compared to 2001 data, a statistically significant¹ decline in average consumption was evident in passive standby mode. The decline in average consumption was significant between 2001 and 2002 and between 2002 and 2003. In 2003/04 it remained stable with a decline of just 0.2W. This indicates that the downward trend in passive standby consumption noted in the previous surveys has stabilised for the products measured in this survey (noting that the mix of products measured in each year is comparable, but not identical).

At present no trend can be identified in consumption for active standby mode or off mode.

In previous years, active standby has appeared to be in decline and had shown significant improvement between 2002 and 2003. However, in 2003/04 this trend has reversed with a statistically significant increase in average consumption when compared to early 2003. This result may have been affected by the large increase in product categories conducted in this survey and will need to be monitored in future surveys to ascertain if a trend can be established.

In 2003/04 the average off mode consumption has once again moved above 1W. The average off mode consumption declined significantly from 2001 to 2002. Over the past two surveys it has risen slightly, though neither rise has a statistical significance. These results suggest that the off mode consumption is fairly stable given that the number and mix of products measured in each year of the survey were somewhat different. Results need to be taken as indicative and trends within each product need to be examined separately to give a more concise picture. Table 1 below summarises the results while Figure 1 graphs these results.

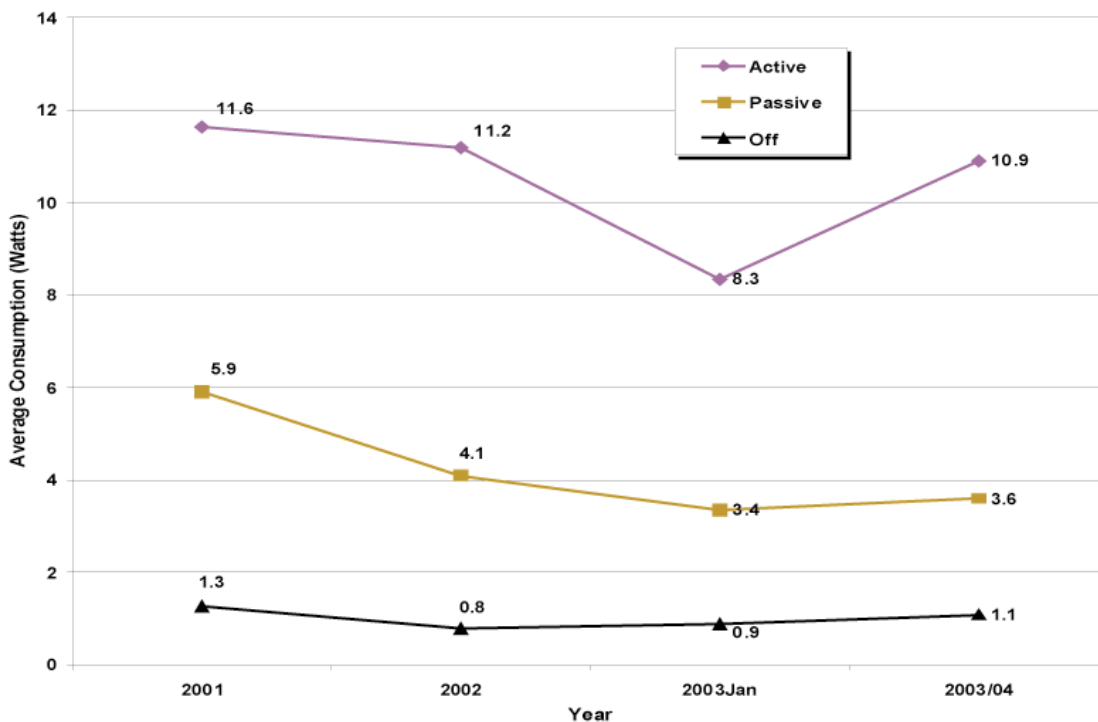


¹ Significant at the 95% confidence level.

TABLE 1 – SUMMARY OF AVERAGE POWER BY MODE ACROSS ALL PRODUCTS

	2001	2002	2003	2003/04
Total readings off	258	380	330	925
Average off	1.3W	0.8W	0.9W	1.1W
Total readings passive standby	440	397	325	682
Average passive standby	5.8W	4.1W	3.4W	3.2W
Total readings active standby	101	210	216	525
Average active standby	11.6W	11.2W	8.3W	10.9W

FIGURE 1 – SUMMARY OF AVERAGE CONSUMPTION ACROSS ALL PRODUCTS



There has been an increase in the proportion of appliances consuming less than 1W in passive standby

Figure 2 below shows the distribution of measurements taken for all products in passive standby mode across the four survey years. Passive standby measurements less than 1 watt have increased steadily over the years. In 2001, 8% of all measurements taken were less than 1W, in 2002 this

had increased to 16%, in 2003, 17% and in 2003/04 this rose to 21%. The proportion of appliances consuming less than 3W in passive standby has also grown since 2001. Just over a third of models (36%) in the first survey recorded passive standby less than 3W, while in the last two surveys over half of the appliances (64%, 61% respectively) were under 3W. The change in distribution further supports that passive standby has declined in the appliances measured since 2001.

- Most appliances continue to consume less than 1W in off mode and there has been a decrease in the proportion of appliances with high consumption.

Figure 3 shows that the overwhelming majority of appliances consume less than 1W in off mode and in 2003/04 over 50% had no consumption at all. Additionally the proportion of consuming more than

5W has decreased significantly since 2001. However many products with a “power” switch continue to use significant amounts of power in “off mode”. While some of this power may be required for some essential functions (eg maintaining clock functions), in many cases the majority would appear to be due to poor product design, or at best, little consideration of standby power issues. Most consumers assume there is zero consumption in this mode.

FIGURE 2: DISTRIBUTION OF “PASSIVE STANDBY MODE” POWER – ALL PRODUCTS

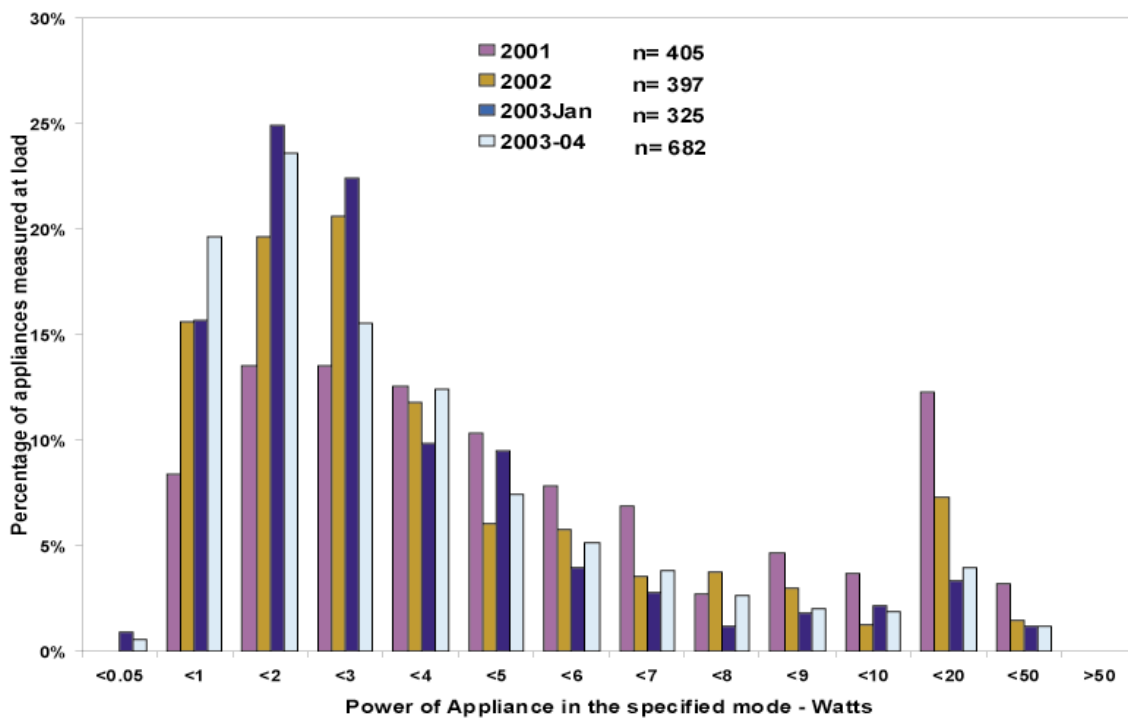
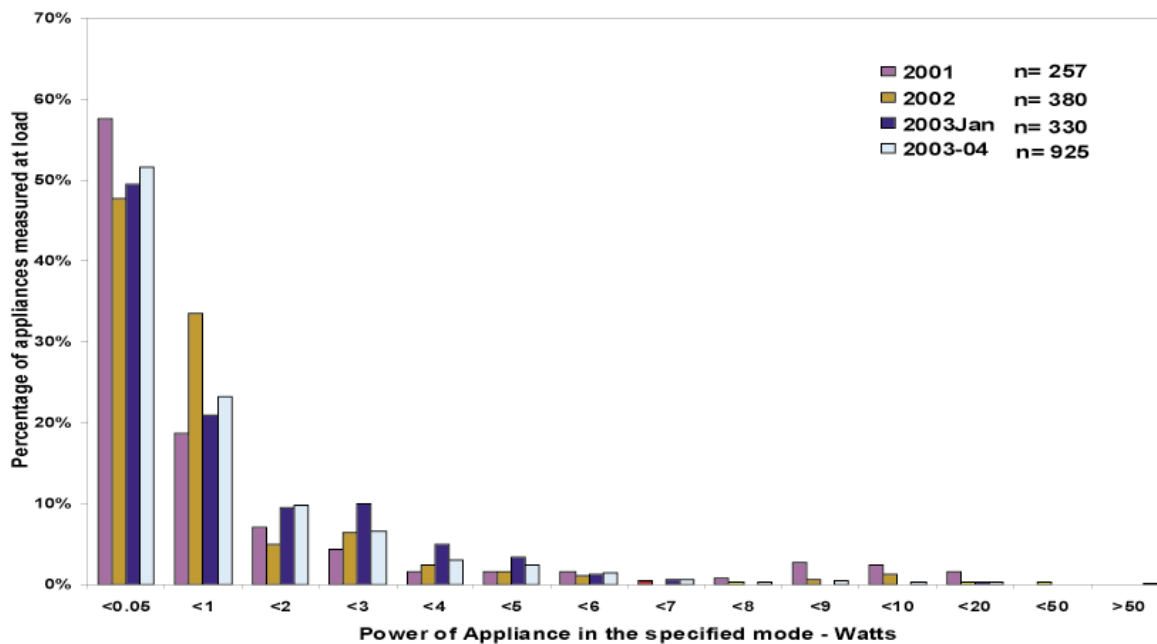


FIGURE 3: DISTRIBUTION OF “OFF MODE” POWER – ALL PRODUCTS



A Delay start function has become more common on major appliances.

This survey found a delay start function was a feature on 71 models across seven appliance categories. Delay start allows the consumer to preset the appliance to begin functioning at a time in the future. It was found that appliances left in this mode recorded different consumption than in their lowest power mode. In 68% of cases delay start mode consumption was higher than standby, while in only

11% of cases it was lower. Given this information, delay start mode has been added to the modes measured during in store surveys. Little is known about consumer behaviour with regard to delay start features, however if appliances are being left in this mode for significant amounts of time then this mode will impact overall consumption. It should also be noted that while store measurements in this mode are indicative, some products may go into a lower power state after a short period – this would need to be determined in the laboratory.

TABLE 2 – A SUMMARY OF DELAY START MODE RESULTS

	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	71	4.1	9.2	0.7

There appears to be only limited connection between standby consumption and price of appliances.

A relationship was found between price and standby consumption for 10 products. However these must be considered tenuous with only one product from last year's survey indicating a similar relationship.

Results indicate that there is an opportunity for many appliances to improve energy consumption in standby and off modes.

For the products measured, there was generally a wide variance in power consumption in off mode and passive standby mode without any difference in performance or functionality between these products. This tends to suggest that there are substantial opportunities for manufacturers to reduce standby power consumption, probably at low marginal cost.



Trends for different product groups are mixed.

While some products appear to be improving, there is still substantial work to be done for other product types. Some products have poor standby power characteristics. Ongoing work is required to track current and future trends. Key trends are:

MAJOR APPLIANCES:

- Air conditioners – significant improvement in off mode consumption since 2002. Increase in units that have passive standby as lowest state, i.e. no off mode.
- Clothes dryers – off mode has decreased since 2001, although with an increase in the number of appliances with an on/off switch, active standby will need to be monitored. End of program mode is also important for this product and cannot be determined in a store survey.
- Dishwashers – standby decreased significantly from 2003 to 2003/04; with an increase in the number of appliances with an on/off switch, active standby will need to be monitored. End of program mode is also important for this product and cannot be determined in a store survey.
- Washing machines – trend of decreasing off mode consumption appears to be continuing while active standby is stable. Samples are biased towards front loader models which have a lower standby and smaller overall market share (approximately 42% in the store sample compared to 18% of sales in the market), so data may be providing a false indication of sales weighted trends. End of program mode is also important for this product and cannot be determined in a store survey.
- Cook Tops, Ovens, Stoves and Range hoods - no trend data (new product in 2003/04).
- Heaters – gas, portable electric and water - no trend data (new product in 2003/04).

COMPUTERS AND PERIPHERALS:

- Computers – small sample but standby appears to be stable;
- Monitors – small sample but standby appears to be decreasing;
- Inkjet printers – standby appears to be stable but is poor;
- Laser printers – insufficient data to determine trends;

HOME ENTERTAINMENT EQUIPMENT:

- Standard TVs – passive standby appears to be trending downwards;
- LCD TVs - no trend data (sample too small);
- Projection TVs – standby appears to be stable;
- Plasma TVs – standby appears to be stable with passive standby usage at the lower end (average 2.4W);
- VCRs – standby appears to be trending downwards with significant differences in 2003/04;
- DVD/VCR Player - no trend data (new product in 2003/04);
- DVD players – significant improvement in off and passive standby mode power;
- DVD recorders – no trend data (new product in 2003/04);
- Integrated stereos – continued improvement in passive standby mode but started from a high base;
- Portable stereos – passive and active standby stable;
- AV Receivers – there are indications that standby is decreasing;
- Home Theatre Systems – no trend data (new product in 2003/04);
- Sub-Woofers – no trend data (sample too small);
- Digital Set Top Boxes - no trend data (sample too small);

SMALL APPLIANCES:

- Breadmakers – standby is stable;
- Hand held vacuum cleaners (dust busters)
– standby may be increasing but sample size small;
- Microwaves ovens – standby may be decreasing;
- Espresso machines – Off mode is stable. Active standby needs a more reliable test method due to the cyclic nature of espresso machines, but is likely to be high.
- Facsimiles – no trend data (new product in 2003/04);
- Multi Function Devices - no trend data (new products in 2003/04);

Overall results - summary

The power consumption of 1431 appliances was measured in 14 retail stores in Melbourne, Australia during November 2003 and June 2004.

Table 3 provides a summary of the average active/passive standby and off readings (as applicable) for each of the appliance groups measured.



TABLE 3 – A SUMMARY OF POWER MEASUREMENTS BY APPLIANCE – 2004 SURVEY

Appliance	Total Number of Appliance	Valid Readings: Off	Average of Off Power (W)	Valid Readings: Passive Standby	Average of Passive Standby Power (W)	Valid Readings: Active Standby	Average of Active Standby Power (W)	Valid Readings: Delay Start	Average of Delay Start Power (W)
Air Conditioner	39	28	0.1	12	1.5			5	2.1
Analogue Set Top Box	3	2	0.1	1	2.0				
Breadmaker	11					11	1.7		
Computers – Box	39	38	3.2	1	3.4				
Computers - Home Theatre Box	6	5	4.0	1	6.0				
Computers – Laptop	21	21	1.5						
Computers – Monitor	73	71	1.4	5	1.7				
Computers – Speakers	13	13	2.8			8	4.1		
Computers - Video Splitter	1	1	2.2			1	4.4		
Cook top	15	15	0.0						
Cordless Phone	1			1	0.9				
Digital Set top Box	29	8	0.0	26	7.9			16	3.6
Dishwasher	50	49	0.4			34	3.0	2	4.0
Dryer	38	38	0.2			12	1.7		
DVD & VCR Player	17			17	3.7	17	15.8		
DVD Player	70	19	0.1	60	2.4	70	10.6		
DVD Player Portable	1			1	0.3	1	4.0		
DVD Recorder	20	1	0.0	19	4.5	20	26.5		
Espresso Machine	46	43	0.4						
Facsimile	20					20	5.0		
Game Console	1	1	2.9			1	60.6		
Gas Water Heaters	4	4	7.1					6	1.6
Hand-held Vac	6			6	1.2	6	10.5	4	8.0
Heater - Electric Portable	62	62	0.3						
Heater – Gas	29	25	1.1	4	7.2				
Home Theatre – Amp	1			1	3.7	1	13.5		
Home Theatre - AV Receiver Only	53	24	0.2	36	1.5				
Home Theatre - AV Receiver with decoder	9	3	0.0	9	1.3				
Home Theatre - AV Receiver/DVD	9	2	0.2	7	3.2				
Home Theatre - Cordless Speaker Base	1	1	0.0			1	16.1		

Appliance	Total Number of Appliance	Valid Readings: Off	Average of Off Power (W)	Valid Readings: Passive Standby	Average of Passive Standby Power (W)	Valid Readings: Active Standby	Average of Active Standby Power (W)	Valid Readings: Delay Start	Average of Delay Start Power (W)
Home Theatre - Cordless Speaker Control Box	1			1	1.1	1	3.4		
Home Theatre - Data Projector	1	1	5.0						
Home Theatre – Subwoofer	39	31	0.4	5	1.7	38	10.9		
Home Theatre - System	22	4	0.0	20	1.0	22	34.1		
Home Theatre - System with decoder	11	3	0.0	10	5.2	11	39.6		
Microwave	75			75	2.8				
Multi Function Device	35	16	6.8			35	9.3		
Oven	5	5	4.3						
Printer – Inkjet	35	35	1.3	35	5.2				
Printer – Laser	12	12	0.0	12	6.9				
Printer – Photo	6	4	2.9	6	4.7				
Range Hood	31	31	0.5						
Stereo – Amp	8	6	45.5	3	2.3				
Stereo - CD player	8	4	0.0	4	4.6	8	7.5		
Stereo - Client Audio Terminal	1	1	0.9	1	7.0	1	8.0		
Stereo – Integrated	60	2	0.0	51	4.3	60	16.2		
Stereo – Portable	36	7	1.4	29	1.9	34	5.4		
Stereo – Receiver	3	1	0.0	2	1.0	3	14.6		
Stereo – Tuner	4	4	0.4			1	8.6		
Stove	18	18	0.2						
TV – LCD	39	26	0.7	36	5.1			1	7.2
TV – Plasma	26	20	0.8	21	2.4			37	4.5
TV – Projection	27	27	0.1	27	5.7				
TV – standard	107	106	0.0	91	4.2				
TV/VCR	1	1	0.1	1	5.7				
VCR	45			45	3.1	45	7.6		
Washer/Dryer	2	2	2.0			2	3.2		
Washing Machine	85	84	0.7			63	3.5		
Grand Total	1431	925	1.1	682	3.6	527	10.9	71	4.1

PRODUCT SUMMARIES

Product summaries, summarising key data and significant trends, are included below. Numbers in brackets indicate the sample size used to determine the average value. It should be noted that where samples are less than five, the results for these products are not reported below.

HOME ENTERTAINMENT

Televisions

Description: Conventional cathode ray tube (CRT) televisions.

Number of products measured in 2003/04: 107

Mode = off: average power 0.0W (106)

Mode = passive standby: average power 4.2W (91),

Mode = in use: average power 78.9W (106).

Trend: The passive standby power consumption for TVs is still high. However there has been a statistically significant decrease in average consumption in passive standby mode in 2003/04.

Notes: In off mode all models were 0.2W or less. In passive standby 10 models used less than 1W in 2003/04. Average screen size in 2003/04 was 62cm.

TVs - LCD

Description: Liquid crystal display (LCD) televisions.

Number of products measured in 2003/04: 39

Mode = off: average power 0.7W (36).

Mode = passive standby: average power 5.1W (36).

Mode = in use: average power 62.4W (39).

Trend: Comparisons are unable to be made due to the previous sample's small size.

Notes: Average screen size in 2003/04 was 56cm.

TVs – Projection

Description: Large projection screen televisions (mostly rear projection).

Number of products measured in 2003/04: 27

Mode = off: average power 0.1W (27).

Mode = passive standby: average power 5.7W (27), maximum 39.4W.

Mode = in use: average power 156.3W (27).

Trend: Standby power consumption appears to be stable.

Notes: In off mode all models were 0.3W or less. In passive standby 8 models used less than 1W. Average screen size in 2003/04 was 123cm.

TVs – Plasma

Description: Plasma Display screens for television viewing

Number of products measured in 2003/04: 26

Mode = off: average power 0.8W (20).

Mode = passive standby: average power 2.4W (21), maximum 4.4W

Mode = in use: average power 147.3W (26).

Trend: standby consumption appears to be stable.

Notes: In off mode most models (13) were 1W or less. In passive standby 2 models used less than 1W. Average screen size was 112cm. While in use power is still high there were indications that this may be declining.



VCRs

Description: Conventional VHS video cassette recorders.

Number of products measured in 2003/04: 45

Mode = passive standby: average power 3.1W (45), maximum 6.0W.

Mode = active standby: average power 7.6W (45).

Trend: Passive and active standby modes are both trending downwards with statistically significant differences noted in 2003/04.

Notes: None of the units measured had an off mode. The minimum power in passive standby was 1.3W. Intermediate sleep mode (down from active standby) and "in use" were not measured as this was too time consuming.

DVD Players

Description: Digital Video Disk players (DVD).

Number of products measured in 2003/04: 70

Mode = off: average power 0.1W (19)

Mode = passive standby: average power 2.4W (60), maximum 10W.

Mode = active standby: average power 10.6W (70)

Trend: Power consumption in all modes measured display a significant downward trend.

Notes: Only a limited number of models had off mode, but most of these were 0.0W.

DVD Recorders

Description: Digital Video Disk players (DVD) that can record from TV.

Number of products measured in 2003/04: 20

Mode = off: average power 0.0W (1)

Mode = passive standby: average power 4.5W (19), maximum 8.1W.

Mode = active standby: average power 26.5W (20) maximum 46.8W

Trend: no trend data (new product in 2003/04).

Notes: Only 1 unit less than 1W in passive standby.

Stereos – Integrated

Description: Integrated stereo systems (usually CD/tape/tuner/amp, non portable).

Number of products measured in 2003/04: 60

Mode = off: average power 0.0W (2).

Mode = passive standby: average power 4.3W (51), maximum 15.6W.

Mode = active standby: average power 16.2W (60).

Trend: Active standby, has declined slightly though this has not been statistically significant. The decrease in passive standby consumption has continued.

Notes: Only 2 models had an off mode. One third of models used less than 1W in passive standby mode while more than a third use more than 5W.

Stereos – Portable

Description: Portable stereo systems (usually CD/tape/tuner/amp, single case).

Number of products measured in 2003/04: 36

Mode = off: average power 1.4W (7).

Mode = passive standby: average power 1.9W (29), maximum 4.8W.

Mode = active standby: average power 5.4W (34).

Trend: There appears to be no change in active or passive standby.

Notes: Seven models measured had an off mode. In passive standby mode two models used less than 1W.

AV Receiver

Description: Amplifiers for home theatre suitable for both audio and visual devices.

Number of products measured in 2003/04: 71

Mode = off: average power 0.2W (29).

Mode = passive standby: average power 1.7W (52), maximum 15W.

Mode = in-use: average power 39.3W (71).

Trend: there are indications that standby is decreasing however it is too early to be certain of a trend with current data.

Notes: Nearly half the models consumed less than 1W in passive standby. There was no discernable difference between models with and without built in DVDs and/or decoders.

Home Theatre Systems

Description: AV receivers with built in DVD and Speakers systems all powered from one power source.

Number of products measured in 2003/04: 33

Mode = off: average power 0.0W (7).

Mode = passive standby: average power 2.4W (30), maximum 15.6W.

Mode = active standby: average power 35.9W (33).

Trend: no trend data (new product in 2003/04).

Notes: Sixteen models consumed less than 1W in passive standby. There was no discernable difference between models with and without built in decoders.

Sub-Woofers

Description: AV receivers with built in DVD and Speakers systems all powered from one power source.

Number of products measured in 2003/04: 39

Mode = off: average power 0.4W (31).

Mode = passive standby: average power 1.7W (5).

Mode = active standby: average power 10.9W (38), maximum 26.3W

Trend: no trend data as previous samples have been too small.

Notes: Most sub-woofers have the off switch at the rear of the appliance where it is difficult to use.



Digital Set Top Box

Description: Decoder allowing digital transmission to be broadcast on an analogue television.

Number of products measured in 2003/04: 29

Mode = off: average power 0.0W (8).

Mode = passive standby: average power 7.9W (26), maximum 20.1W

Mode = in use standby: average power 15.4W (29)

Trend: no trend data as previous samples have been too small.

PRODUCT SUMMARY – MAJOR APPLIANCES

Air Conditioners

Description: Fixed (window wall) and portable air conditioners.

Number of products measured in 2003/04: 39

Mode = off: average power 0.1W (28), maximum 0.8W

Mode = passive standby: average power 1.5W (12),

Mode = delay start: average power 2.1W (5).

Trend: Off mode consumption in Air Conditioners appears to be decreasing.

Notes: Models without off mode were found for the first time. Additionally an increasing number of coolers had a delay start function. Very few of the models measured had remote control operation. The most popular type of air conditioners is split systems (many of these use remote controls) and almost all are "hard wired", so in-store measurements were not possible. Lab measurements will be necessary to collect data.

Dishwashers

Description: Domestic dishwashers.

Number of products measured in 2003/04: 50

Mode = off: average power 0.4W, maximum 5.0W

Mode = active standby: average power 3.0W (34),

Mode = delay start: average power 3.6W (16).

Trend: Consumption appears to be decreasing

Notes: Delay start is now a feature on many units. End of program mode is also important for this product and cannot be determined in a store survey.

Clothes Dryers

Description: Domestic clothes dryers.

Number of products measured in 2003/04: 38

Mode = off: average power 0.2W, maximum 2.7W, 82% were 0.0W

Mode = active standby: average power 1.7W (12),

Mode = delay start: average power 4.0W (2).

Trend: There appears to be a positive trend toward reducing standby.

Notes: Delay start feature was found. End of program mode is also important for this product and cannot be determined in a store survey.

Washing Machines

Description: Domestic clothes washers (front and top loading).

Number of products measured in 2003/04: 85

Mode = off: average power 0.7W, maximum 5.0W, 54% were 0.0W

Trend: Declining off mode consumption.

Notes: Some 70% of clothes washers had an off mode consumption of less than 1W. Care is required when examining this trend as the samples include up to 42% front loaders which have generally had a low off mode consumption. However, front loader sales are less than 15% of total sales. Some machines had to be "tricked" into standby mode after power is first applied (normally this takes up to 30 minutes). End of program mode is also important for this product and cannot be determined in a store survey.

Cook Tops

Description: Cook top or Hob; gas or electric burners

Number of products measured in 2003/04: 15

Mode = off: average power 0.0W, maximum 0.0W

Trend: no trend data (new product in 2003/04)

Ovens

Description: Oven without cook top.

Number of products measured in 2003/04: 5

Mode = off: average power 4.3W, maximum 5.9W

Trend: no trend data (new product in 2003/04)

Stoves

Description: Combination oven and cook top in one housing.

Number of products measured in 2003/04: 18

Mode = off: average power 0.2W, maximum 1.1W

Trend: no trend data (new product in 2003/04)

Range Hoods

Description: Kitchen extraction fan.

Number of products measured in 2003/04: 30

Mode = off: average power 0.5W, maximum 7.5W

Trend: no trend data (new product in 2003/04)

Electric Heaters

Description: portable electric heater.

Number of products measured in 2003/04: 62

Mode = off: average power 0.3W, maximum 3.7W

Mode = delay start: average power 1.6W (6).

Trend: no trend data (new products in 2003/04)

Gas Heaters

Description: gas heating products.

Number of products measured in 2003/04: 29

Mode = off: average power 1.1W, maximum 5.8W (25)

Mode = passive standby: average power 7.2W (4),

Mode = delay start: average power 8.0W (4).

Trend: no trend data (new products in 2003/04)

PRODUCT SUMMARY – COMPUTERS, PERIPHERALS, OFFICE EQUIPMENT

Computers - Box

Description: PC/hard drive box with desktop computers.

Number of products measured in 2003/04: 39

Mode = off: average power 3.2W (38), maximum 7.9W, 2 consumed < 1W.

Mode = passive standby: average power 3.4W (1),

Trend: Appears to be a stable off mode consumption

Notes: Off mode consumption may allow hot key start for some models. For the first time one unit had a display screen which was always activated, hence passive standby only.

Computers - Laptop

Description: Portable or laptop computer.

Number of products measured in 2003/04: 21

Mode = off: average power 1.5W, maximum 3.2W, 7 consumed less than 1W.

Trend: Currently off mode is stable

Computer - Monitors

Description: Separate monitors for desktop computers.

Number of products measured in 2003/04: 73

Mode = off: average power 1.4W (71), maximum 4.3W.

Mode = passive standby: average power 1.7W (5),

Trend: Appears to be decreasing.

Notes: There was an increase in the number of LCD screens in this sample.

Computer - Speakers

Description: speakers including sub woofers for use with computers.

