APP Alignment of National Standby Power Approaches Project: 2009/10 Data Outcomes

Prepared for

Department of Climate Change and Energy Efficiency

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Introduction

Background

The Alignment of National Standby Power Approaches Project is being driven by the Australian Government's Department of Climate Change and Energy Efficiency with assistance from Korea, as part of the Asia Pacific Partnership on Clean Development and Climate Change (APP). The APP members include Australia, Canada, China, India, Japan, Republic of Korea, and the United States of America. The purpose of this union is "to address the challenges of climate change, energy security and air pollution in a way that encourages economic development and reduces poverty". The standby project is one of several being undertaken by the APP's Building and Appliances Taskforce (BATF).

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

The *Basket of Products* survey is the key component of the Alignment of National Standby Power Approaches Project and has been designed to enable consistent collection of data on standby power, resulting in a representative set of standby measurements. The data will be gathered for a common set of products (See Appendix A) in different regions and countries around the world. Such a comprehensive set of data will facilitate international comparisons, allowing trends in standby consumption, by products and/or by countries, to be tracked over time. The benefit of such a high quality data set is to enable benchmarking for success and to provide a sound basis for policy development and analysis.

The international survey method uses the principles set out in the test procedure IEC62301 and is based on the experience Australia has gained by conducting in-store surveys in the Australian marketplace since 2001. The Australian surveys target new appliances being offered for sale in selected major retailers (measured in situ) and complement related surveys of individual homes measuring all electronic products. This information has been extremely valuable because it provides trend data in standby power for new products. The database of over nearly 8,000 measurements has enabled policy makers to very quickly establish which appliance types have increasing or decreasing standby trends.

Purpose of Report

This report provides an update on progress to-date and results of the multi-country survey of standby power consumption. In some cases the result show sample sizes of less than 5 products, which is too low to use for comparison purposes. However, to provide an indication of the type of analysis and reporting that is possible, these results are currently included. Therefore the results should be qualified as indicative if they are cited or used in other studies.

Progress to Date

At the beginning of 2007 a discussion paper 'Basket of Products' was released identifying 14 core products and 29 secondary products. These products were seen to be relatively common in most markets and readily available in retail outlets, making them easily measured in any country around the world. The core products form the basis of the survey with all participating countries aiming to measure appliances in this group. In those countries where resources allow products in the secondary basket or/and other products of interest can be tracked using the same methodology. Table 1 below lists the 14 core products while the complete list of products measured can be found in Appendix A.

Table 1: Basket of Core Products

	Appliance Name
1	Clothes washers
2	Microwaves
3	Televisions – CRT
4	Televisions – LCD
5	Televisions – Plasma
6	DVD players
7	Integrated stereos
8	Portable stereos
9	Computer monitors – CRT
10	Computer monitors - LCD
11	Computer Printers Laser
12	Computer Printers Inkjet
13	Multi-Function Devices (MFD's)
14	External Power Supplies

Following on from the identification of the core products a data collection tool was developed that included an Excel recording spreadsheet and detailed instructions. The tool has been designed in a user-friendly format with multiple drop down lists in order to minimise data entry error while still allowing flexibility for unique situations that may apply in a particular country or a distinctive model. This tool was updated in 2010 to allow partners using the 'wattman' meter to link into the spreadsheet and have readings automatically entered. There were also some small changes to the survey process to help make the testing procedure more robust. Data sharing arrangements and verification procedures were also agreed of during 2009/10 and have been included with the instructions provided to partners undertaking the measurements. The new survey instrument and instructions were then distributed to the participating APP partners in May 2010.

Training workshops providing participants with detailed instruction on the testing procedure as well as practical experience in testing products have been conducted in China, Korea, India and Japan. Support has also been provided by email and phone to the APP partners in Canada, Korea, India, Japan and the USA.

A website has been developed in order to support the project and share information. (http://www.energyrating.gov.au/standbydata/app/). The website contains graphs allowing comparisons by country and summary graphs looking at products over time and across modes. Users are able to choose data by selecting desired country, product type, mode and year. This website will be updated over 2010-11 to include greater functionality.

The project has also undertaken to co-operate with and support the Intelligent Energy Europe (IEE): **S**tandby and Off-Mode **E**nergy **L**osses **I**n **N**ew **A**ppliances Measured in Shops (SELINA) project (see www.selina-project.eu) and the International Energy Agency (IEA), Efficient Electrical End-Use Equipment (4E) Standby Annex (see www.iea-4e.org). By participating in each others meetings, sharing data and information and running combined workshops many mutual benefits have been obtained. An improved, more robust methodology has been rolled out thanks to work undertaken with the SELINA project. Additionally, APP has been able to build on SELINA's existing database to develop a consistent approach to data across the different projects, while reducing duplication and development costs. The APP data base should be finished at the end of 2010. Conducting a combined workshop with 4E in Korea in 2009 and with 4E and SELINA in Vienna in 2010 has meant closer alignment of methodologies, understanding and future pathways. Some of the APP partners have also shared their data with our SELINA counterparts and we are in the process of arranging a reciprocal arrangement in order to access the European data.

Data collection has now been completed in the Australia, Canada, China, India, Korea, and the United States as part of the APP project. Additionally the SELINA project has finalised its data collection which will afford APP partners the opportunity to access this information under the data sharing agreement. The result of data collections to date can be found in Table 2 below.