Number of products measured in 2003/04: 13

Mode = off: average power 2.8W, maximum 6.1W

Mode = active standby: average power 4.1W (8),

Trend: no trend data (new product in 2003/04)

Home Theatre Box

Description: computer box that can be used to view television.

Number of products measured in 2003/04: 6

Mode = off: average power 4W, maximum 5.9W (5)

Mode = active standby: average power 6W (1),

Trend: no trend data (new product in 2003/04)

Printers - Inkjet

Description: Inkjet printers for personal computers.

Number of products measured in 2003/04: 35

Mode = off: average power 1.3W, maximum 5.7W,

Mode = passive: average power 5.2W, maximum 15.1W, None less than 1.0W

Trend: Standby power values appear to be stable however off mode is decreasing. Standby power levels are still poor.

Printers - Laser

Description: Laser printers for personal computers.

Number of products measured in 2003/04: 12

Mode = off: average power 0.0W (12).

Mode = passive: average power 6.9W, (12).maximum 21.5W

Trend: Insufficient data to establish a trend

Notes: All models had zero consumption in off. Passive standby power was instantaneous only and did not include laser drum heating cycles.

Printer - Photo

Description: printer designed to print direct from digital camera.

Number of products measured in 2003/04: 6

Mode = off: average power 2.9W, maximum 4.4W (4)

Mode = passive standby: average power 4.7W (6),

Trend: no trend data (new product in 2003/04)

Facsimile

Description: Fax machine.

Number of products measured in 2003/04: 20

Mode = active standby: average power 5.0W (34), maximum 8.6W

Trend: no trend data (new product in 2003/04)

Multi Function Device

Description: Machine that provides a combination of functions which include telephone, fax, copier, scanner, email, printer.

Number of products measured in 2003/04: 35

Mode = off: average power 6.8W, (16)

Mode = active standby: average power 9.3W, maximum 24W

Trend: no trend data (new product in 2003/04)

PRODUCT SUMMARY – SMALL APPLIANCES

Breadmakers

Description: Domestic electric breadmakers.

Number of products measured in 2003/04: 11

Mode = active: average power 1.7W, maximum 2.1W

Trend: Standby is stable with little change since 2001 value (1.6W).

Notes: No models had an off button

Hand Held Vacuum

Description: Portable battery operated vacuum cleaners (dust busters).

Number of products measured in 2003/04: 6

Mode = passive standby: average power 1.2W (6) maximum 2.0W

Mode = active standby: average power 10.5W (6) maximum 39.6W

Trend: Active and passive standby appear to be stable.

Notes: Passive mode is power supplied to the charging station but appliance removed. Active standby mode is when the appliance is on the charging station, battery is charging.

Microwaves

Description: Domestic microwave ovens.

Number of products measured in 2003/04: 75

Mode = passive standby: average power 2.8W, maximum 6.6W

Trend: Microwave ovens may be declining

Notes: This years survey saw a statistically significant decline compared to 2001 however average consumption has risen and then fallen each alternate survey. Therefore a definite trend can not yet be assumed. All but 8 models had electronic controls in 2003/04.

Espresso Machines

Description: Steam or pump operated coffee maker.

Number of products measured in 2003/04: 46

Mode = Off: average power 0.4W, maximum 4.3W (67% no consumption)

Trend: 2003 Sample too small to compare

Notes: In active standby, all machines consumed a great deal of energy due to the machine warming up at a fast rate. Further research needs to be conducted to determine consumer behaviour towards turning off their espresso machines. Testing this mode in stores does not provide solid quantitative data due to the cyclic nature of the machine during the active phase. The range of consumption was 0.3W to 1631W; however test methods need to be explored to get an accurate picture of active standby.

Further Information:

The main report, which is attached to this executive summary, has more detailed data for all product categories.

Energy Efficient Strategies and EnergyConsult, 2003, Appliance Standby Power Consumption: Store Survey 2003, NAEEEEC report 2003/04. This report contains the detailed results of the Australian retail store standby survey undertaken in early 2003 as outlined in this executive summary. A copy is available at www.energyrating.gov.au from the electronic library under the standby section.

Energy Efficient Strategies and EnergyConsult, 2002, Appliance Standby Power Consumption: Store Survey 2002, NAEEEEC report 2002/08. This report contains detailed results of the Australian retail store standby survey undertaken in early 2002. A copy is available at www.energyrating.gov.au from the electronic library under the standby section.

Energy Efficient Strategies and EnergyConsult 2001, Quantification of Residential Standby Power Consumption In Australia: Results of Recent Survey Work. Prepared for NAEEEEC, this report provides results of an intrusive survey where measurements on 2,500 appliances were undertaken in 64 houses in Melbourne, Sydney and Brisbane. The report also includes results of measurements on 531 new appliances in retail outlets and results of a telephone survey of 801 households in Australia, which documents information on appliance ownership, age and usage patterns. A copy is available at www.energyrating.gov.au from the electronic library under the standby section.

MCE 2002, Australia's Standby Power Strategy 2002-2012 - "Money Isn't All You're Saving". Final report of long-term strategy to achieve Australia's One-Watt Goal 2002 to 2012, Ministerial Council on Energy. NAEEEEC Report 2002/12. Available from www.energyrating.gov.au in the electronic library.

An electronic copy of this executive summary and the main report is available from www.energyrating.gov.au from the electronic library under the standby section

Contents – Main Report

<i>Introduction</i>	<i>4</i>
Background	4
Definition of "Standby"	4
Aims & objectives	5
Research Methods	6
Equipment and Preparation	6
Problems encountered during data collection	9
Acknowledgements	9
<i>Results</i>	<i>11</i>
Overview	11
Equipment Profiles	13
Major Appliances	13
Small Appliances	23
Computers, Peripherals, Office Equipment	29
Home Entertainment Equipment	39
Price and Standby Power Consumption	66
<i>References</i>	<i>76</i>

Index of Tables

Table 1 – A summary of modes tested by appliance	8
Table 2 – A summary of air conditioner results	13
Table 3 – A summary of clothes dryer results	15
Table 4 – A summary of clothes washer/dryer results	16
Table 5 – A summary of dishwasher results	17
Table 6 – A summary of washing machine results	18
Table 7 – A summary of cook top results	20
Table 8 – A summary of oven results	20
Table 9 – A summary of stove results	21
Table 10 – A summary of range hood results	21
Table 11 – A summary of electric portable space heaters results	22
Table 12 – A summary of gas space heaters results	22
Table 13 – A summary of gas water heaters	23
Table 14 – A summary of breadmaker results	23
Table 15 – A summary of hand-held vacuum cleaner results	24
Table 16 – A summary of microwave results	26
Table 17 – A summary of espresso machine results	28
Table 18 – A summary of Hard Drive/CPU Box results	30

Appliance Standby Power Consumption: Store Survey Results 2003/04, Main Report, August 2004

Table 19 – A summary of laptop computer results	31
Table 20 – A summary of computer monitor results	32
Table 21 – A summary of computer speaker results	34
Table 22 – A summary of Home Theatre Box results	34
Table 23 – A summary of inkjet printer results	35
Table 24 – A summary of laser printer results	36
Table 25 – A summary of photo printer results	38
Table 26 – A summary of facsimile results	38
Table 27 – A summary of multi function device results	39
Table 28 – A summary of standard television results	40
Table 29 – A summary of LCD TV results	43
Table 30 – A summary of projection TV results	44
Table 31 – A summary of plasma TV results	45
Table 32 – A summary of VCR results	49
Table 33 – A summary of DVD/VCR combination unit results	52
Table 34 – A summary of DVD player results	53
Table 35 – A summary of DVD recorder results	56
Table 36 – A summary of integrated stereo results	57
Table 37 – A summary of portable stereo results	59
Table 38 – A summary of AV Receiver results	61
Table 39 – A summary of home theatre system results	64
Table 40 – A summary of subwoofer results	64
Table 41 – A summary of digital set top box results	65
Table 42 – A summary of price vs. standby power consumption analysis	66

Index of Figures

Figure 1 – Power measurements for air conditioners: off mode	14
Figure 2 – Power measurements for clothes dryers: off mode	15
Figure 3 – Power measurements for dishwashers: off mode	17
Figure 4 – Power measurements for washing machines: active standby mode	18
Figure 5 – Power measurements for washing machines: off mode	19
Figure 6 – Power measurements for breadmakers: active standby mode	24
Figure 7 – Measurements for hand-held vacuum cleaners: active standby mode	25
Figure 8 – Power measurements for hand-held vacuum cleaners: passive standby mode	26
Figure 9 – Power measurements for microwaves: passive standby mode	27
Figure 10 – Power measurements for espresso machines: off mode	29

Appliance Standby Power Consumption: Store Survey Results 2003/04, Main Report, August 2004

Figure 11 – Power measurements for computers: off mode	30
Figure 12 – Power measurements for portable computers: off mode	31
Figure 13 – Power measurements for monitors: off mode	33
Figure 14 – Power measurements for inkjet printers: passive standby mode	35
Figure 15 – Power measurements for inkjet printers: off mode	36
Figure 16 – Power measurements for laser printers: passive standby mode	37
Figure 17 – Power measurements for standard televisions: in-use mode	41
Figure 18 – Power measurements for standard televisions: passive standby mode	42
Figure 19 – Power measurements for standard televisions: off mode	42
Figure 20 – Power measurements for projection televisions: passive standby mode	44
Figure 21 – Power measurements for plasma screens: in-use mode	46
Figure 22 – Power measurements for plasma televisions: passive standby mode	47
Figure 23 – Power measurements for plasma televisions: off mode	48
Figure 24 – Power measurements for VCR: active standby mode	50
Figure 25 – Power measurements for VCR: passive standby mode	51
Figure 26 – Power measurements for DVD players: active standby mode	53
Figure 27 – Power measurements for DVD players: passive standby mode	54
Figure 28 – Power measurements for DVD players: off mode	55
Figure 29 – Power measurements for integrated stereos: active standby mode	57
Figure 30 – Power measurements for integrated stereos: passive standby mode	58
Figure 31 – Power measurements for portable stereos: active standby mode	59
Figure 32 – Power measurements for portable stereos: passive standby mode	60
Figure 33 – Power measurements for AV receivers: in-use mode	61
Figure 34 – Power measurements for AV receivers: passive standby mode	62
Figure 35 – Power measurements for AV receivers: off mode	63
Figure 36 – Price vs. passive standby performance: VCRs	68
Figure 37 – Price vs. passive standby performance: DVD recorders	69
Figure 38 – Price vs. active standby performance: DVD recorders	69
Figure 39 – Price vs. off mode performance: AV Receivers	70
Figure 40 – Price vs. passive standby performance: Home Theatre Systems	71
Figure 41 – Price vs. off mode performance: Heaters Electric Portable	72
Figure 42 – Price vs. passive standby performance: Microwaves	73
Figure 43 – Price vs. off mode performance: Laptops	74
Figure 44 – Price vs. active standby mode measurements: Multi Function Devices	75

Introduction

Background

In 2000 the Australian Greenhouse Office (AGO) and the National Appliance & Equipment Energy Efficiency Committee (NAEEEC) commissioned the report, *Quantification of Residential Standby Power Consumption in Australia* (Energy Efficient Strategies and EnergyConsult, 2001). This study provides results of an intrusive survey where measurements on 2,500 appliances were undertaken in 64 houses in Melbourne, Sydney and Brisbane. The report also includes results of measurements on 531 new appliances in retail outlets and results of a telephone survey of 801 households in Australia, which documents 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.

Following the 2000 study, two follow-up store surveys of new appliances have been conducted. The report titled *Appliance Standby Power Consumption: Store Survey 2002* (Energy Efficient Strategies & Energy Consult), measured energy consumption of 635 appliances in January 2002 while, *Appliance Standby Power Consumption: Store Survey 2003* (Energy Efficient Strategies and EnergyConsult) measured 573 appliances in January 2003. This data was compared with the information recorded in the 2001 report, finding that while there appeared to be a slight decrease in standby power consumption overall, a large proportion of products still consumed more than 1W in standby and off modes.

The results presented in this report provide details of in-store standby measurements for 1431 new household appliances that were undertaken in November 2003 and June 2004. 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 *Appliance Standby Power Consumption: Store Survey 2003/04 – Executive Summary* (EnergyConsult and EES, 2004).

These in-store surveys are the beginning of a longer term benchmarking program and results need to be viewed in this light. NAEEEC propose to undertake similar surveys in future to assess industry progress in reducing standby consumption of appliances. This report was prepared by EnergyConsult with assistance from Energy Efficient Strategies on contract to NAEEEC.

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 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 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 or operation (such as DVD and CD players). Active standby is when the appliance on but not performing its main function. For example, a 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 now common 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.

Aims & objectives

The Australian Greenhouse Office (AGO) and the National Appliance & Equipment Energy Efficiency Committee (NAEEEC) commissioned this research as part of its program to reduce the standby consumption of all electronic appliances to less than 1W (refer to MCE 2002 for more details). 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:

Appliance Standby Power Consumption: Store Survey Results 2003/04, Main Report, August 2004

- Quantify the magnitude of electricity used in standby mode by new appliances offered for sale in the Australian market in November 2003 and June 2004.
- Compare the results of this study with those from the three previous in store surveys undertaken in early 2001, 2002 and 2003 in order to track industry's progress in reducing standby power consumption.

In contrast to previous year's store surveys, this survey was done in two segments to ensure a broader range of seasonal appliances were included such as heaters and air conditioners.

The survey also collects information on the sale price of appliances, allowing an analysis of standby power consumption in relation to the cost of the appliance, to determine if there is a relationship between poor standby performances and "budget" priced appliances.

The survey also records the presence of an Energy Rating label or an ENERGY STAR label on appliances. Products (excluding white goods) that displayed an ENERGY STAR label were cross checked 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 was noted in the survey, as it is not possible to verify the details shown in the energy label in a retail store.

Research Methods

Equipment and Preparation

The meter used for measuring most of the appliance's energy usage was a Yokogawa¹ digital power analyser, Model WT200. However, for a small number of appliances, where access was difficult, a smaller portable meter was used. (Sparmeter Model NZR 230) which is known to provide reasonably accurate results in most cases.

Eleven major Melbourne retail stores were approached to take part in the study, along with three suburban computer stores. This allowed measurements of a large range of appliances, across a number of manufacturers to be taken. This year's survey also aimed to target specific products. Some stores were specifically visited in order to capture the following appliances: air conditioners; home theatre products; cooking appliances; heaters and computer peripherals. The metering device was systematically plugged into the floor stock across 58 appliance categories. This represents a large increase in appliance categories from previous surveys due to new product types entering the market. As parts of the survey were conducted in both winter and in summer it was possible to cover seasonal products in a more comprehensive manner. During the survey appliance brand and model number were recorded to prevent the duplication of measurements. There was no selection process, with most of the available stock on display in the store being measured as part of the survey. The reasons that individual appliances could not be measured included:

¹ Fundamental power accuracy of 0.25%.

- Appliance power cord missing;
- European or US power cord;
- Appliance difficult to access without disturbing the store display (this was particularly the case for some home theatre displays, plasma TVs and computers and peripherals);
- Shop Fixture design does not allow access to power cords with out removing shelving and panels (used by stores as an anti theft solution);
- No display model available at the time or only appliance casing displayed (not a working model);
- Appliance locked in a cabinet for security reasons (usually small high value items);
- Display appliances are hard wired or built in (this was the case particularly for cooking and air conditioning appliances which may not have a plug).

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

For televisions power factor, crest factor and supply voltage information was also recorded during measurements.

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.

The crest factor is defined as the ratio of peak current to RMS (root mean square) current (or peak voltage to RMS voltage). For a pure sinusoidal wave shape the crest factor is 1.414, while for a pure constant DC load the crest factor is 1.0. The parameter of particular concern from a metering perspective for standby current and its waveform. During the measurement, it is critical that the crest factor available on the meter is greater than the actual crest factor of the load; otherwise the peak value of the current will be "lopped off". Note that the current crest factors for standby loads are typically 3 and can be as high as 10 in some circumstances. Crest factor is a measure of the level of distortion of the current waveform (and the difficulty in performing an accurate power measurement). Values for crest factor are low <2.5, moderate 2.5-4, high >4.

As indicated in Table 1, appliances were measured in various combinations of in-use (on mode), standby (passive or active, where applicable) and off mode. As previously mentioned it was not always practical to measure appliances in normal use (on mode) during an in store survey.

Table 1 – A summary of modes tested by appliance

Appliance List	In Use	Active Standby	Passive Standby	Delay Start	Off
Air Conditioner				✓	✓
Analogue Set Top Box	✓		✓		✓
Breadmaker		✓			✓
Computers – Box					✓
Computers – Laptop					✓
Computers – Monitor					✓
Computers – Speakers		✓			✓
Computers – Video Splitter		✓			✓
Cook top					✓
Cordless Phone		✓	✓		
Digital Set Top Box	✓		✓		
Dishwasher				✓	✓
Dryer				✓	✓
DVD & VCR Player		✓	✓		✓
DVD Player		✓	✓		✓
DVD Player Portable		✓	✓		✓
DVD Recorder		✓	✓		
Espresso Machine		✓			✓
Facsimile		✓			
Game Console		✓			✓
Gas Water Heaters					✓
Hand-held Vacuum		✓	✓		
Heater - Electric Portable				✓	✓
Heater – Gas				✓	✓
Home Theatre – Cordless speaker		✓	✓		
Home Theatre – Amp		✓	✓		✓
Home Theatre – AV Receivers	✓		✓		✓
Home Theatre – Data Projector					✓
Home Theatre – Subwoofer		✓	✓		✓
Home Theatre – Systems		✓	✓		✓
Microwave			✓		
Multi Function Device		✓			✓
Oven					✓
Printer – Inkjet			✓		✓
Printer – Laser			✓		✓
Printer – Photo			✓		✓
Range Hood					✓
Stereo – Integrated		✓	✓		✓
Stereo – Portable		✓	✓		✓
Stereo – Other		✓	✓		✓
Stove					✓
TV – LCD	✓		✓		✓
TV – Plasma	✓		✓		✓
TV – Projection	✓		✓		✓
TV – standard	✓		✓		✓
TV/VCR	✓	✓	✓		✓
VCR		✓	✓		✓
Washer/Dryer				✓	✓
Washing Machine			✓	✓	✓

Mode tested ✓

Note *: Battery operated appliance, passive = no battery charging, active = with battery charging.

Appliance Standby Power Consumption: Store Survey Results 2003/04, Main Report, August 2004

The modes measured for each product type reflect the design and operation of the product. While some products 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 active standby), not all of these modes were measured or are relevant to this study.

A total of 1431 products were measured in November 2003 and June 2004, bringing the total number of appliances measured in these surveys since early 2001 to 3151. The results for 2003/04 were analysed and compared with outcomes from the previous surveys in early 2001, 2002 and 2003 where possible.

Problems encountered during data collection

Not all products could be measured in all of the desired modes. For example, security reasons prevented many remote controls being displayed with items. As a result, appliances reliant on remote controls for operation into some modes were unable to be measured across all modes. This problem should be minimised in future surveys as a universal remote was trialled in last two days of the survey and was able to activate most home entertainment appliances tested. In some cases comparisons with previous surveys are not possible due to the changing market, for example; in 2003 individual stereo components were not found in retail outlets, having been replaced in the market by home theatre systems.

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.

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- Myer Mega Mart, Sunshine;
- Hi Fi Supermarket Maribyrnong;
- Clive Peeters Moorabbin;
- McKnights Retravision, Moorabbin;
- Origin Energy Store Maribyrnong;
- Officeworks Maribyrnong;
- Encel Hi Fi, Niddrie;
- Elite Appliances Carlton;
- Standard Computers, Altona;
- WTC, Werribee;
- Home Entertainment Centres, Werribee.

The study was coordinated by Melissa Damnic of EnergyConsult with support from Lloyd Harrington of Energy Efficient Strategies. Melissa Damnic and Debra Frey of EnergyConsult were responsible for undertaking field measurements on appliances and the recording of data. Paul Ryan of EnergyConsult was responsible for setting up the data collection instrument used in the field and subsequent data analysis software. The report was prepared by Melissa Damnic with editorial input from Lloyd Harrington and Jack Brown, both of Energy Efficient Strategies.

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 58 appliance types were tested during the 2003/04 in store survey:

- Air Conditioner
- Analogue Set Top Box
- Breadmaker
- Computers - Box
- Computers - Data projector
- Computers - Laptop
- Computers - Monitor
- Computers - Speakers
- Computers - Video Splitter
- Cook Top
- Cordless Phone
- Digital Set top Box
- Dishwasher
- Dryer
- DVD & VCR Player
- DVD Player
- DVD Player Portable
- DVD Recorder
- DVD Recorder with Hard Drive
- Espresso Machine
- Facsimile
- Game Console
- Gas Hot Water Heaters
- Hand-held Vac
- Heater - Electric Portable
- Heater - Gas
- Home Theatre - Cordless Speaker Base
- Home Theatre - Cordless Speaker Control Box
- Home Theatre - Amp
- Home Theatre - AV Receiver
- Home Theatre - AV Receiver with Decoder
- Home Theatre - AV Receiver/DVD
- Home Theatre - Hard Disk Drive
- Home Theatre - Subwoofer
- Home Theatre - System
- Home Theatre - System with Decoder
- Microwave
- Multi Function Device
- Oven
- Printer - Inkjet

- Printer - Laser
- Printer - Photo
- Range Hood
- Stereo - Amp
- Stereo - CD player
- Stereo - Client Audio Terminal
- Stereo - Integrated
- Stereo - Portable
- Stereo - Receiver
- Stereo - Tuner
- Stove
- TV - LCD
- TV - Plasma
- TV - Projection
- TV - standard
- TV/VCR
- VCR
- Washer/Dryer
- Washing Machine

The survey had also intended to measure mobile phones, scanners and modems but found that for security reasons, these items were displayed in locked cabinets and in the case of mobile phones, usually without chargers. Modems were usually displayed without any internal mechanisms i.e. case only. Security also prevented testing of all models on display in the electrical product groups as the newer shop fixtures allow power cords to be secured behind screwed in panels.

The following section details the results by appliance type.

Equipment Profiles

Major Appliances

Air Conditioners

A total of 39 air conditioner units were measured; 20 were window-wall models and 19 were portable appliances. The split system units found in stores were either hard wired or had 15 amp power plugs so could not be measured. Eight of the portable units used evaporative cooling. Of the 20 window wall units, 18 displayed an Energy Rating label. None of the portable units displayed a rating as these are not covered by the program.

This year's store survey measured air conditioners in the following modes; off, passive and delay start. The majority of these appliances had a hard off switch on the unit. However 12 units had electronic controls with digital displays or clocks constantly displayed, which meant passive standby was the lowest possible state. Six units had remote control operation, while five had a delay start mode. The average power consumption in passive mode was 1.5W, with a high of 2.5W and a low of 0.5W. In off mode, average consumption was 0.1W, with a high of 0.8W and a low of 0.0W. Delay start consumption ranged from 1.4W to 2.7W with an average consumption of 2.1W. The results for air conditioners are summarised in Table 2 below.

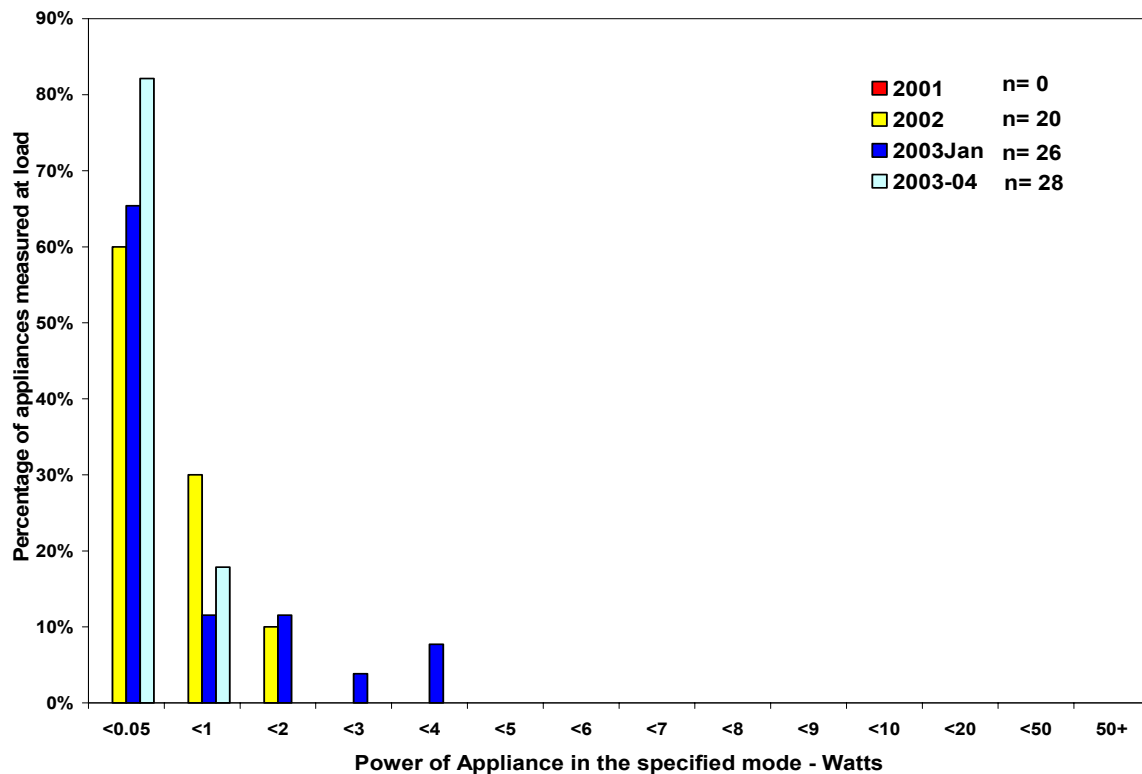
Table 2 – A summary of air conditioner results

Appliance:	Air Conditioner			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	5	2.1	2.7	1.4
Active	NA	-	-	-
Passive	12	1.5	2.5	0.5
Off	28	0.1	0.8	0.0
Total Number of Units	39			

Figure 1 presents the data recorded for air conditioners during the annual surveys undertaken thus far. The 2003/04 figures indicate an improvement in consumption, with all models tested consuming less than 1W in off mode. These results show that in off mode there has been a statistically significant reduction in the consumption of air conditioners. However, unlike previous years, 28% of models were recorded as having no off mode. These units had passive standby as the lowest possible state, with the average consumption much higher than the average off mode consumption in previous years. If these results are indicative of the future design trends for air conditioners and consumers are unable to activate a hard off, it would lead to a trend of increasing standby consumption. Additionally, this year's survey noted a number of appliances with a delay start function, which compounds this issue; average consumption was more than 2W and no models in this mode consumed less than 1W.

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

Figure 1 – Power measurements for air conditioners: off mode



Note: Most histograms included in this report use the same bin definitions (except where noted). The first bin 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). The second bin is the number of appliances with >0.0 Watts but less than 1.0 Watts. The third bin is the number of appliances with greater than or equal to 1.0 Watts and less than 2.0 Watts and so on. Note that bin sizes for > 10 Watts are non linear.

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 not possible. Lab measurements (e.g. during energy labelling and MEPS tests) will be necessary to collect data.

Clothes Dryers

The survey measured 38 clothes dryers in total; a much larger number than in previous surveys. All units displayed an Energy Rating label. This survey found almost one third of models had an on/off switch and two models had a delay start function. This allowed measurements to be taken in active standby, off and delay start mode. In active standby the average power consumption was 1.7W with a maximum of 4.2W and a minimum of 0.0W. The average power consumption in off mode was 0.2W, with a maximum of 2.7W and a minimum of 0.0W. The two units with delay start function recorded consumption of 4.3W and 3.6W in this mode. End of program mode is also important for this product (typically

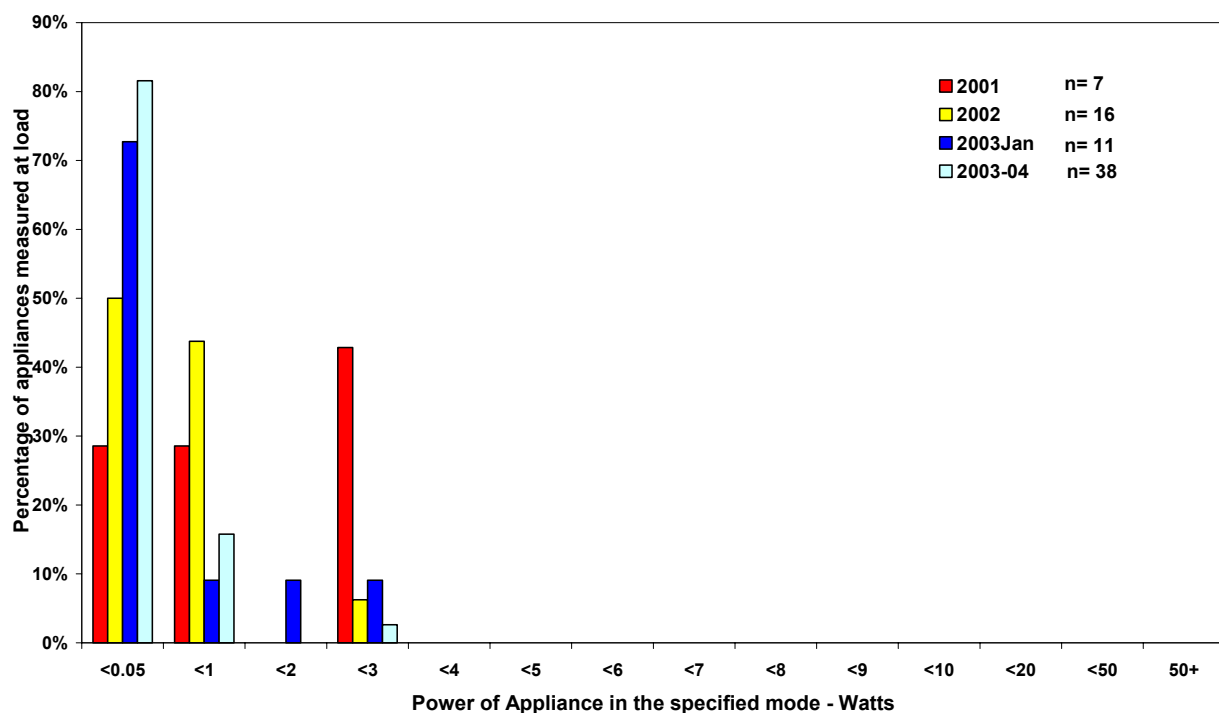
European machines) and cannot be determined in a store survey – laboratory measurements are required to determine the power consumption of this mode. Table 3 below summarises the results for clothes dryers.

Table 3 – A summary of clothes dryer results

Appliance:	Dryer			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	2	4.0	4.3	3.6
Active	12	1.7	4.2	0.0
Passive	NA	-	-	-
Off	38	0.2	2.7	0.0
Total Number of Units	38	NA	-	-

As presented in Figure 2 below, the vast majority of clothes dryers consume less than 1W in off mode. 82% of units measured in 2003/04 consume zero energy when in off mode and only one model consumed greater than 1W. It would seem there is a positive trend of decreasing standby consumption. The proportion of 2003/04 models with zero consumption is again more than double the 2001 results and almost 10% higher than 2003. In contrast with this, the range of results over the three years has been almost identical, with 0.0W being the minimum and 2.9W, 2.6W, 2.5W and 2.7W the maximum consumption recorded in each of the four years respectively. Consumer behaviour will influence the overall consumption of dryers, with the addition of on/off controls and delay start functions, these will need to be monitored in future surveys.

Figure 2 – Power measurements for clothes dryers: off mode



Clothes Washer/Dryers

Clothes washer-dryers are units that are capable of both washing and drying clothes in single or separate cycles. A total of 2 washer-dryers from different manufacturers were tested in this survey and both displayed Energy Rating labels. The two models were front loaders with a power on/off switch; one had a delay start function. They were tested in off, active standby and delay start mode. One machine had manual controls and recorded less than 1W power consumption in both off and active standby mode. The other model recorded much higher readings, with 3.9W in off; 5.9W in active and 7.9W in delay start. End of program mode is also important for this product (typically European machines) and cannot be determined in a store survey – laboratory measurements are required to determine the power consumption of this mode. A summary of these results can be found in Table 4.

Table 4 – A summary of clothes washer/dryer results

Appliance:	Washer/Dryer			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	1	7.2	7.2	7.2
Active	2	3.2	5.9	0.5
Passive	NA	-	-	-
Off	2	2.0	3.9	0.0
Total Number of Units	2			

Dishwashers

During the survey 50 dishwashers were measured. One model was found not to have an Energy Rating label displayed. The operating controls on the dishwashers varied, with some having mechanical dials while others had soft touch electronic controls. A quarter of units did not have a power on/off button and 16 models were identified as having a delay start function.

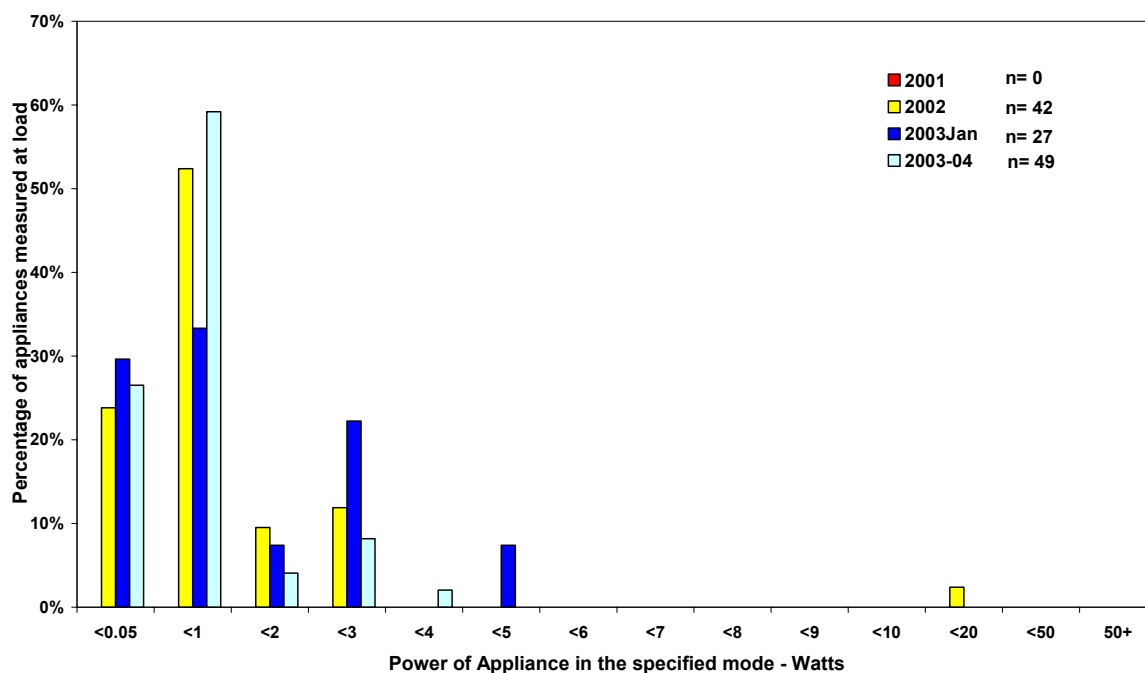
These appliances were measured only in delay start, active standby and off mode. Power consumption in delay start ranged from 1.1W to 8.1W, with the average being 3.6W. The consumption range for dishwashers in active standby was quite wide, with a minimum consumption of 0.1W, a maximum of 14.7W and an average of 3.0W. In off mode, consumption was mostly below 1.0W with average consumption of 0.4W. End of program mode is also important for this product (typically European machines) and cannot be determined in a store survey – laboratory measurements are required to determine the power consumption of this mode. Table 5 below summarises the in store results for dishwashers.

Table 5 – A summary of dishwasher results

Appliance:	Dishwasher			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	16	3.6	8.1	1.1
Active	34	3.0	14.7	0.1
Passive	0	NA	-	-
Off	49	0.4	3.3	0.0
Total Number of Units	50			

Figure 3 demonstrates that 86% of dishwashers in the 2003/04 survey consumed less than 1W, up from 63% of models in the 2003 survey. Average consumption also demonstrated a significant decrease, from 1W in 2003 to 0.4W in 2003/04.

Figure 3 – Power measurements for dishwashers: off mode



Washing Machines

The washing machine category includes both top loading models and front-loading machines. The machines varied in their rated capacity and most machines had power on/off switches. Nearly half of the units surveyed offered the delay start mode. Only one of the machines measured did not display an Energy Rating label.

In total, 85 washing machines were tested in the store survey. All machines were measured in off mode with one exception. 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 with most machines (72%) consuming between 2.0W and

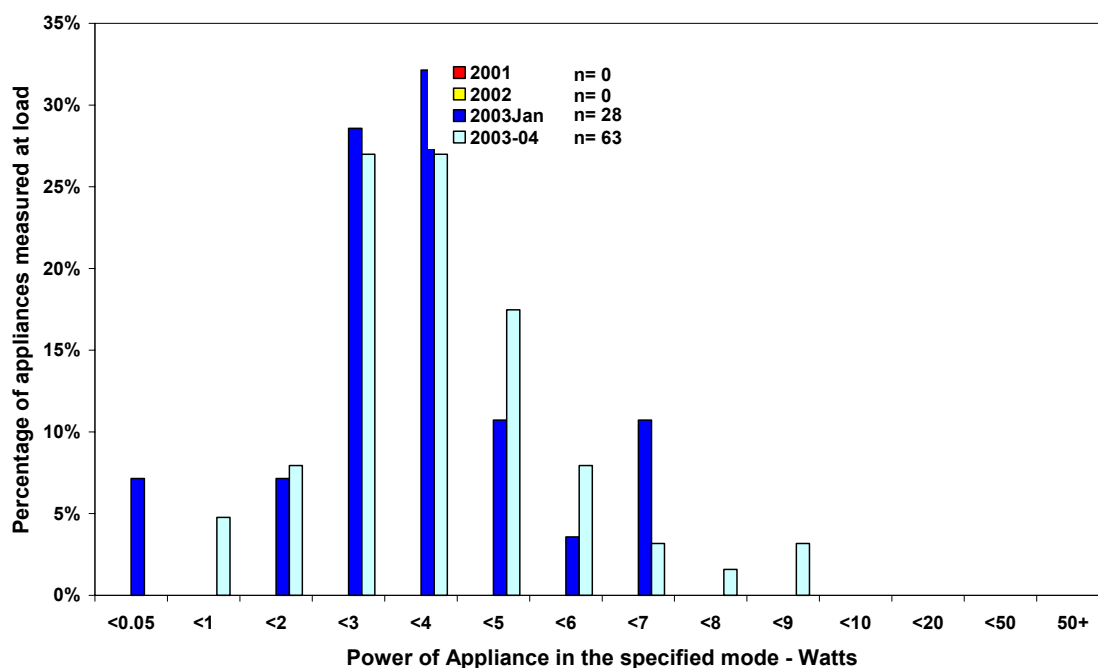
5.0W. In off mode the range of consumption was from 0.0W to 5.0W with an average consumption of 0.7W. While there was no common link between consumption and electronic controls in this mode, all the highest consuming models did have electronic rather than manual dials. Delay Start consumption was measured for the first time this survey and ranged from 1.0W to 8.3W with an average of 4.5W. End of program mode is also important for this product (typically European machines) and cannot be determined in a store survey – laboratory measurements are required to determine the power consumption of this mode. Table 6 below summarises the in store results for washing machines.

Table 6 – A summary of washing machine results

Appliance:	Washing machine			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	37	4.5	8.3	1.0
Active	63	3.5	8.7	0.1
Passive	NA	-	-	-
Off	84	0.7	5.0	0.0
Total Number of Units	85			

Active standby mode has only been measured in the last two surveys. The results in Figure 4 indicate this mode to be stable with average consumption at 3.2W in 2003 and 3.5W in 2003/04. While the 2003/04 results were spread over a larger range this is to be expected given that the sample was more than twice the size of the previous survey. However, unlike the 2003 survey, no machines were found to have zero consumption in active standby mode.

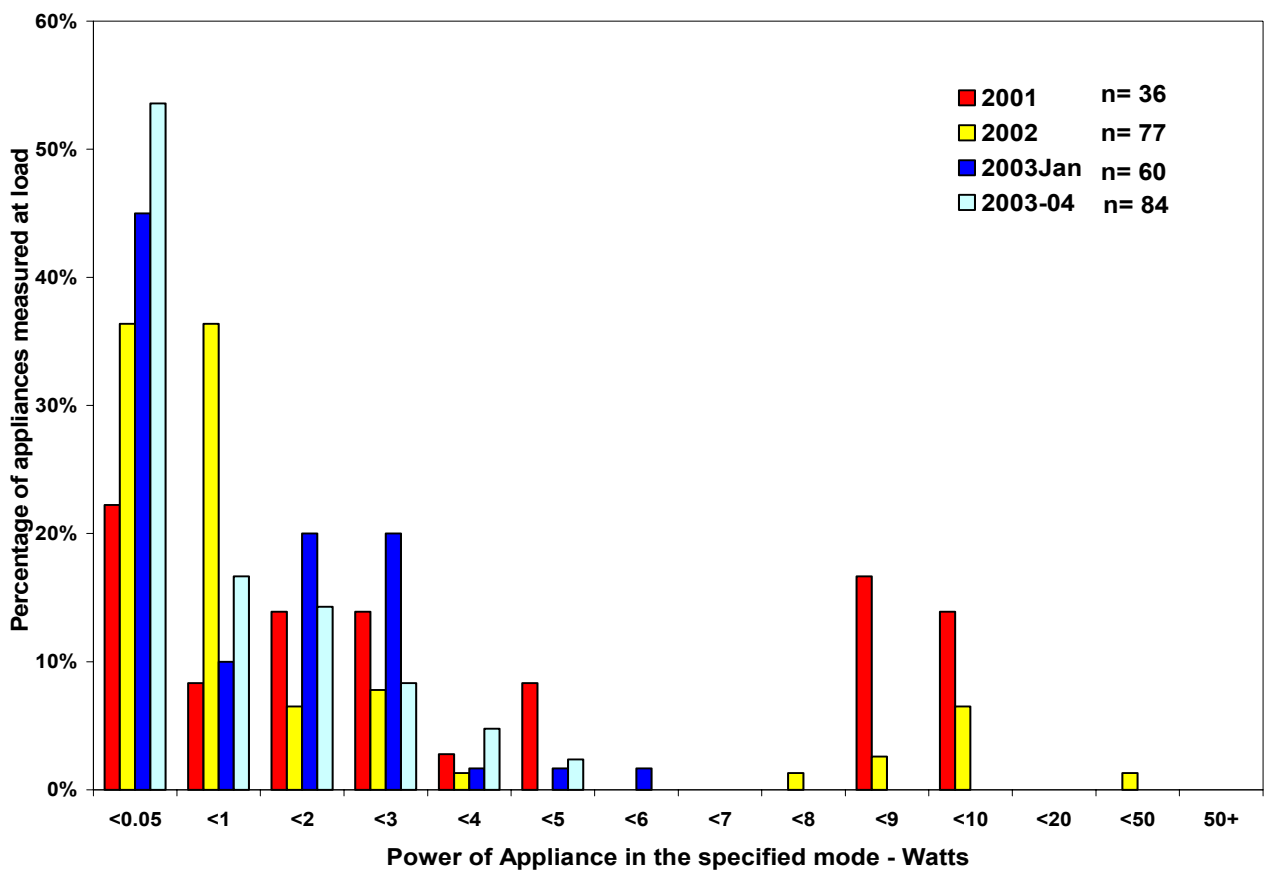
Figure 4 – Power measurements for washing machines: active standby mode



As demonstrated in Figure 5, 70% of washing machines in 2003/04 consumed less than 1W when in off mode, which is up from the previous survey (55%) and nearing the 2002 level of 73%. The proportion of models recording zero consumption has continued to increase, from 22% in 2001, steadily increasing to 54% in 2003/04. Additionally there were no models consuming over 5W. The growth in the number of models with no consumption would seem to indicate that those models with consumption greater than 1W should be able to improve their performance.

A comparison of the average power consumption of washing machines indicates that average off mode consumption has reduced from 1.7W in 2002 to 0.7W in 2003/04. This result is statistically significant² indicating that the decrease in standby consumption observed from the 2001 data has continued. The type of washing machine, i.e. front loader versus top loader, seemed to make no impact on the consumption results. However it should be noted that front loader sales are around 15% of total sales, yet front loaders made up 42% of the 2003/04 sample, which was similar to earlier surveys.

Figure 5 – Power measurements for washing machines: off mode



² Throughout this report, significance has been tested at 95% confidence level.

Cook Tops

Often also referred to as a hot plate or a hob, cook tops are available in gas or electric with a varying number of burners. Gas cook tops use electricity for ignition and/or clock functions. Cook tops were measured for the first time in the 2003/04 survey. All fifteen appliances measured were gas and had either four or five burners. None had a clock function. Cook tops were measured in off mode; no consumption was recorded for any model. Table 7 presents these results.

Table 7 – A summary of cook top results

Appliance:	Cook Tops			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	15	0.0	0.0	0.0
Total Number of Units	15			

Ovens

An oven refers to either a gas or electric oven that has no cook top burners. Gas ovens use electricity for ignition, fan, and/or clock functions. Ovens varied in size and were both fan-forced and conventional. Ovens were measured for the first time in the 2003/04 survey. Five ovens were measured in off mode; 2 were gas and 3 were electric. Clocks were present on 4 models and 2 ovens had the fan forced function available. The average consumption for ovens in off mode was 4.3W (including the units with a clock), with a maximum of 5.9W. One oven had zero consumption. Results for ovens are summarised in Table 8.

Table 8 – A summary of oven results

Appliance:	Oven			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	5	4.3	5.9	0.0
Total Number of Units	5			

Stoves

A stove refers to an appliance that combines both an oven and a cook top in the one unit (this is also called a cooking range). Stoves can be either gas or electric and use electricity for ignition, fan, and/or clock functions. Stoves were measured for the first time in the 2003/04 survey. Eighteen stoves were measured in off mode; 2 had gas cook tops with

electric ovens all the other models were gas only. Nine models had fan forced ovens, the cook tops had 4 or 5 burners and one model had a clock. The average consumption of stoves in off mode was 0.2W (including the unit with the clock), with a maximum of 1.1W. Nearly 80% of stoves had zero consumption in off mode. Results for stoves are summarised in Table 9.

Table 9 – A summary of stove results

Appliance:	Stove			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	18	0.2	1.1	0.0
Total Number of Units	18			

Range Hoods

A range hood is an extraction fan designed to remove steam and odours from above a cook top or stove. Range hoods can be operated by buttons (manual or electronic) or will automatically start when the hood is opened. Range hoods were measured for the first time in the 2003/04 survey. Thirty range hoods were measured in off mode only. The average consumption of range hoods in off mode was 0.5W, with a maximum of 7.5W. Around 90% of range hoods had zero consumption. Results for range hoods are summarised in Table 10.

Table 10 – A summary of range hood results

Appliance:	Range Hood			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	30	0.5	7.5	0.0
Total Number of Units	30			

Heaters – Electric Portable

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 and off mode. Portable electric heaters were measured for the first time in the 2003/04 survey. A total of 62 heaters were measured, all had off mode. While over 80% of heaters

had zero consumption in off mode, the maximum recorded was 3.7W. Only 6 models had delay start function. The average consumption in delay start mode was 1.6W, with a maximum of 2.8W and a minimum of 0.7W. Results for portable electric heaters are summarised in Table 10.

Table 11 – A summary of electric portable space heaters results

Appliance:	Heaters – electric portable			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	6	1.6	2.8	0.7
Active	NA	-	-	-
Passive	NA	-	-	-
Off	62	0.3	3.7	0.0
Total Number of Units	62			

Heaters - Gas

In the 2003/04 survey gas space heaters were measured for the first time. 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. A total of 29 gas heaters were measured. In off mode, nearly three quarters of models had zero consumption. The maximum consumption recorded was 5.8W and the average was 1.1W. The lowest possible state for four gas heaters was passive standby. All of these had a constant electronic clock display. These models ranged from 5.8W to 9.2W in passive standby. These four models also had a delay start feature which recorded consumption ranging from 5.8W to 9.2W. Gas heater results are summarised in Table 12.

Table 12 – A summary of gas space heaters results

Appliance:	Heaters – gas			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	4	8.0	9.2	5.8
Active	NA	-	-	-
Passive	4	7.2	9.0	5.2
Off	25	1.1	5.8	0.0
Total Number of Units	29			

Gas Water Heaters

In the 2003/04 survey instantaneous gas hot water units were measured for the first time. Electricity is used in gas water heaters for ignition and/or electronic controls. Water heaters were measured in off mode. A total of 4 water heaters were measured all were instantaneous systems. In off mode, the maximum consumption recorded was 8.9W and the minimum was 5.3W, this resulted in an average of 7.1W. Water heater measurements are summarised in Table 13.

Table 13 – A summary of gas water heaters

Appliance:	Gas water heaters			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
Delay Start	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	4	7.1	8.9	5.3
Total Number of Units	4			

Small Appliances

Breadmakers

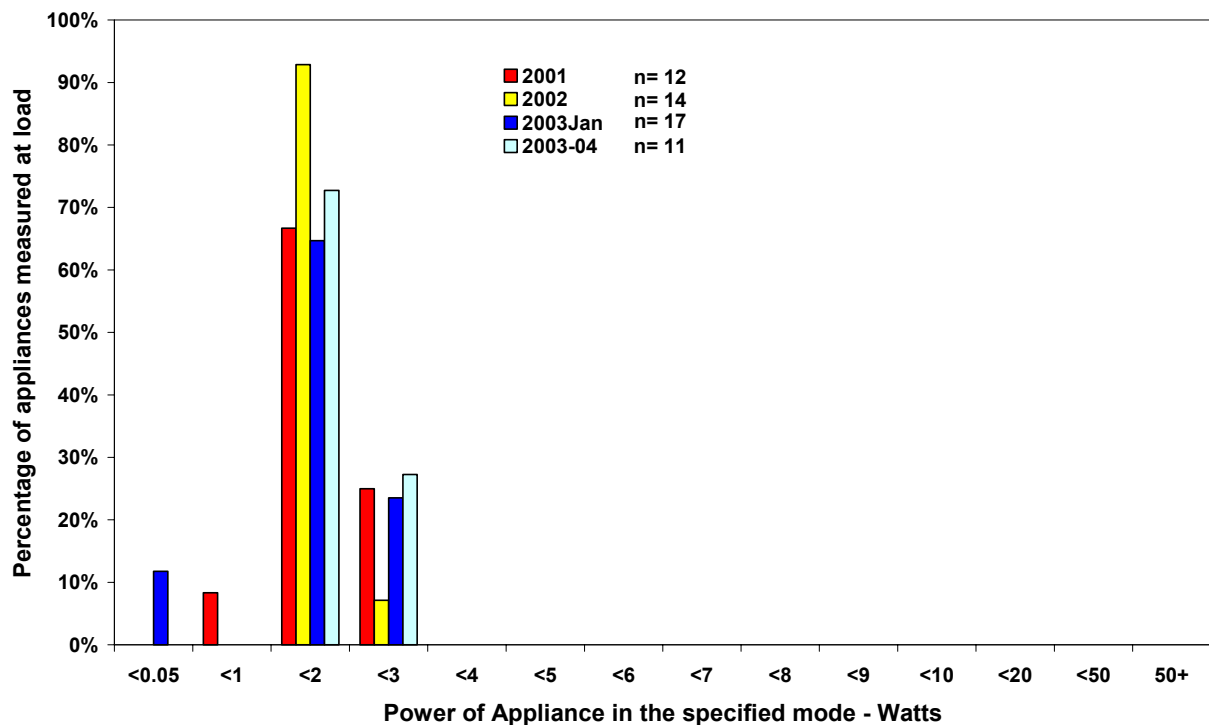
Most breadmakers when switched on are in active standby as a display is lit up and the machine is awaiting instructions from the user. In this survey, no units were found to have a power on/off button and as such the units were measured in active standby mode only. The average power used by breadmakers in active standby mode was 1.7W with a minimum of 1.2W and a maximum of 2.1W. Table 14 below summarises the results for breadmakers.

Table 14 – A summary of breadmaker results

Appliance:	Breadmaker			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	11	1.7	2.1	1.2
Passive	NA	-	-	-
Off	NA	-	-	-
Total Number of Units	11			

With a very small sample size, it is difficult to predict trends with any certainty; however Figure 6 indicates that power consumption for breadmakers in active standby is relatively stable, with most consuming less than 2W. In the 2003 and 2001 survey the average power consumption recorded for breadmakers was 1.6W and in 2002 it was 1.5W in active standby mode.

Figure 6 – Power measurements for breadmakers: active standby mode



Hand-held Vacuum Cleaners

A total of 6 hand-held vacuum cleaners were measured during the in-store survey. The main differences between models were size and whether the unit can vacuum wet and/or dry.

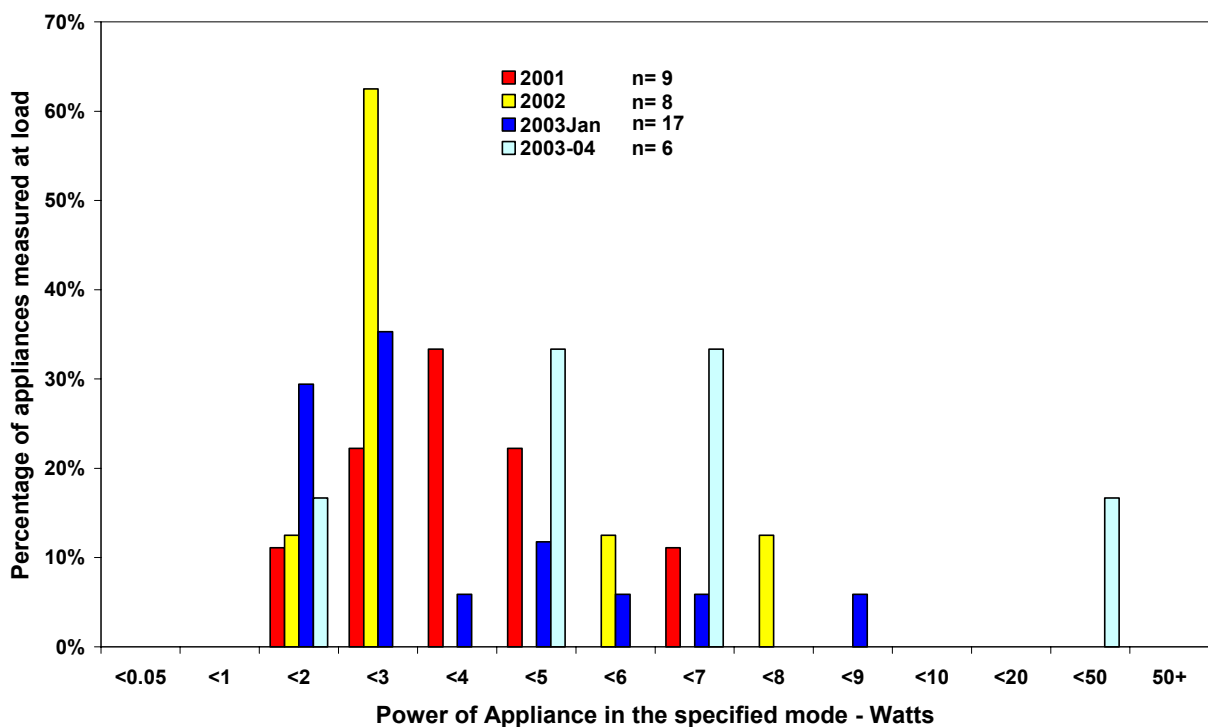
The hand-held vacuum cleaners were measured in active standby (plugged in and charging) and passive standby (the base station plugged in but not charging). One unit was measured with an unusually high active standby reading of 39.6W; 33W higher than the next model. Therefore the average of 10.5W for hand held vacuum cleaners in active standby has been skewed by this high reading and the small sample size. If this unit is excluded, the average is lowered to 4.7W when charging, with a maximum of 6.3W. When in passive standby the units recorded an average power consumption of 1.2W, a minimum of 0.8W and a maximum of 2.0W. In most cases the majority of this power consumption will be standing losses of the low voltage power supply which is typically a transformer. These results are summarised below in Table 15.

Table 15 – A summary of hand-held vacuum cleaner results

Appliance:	Hand-held Vac			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	6	10.5	39.6	1.5
Passive	6	1.2	2.0	0.8
Off	NA	-	-	-
Total Number of Units	6			

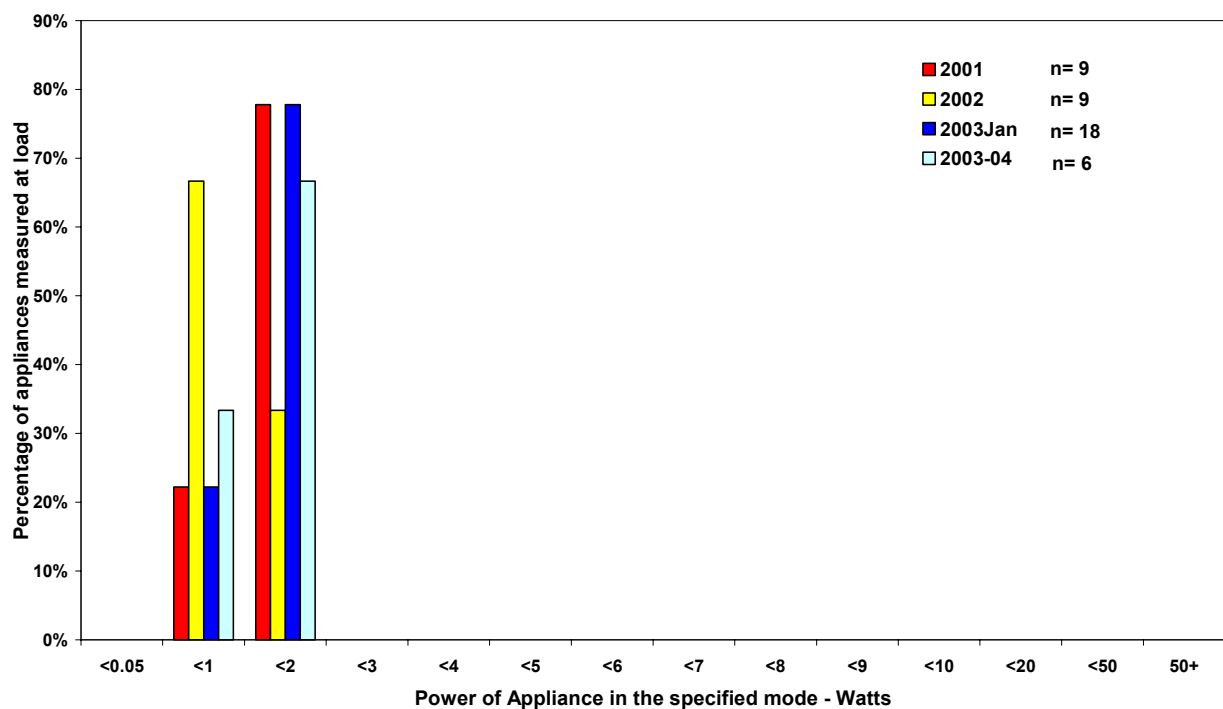
Figure 7 below shows the distribution of measurements for hand-held vacuum cleaners in active standby mode for the past 4 surveys. The graph demonstrates that for the 2003/2004 survey, most models consume more than 3W in active mode. While there has been little change in the range of measurements over the years, the maximum consumption recorded has been higher each survey. However, the sample size for this recent survey was the smallest to date, so care is required if using this data to suggest any change in the trend in recent years. Care is also required for this type of product, as the active standby measurement can be affected by the state of charge of the battery. A unit that has not been charged for some time is likely to draw far more power than a unit that has been on charge prior to the reading.