Table 2 Store Data Collected

	No of Appliances measured			
Country	**2007/08**	**2008/09**	**2009/10**	**Next Scheduled Test**
APP Project Participants				
Australia*	649	517	632	Nov 2010
Canada	1154	-		
Korea	119	137	171	Oct 2010
China	-	-	82	
India	123	-		July 2010
Japan	-	-	Trial Sample	
USA	113	135		
Other				
Europe (SELINA)	-	-	6000	June 2011 (awaiting funding approval)
Czech Republic	561	-	500[a]	*measured during SELINA project
Hungary	500	-		
New Zealand	353	-		

Interpreting the Results

Definition of Standby Modes

Appliances and equipment with a 'standby mode' may include any 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 the international basket of products survey the following definitions were used:

Power – In Use (on): The power used by the product when performing its primary function.

Power – Active standby Active standby is when the appliance is on, but not performing its main function. For example, the DVD may be on, but is not playing or recording. This mode is usually only present in devices (a) where there is a mechanical function which is not active (e.g. DVD drive or motor) but where power circuits are on, or (b) where a device has a battery and the device is charging.

Power – Passive standby When a product or appliance is not performing its main function (sleeping) but it is ready to be switched on (in most cases with a remote control) or is performing some secondary function (e.g. has a display or clock which is active in this mode). 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 (disconnected).

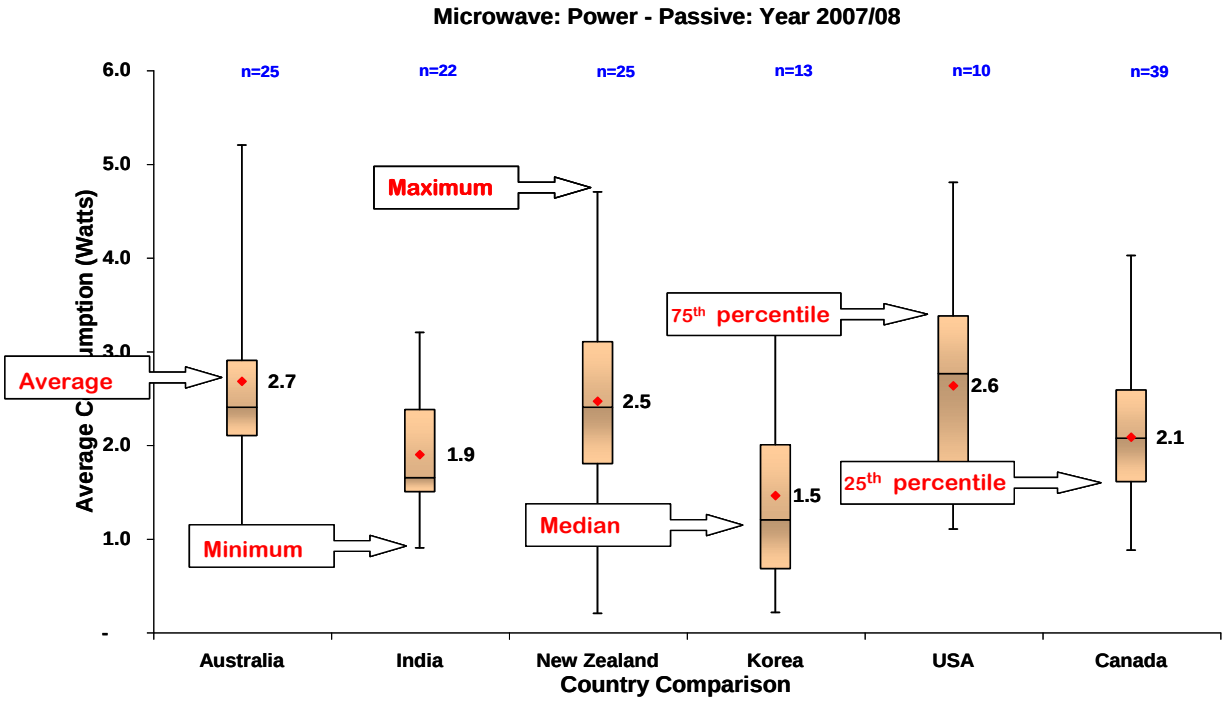
Power – Off The product must have a power switch located on the product. Off mode is when a product or appliance is connected to a power source, but does not produce any sound or picture, transmit or receive information or is waiting to be switched 'on' by the consumer. If the product has a remote control, it cannot be woken by the remote control from off mode – it can only be activated via the power switch on the product. No display should be active in 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. An LED may be present to indicate off mode.

Box and Whisker Graphs

The international comparison data has been presented using the Box and Whisker graph format. This enables the maximum and minimum consumption data to be displayed along with the mean, the median and percentile data. The maximum and minimum power consumption recorded in each country is represented by the marks at the end of the vertical lines (the whiskers). The mean or average power consumption is marked on the chart with a red diamond and the actual figure written alongside. The median or middle data point is shown by a black line inside the brown box. Fifty percent of all readings fall within the brown box, the upper edge represents the 75th percentile and the lower edge represents the 25th percentile. Therefore the upper whisker represents the range of values in the highest

25% of readings and the bottom whisker represents the lowest 25%. Figure 1 below further illustrates how to interpret the data from these graphs.