Figure 7 – Measurements for hand-held vacuum cleaners: active standby mode



In passive standby mode all hand-held vacuum cleaners consumed less than 2W, which is consistent with data from the previous three years as shown in Figure 8 below. Average passive standby for each of these years has also remained stable at around 1.0W.

Figure 8 – Power measurements for hand-held vacuum cleaners: passive standby mode



Microwave Ovens

The majority of microwave ovens measured in the surveys have a digital clock display and electronic controls. A very small number use mechanical controls (only eight units in this year's sample). The microwaves varied in size and included both combined convection/microwave and microwave only models.

Microwave ovens were measured in passive mode only (though models with mechanical controls should be classified as off mode). As demonstrated below in Table 16, the average power measured for microwaves was 2.8W with a minimum of 0.1W and a maximum of 6.6W. The eight units with mechanical controls and no clock had an average passive standby power consumption of 0.83W with a maximum of 2.9W (technically off mode).

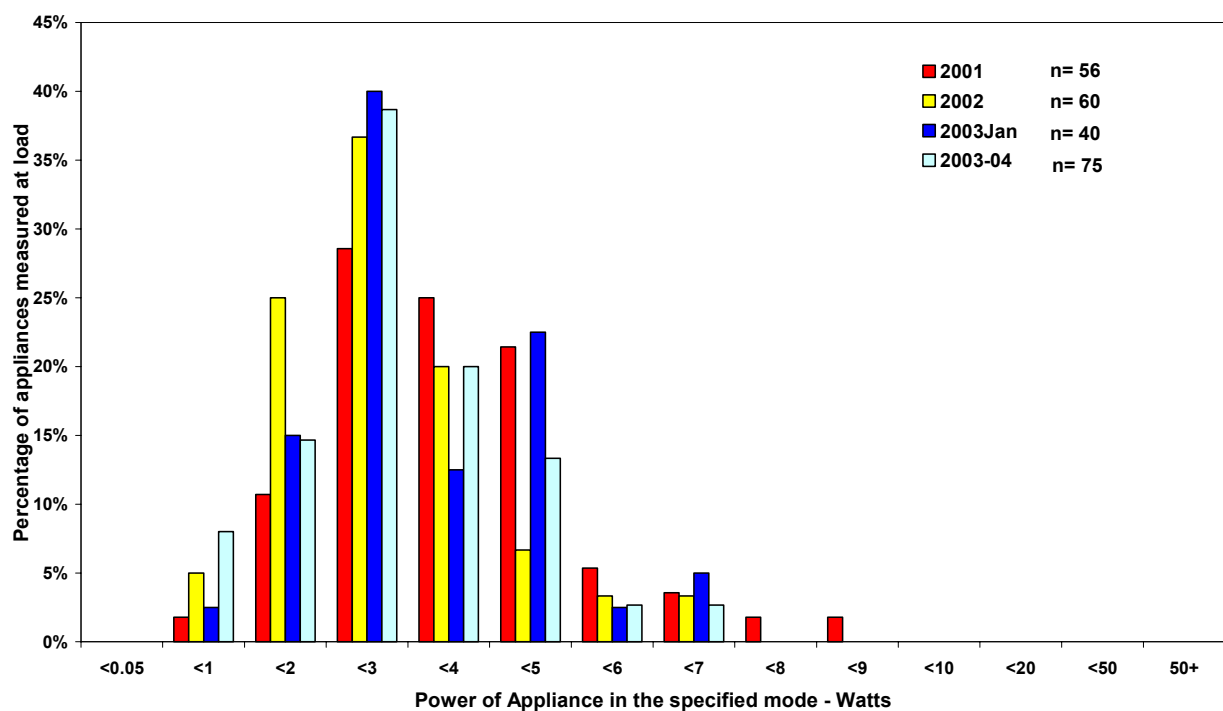
Table 16 – A summary of microwave results

Appliance:	Microwave			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	75	2.8	6.6	0.1
Off	NA	-	-	-
Total Number of Units	75			

Figure 9 shows that there may be a slight improvement in the power consumption of microwaves in passive standby mode. The distribution shows that in 2002, standby consumption was trending downwards, with a greater proportion of units consuming less than 3W when compared to 2001. Average passive standby consumption improved (i.e. decreased) significantly between 2001 and 2002, but rose again in 2003 (3.0W) with no statistical significance noted between 2001 and 2003. However in 2003/04 there is again a statistically significant decrease from the 2001 figures, although no relationship between this year's survey and the results of 2002 and 2003.

It appears that passive standby consumption is potentially decreasing for microwaves, although until data is collected in forthcoming years it may be premature to indicate that a improving trend is emerging.

Figure 9 – Power measurements for microwaves: passive standby mode



Espresso Machines

Forty-six espresso machines were measured in the survey including a mixture of pump operated and steam operated machines. Units were measured in off mode, however for three units active standby was the lowest mode of operation. Readings were also taken in active standby. Eleven units did not have an active standby mode; when switched on they performed a function.

In off mode, 43 machines were measured with an average off mode power consumption of 0.4W. Results ranged from a minimum of zero and a maximum of 4.3W. See Table 17 below for more details.

In active standby, all machines were measured with high power levels. 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 only provides indicative results of the range of power consumption that occurs. While consumption in active mode was recorded, the findings have not been presented here in detail as they offer a distorted picture, providing qualitative rather than quantitative information about the consumption pattern of active standby.

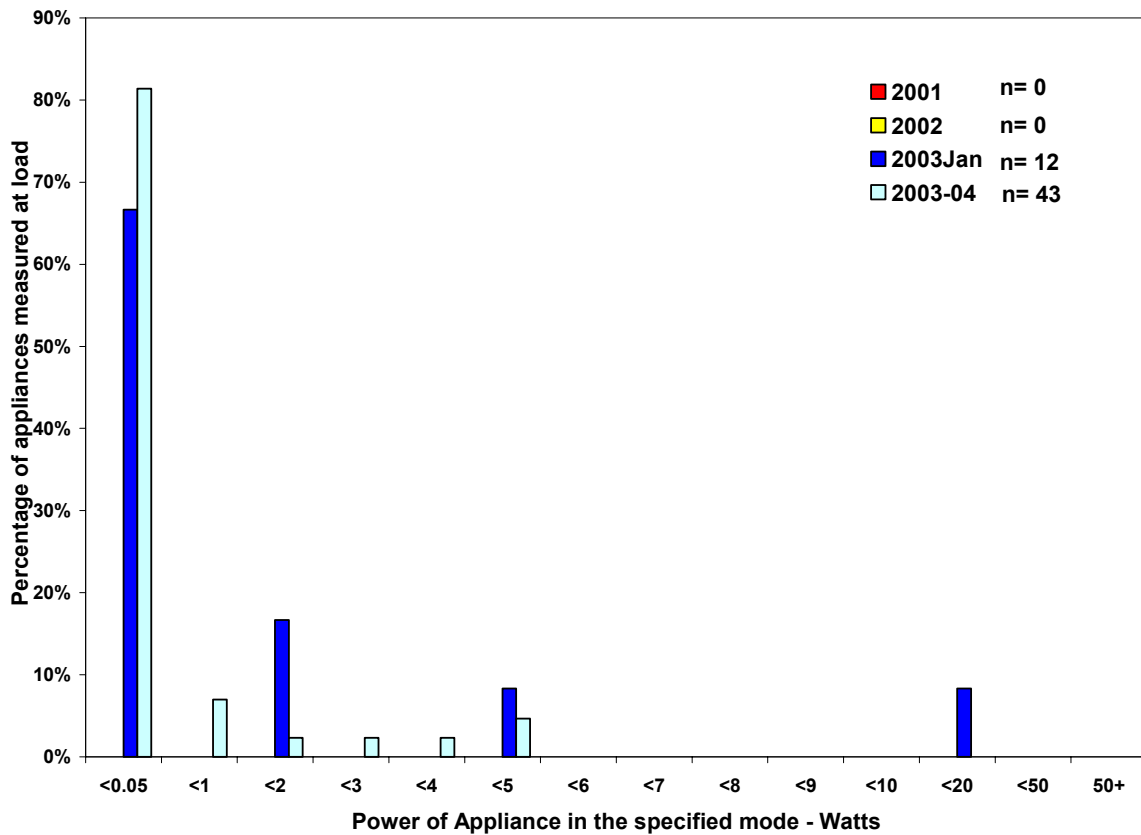
During the store survey, units were plugged in for a two minute period to allow time for the machine to power down. Nearly a third of units powered down during this time. The other units either have a longer cycle or do not power down. The maximum consumption measured in active standby mode was 1,631W while the minimum was 0.3W. More quantitative results may be able to be returned by exploring different test method options.

Table 17 – A summary of espresso machine results

Appliance:	Espresso Machine			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active		-	1631	0.3
Passive	NA	-	-	-
Off	43	0.4	4.3	0.0
Total Number of Units	46			

Espresso Machines were also measured in the 2003 store survey. Figure 10 below demonstrates that the overwhelming majority of machines have no consumption in off mode and only 12% of 2003/04 units consume more than 1W in this mode. The graph indicates that a small improvement has occurred since last years survey, however as the 2003 sample was quite small there is no statistical significance.

Figure 10 – Power measurements for espresso machines: off mode



Computers, Peripherals, Office Equipment

Computers - Hard Drive/CPU Box

A total of 39 computers were included in the store survey. The measurements included only the hard drive/CPU box with peripherals such as monitors and printers measured separately. None of the products measured displayed an ENERGY STAR label. Portable/laptops were measured separately and are reported on in the following section.

Computers were measured in off mode only with one exception: One model was recorded as passive because it had a constant visual display with a built in clock. 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.

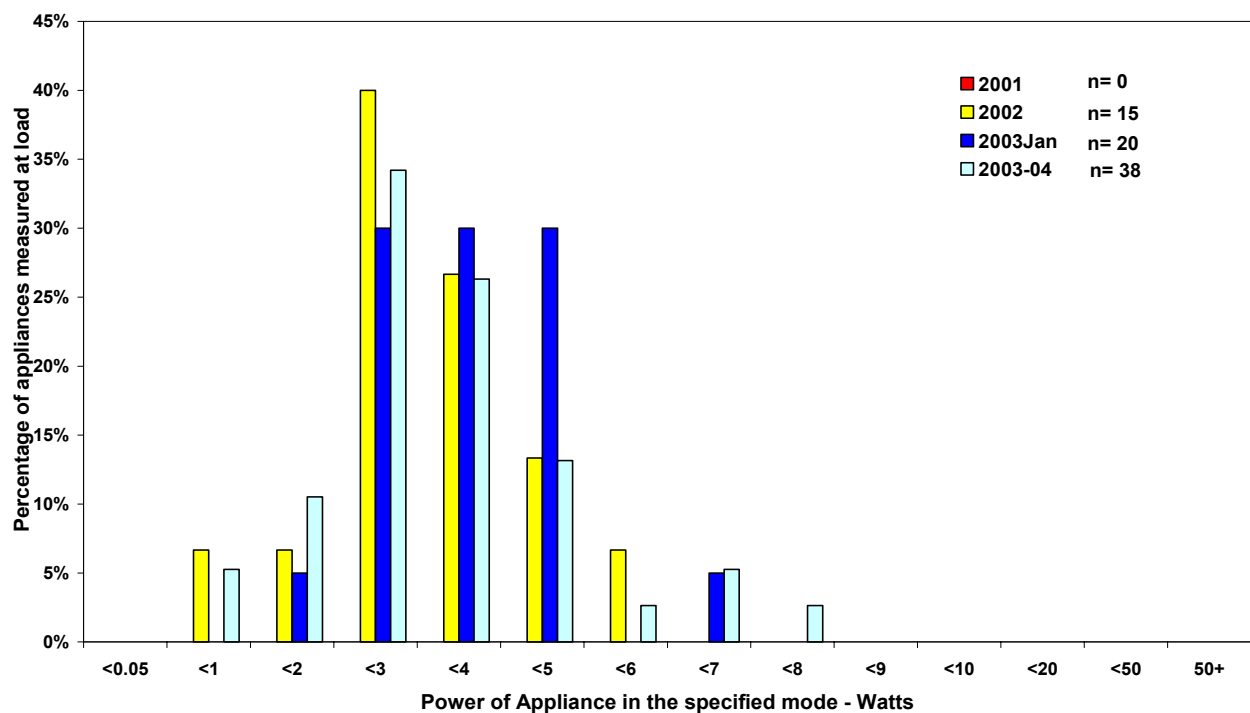
The average off mode power consumption was 3.2W with the highest consuming unit using 7.9W and the lowest using 0.5W. These results are summarised in Table 18 below.

Table 18 – A summary of Hard Drive/CPU Box results

Appliance:	Computers - Box			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	1	3.4	3.4	3.4
Off	38	3.2	7.9	0.5
Total Number of Units	39			

As illustrated in Figure 11, the majority of computers consume between 2W and 5W in off mode. While the average consumption was similar to the 2003 survey a larger proportion of models were at the high end machines (high speed processors, advanced graphics, etc.) with one model recording more than 7W. Additionally, unlike the 2003 survey, two units consumed less than 1W in off mode. Overall these results indicate a stable off mode.

Figure 11 – Power measurements for computers: off mode



Computers- Portable/Laptop

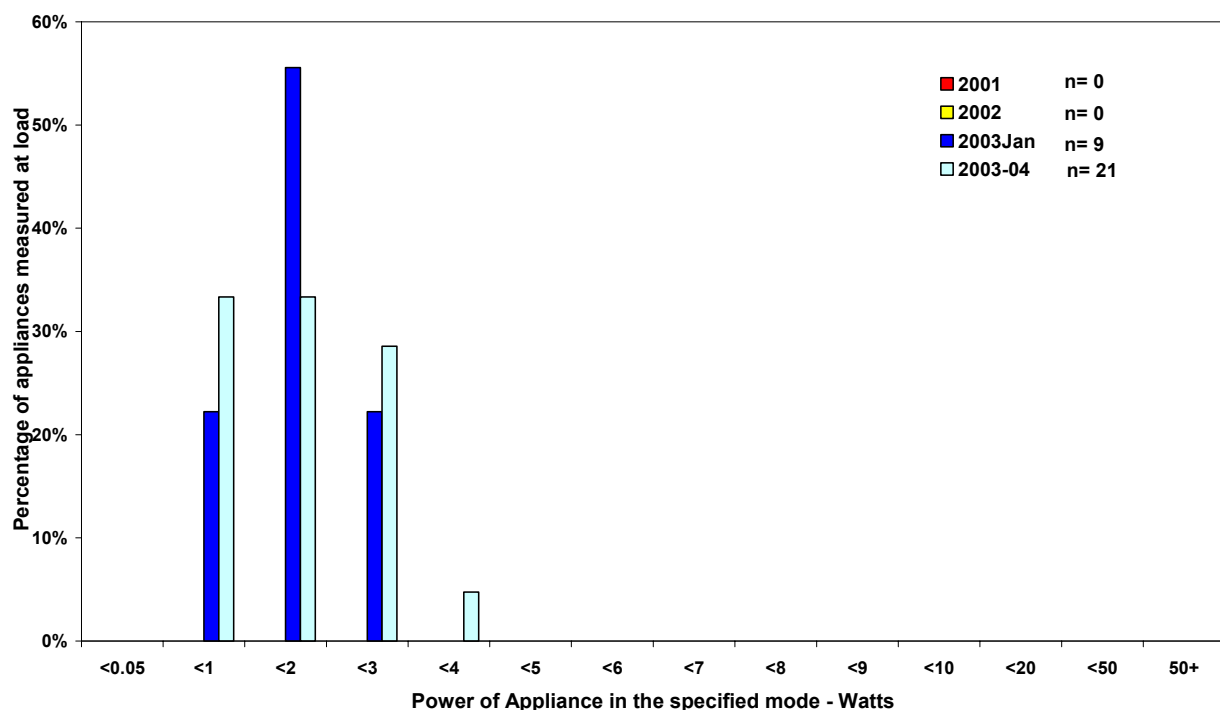
A total of 21 portable computers were included in the in store survey. None of these displayed an ENERGY STAR label. The units were measured in off mode only (meaning the no load power consumption of the laptop external power supply which was not connected to the laptop itself). A minimum power consumption of 0.6W was recorded with an average consumption of 1.5W. The results are summarised in Table 19 below.

Table 19 – A summary of laptop computer results

Appliance:	Computers - Laptop			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	NA	-	-	-
Off	21	1.5	3.2	0.6
Total Number of Units	21			

Figure 12 below compares the portable computer measurements from the last two surveys. There is little difference between the results especially when taking into account the large difference in sample sizes. The average consumption was 1.4 in 2003 and 1.5 in 2003/04. In off mode, the majority of portable computers use less than 2W and one third of the 2003/04 models use less than 1W.

Figure 12 – Power measurements for portable computers: off mode



Computer Monitors

This year's survey included a much larger number of computer monitors than in any previous sample. In all, 73 monitors were measured. They ranged in size from 15 inch (38cm) to 19 inch (48cm) screens and included both LCD (75%) and CRT (25%) monitors. Eight monitors were recorded as having external power supplies for their power source. Most were measured in off mode only, however two models had passive standby as the lowest possible state. Additionally three models were measured in passive standby as they

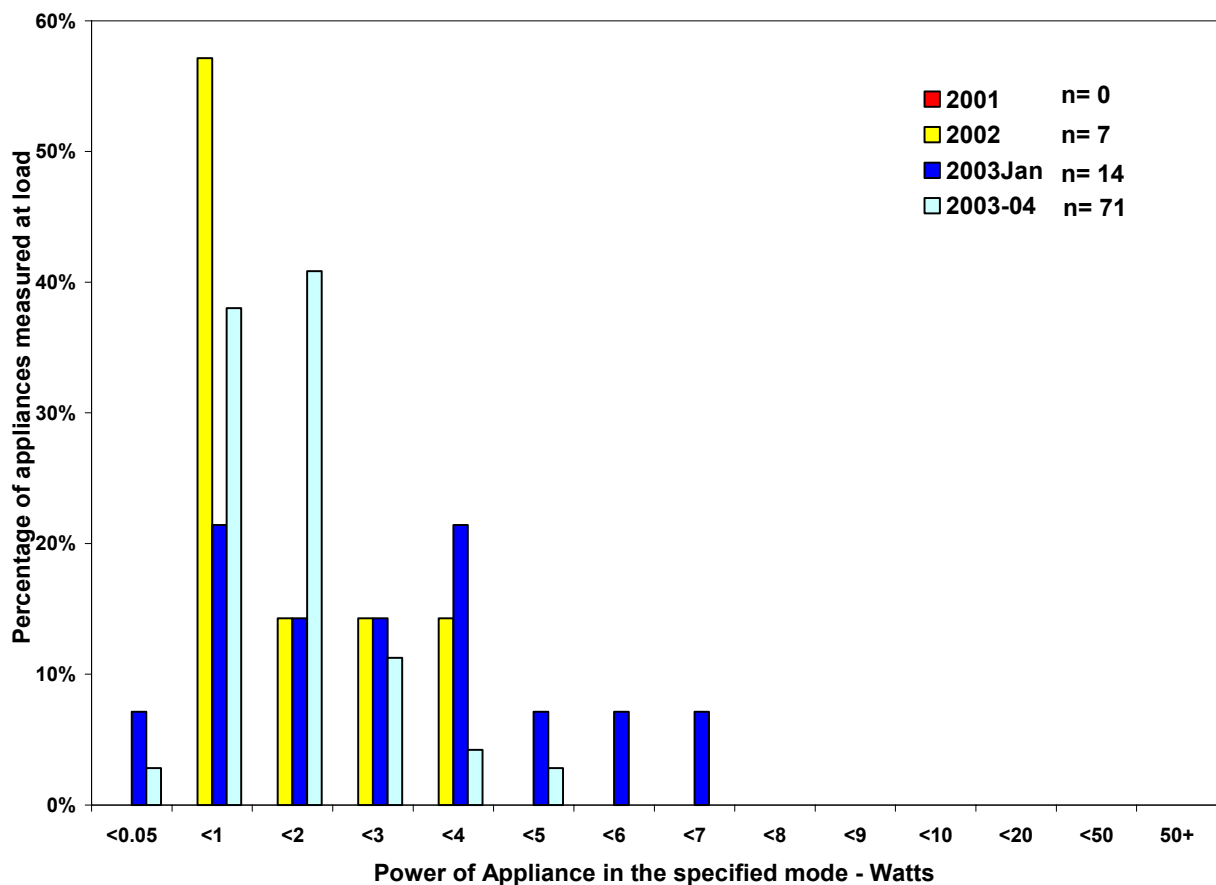
had both standby and hard off switches. Two of the monitors measured displayed an ENERGY STAR label. The average off mode power consumption was 1.4W with a minimum of 0.0W and a maximum of 4.3W. The results for computer monitors are summarised in Table 20 below.

Table 20 – A summary of computer monitor results

Appliance:	Computers - Monitor			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	5	1.7	3.9	0.9
Off	71	1.4	4.3	0.0
Total Number of Units	73			

The overwhelming majority of monitors consume some energy in off mode. As shown in Figure 13 only 3 monitors in the past three years have had zero off mode consumption. Most models were found to consume more than 1W, however in comparison to the 2003 survey there has been a statistically significant decline in off mode consumption with the average reducing from 2.6W in 2003 to 1.4W in 2003/04. Additionally the distribution of values has also shrunk from a maximum in 2003 of 6.3W to 4.3W in 2003/04. This may be due to the higher number of LCD screens sampled in the 2003/04 survey.

Figure 13 – 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 as they may now include sub woofer and surround sound packages. The 2003/04 survey was able to test 13 units in off mode and 8 units in active standby (ie. no sound being produced). Average active standby consumption was 4.1W with a minimum of 1.5W and a maximum of 4.1W. The average consumption in off mode was 2.8W with a minimum of 0.0W and a maximum of 6.1W. Most speakers consumed between 1W and 3W. In the 2002 survey two speakers were recorded with off mode consumption of 2.4W and 2.6W. The results are summarised in Table 21.

Table 21 – A summary of computer speaker results

Appliance:	Computer speakers			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	8	4.1	6.8	1.5
Passive	NA	-	-	-
Off	13	2.8	6.1	0.0
Total Number of Units	13			

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. Six of these units were measured during the survey. Five Home Theatre Boxes were measured in off mode only. Consumption ranged from 2W to 5.9W, with an average of 4W. One model had a permanent display panel with a clock, which made passive standby its lowest possible state. This unit consumed 6W in passive standby.

Table 22 – A summary of Home Theatre Box results

Appliance:	Computers - Home Theatre Box			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	1	6.0	6.0	6.0
Off	5	4.0	5.9	2.0
Total Number of Units	6			

Printers – Inkjet

A total of 35 inkjet printers were tested during the in-store survey. None of the printers measured 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.

During the survey inkjet printers were measured in off mode and in passive mode; switched on ready to print (but not printing). All models had a power on/off switch. When in passive standby the average power consumption was 5.2W with a maximum consumption of 15.1W and minimum of 1.2W. In off mode, the average power was 1.3W with a maximum of 5.7W and a minimum of 0.0W. Table 23 summarises these findings.

Table 23 – A summary of inkjet printer results

Appliance:	Printer - Inkjet			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	35	5.2	15.1	1.2
Off	35	1.3	5.7	0.0
Total Number of Units	35			

The power measurements for inkjet printers in passive mode are displayed in Figure 14. In 2003/04 there has been little change in the passive mode consumption with all printers consuming more than 1W. Average power consumption has remained stable (5.5W in 2002, 6W in 2003 and 5.2W in 2003/04).

Figure 14 – Power measurements for inkjet printers: passive standby mode

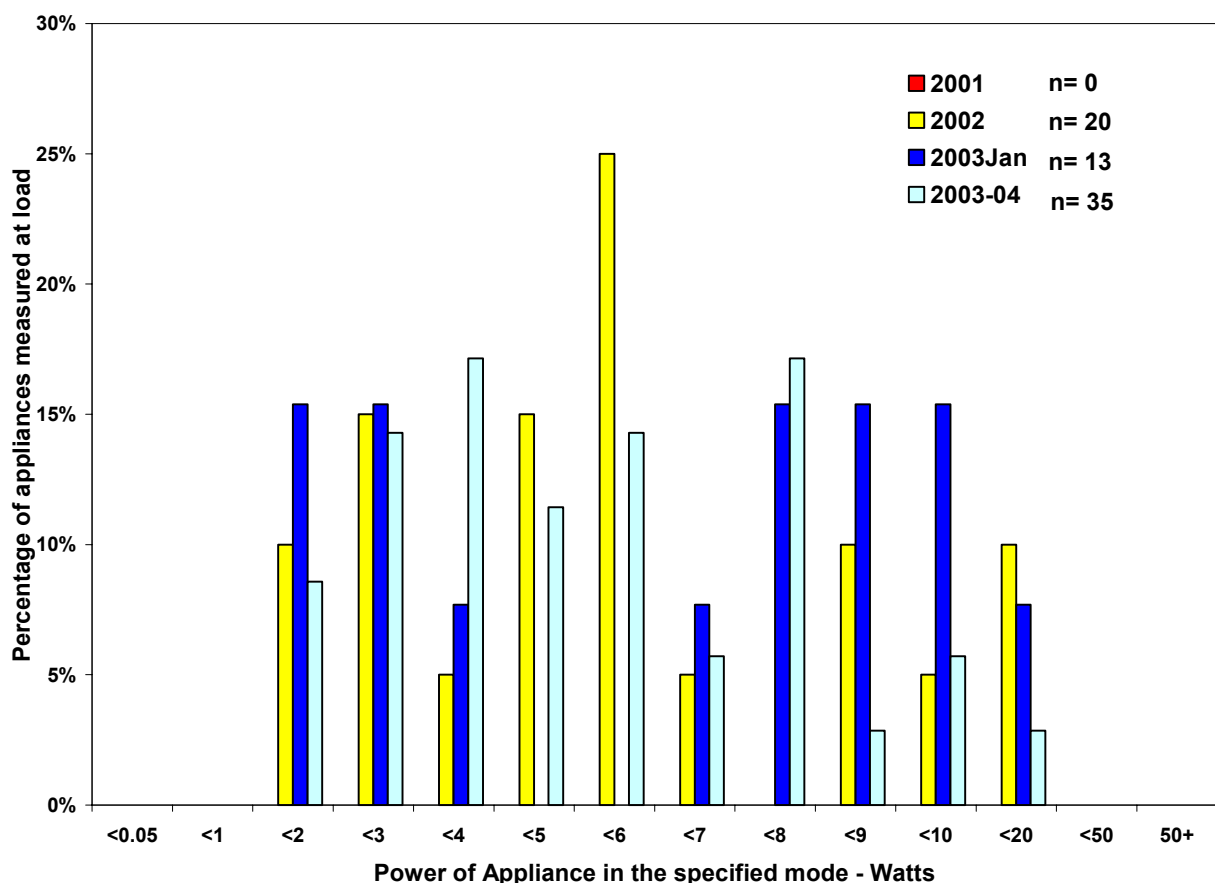
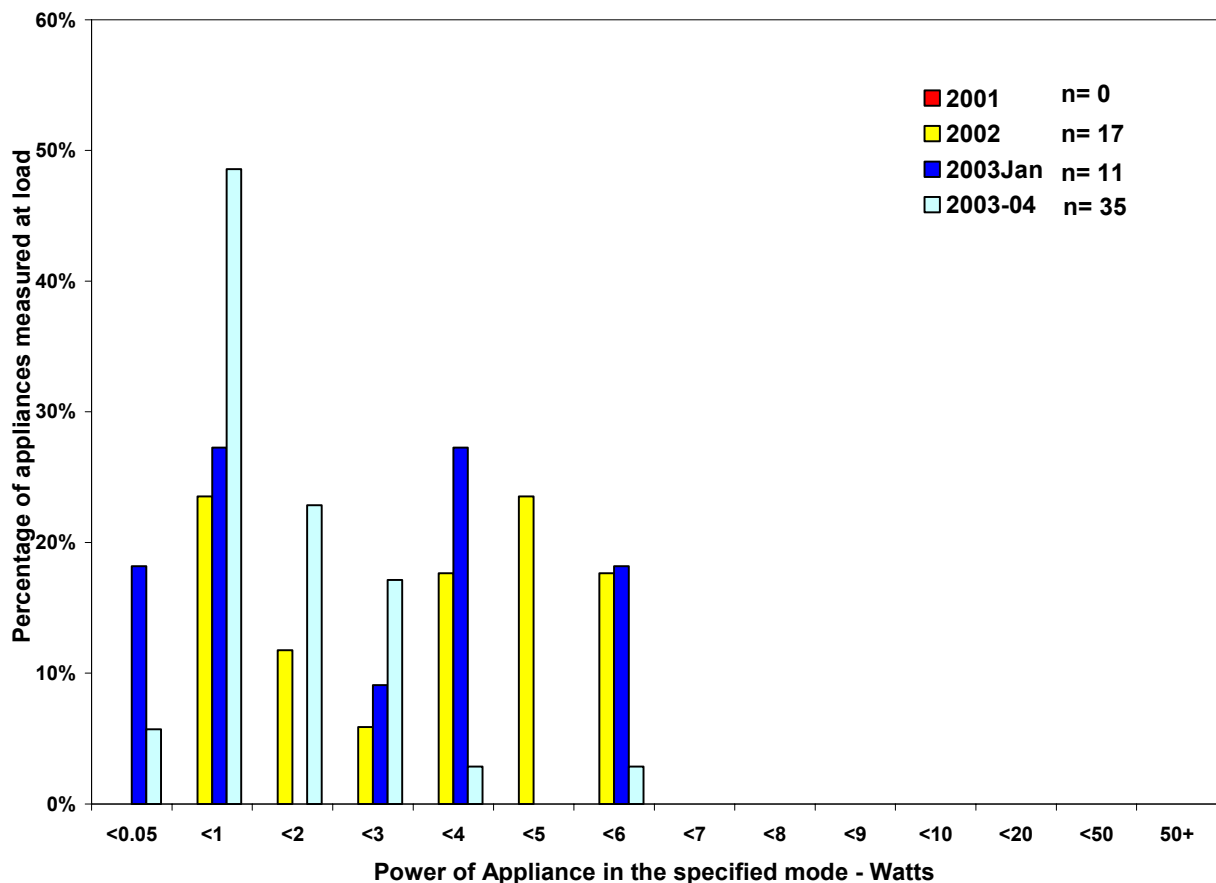


Figure 15 presents the power consumption results for inkjet printers in off mode. These results indicate that consumption may be trending downwards, i.e. decreasing. Average power consumption has been lower for each survey undertaken over the past 3 years (3W in 2002, 2.4W in 2003, 1.4W 2003/04). The decrease in the 2003/04 survey is statistically

significant when compared to the 2002 results. Additionally, the number of models that consume less than 1W in off mode, jumped from 24% in 2002 to 55% in 2003/04.