Figure 1 Example Box and Whisker Graph



Qualification of Survey Results

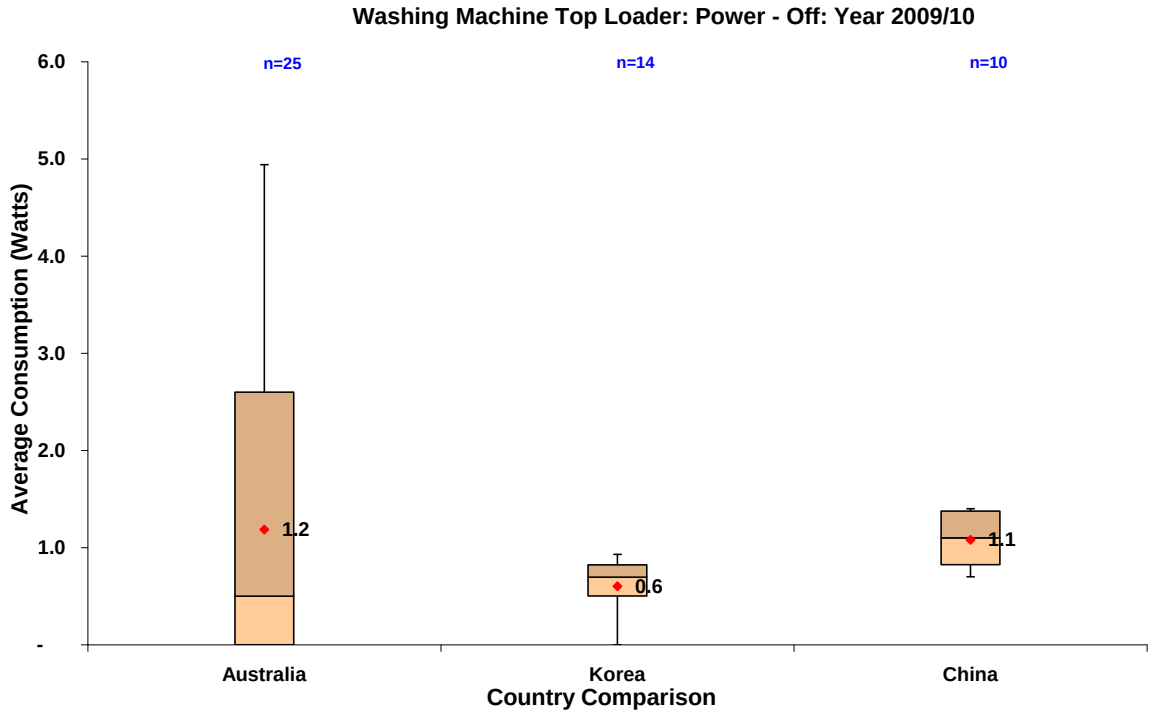
This document is reporting on the 2009/10 data outcomes for the APP project. As not all data included brand and feature information it can make it difficult to assess why differences in consumption are occurring from one country to the next. Slight differences in the categorisation of modes means the data has been slotted into best fit categories, which may result in small data errors.

International Product Data by Mode

Clothes Washer – Top Loaders

Top loading washing machines have been measured in 3 countries in 2009/10. The off power results as shown in Figure 2 demonstrate that Korea found the product average to be below one watt, and the range of consumption to be smaller than the other countries. The Chinese and Australian samples both averaged close to one watt however the Australian sample had a much broader range of results.

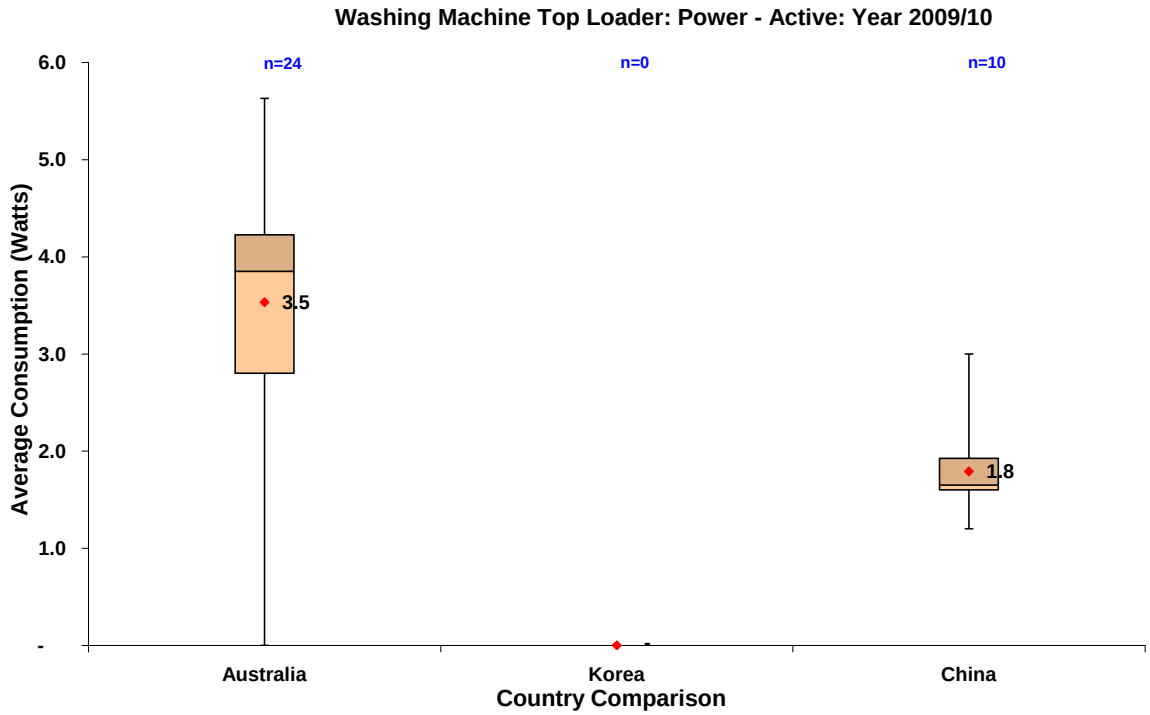
Figure 2 2009/10 International Comparison Washing Machine Top Loader Off Mode