Figure 15 – Power measurements for inkjet printers: off mode



Printers – Lasers

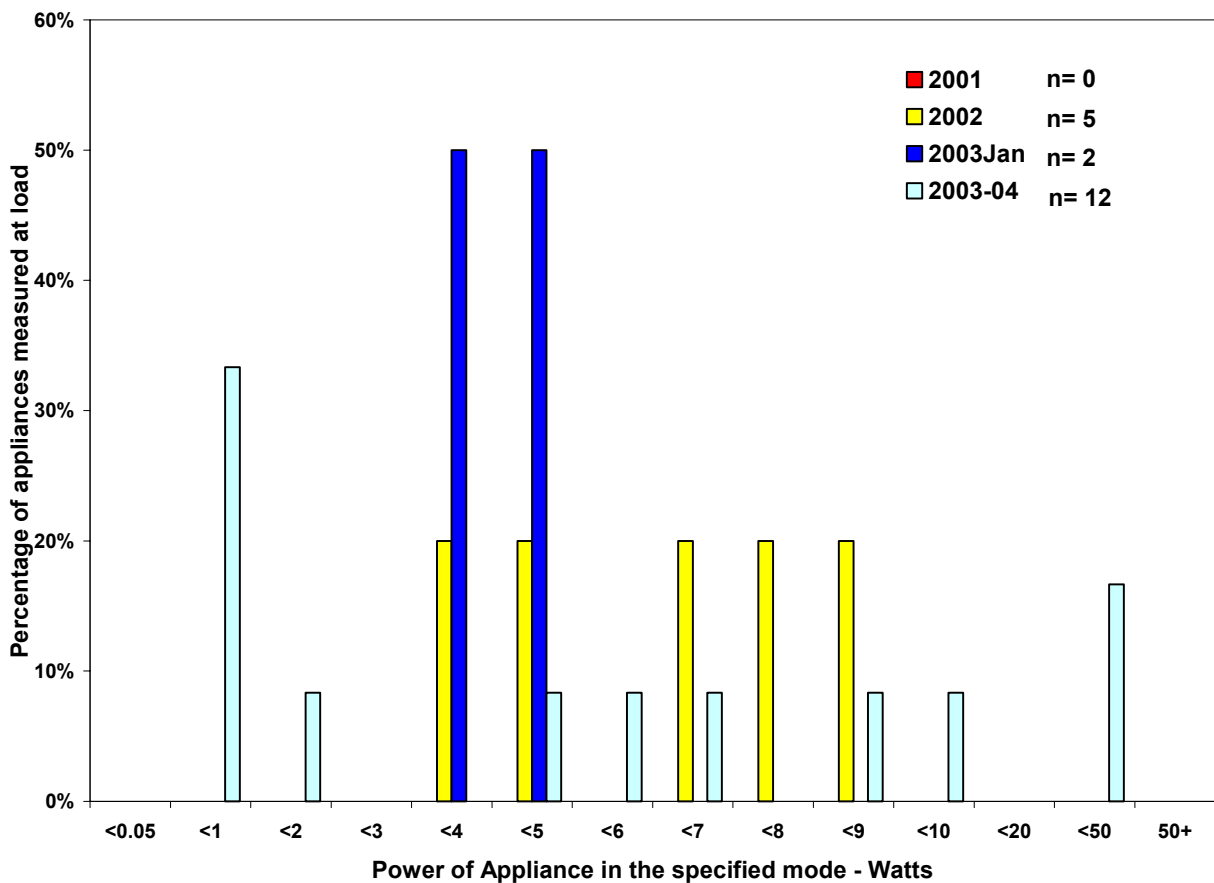
The 2003/04 survey tested 12 laser printers in passive standby and in off mode. Only one model displayed an ENERGY STAR label. The average power consumption in passive standby mode was 6.9W with a maximum of 21.9W and a minimum of 0.6W. In off mode all laser printers recorded zero consumption, as was the case in 2002 and 2003.

Table 24 – 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	12	6.9	21.5	0.6
Off	12	0.0	0.0	0.0
Total Number of Units	12			

The 2003/04 survey was able to gather information on nearly double the number of printers than previous surveys. The average consumption in passive standby was much higher. However, this is due to a broad range of results spanning from less than 1W to 21.5W. In both the previous surveys no models consumed less than 3W, whereas in 2003/04 a quarter of laser printers tested consumed less than 1W in passive standby. Given the small sample sizes (5 in 2002, 2 in 2003 and 12 in 2003/04) it would be unwise to predict any trends at this stage. Figure 16 presents these results.

Figure 16 – Power measurements for laser printers: passive standby mode



Once again all laser printers recorded 0.0W in off mode.

Printers – Photo

New to the store survey in 2003/04 was the photo printer. This product is essentially a small inkjet printer which allows direct printing from a digital camera and is designed to perform optimally when producing photographic quality prints. The popularity of this item may increase in the coming years as digital cameras become more prevalent. Six models were found in stores with an average passive standby consumption of 4.7W. The average consumption in off mode was 2.9W with all models consuming more than 2W. Two models had no off mode.

Table 25 – A summary of photo printer results

Appliance:	Printer - photo			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	NA	-	-	-
Passive	6	4.7	6.7	2.8
Off	4	2.9	4.4	1.1
Total Number of Units	6			

Other Computer Peripherals

This year the survey visited computer stores, and specifically targeted modems. However even specialised computer shops did not display working modems. All stores had only empty modem cases displayed for security reasons. Additionally, scanners were once again not recorded due to the stores not displaying the units as working models. However, measurements were taken on a new product, a video splitter. A video splitter allows images to be displayed on several monitors from a hard drive. The unit measured consumed 2.2W in off mode and had an active standby consumption of 4.4W.

Facsimile Machines

Facsimile machines were measured for the first time in the 2003/04 survey. Fax machines are differentiated by printer type, phone type, answering machine and visual display screens. In this sample of 20 faxes, only one model used laser printing, 2 units had cordless telephones, 7 had built in answering machines and all had a visual display screen. Active standby is deemed the lowest possible state for this appliance and as such the machines were measured only in this mode. Average consumption was recorded at 5W with the units evenly distributed between 2.7W and 8.6W. These results are summarised in Table 26.

Table 26 – A summary of facsimile results

Appliance:	Facsimile			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	20	5.0	8.6	2.7
Passive	NA	-	-	-
Off	NA	-	-	-
Total Number of Units	20			

Multi Function Devices

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. The 2003/04 survey was the first time

MFD's have been measured. These appliances were measured in active mode, as this is the lowest possible state for many models (especially those with telephone function). Where appropriate, the units were also measured in off mode. In all, 35 MFD's were measured. They consisted of six different combinations of functions with copier, printer fax the most common (40%). However function appeared to have no impact on consumption. Two models displayed and ENERGY STAR label. In active mode the average consumption was 9.3W with a minimum of 2.5W and a maximum of 24W. As demonstrated in Table 27, sixteen units were measured in off with an average consumption of 6.8W. Models consuming more than 8W in off made up 57% of the sample, with only 13% having zero consumption.

Table 27 – 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	35	9.3	24.0	2.5
Passive	NA	-	-	-
Off	16	6.8	10.9	0.0
Total Number of Units	35			

Home Entertainment Equipment

Standard Televisions (CRT)

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 televisions ranged in size from 34cm to 108cm, with the average size on display being 64cm. The 2003/04 survey tested 107 televisions, all of which were colour sets.

Televisions were measured in the following mode: in-use (on), passive standby and off. One unit could not be measured in use as the remote control could not be located and it had no manual controls built into the unit. The average power consumption for a television in use was 78.9W with a maximum of 199.3W and a minimum of 28.6W. The average crest factor (2.68) and average power factor (0.68) were both moderate.

Ninety-one televisions were measured in passive standby mode, 15 units could not be measured due to remote controls not being available and a manual standby function not present. In this mode the average power consumption was 4.2W with a maximum of 13.6W and a minimum of 0.4W. Low average power factor was recorded at 0.68 with a moderate average crest factor of 3.2.

One television could not be measured in off mode as the off button was not working. The average consumption recorded was 0.0W. The highest reading was 0.2W. Both average power factor and average crest factor were low at 0.0 and 0.3 respectively. Table 28 summarises these results.

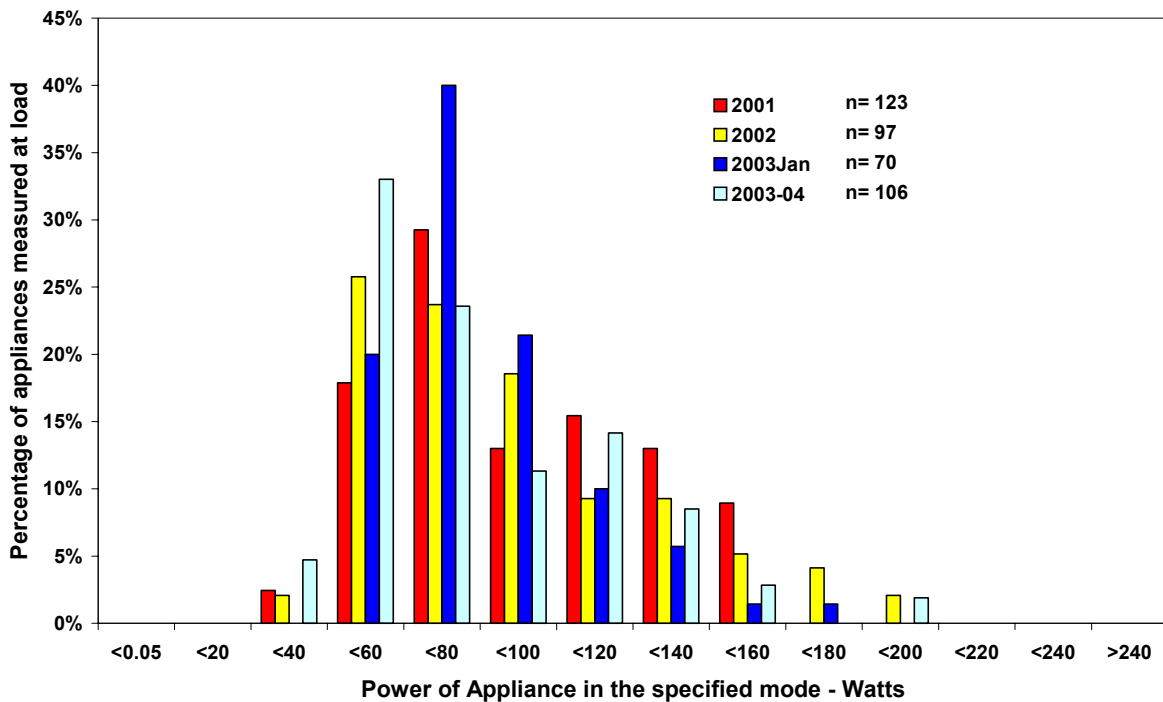
Table 28 – A summary of standard television results

Appliance:	TV - standard					
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Average Crest Factor	Power Max	Power Min
In Use	106	78.9	0.68	2.68	199.3	28.6
Active	NA	-	-	-	-	-
Passive	91	4.2	0.34	3.20	13.6	0.4
Off	106	0.0	0.30	6.51	0.2	0.0
Total Number of Units	107					

Twelve televisions from the sample displayed an ENERGY STAR label. One model recorded a passive standby reading of 3.4W which is higher than the criteria required to display the label (i.e. consumption was less than 3W). Two of the models did not have a remote control available and so could not be tested in passive standby to determine if the ENERGY STAR criteria were being met. As of 1 July 2004 the energy star criteria has been reduced to 1W. Only three of the televisions currently displaying energy star labels will meet these new criteria, with most consuming 2W or more in passive standby mode.

Figure 17 shows the distribution of power measurements for television in-use (on) mode for the years 2001 through to 2003/04. The chart shows that the majority of televisions use between 50W and 100W, although each survey has seen an increase in those using less than 50W. Average in-use power consumption fell significantly from the 2001/2002 surveys to the 2003 and 2003-04 surveys from around 88W to 79W. This trend to lower power should be treated with caution as no correction for size or features has been included; only further analysis and future monitoring will reveal if in-use consumption is actually trending downwards. It should be noted that previous reports suggested that the decrease in consumption may have been effected by the larger number of small screen size models being measured. However in 2003/04 the average screen size was the same as for 2002 (62cm) and the proportion of models over 80cm was the largest yet at 20% of models.

Figure 17 – Power measurements for standard televisions: in-use mode

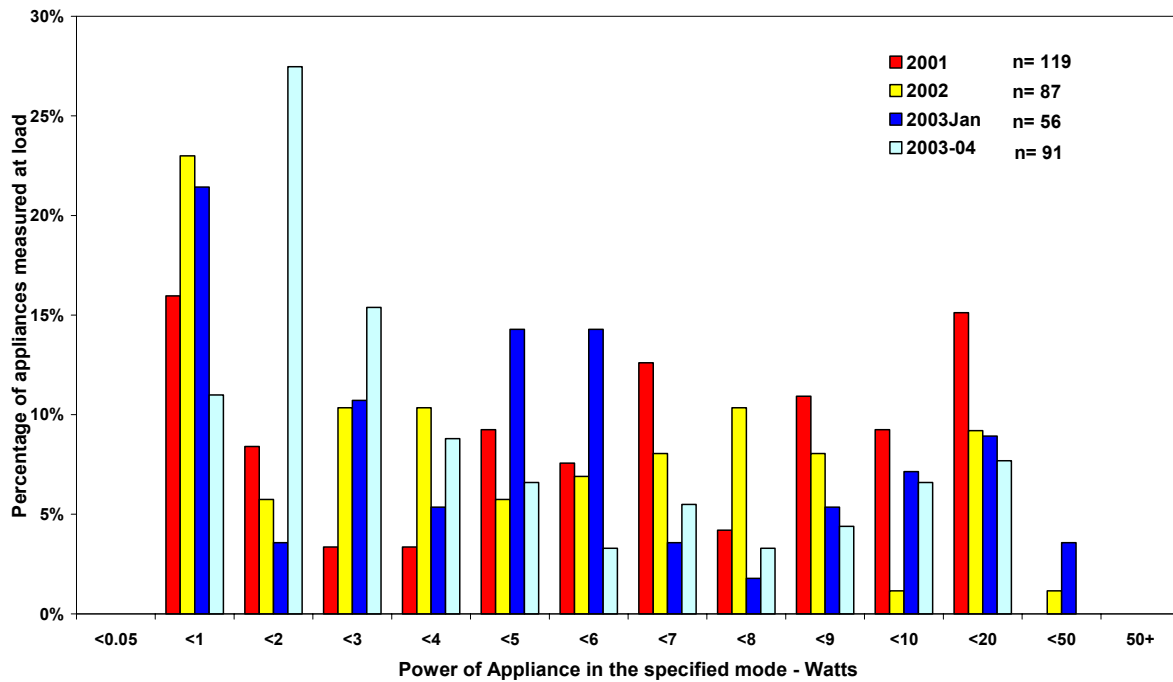


Note: This figure has non standard power bin sizes.

Passive standby mode in 2003, as in previous years, showed readings that were widely distributed. Around 20% of televisions consumed less than 1W in passive standby, which is a slight improvement since 2001. However, as Figure 18 shows, there are still a high proportion of units with passive standby of between 4W and 6W (28%). Average consumption in passive standby in 2001 was 6W and this fell (although not significantly) to 5.1W in 2002. In 2003, the average was 5.9W with no statistically significant improvement noted.

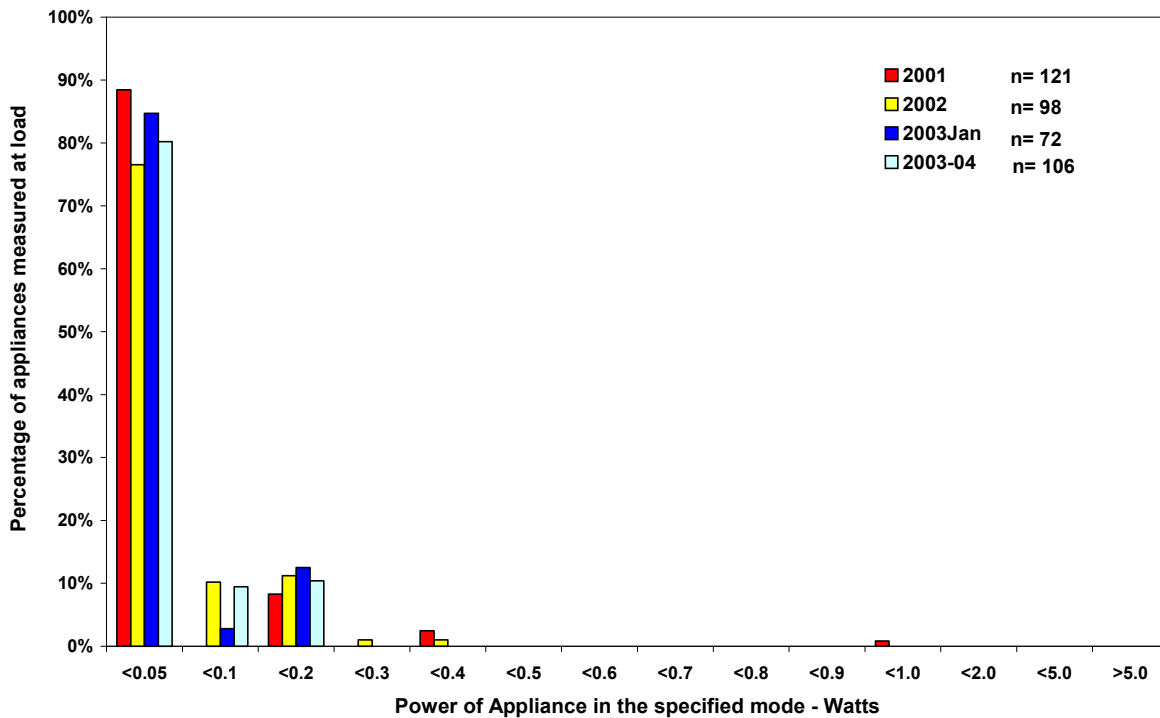
Passive standby mode in 2003/04, as in previous years, showed readings that were widely distributed. Around 10% of televisions consumed less than 1W, which is much lower than in previous surveys and trending away from the national target of 1W standby power consumption. Countering this, average consumption in 2003/04 was 4.1W which is lower than 2001 (6.0W). No clear trend can be determined as the average power consumption in passive standby mode has fluctuated each year (5.1W in 2002, 5.9W in 2003). Figure 18 shows there are still a high proportion of units between 2W and 7W (67%).

Figure 18 – Power measurements for standard televisions: passive standby mode



In off mode all televisions consume less than 1W, with zero consumption recorded for the majority. This is illustrated in Figure 19.

Figure 19 – Power measurements for standard televisions: off mode



Note: This figure has non standard power bin sizes.

LCD Televisions

In the 2003/04 survey, 39 LCD (Liquid Crystal Display) televisions were measured. The units were measured in the following modes: in-use, passive standby and off. The screen size ranged from 30cm to 94 cm. Average in-use consumption was 62.4W with models ranging from 24.2W to 172W. In passive standby mode one third of LCD televisions recorded less than 1W with 35 (88%) models using less than 5W. This indicates that the average consumption of 5.1W could be misleading, skewed by the 4 models that consumed more than 10W. Average off mode consumption for LCD televisions was 0.7W with a maximum of 2.0W and a minimum of 0.0W. For 13 models, passive standby was the lowest possible state. Table 29 summarises these results.

Table 29 – A summary of LCD TV results

Appliance:	TV – LCD					
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Average Crest Factor	Power Max	Power Min
In Use	39	62.4	0.68	2.64	172.0	24.2
Active	NA	-	-	-	-	-
Passive	36	5.1	0.22	2.85	44.9	0.6
Off	26	0.7	0.06	2.30	2.0	0.0
Total Number of Units	39					

Due to the limited number of televisions being measured in the previous surveys (1 in 2003, 2 in 2002) results cannot be compared with those of 2003/04.

Projection Televisions

Projection televisions are made as either a front or rear projection type. The models in the survey ranged in size from 99cm to 155cm. Of the 27 units measured in total, 3 displayed an ENERGY STAR label. All complied with the ENERGY STAR specifications required to display the label (passive consumption was <3W), however all consumed more than 1W in passive standby mode.

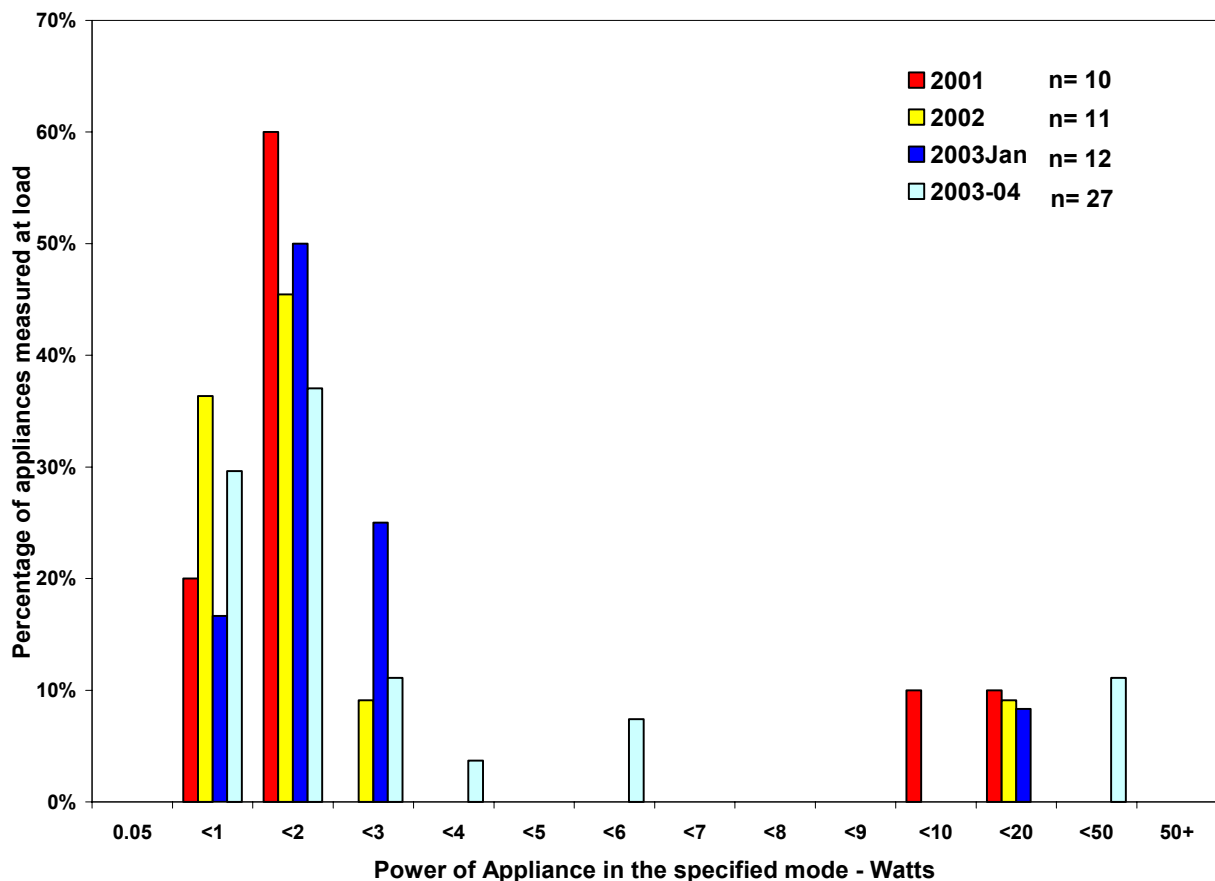
Projection televisions were measured in the following modes: in-use, passive standby and off. When in-use (see Table 30) the average power consumption in the 2003/04 store survey was 156.3W, with a maximum of 223.5W and a minimum of 94.2W. Although the in-use power consumption has decreased from 2003 to 2003/04, a comparison with the survey data from 2001 and 2002 shows no trend. Again, no correction for size or features has been undertaken. When in passive standby the range of consumption in 2003/04 extended from 0.4W to 39.4W producing an average of 5.7W. In off mode the average power consumption was 0.1W with a maximum of 0.3W and a minimum of 0.1W.

Table 30 – A summary of projection TV results

Appliance:	TV - Projection					
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Average Crest Factor	Power Max	Power Min
In Use	27	156.3	0.72	2.47	223.5	94.2
Active	NA	-	-	-	-	-
Passive	27	5.7	0.25	3.14	39.4	0.4
Off	27	0.1	0.07	2.40	0.3	0.0
Total Number of Units	27					

As presented in Figure 20 most projection televisions consume less than 2W when in passive standby; this is consistent across all years. In 2003/04 more than 10% of models measured passive standby was between 20W and 50W.

Figure 20 – Power measurements for projection televisions: passive standby mode



All projection televisions consume less than 1W when in off mode and this is consistent with previous surveys. In 2003/04 no model recorded zero consumption in off mode.

Plasma Televisions

This year 26 plasma televisions were measured. They provide high definition colour and picture quality, are only about 10cm deep and need to be attached to an additional device to receive a signal. The plasma televisions in the survey were measured in the following modes: in-use, passive standby and off. None of the plasma televisions displayed an ENERGY STAR label.

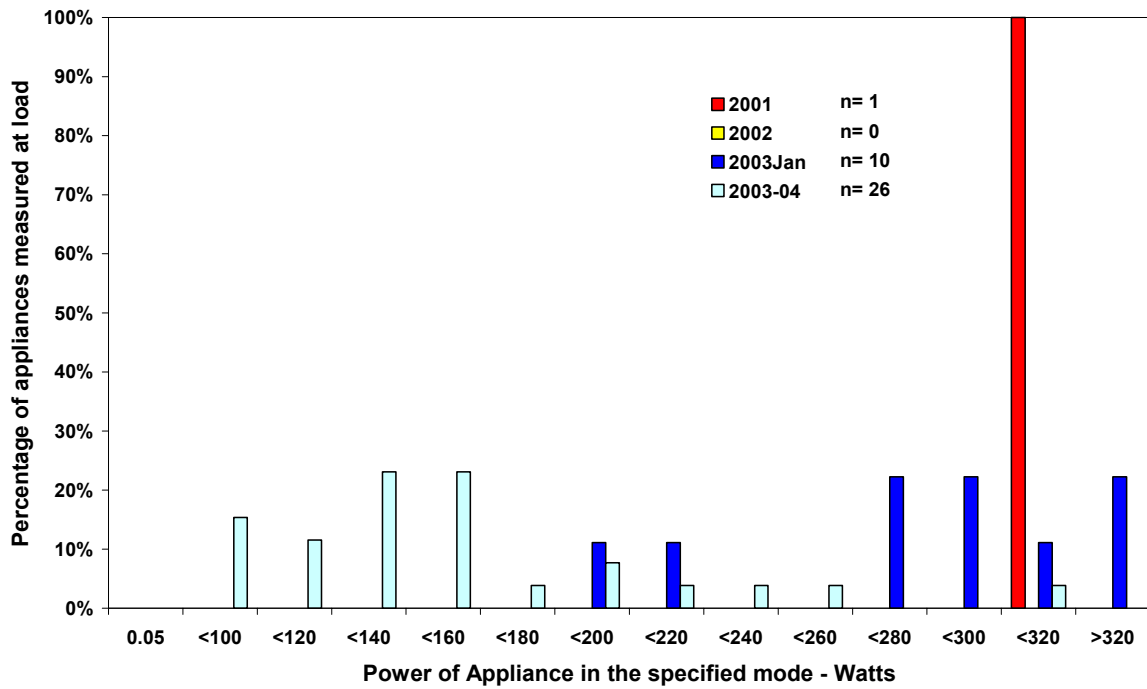
When in use, some plasma televisions were found to use a considerable amount of energy. The average in-use power was 147.5W with a maximum power of 305W and a minimum power of 65.7W. The average in-use power was 147.3W. Passive standby power was found to be an average of 2.4W with a range from a maximum of 4.4W and a minimum of 0.7W. Five plasma televisions did not have passive mode recorded as remote controls could not be located. Six units did not have an on/off switch, thus only 20 units could be measured in off. The average power for off mode was 0.8W with a maximum of 2.9W and a minimum of 0.0W. Table 31 presents the results for the plasma televisions.