In active standby mode top loading machines were averaging 3.5 watts in Australia but only 1.8 watts in China. Again the range of results for the Australian models was larger. The data for active mode[1] is presented in Figure 3

[1] The term 'active mode' is used as shorter name for ,active standby mode' throughout the document and similarly 'passive mode' is used as a shorter name for 'passive standby mode'.

Figure 3 2009/10 International Comparison Washing Machine Top Loader Active Mode



Clothes Washers – Front Loaders

Front loading clothes washer data was collected in the three countries with both Australia and China finding average consumption below one watt in off mode. However in Australia the range spanned from zero to a little over four watts. Korea average was a little over 1 watt, but this is likely to be effected by the extreme outlining model at eight watts with at least 75% of models consuming less than half a watt in off mode. The data is shown in Figure 4.

The average active mode consumption for front loading clothes washers was similar in Australia and China as can be seen in Figure 5.

Figure 4 2009/10 International Comparison Washing Machine Front Loader Off Mode

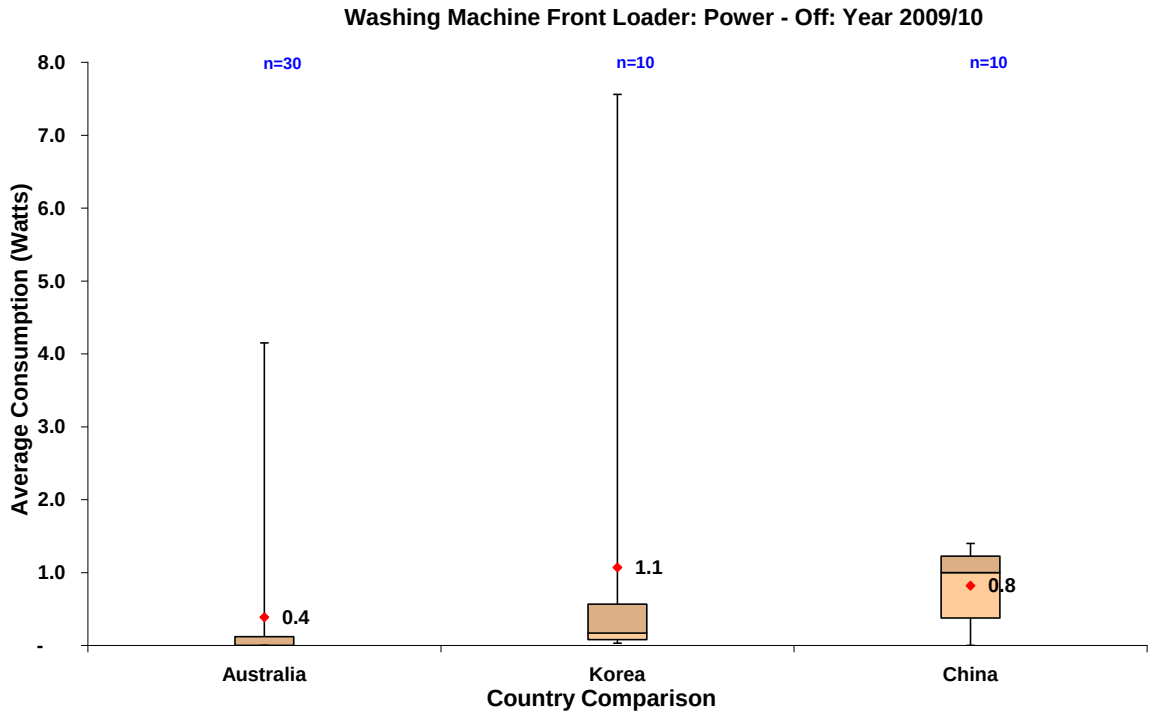
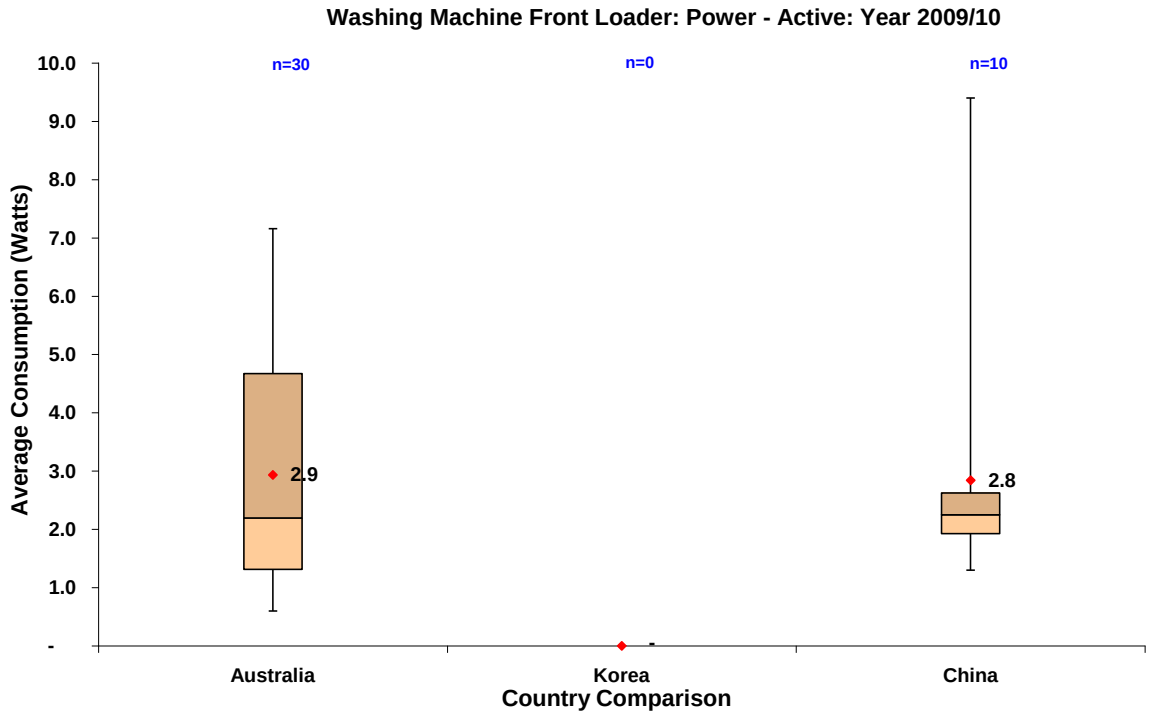


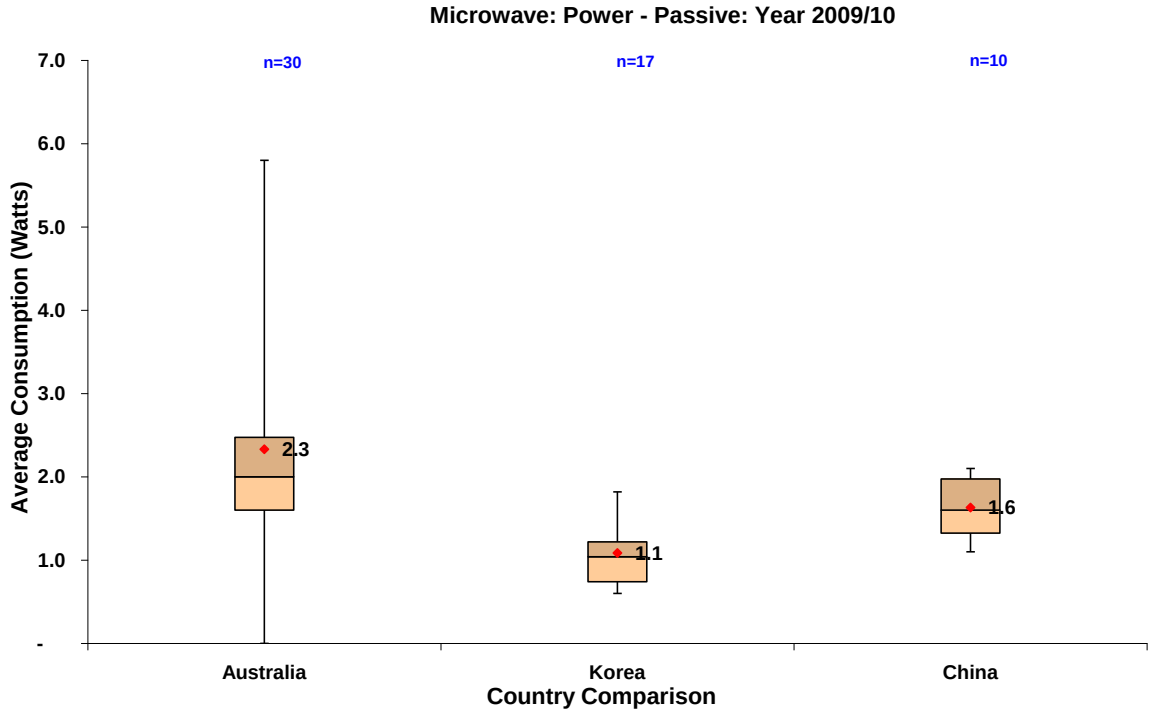
Figure 5 2009/10 International Comparison Washing Machine Front Loader Active Mode



Microwaves

All three countries were able to collect data on Microwave ovens in passive standby. Both Korea and China found average consumption and the range of consumption to be lower. As shown in Figure 6, Australia's average consumption was more than double Korea's at 2.3 watts with most Australian models being greater than the highest consuming Korean model.