Table 31 – A summary of plasma TV results

Appliance:	TV – Plasma					
Mode	Number of Measurements	Average Power (W)	Average Power Factor	Average Crest Factor	Power Max	Power Min
In Use	26	147.3	0.86	2.19	305.0	65.7
Active	NA	-	-	-	-	-
Passive	21	2.4	0.17	1.81	4.4	0.7
Off	20	0.8	0.04	2.00	2.9	0.0
Total Number of Units	26					

The 2003/04 survey results saw plasma televisions recording much lower in-use consumption than previous years. The maximum power usage measured in the 2003 store survey was 444W while in 2003-04 the maximum was 305W and the minimum measurement was 65W compared to 195W and 303W in previous samples. The average in-use power was 150W in 2003-04 compared to 292.4W in 2003. Figure 21 shows the range of in-use power of plasma screens and TVs. The survey data indicate a trend towards lower in-use consumption for plasma type TVs, which is encouraging, considering the high consumption characteristics of this technology. The measurement of the 4 of the plasma TVs with in-use power consumption of less than 100W will be checked in the next store survey; however the results show a declining in-use power consumption trend. Note that prior to the 2003/04 survey, the sample size for this product was small.

Figure 21 – Power measurements for plasma screens: in-use mode



This figure has non standard power bin sizes.

Note:

Figure 22 below shows that the distribution of measurements for plasma televisions in passive standby mode is consistent across both years. Most units registered less than 3W.

Figure 22 – Power measurements for plasma televisions: passive standby mode

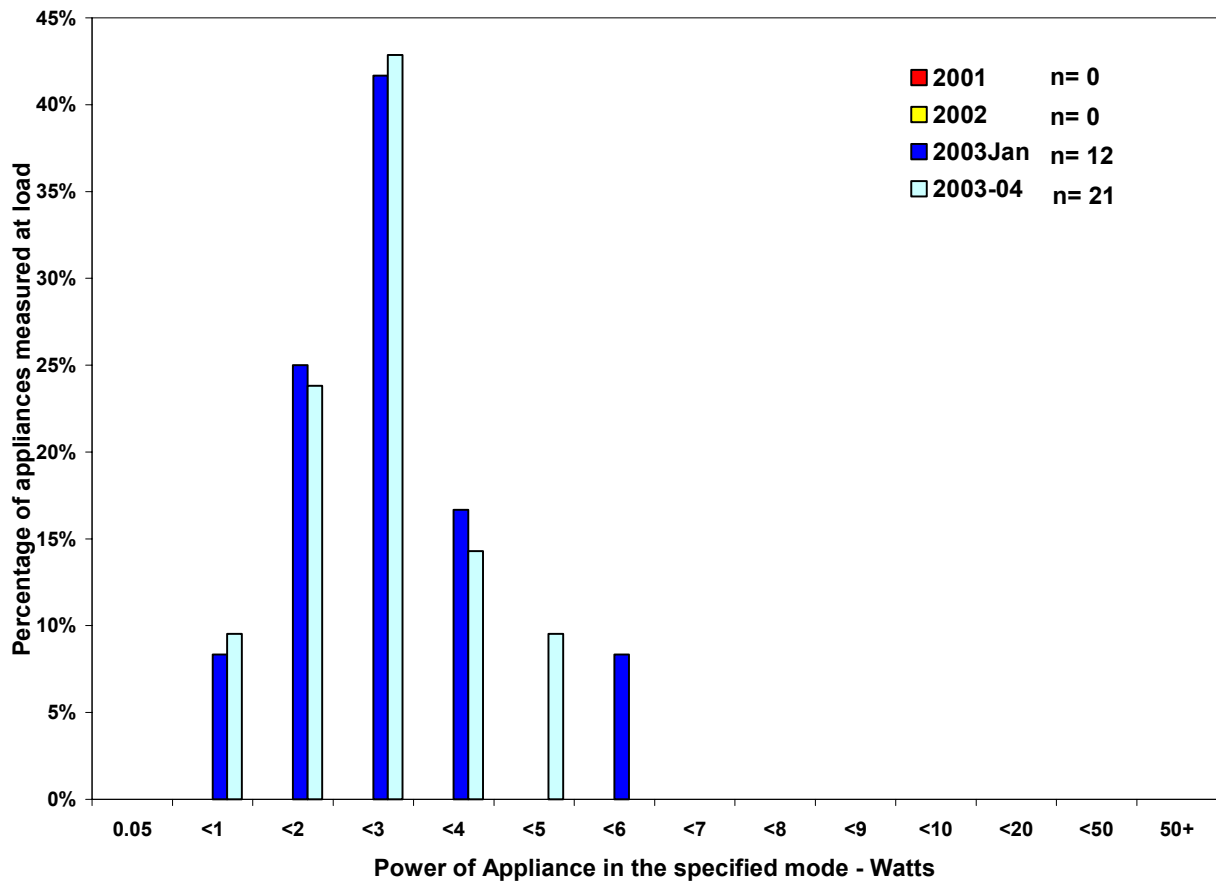
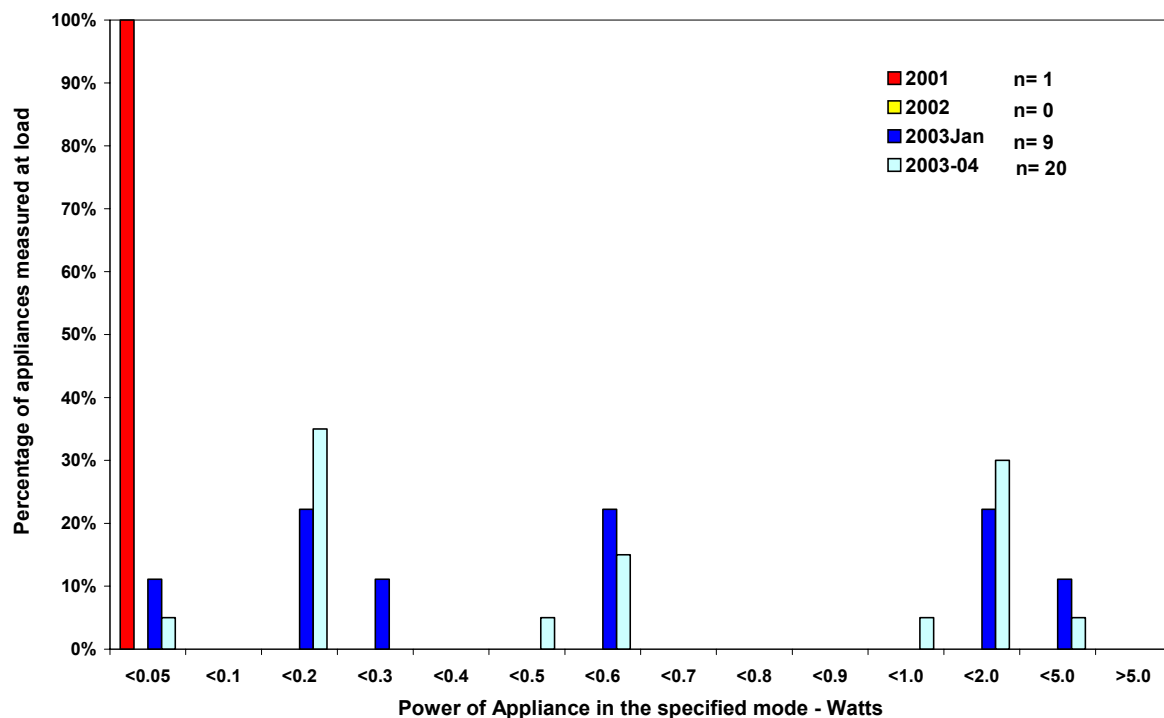


Figure 23 shows the distribution of readings for plasma televisions in off mode. This too has remained consistent over the 3 samples with most units consuming less than 1W.

Figure 23 – Power measurements for plasma televisions: off mode



TV/VCR

A TV/VCR is a standard television with a built-in video recorder. Only 1 model was measured in the 2003/04 survey. In-use mode was measured at 65.7W, passive standby at 5.7W and off mode at 0.1W. Sample numbers for this appliance are low and monitoring of TV/VCRs in future years is not likely. TV/VCRs are not considered a priority in standby policy development.

VCRs

Although VCRs are expected to be superseded by DVD players in the medium term, there are still an abundance of models in the market place and their prices have declined markedly in recent years. In 2003/04 a total of 45 VCRs were measured. Ten units displayed an ENERGY STAR label and all complied with the ENERGY STAR criteria for passive standby power of less than 4W. None of these VCRs will meet the new July 2004 ENERGY STAR specification of less than 1W. All models in the study had remote control operation; none of the models could be turned off and all had some type of clock display. The VCRs were measured in active standby mode (on but not playing) and in passive standby (ready for remote operation and still displaying the clock). Average active standby was 7.6W with a maximum of 12.1W. Passive standby ranged from 1.3W to 6W with an average of 3.1W. Table 32 summarises the results.

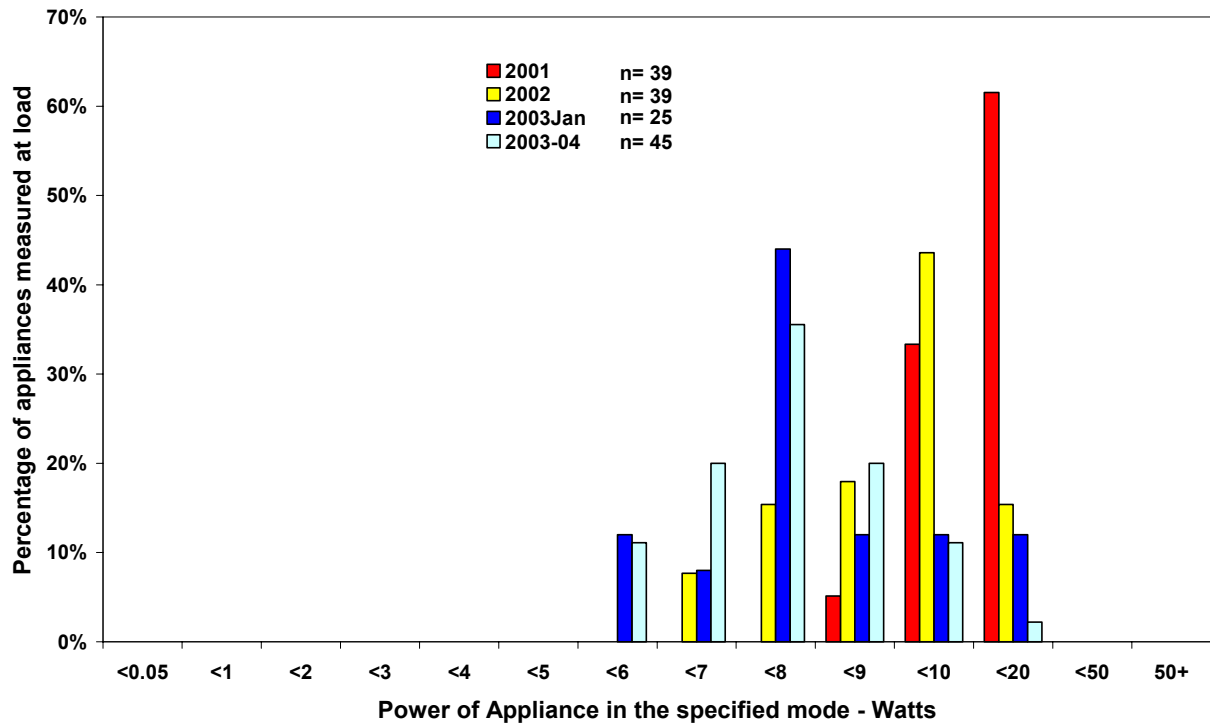
Table 32 – A summary of VCR results

Appliance:	VCR			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	45	7.6	12.1	5.6
Passive	45	3.1	6.0	1.3
Off	NA	-	-	-
Total Number of Units	45			

Figure 24 shows the distribution of power consumption for VCRs in active standby mode. The results show a considerable improvement in active standby power consumption, although there are still no VCRs consuming less than 5W in this mode. Average active standby results show that consumption is trending downwards with average active standby at 10.9W in 2001, 9.0W in 2002, 8.0W in 2003 and 7.6W in 2003/04. These results reflect a statistically significant decrease from 2001 and 2002 to 2003 and 2003/04.

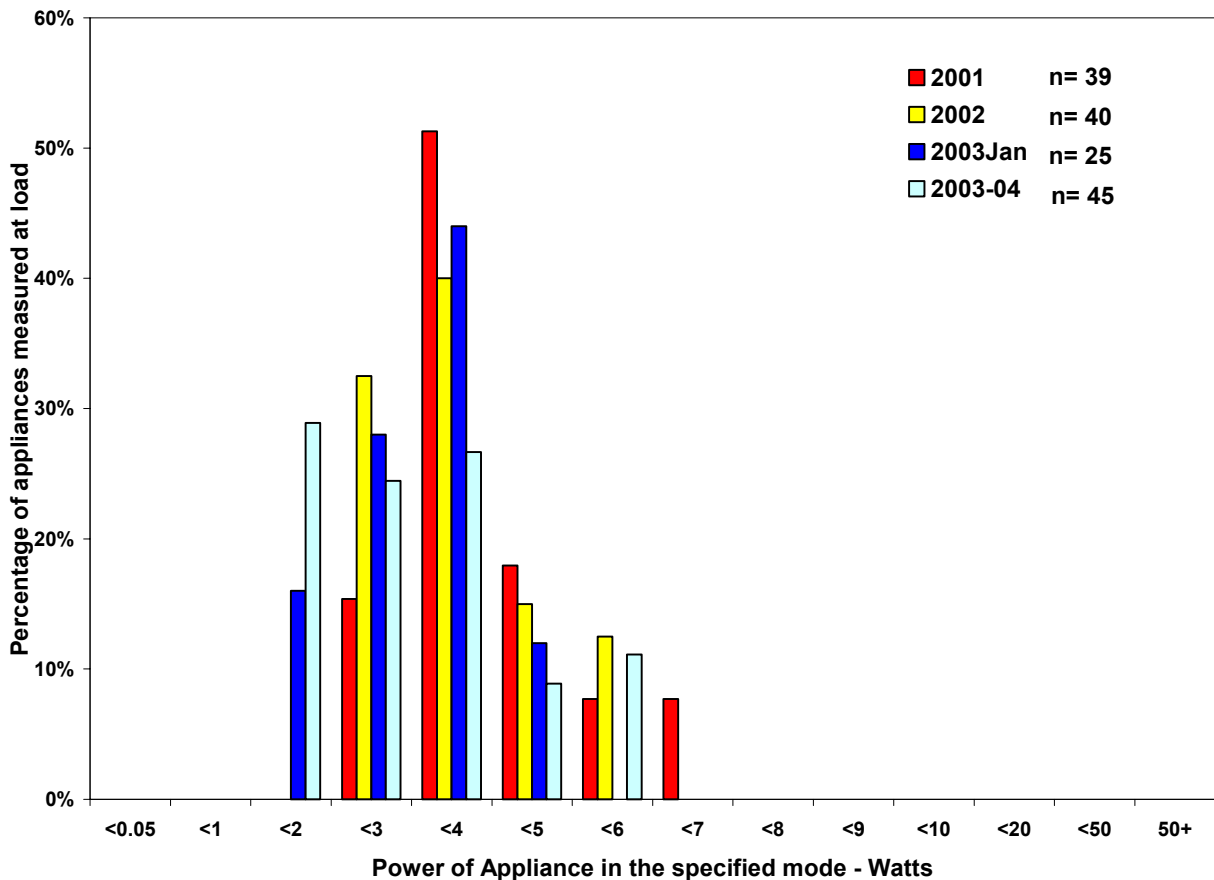
Care is need in the interpretation of this result, as most VCRs will go to “sleep” when left in active standby mode without playing a tape for some period (typically 20 minutes). For practical reasons it was not possible to make this measurement during the in-store survey (as the power has to be re-connected to make a power measurement). Experience indicates that a VCR which is left on but allowed to go to “sleep” will consume less than active standby but more than passive standby (typically sleep mode consumption will be about an average of active and passive standby). This intermediate “sleep” mode would be a common mode in normal use in households.

Figure 24 – Power measurements for VCR: active standby mode



No VCRs measured in any of the four surveys were found to consume less than 1W in passive standby mode. In 2003/04 the proportion of models less than 2W increased to almost 30%, from 16% in 2003 and 0% in previous years. Most models still consumed between 2W and 4W with only a few units above this range. As with active standby, average passive standby appears to be trending downwards with the average at 3.8W in 2001, 3.5W in 2002 and 3.1W in 2003 and 2003/04. These results show a statistically significant decrease from 2001 to 2003/04. These results are presented in Figure 25.

Figure 25 – Power measurements for VCR: passive standby mode



DVD/VCR Combos

DVD/VCR combination units allow you to watch both DVDs and video tapes with the added function of being able to record on video, like a standard VCR. Seventeen DVD/VCR combination units were measured in this year’s survey and two displayed an ENERGY STAR label. Both units met the passive standby less than 4W criteria. The units were measured in active standby and passive standby. All units can be operated with a remote and none of the units had an on/off switch.

Table 33 below summarises the results for DVD/VCR combo units. Active standby is quite high for the units measured, with an average of 15.8W. The minimum was 13W and the maximum 20.3W. Average passive standby was 3.7W with the minimum and maximum of 2.3W and 6W respectively. These results are lower than those recorded in 2003 with a reduction in average active standby of 1.5W and in passive standby of 0.6W. However given that only 6 models have been measured prior to this survey there is little value in comparisons at this stage.

It is hard to imagine that DVD/VCR combination units will be embraced the same way that DVD players currently are in the Australian market place. Their main appeal is that these combination units offer new DVD technology while allowing the consumer to record using conventional VCR technology. However, as DVD recorders become more competitively

priced it is likely that DVD/VCR combos will lose their current market advantage. As such, this technology is considered to be a low priority for standby power policy.

Table 33 – A summary of DVD/VCR combination unit results

Appliance:	DVD & VCR Player			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	17	15.8	20.3	13.0
Passive	17	3.7	6.0	2.3
Off	NA	-	-	-
Total Number of Units	17			

DVD Players

Digital Video Disk players, more commonly known as DVDs, are gaining increasing popularity in the Australian market place. DVDs deliver superior sound and picture quality and compared to VCRs, offer much greater user convenience. DVD players are also able to play CDs and video games, link to the Internet and even record and play home movies. Seventy-one units were tested and of those, 7 displayed an ENERGY STAR label. All seven units complied with Phase I criteria (models in the market place before 31 December 2002 register 3W or less). Three units also complied with Phase II criteria (applicable to all units released onto the market after 1 January 2003) which requires units to consume less than or equal to 1W in passive standby.

DVDs were measured in 3 modes: active standby (ready to play a disc), passive standby (ready to be activated) and off (where present - powered down and not able to be activated by a remote).

All 71 units measured in 2003/04 could be tested in active standby with the average consumption being 10.5W. The range varied from a minimum of 4.0W to a maximum of 41.5W. Passive standby could be measured on just 61 units as remote controls were not always available and some units did not have a remote control function. The average power consumption was found to be 2.3W in passive standby with a minimum of 0.1W and a maximum of 10W. Only 27% of DVD players had a power on/off control providing a total of 19 measurements for off mode. The average power consumption was 0.1W with results ranging from 0.0W to 0.9W. For a summary of these results see Table 34 below.

Table 34 – A summary of DVD player results

Appliance:	DVD Player			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	71	10.5	41.5	4.0
Passive	61	2.3	10.0	0.1
Off	19	0.1	0.9	0.0
Total Number of Units	71			

DVD players are already showing improvements in active standby power consumption in the short time that they have become available. Figure 26 below shows how power consumption between 10W and 20W has declined since 2001 and how the distribution has shifted into categories less than 10W. In 2003/04 for the first time, three models recorded active standby of less than 6W. In 2001, average active standby was 14.9W decreasing to 13W in 2002, 9.9W in 2003 and 10.5W in 2003/04. Even though 2003/04 saw a slight increase from the previous year's result, the decrease in active standby since 2001 is still statistically significant. This provides a strong indication that active standby is trending downwards.

Figure 26 – Power measurements for DVD players: active standby mode

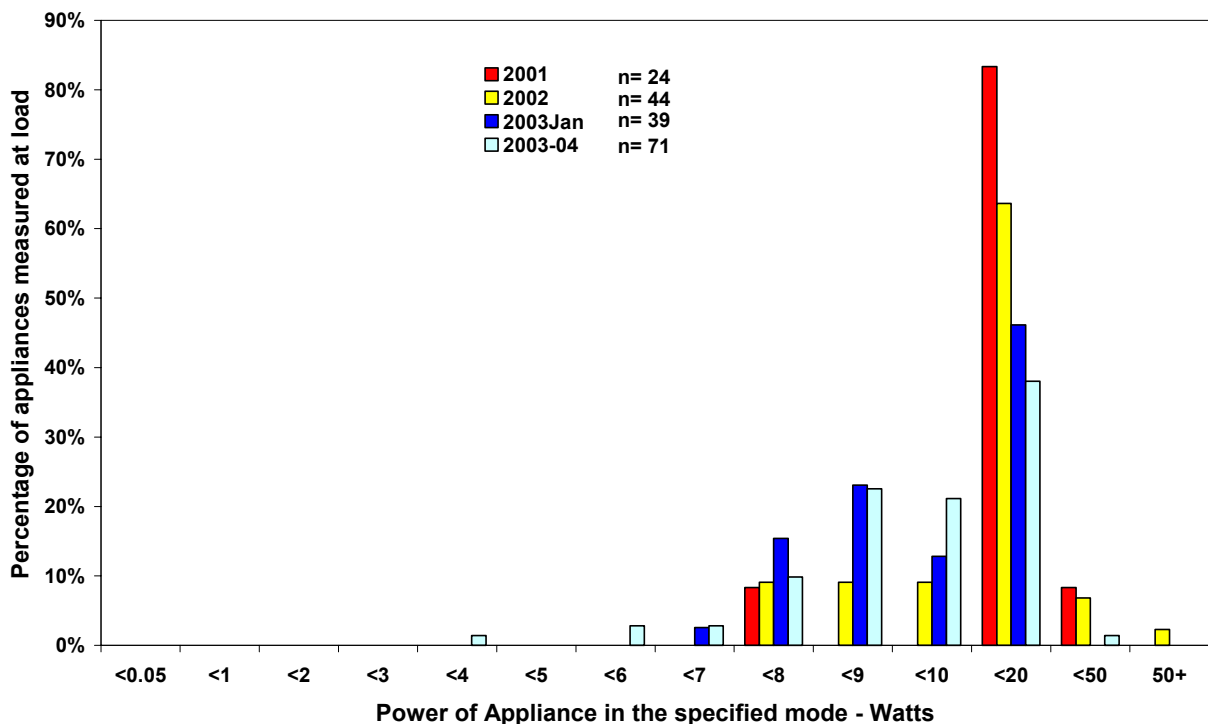
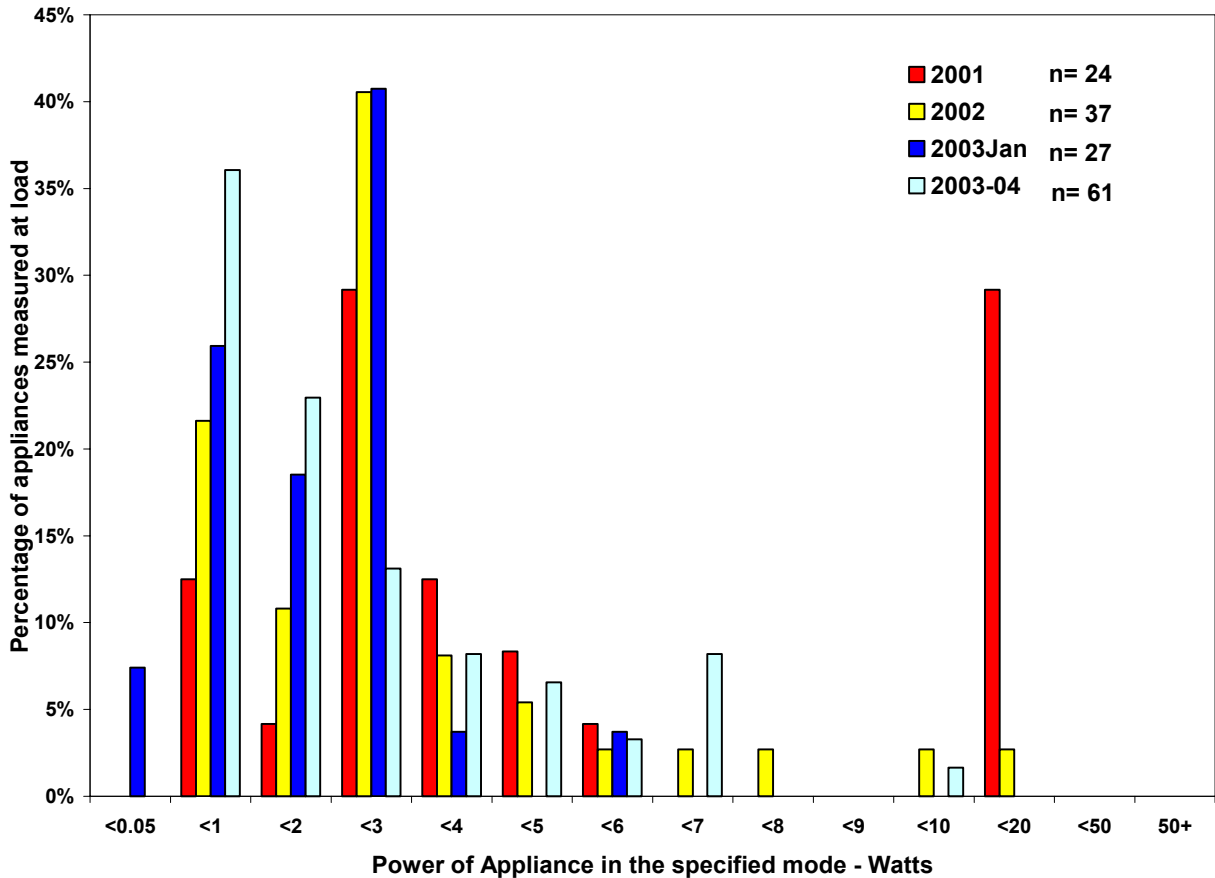


Figure 27 shows that a greater proportion of DVD players consume less than 3W in 2003/04 compared to previous years. However average power consumption has increased to 2.3W in this survey up from 1.7W in 2003. There was also an increase in the number of

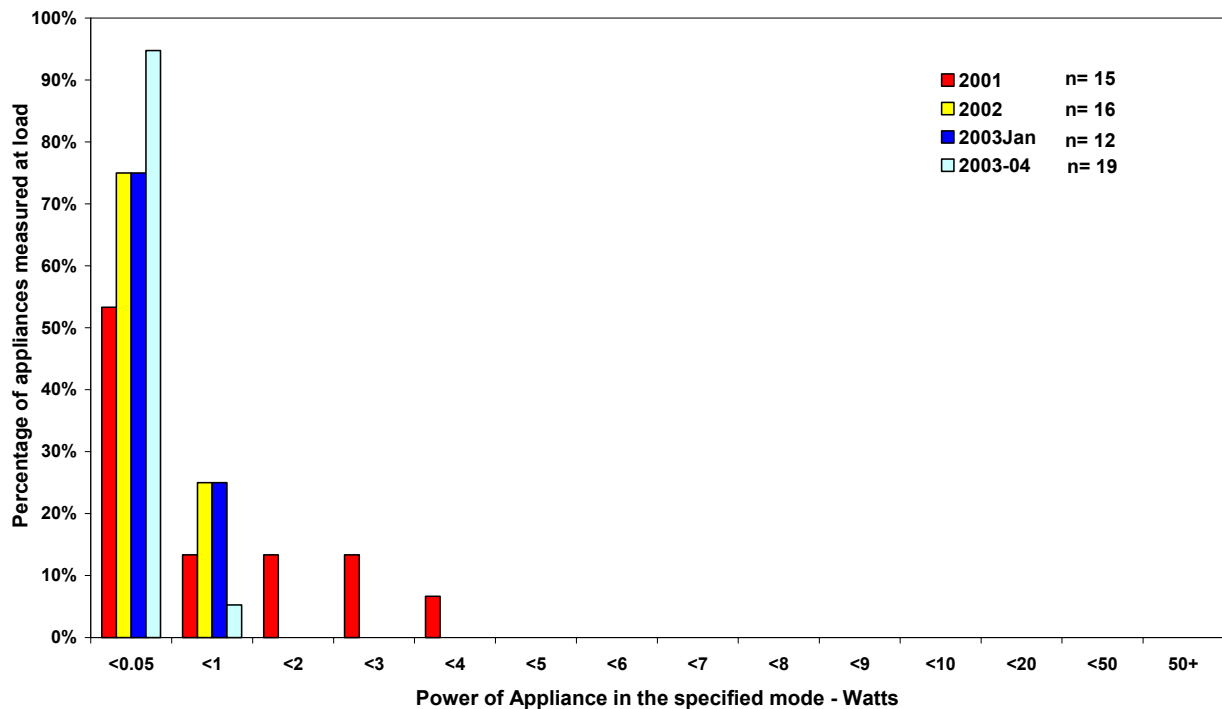
models registering passive standby greater than 6W. The result still indicates passive standby has decreased significantly since 2001.

Figure 27 – Power measurements for DVD players: passive standby mode



Nineteen units (27%) had an on/off switch. Once again all units measured in 2003/04 registered less than 1W. Amazingly, 95% of models recorded zero consumption in this mode which is statistically significant when compared to 2001 results. Figure 28 illustrates the results.

Figure 28 – Power measurements for DVD players: off mode



These results indicate a downward trend is evident in DVD players in active, passive standby and off modes.

It should also be noted that portable DVD players are entering the market. 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, however one model was able to be tested in the survey. This unit was measured 4W in active standby (i.e. charging and 0.3W) and in passive standby (i.e. with the power supply plugged in but not connected to the player – no load).

DVD Recorders

DVD Recorders allow the user to play DVDs as well as record from television onto a DVD. DVD recorders offer varying levels of sophistication with newer models incorporating a hard disk for recording. Basic functions vary from unit to unit but essentially they are same as a VCR. The price of DVD recorders has decreased swiftly since the last survey and consumer uptake is likely to be rapid.

Twenty DVD recorders were measured in the survey, in active, passive standby and off mode. None of the units had an ENERGY STAR label while four units had an internal hard disk. In active standby the average power consumed was 26.5W with a maximum of 46.8W and a minimum of 18.8W. Average passive standby was 4.5W with measurements ranging from zero to 8.1W. One unit had no passive standby as it had no remote control function. This unit had a hard off switch, which when activated recorded zero consumption. Previously only 1 DVD recorder has been measured so no comparisons are possible at this

stage. The results are summarised in Table 35. Standby in DVD recorders will be monitored closely in forthcoming store surveys.

Table 35 – A summary of DVD recorder results

Appliance:	DVD Recorder			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	20	26.5	46.8	18.8
Passive	19	4.5	8.1	0.0
Off	1	0.0	0.0	0.0
Total Number of Units	20			

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 60 of these appliances and of those, 12 displayed an ENERGY STAR label. Of these 12 units, passive standby could only be measured for half as the other units were set to demonstration mode. In this mode, when the appliance placed in standby it either automatically restarts or flashes advertising messages across the visual display. Of the six remaining units, 3 complied with the ENERGY STAR criteria stipulated in Phase I (where passive standby consumption for appliances released on the market before 31 December 2002 is less than or equal to 2W) while the remaining three units complied with Phase II, where passive standby is required to be less than 1W.

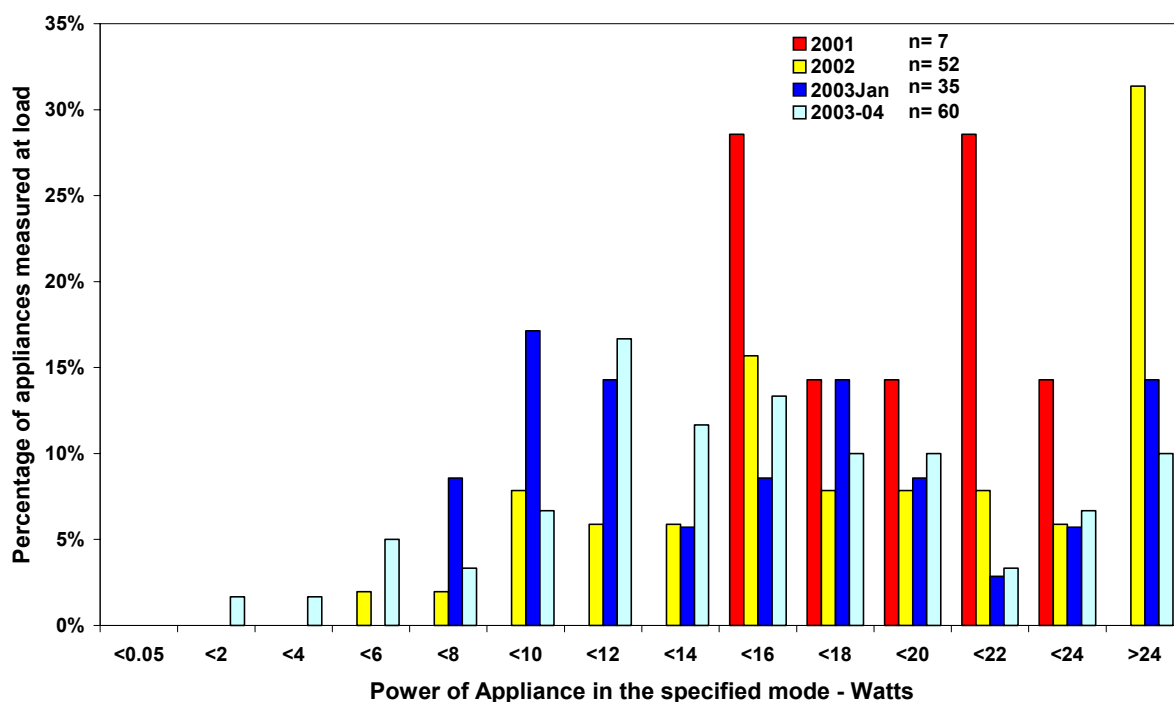
Integrated stereos were measured in 2 modes: active standby (ready to play a disc), and passive standby. Only two integrated stereos had an on/off switch reinforcing previous results that indicated that this mode is rare on this product. In active standby mode there was a large variation in power consumption with an average of 16.2W and a maximum of 46.6W and a minimum of 0.2W. In passive mode only 51 stereos could be measured as there were a number of models set in a demonstration mode that always operated either in active standby or with advertising display functions. The average power consumption for passive standby mode was 4.3W with a maximum of 15.6W and a minimum of 0.1W. Off mode was present on two stereos, both recording zero consumption in this state. These results are summarised in Table 36.

Table 36 – A summary of integrated stereo results

Appliance:	Stereo - Integrated			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	60	16.2	46.6	0.2
Passive	51	4.3	15.6	0.1
Off	2	0.0	0.0	0.0
Total Number of Units	60			

Figure 29 indicates that a high proportion of integrated stereos are consuming more than 10W in active standby with little change over the four samples. There has been an improvement in the last two years with fewer models consuming more than 20W. In the 2003/04 survey some models were recorded consuming less than 2W in this mode, however this made up only 4% of the sample. Based on average consumption, there has been no significant improvement from 2001 to 2003/04. In 2001 average active standby was 19.1W, in 2002, 20.1W, in 2003, 17.4W and in 2003/04 it was 16.2W.

Figure 29 – Power measurements for integrated stereos: active standby mode

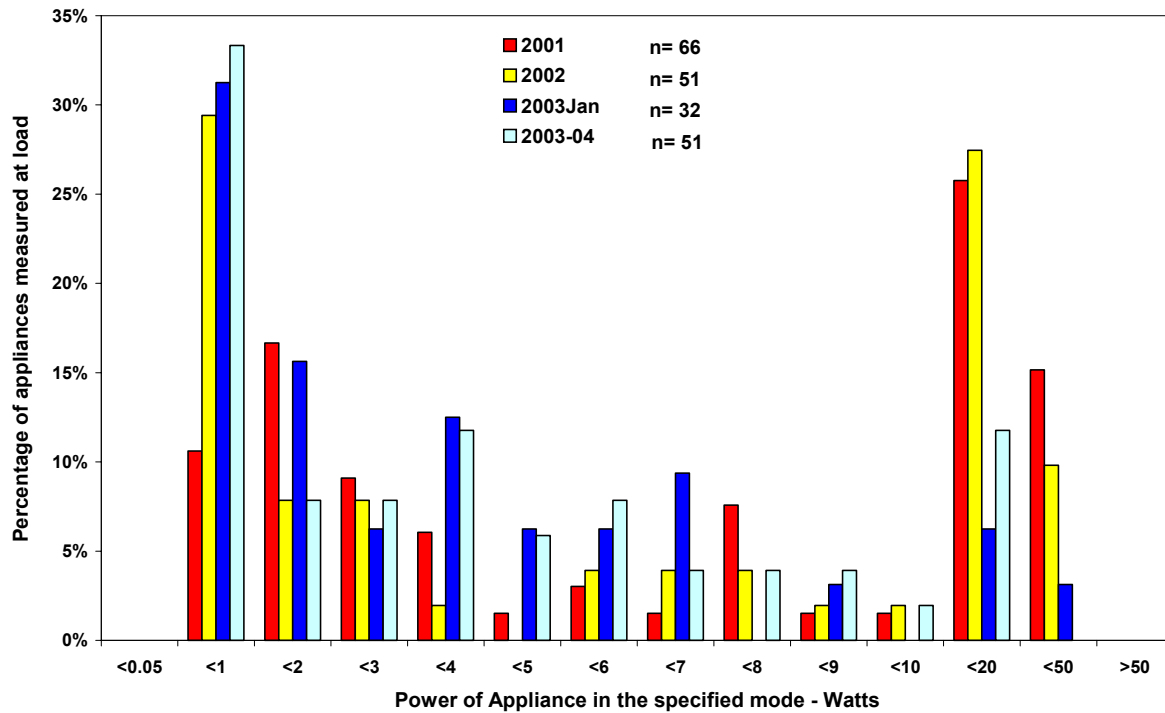


Note: This figure has non standard power bin sizes.

Figure 30 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 four survey's in the units consuming less than 1W. One third of units are now achieving passive standby readings of

less than 1W. Based on average consumption, there has been a statistically significant improvement (i.e. decrease) in passive standby consumption from 2002 to 2003. In 2001 the average was 9.3W, in 2002, 7.8W and in 2003 average passive standby was 4.1W. However there was no further decline evident in 2003/04 with average passive standby static at 4.3W.

Figure 30 – Power measurements for integrated stereos: passive standby mode



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 38 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. None of the products tested had an off mode.

These appliances were measured in active and passive standby. In active mode the average power was 5.4W with a maximum of 10.5W and a minimum of 2.8W. Two models were not measured in this mode as they had limited functions with only in-use and off mode present. Average power consumption in passive mode was 1.9W and the maximum power was 4.8W with a minimum of 0.8W. Seven stereos had no remote control function and no passive mode. All of these units had an off mode resulting in an average consumption of 1.4W and a range from zero to 2.1W. Table 37 presents these results.

Table 37 – A summary of portable stereo results

Appliance:	Stereo - Portable			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	34	5.4	10.5	2.8
Passive	29	1.9	4.8	0.8
Off	7	1.4	2.1	0.0
Total Number of Units	36			

Figure 24 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. The average active standby measurements show that there has been no improvement in active standby with an average of 5.4W in 2003/04 and 2003 and 5.2W in 2002. Only one unit was measured in active standby in the 2001 store survey.

Figure 31 – Power measurements for portable stereos: active standby mode

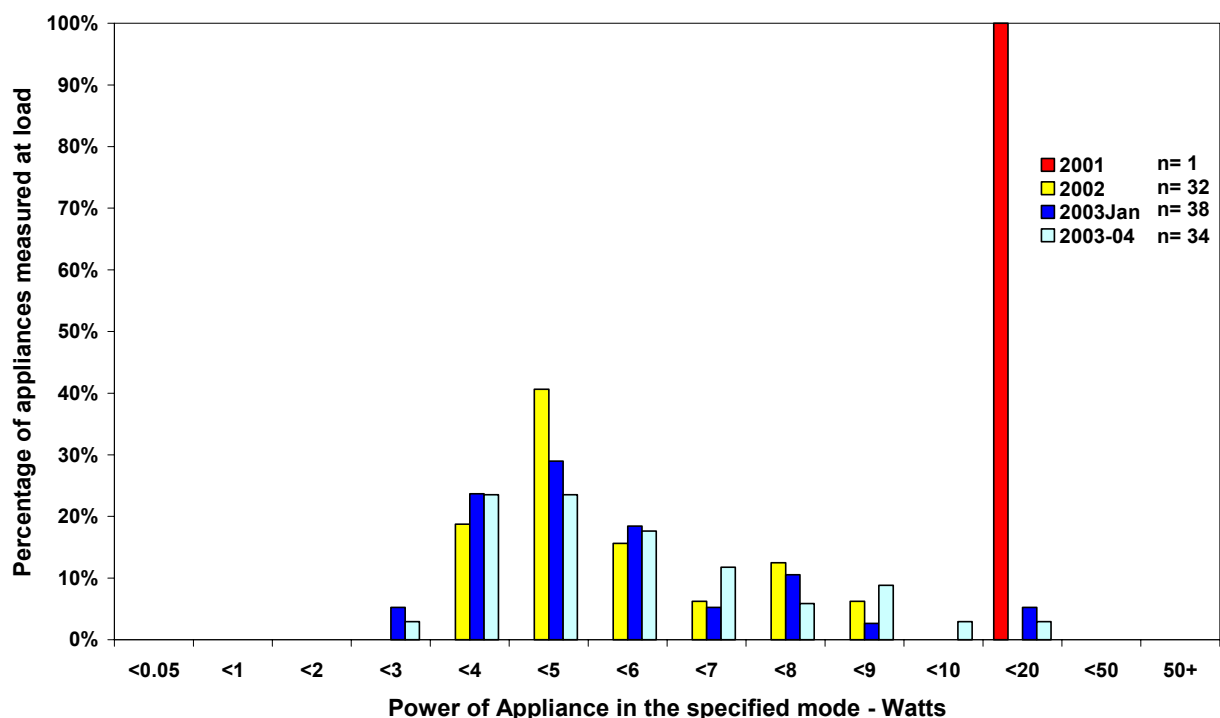
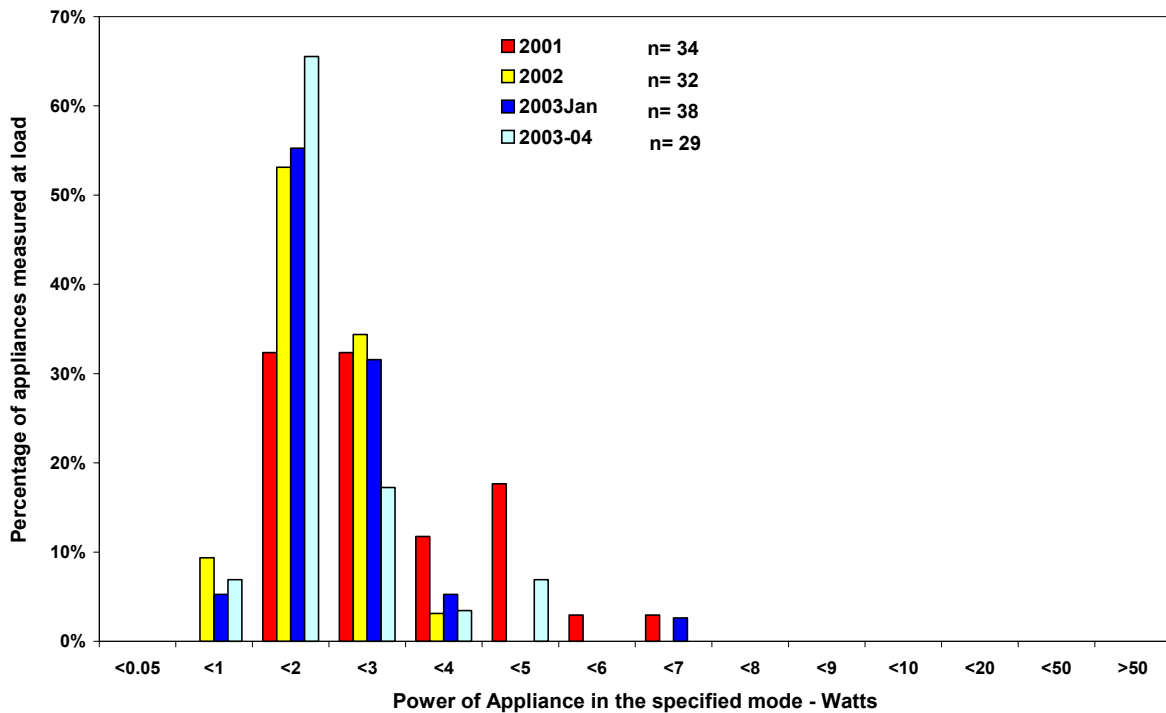


Figure 32 shows that there has been a slight increase in the proportion of units registering a passive standby of less than 2W compared to 2001. Overall however, average passive standby shows that there has been no improvement. In 2002 it was 1.8W, in 2003 it was 2.0W and in 2003/04 it was 1.9W. Too few models have off mode to allow a comparison. Overall it appears that portable stereo consumption is stable for all modes.

Figure 32 – 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 (4 tuners, 8 CD players, 8 amplifiers, 3 receivers and 1 client audio terminal). 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 amplifiers³, 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/or decoders for accessing digital television signals

Seventy-one AV Receivers were measured in use, passive standby and off modes. Nine models had built in DVD players, five models had built in decoders and three units had built

³ 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.

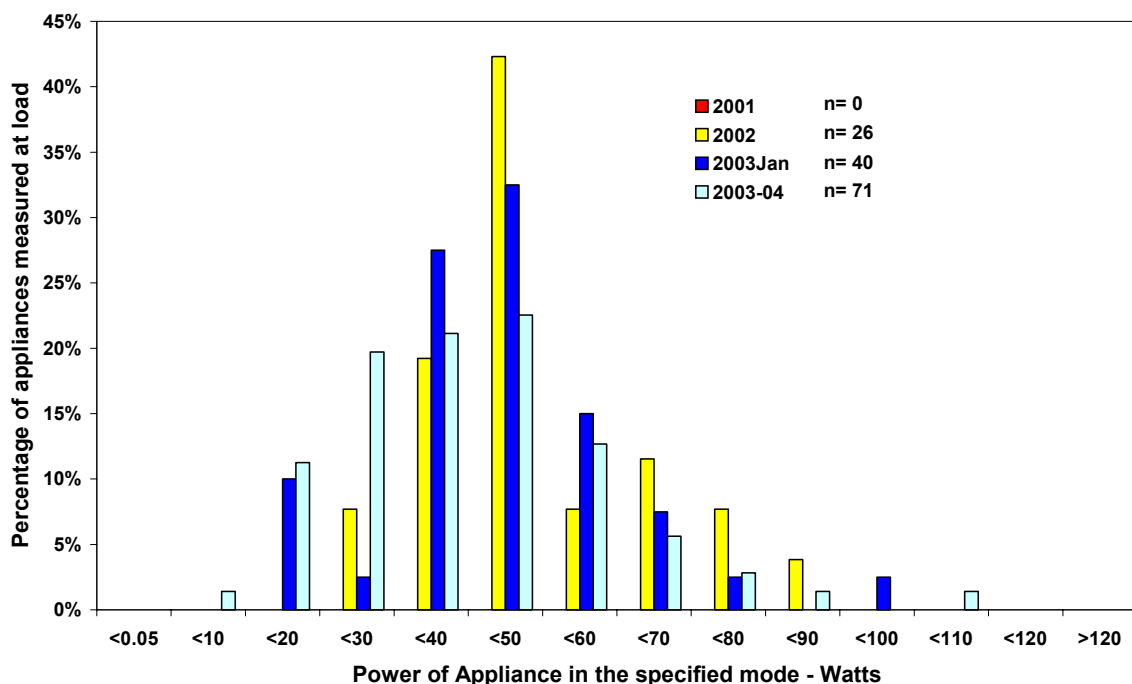
in DVD and decoder functions. The presence of these added functions appears to have no impact on the energy consumption. There were 8 AV receivers displaying an ENERGY STAR label, and all complied with Phase II passive standby criteria (less than 1W from 1 January 2003). The in-use average power consumption was 39.3W with a maximum of 100.7W and a minimum of 9.4W. A total of 52 units could be tested in passive standby mode with the average power being 1.7W with a maximum of 15W and a minimum of 0.2W. Off mode was measured for 29 AV receivers with an average power of 0.2W with a maximum of 2.9W and a minimum of zero. Table 38 provides a summary of the results for AV receivers.

Table 38 – A summary of AV Receiver results

Appliance:	Home Theatre - AV Receiver			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	71	39.3	100.7	9.4
Active	NA	-	-	-
Passive	52	1.7	15.0	0.2
Off	29	0.2	2.9	0.0
Total Number of Units	71			

Figure 33 shows that the distribution of measurements taken in-use has slightly increased at both ends of the spectrum with a small number of units now consuming less than 20W and more than 90W. Most units still consume between 20W and 50W.

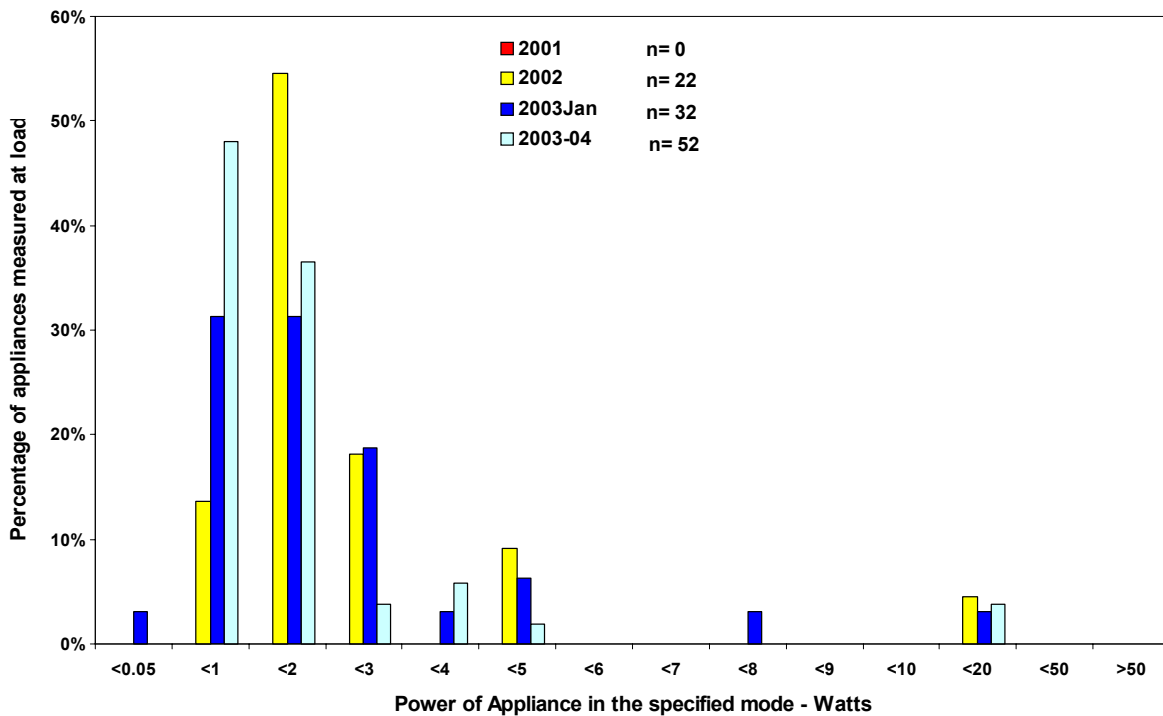
Figure 33 – Power measurements for AV receivers: in-use mode



Note: This figure has non standard power bin sizes.

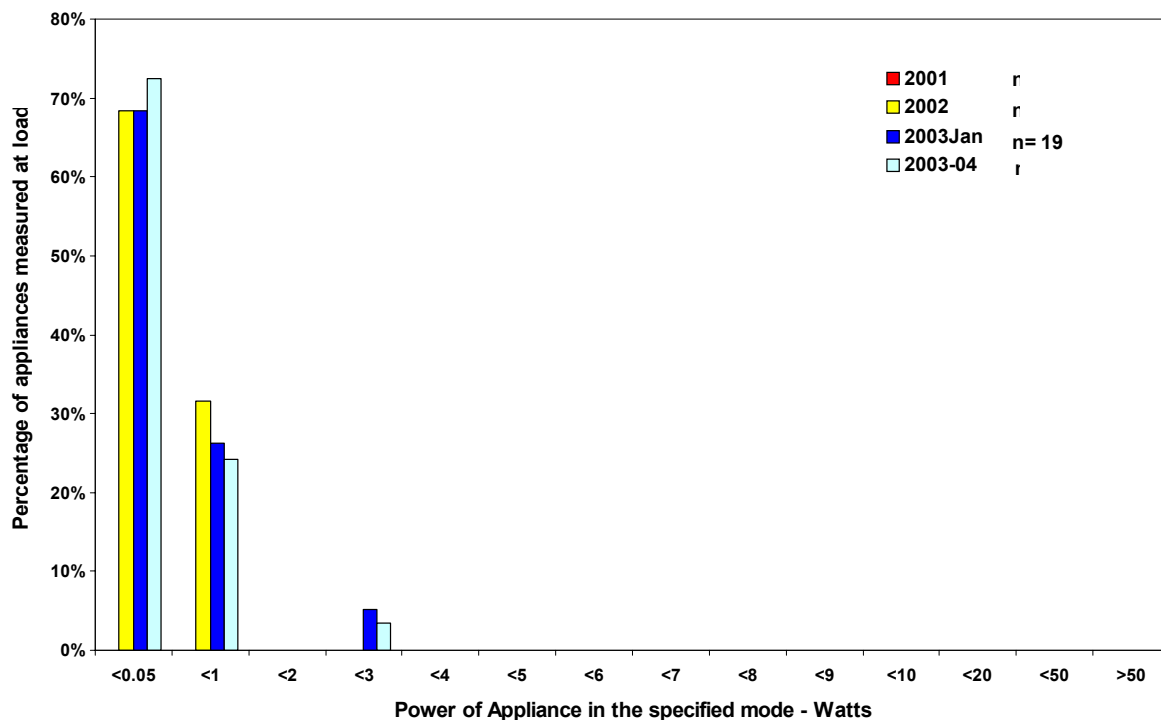
Figure 33 shows that the distribution of measurements taken in passive standby has changed in that a greater proportion of units are consuming less than 1W in 2003/04 compared to 2003. Average passive standby measurements show that there been a slight improvement in standby consumption: dropping from 2.0W in 2003 to 1.7W in 2003/04. Whilst not statistically significant, when considered with the distribution data, suggests a positive indication for declining standby.

Figure 34 – Power measurements for AV receivers: passive standby mode



The vast majority of AV receivers have no consumption when in off mode. In fact only 3% of models tested consume more than 1W. This is demonstrated in Figure 35.

Figure 35 – Power measurements for AV receivers: off mode



AV receivers (or surround sound amplifiers as they were previously named) were not measured during the 2001 in store survey.

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. Seven systems displayed an ENERGY STAR label. Six complied with the Phase I criteria (<2W) and three complied with the Phase II criteria (<1W). One unit could not be measured in passive standby.

Home Theatre Systems were measured for the first time in 2003/04. They were measured in active, passive standby and off mode. In total, 33 units were measured and 11 of these had built in decoders. Units with decoders were spread across the entire distribution range and there appears to be no obvious difference between models with and without decoders. However, the 3 highest consuming models in both active and passive standby were those with decoders. Active standby power averaged 35.9W with a minimum of 18.5W and a maximum of 54.4W. The average consumption for passive standby was 2.4W with more than half the units consuming less than 1W. In fact only 3 units consumed more than 4W. The minimum was 0.4W and the maximum was 15.6W. Only seven home theatre systems

had an off mode. All had zero consumption in this mode. Table 39 summarises these results.

Table 39 – A summary of home theatre system results

Appliance:	Home Theatre –Systems			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	33	35.9	54.4	18.5
Passive	30	2.4	15.6	0.4
Off	7	0.0	0.0	0.0
Total Number of Units	33			

Home Theatre – Sub Woofers

Subwoofers are large speakers that produce low-frequency (bass) sounds. There are two types of subwoofers: passive subwoofers, which rely entirely on the main amplifier for power, and active subwoofers, which 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 2003/04 survey found 39 subwoofers could be measured in stores. They were measured in active, passive standby and off as appropriate. In active mode 38 models were measured with average active standby of 10.9W. The distribution of results was quite wide with a minimum of 0.1W and a maximum of 26.3W. One unit could not be measured in active as it required an AV receiver to be plugged in to activate it. Passive standby is not usually considered as subwoofers generally do not have remote control operation, however five units were found to have passive as their lowest possible state. Three of the units were controlled by the AV receiver (i.e. when the AV was in standby so were the subwoofers), the other 2 units always displayed a light. None of these units had an off switch. In passive standby the units registered between zero and 7.4W. In off mode 31 subwoofers were measured. The average was 0.4W with the vast majority having zero consumption and a total of 91% consuming less than 1W. The maximum consumption was 6.6W and the minimum was zero. It should be noted that the off switch for most subwoofers was at the rear of the appliance and difficult to access. This may reduce the likelihood of consumers using this mode. Table 40 summarises the results. Previous surveys have recorded results for only 3 sub woofers so no comparisons can be made at this stage.

Table 40 – A summary of subwoofer results

Appliance:	Home Theatre - Subwoofer			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	NA	-	-	-
Active	38	10.9	26.3	0.1
Passive	5	1.7	7.4	0.0
Off	31	0.4	6.6	0.0
Total Number of Units	39			

Digital 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 in use, passive standby and off modes. Set top boxes were measured in 2003 but the results were not reported, as only 4 models were found. In 2003/04 the survey found 29 different models in the stores. The average in-use power was 15.4W with a minimum of 6.9W and a maximum of 35.3W. In passive standby mode 26 units were measured ranging from 1.9W to 20.1W. The average passive standby consumption was 7.9W. Only 8 set top boxes had an off mode. All 8 of these consumed less than 1W in this mode with 88% having zero consumption. Table 41 summarises these results.