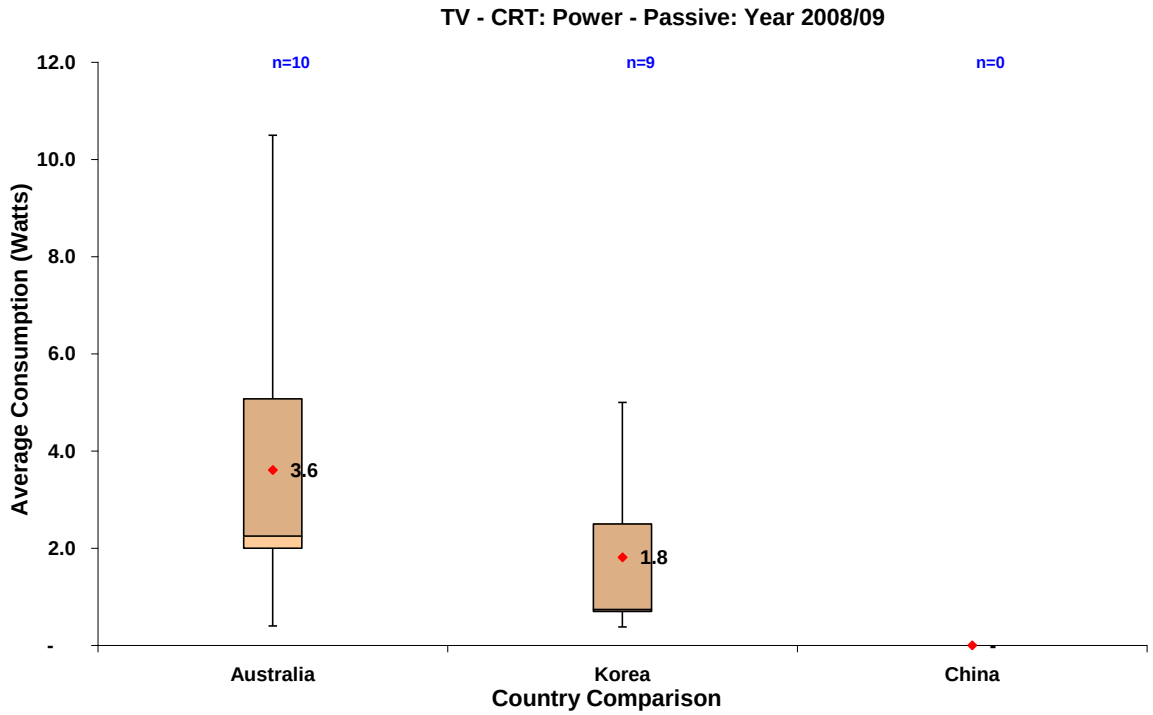
Figure 6 2009/10 International Comparison Microwaves Passive Mode



Televisions – CRT

Korea was the only country to supply CRT television data in 2009/10; this data will be discussed in the product trends section. Below the 2008/09 has been presented as the most current comparison data available. Figure 7 demonstrates that standby consumption in the majority of Korean models was much lower than Australian models. The Korean average consumption was recorded as 1.8 watts compared to Australia's 3.6 watts.

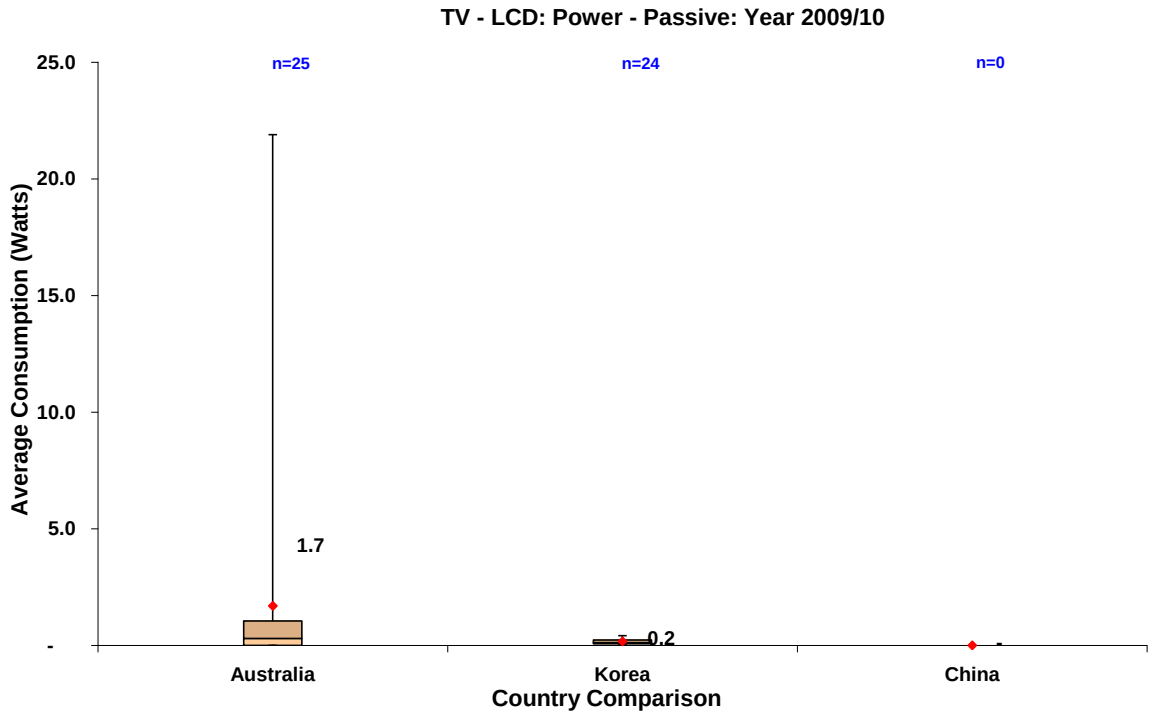
Figure 7 2008/09 International Comparison TV - CRT Passive Mode



Televisions – LCD

An increasing number of LCD televisions are being manufactured without an off mode and as such there was insufficient data for comparison in this mode. As shown in Figure 8, Korean data for LCD televisions measured in passive standby is approaching zero with an average of 0.2 watts and a maximum of 0.4 watts. The Australian average of 1.7 watts is slightly distorted by one outlining model (21.9 watts), which when removed brings average consumption below 1 watt (0.8).

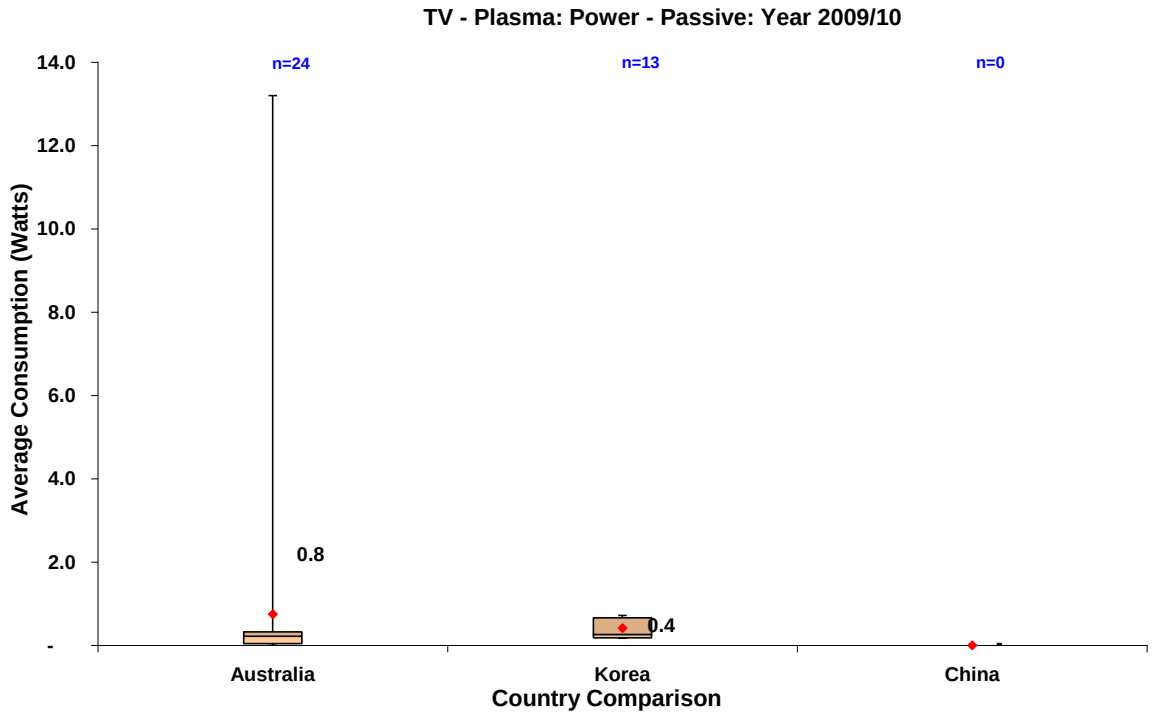
Figure 8 2009/10 International Comparisons TV - LCD Passive Mode



Televisions – Plasma

In plasma televisions, the presence of an off mode also appears to be declining. Those models with an off mode recorded no consumption in this state. Passive standby was comparable in both Korea and Australia. Again the Australian data is distorted by one outlying result (13.2) which when removed bring the average to 0.2 watts as all other models were recorded below 1 watt. All other models in both surveys consumed less than 1 watt in this mode.

Figure 9 2009/10 International Comparison TV - Plasma Passive Mode



DVD Players

Figure 10 and Figure 11 show passive and active standby mode for DVD players. In both modes average consumption is similar across countries. Few models were found to have an off mode with the overwhelming majority of these having zero consumption.