Table 41 – A summary of digital set top box results

Appliance:	Digital Set Top Box			
Mode	Number of Measurements	Average Power (W)	Power Max	Power Min
In Use	28	15.4	35.3	6.9
Active	NA	-	-	-
Passive	26	7.9	20.1	1.9
Off	8	0.0	0.2	0.0
Total Number of Units	29			

Other Home Theatre Components

A number of home theatre components were measured for the first time however as each category contained less than five models they have not been reported individually. These included; cordless speaker system (1), analogue set top box (3), Game console (1), Home theatre amplifier (1), and a data projector (1).

Price and Standby Power Consumption

The 2003/04 survey again noted the sale price of appliances measured in the survey. The purpose of collecting this information is to determine if any relationship exists between the performance of an appliance in standby modes(s) and the purchase price. This section presents the results of that analysis. It is important to note that this analysis is only indicative because:

- There is variation in sale price of an appliance among retail outlets.
- Within a standby power bin, there can be both large variations in price and/or a small or large numbers of units, which can impact on the reliability of the result for each bin.
- The limited number of stores visited to conduct the survey.
- The small sample sizes of some product groupings (where there were less than 20 measurements taken for a particular appliance). Products with small samples are not included in this analysis. Small samples would provide a very poor indication of the true relationship between price and standby performance of a product.
- Other factors which may play an important part in the amount of power an appliance consumes in standby modes, such as display panels, size of unit, communications capability and other services etc.

Where an appliance type showed very little variation in the readings obtained in either off, passive standby or active standby modes (i.e. the difference between the minimum and maximum readings is less than 2W) these appliances were not included in this analysis.

Table 42 shows the appliances that were covered in the analysis, as well as a summary of the results. The results indicate that for most products price is not normally an indicator of a better or worse performing appliance in standby mode. For those products where a relationship was found, it was more common for a higher priced appliance to consume *more* power in standby mode(s) (although this may be related to features as noted above).

Table 42 – A summary of price vs. standby power consumption analysis

Product	Mode	Conclusion
Standard Televisions	Passive Standby	No relationship found
LCD Televisions	Passive Standby	No relationship found
Plasma Televisions	Passive Standby	No relationship found
	Off Mode	No relationship found
Projection Televisions	Passive Standby	No relationship found
VCRs	Passive Standby	More expensive models have greater standby
	Active Standby	No relationship found

Product	Mode	Conclusion
DVD Players	Passive Standby	No relationship found
	Active Standby	No relationship found
DVD Recorders	Passive Standby	More expensive models have greater standby
	Active Standby	More expensive models have greater standby
Computer Box	Off Mode	No relationship found
Espresso Machines	Off Mode	No relationship found
Facsimile Machine	Active Standby	No relationship found
Home Theatre – AV receivers	Off Mode	More expensive models have lower standby
	Passive Standby	No relationship found
Home theatre – Subwoofers	Off Mode	No relationship found
	Active Standby	No relationship found
Home Theatre – Systems	Passive Standby	More expensive models have lower standby
	Active Standby	No relationship found
Heaters Electric Portable	Off Mode	More expensive models have greater standby
Heaters Gas	Off Mode	No relationship found
Computers Laptop	Off Mode	More expensive models have lower standby
Computer Monitors	Off Mode	No relationship found
Digital Set Top Box	Passive Standby	No relationship found
Dishwasher	Off Mode	No relationship found
	Active Standby	No relationship found
Dryer	Off Mode	No relationship found
Integrated Stereos	Passive Standby	No relationship found
	Active Standby	No relationship found
Portable Stereos	Passive Standby	No relationship found
	Active Standby	No relationship found
Microwaves	Passive Standby	More expensive models have greater standby
Multi Function Devices	Active Standby	More expensive models have greater standby
Washing Machines	Off	No relationship found
	Active Standby	No relationship found

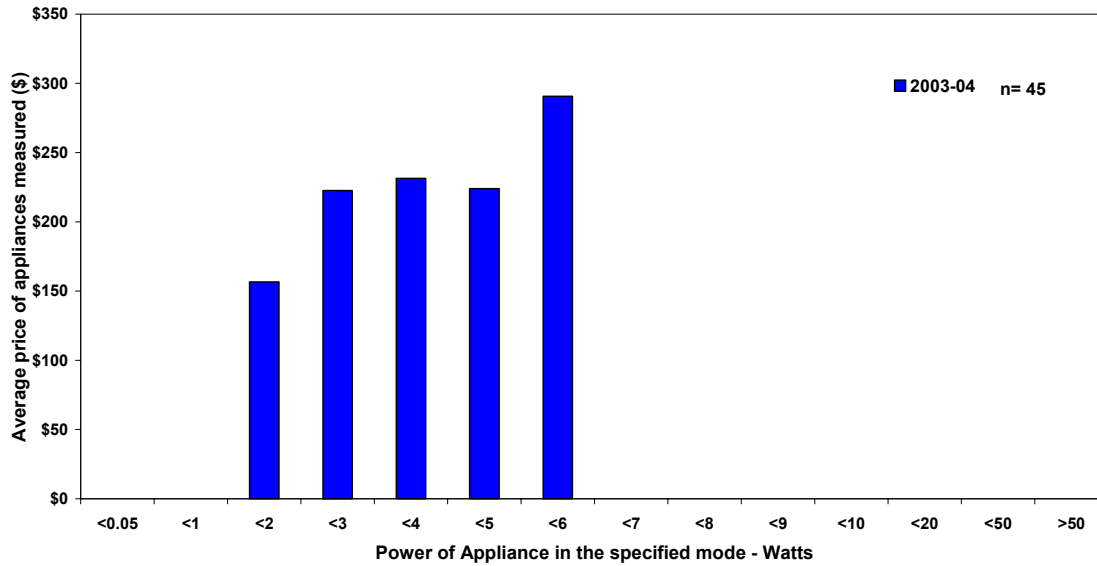
Microwave ovens are the only appliance to show a similar result to the 2003 survey. Unlike last year, no relationship between price and standby was found for DVD players, integrated stereos or portable stereos. Detailed results for those appliances where the analysis indicated a relationship are presented below.

VCRs

Figure 36 shows a comparison of price and consumption of VCRs in passive standby. The graph illustrates that there may be a correlation between more expensive models and higher active standby consumption, however the link is not strong. In fact, 2003's results found no relationship for VCR's between passive standby mode and price. Conversely 2003's survey

found a small correlation between price and active standby mode which was not repeated in 2003/04.

Figure 36 – Price vs. passive standby performance: VCRs



DVD Recorders

Figure 37 illustrates that generally more expensive DVD recorders registered higher passive standby readings than cheaper models. While Figure 38 shows a stronger relationship between high active standby and higher priced products, consideration needs to be given that these sample sizes are quite small and the range of power consumption is narrow in active mode. No comparison can be made with 2003 as sample sizes were too small to allow comparison between price and standby consumption.

Figure 37 – Price vs. passive standby performance: DVD recorders

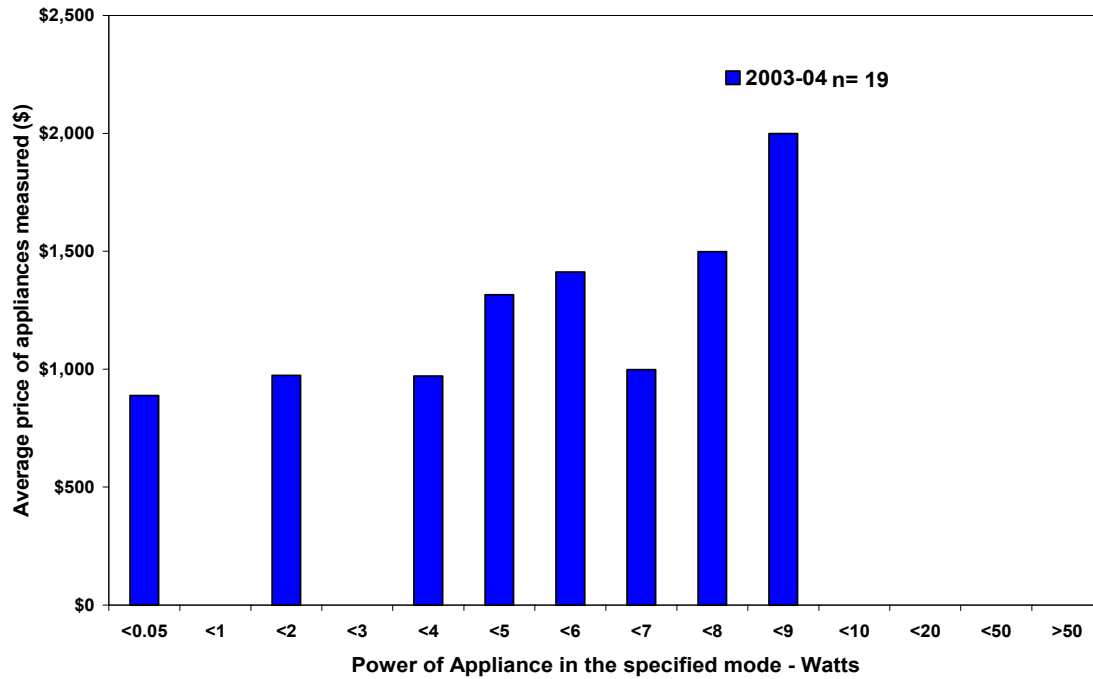
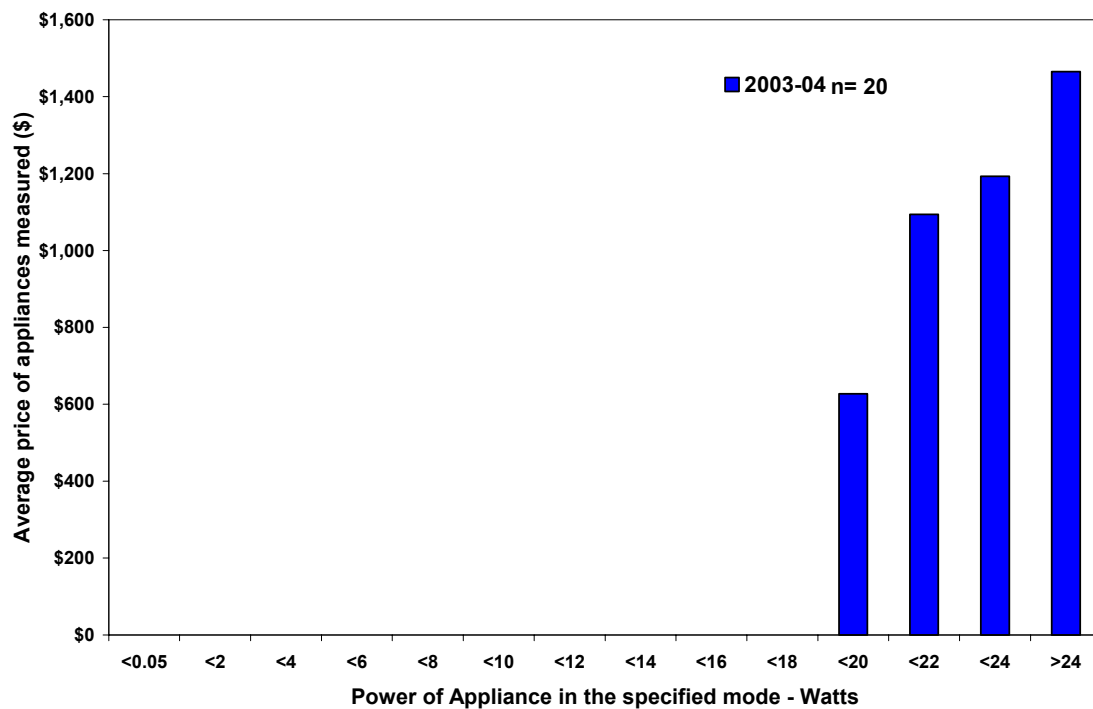


Figure 38 – Price vs. active standby performance: DVD recorders

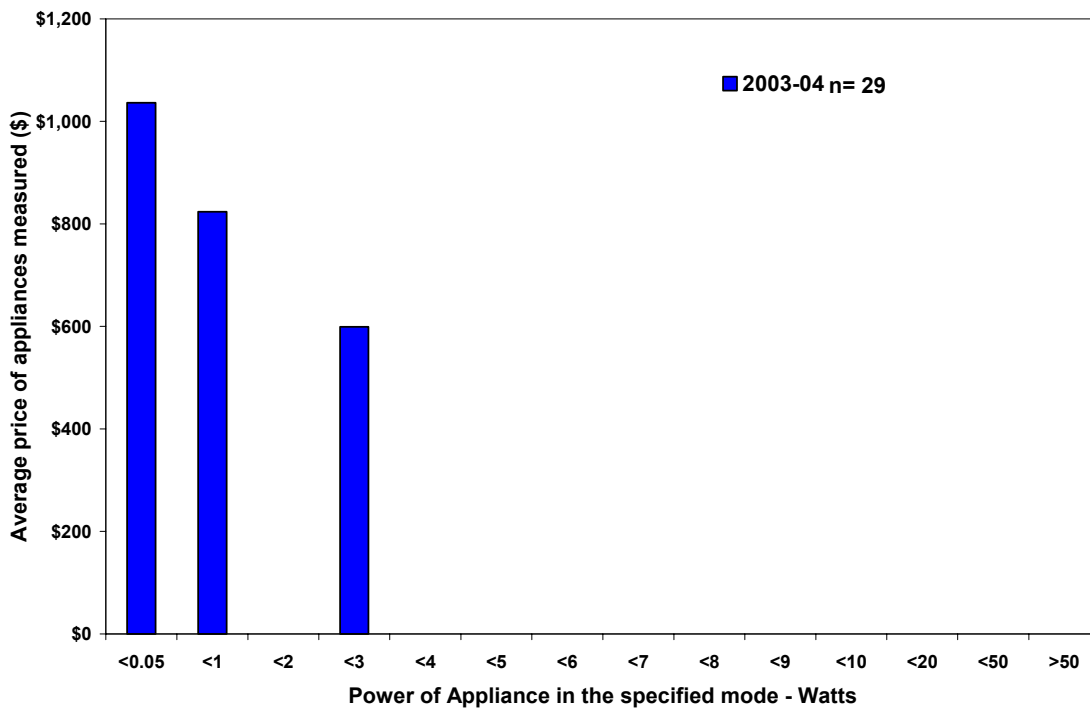


Note: This figure has non standard power bin sizes.

Home Theatre Systems – AV Receivers

Figure 39 illustrates that for AV receivers, in off mode generally the more expensive models appear to have lower consumption in off mode. Only 15% of units tested recorded any consumption in this mode, however all were priced under \$1000. Prices of units with no power consumption in off mode ranged from \$200 to nearly \$5500 with the average price equal to \$1180.

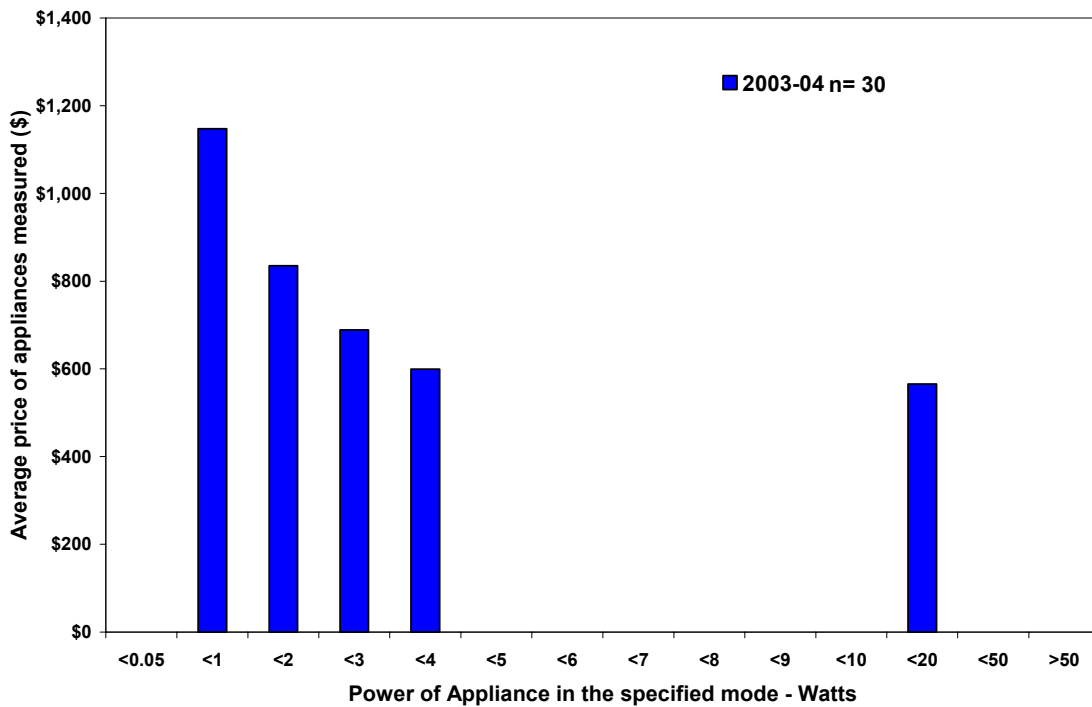
Figure 39 – Price vs. off mode performance: AV Receivers



Home Theatre Systems

Figure 40 below shows that generally the more expensive home theatre systems use less energy in passive standby mode. It should be noted that only 17% of products tested consumed more than 2W in passive standby.

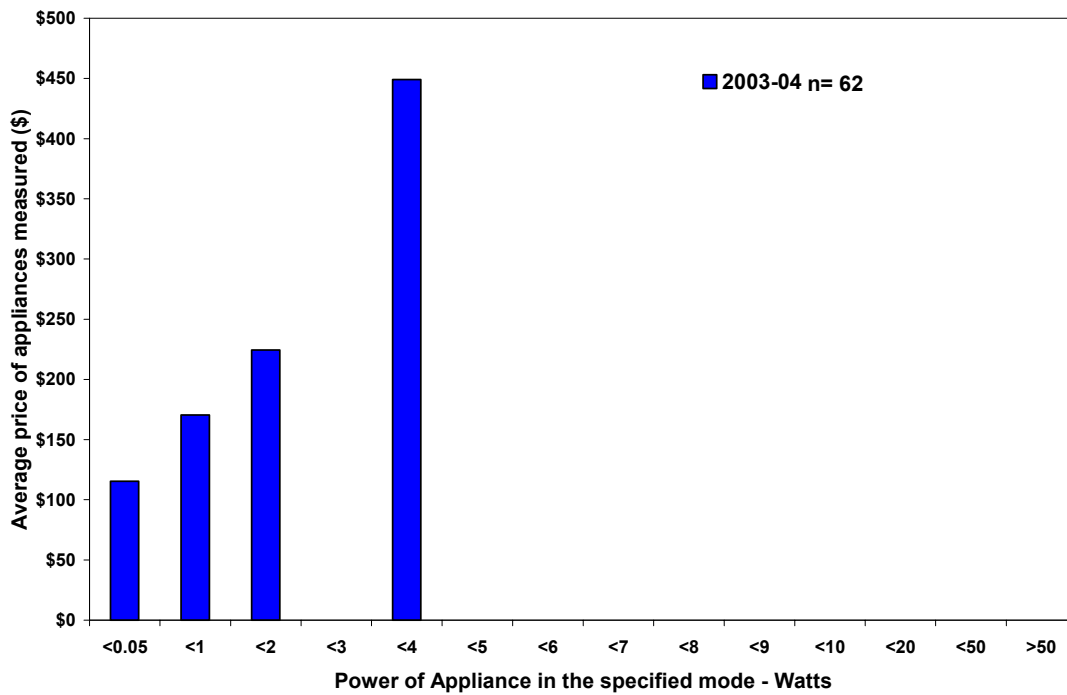
Figure 40 – Price vs. passive standby performance: Home Theatre Systems



Heaters – Electric Portable

Figure 41 indicates that the more expensive electric heaters have higher consumption in off mode. However, 80% of models tested had zero consumption in this mode, so the non zero power bins have few models on which to base the trend..

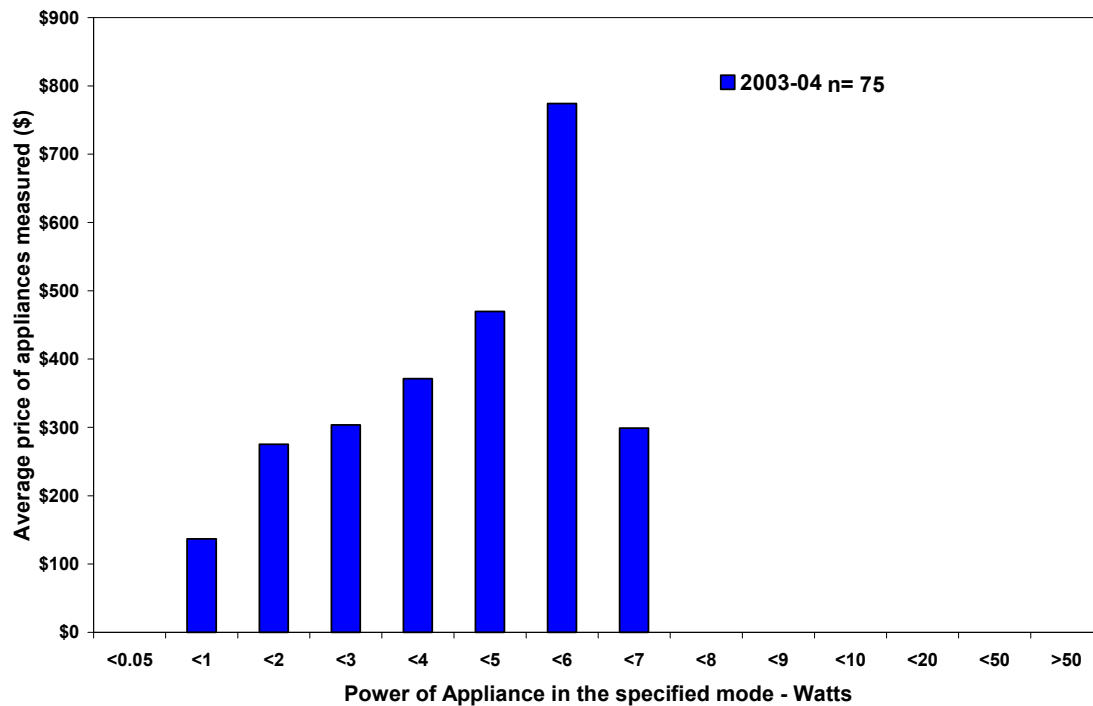
Figure 41 – Price vs. off mode performance: Heaters Electric Portable



Microwave Ovens

Figure 42 illustrates that, in most cases, the greater the cost of the microwave, the greater the power consumption in passive standby. These results indicate this more clearly than the 2003 results that reached the same conclusion. In 2003/04 only 2 units had consumption greater than 6W and they were both the same brand. All of the lower power models (<1W) are the much cheaper manual dial style microwave.

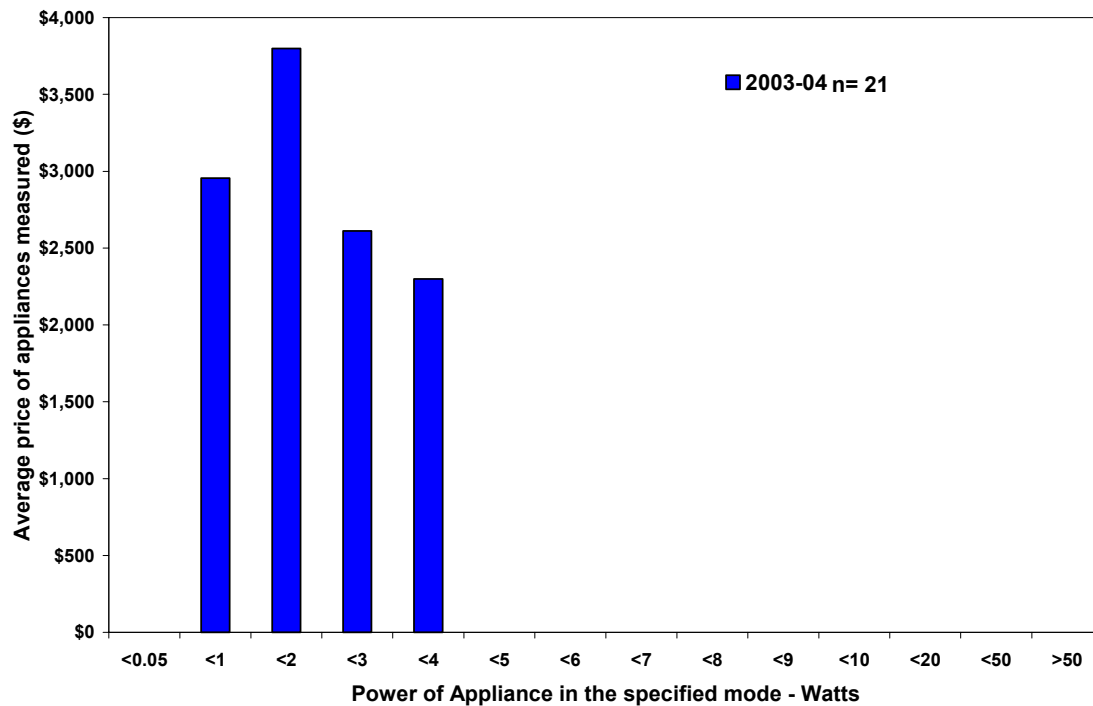
Figure 42 – Price vs. passive standby performance: Microwaves



Computer Laptops

Figure 43 illustrates; that in most cases, the greater the cost of the laptop, the lower the power consumption in off mode (this is when the external power supply is not connected to the laptop – ie no load condition). Caution is required as the sample size is quite small for this product.

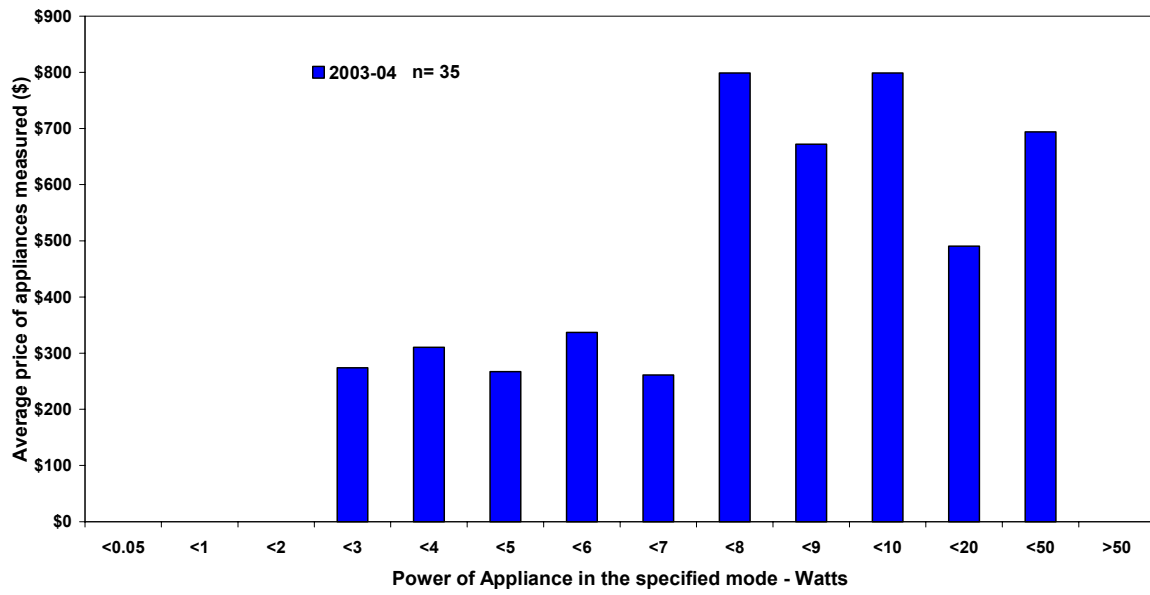
Figure 43 – Price vs. off mode performance: Laptops



Multi Function Devices

In active standby mode it appears that higher priced MFD's consume notably more energy. This is illustrated in Figure 44, where units consuming more than 7W in active standby mode have an average price almost double those under 7W. This is likely to be related to the level of features (eg fax, answering machine etc.).

Figure 44 – Price vs. active standby mode measurements: Multi Function Devices



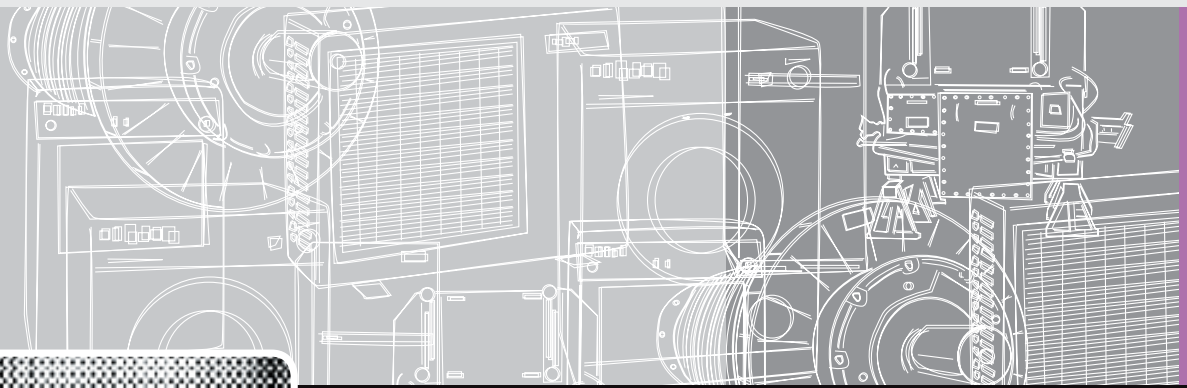
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Energy Efficiency Program.