Figure 10 2009/10 International Comparison DVD Passive Mode

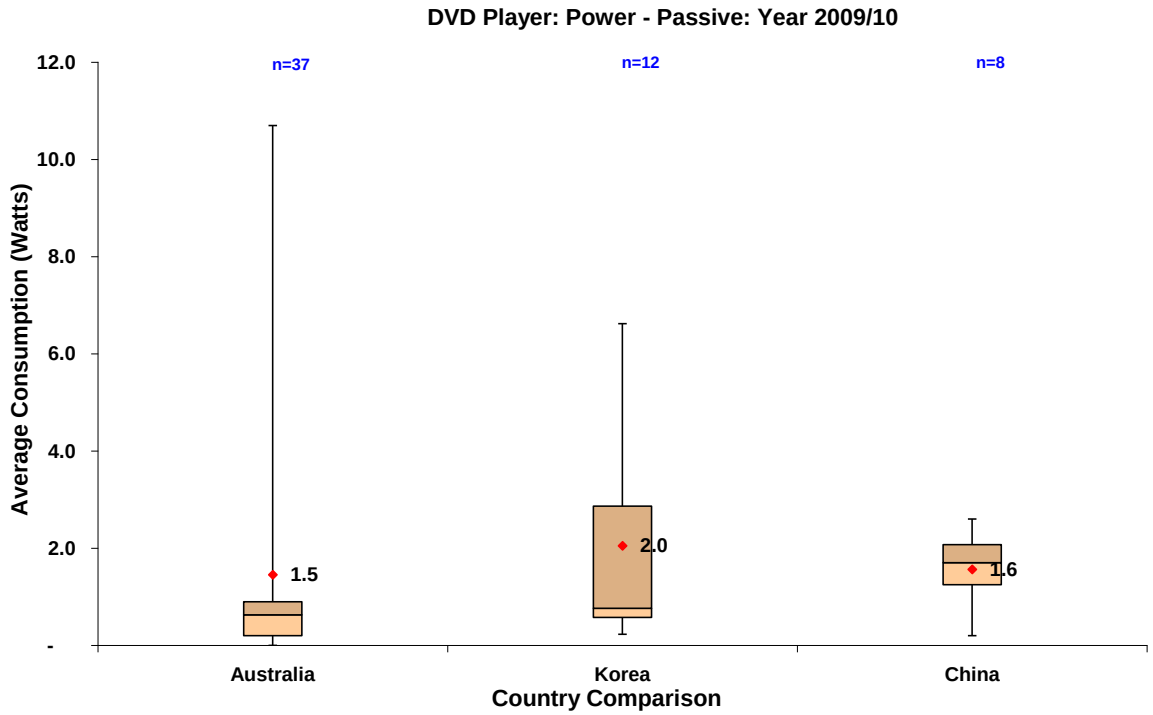
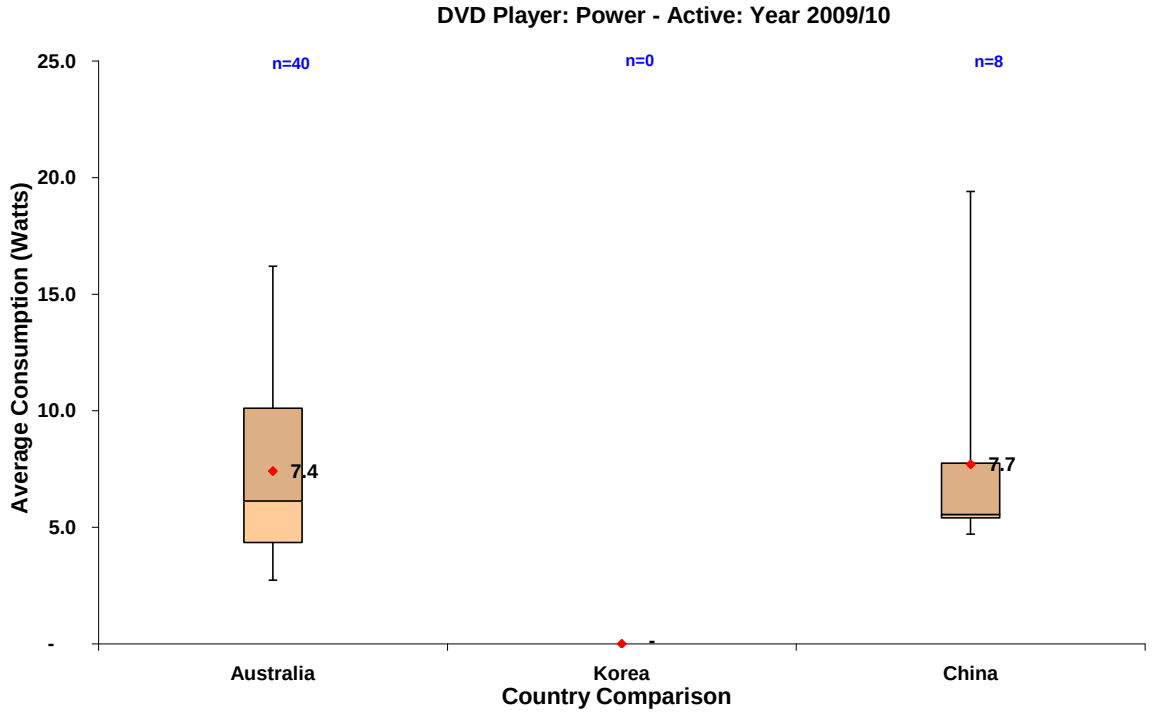


Figure 11 2009/10 International Comparison DVD Active Mode



Integrated Stereos

Integrated stereo data was collected for a variety of brands in all three countries. The passive standby results were remarkably similar across all three countries with 75% of products falling within a similar range. The Korean average is slightly distorted by an outlying result. Active standby was only reported by China and Australia. These results were very different with the vast majority of Australian models consuming more than the highest consuming Chinese unit in this mode. As in previous years this highlights that products can be low consumers in one mode and high consumers in another mode. Figure 12 and Figure 13 present this data.

Figure 12 2009/10 International Comparison Stereo - Integrated Passive Mode

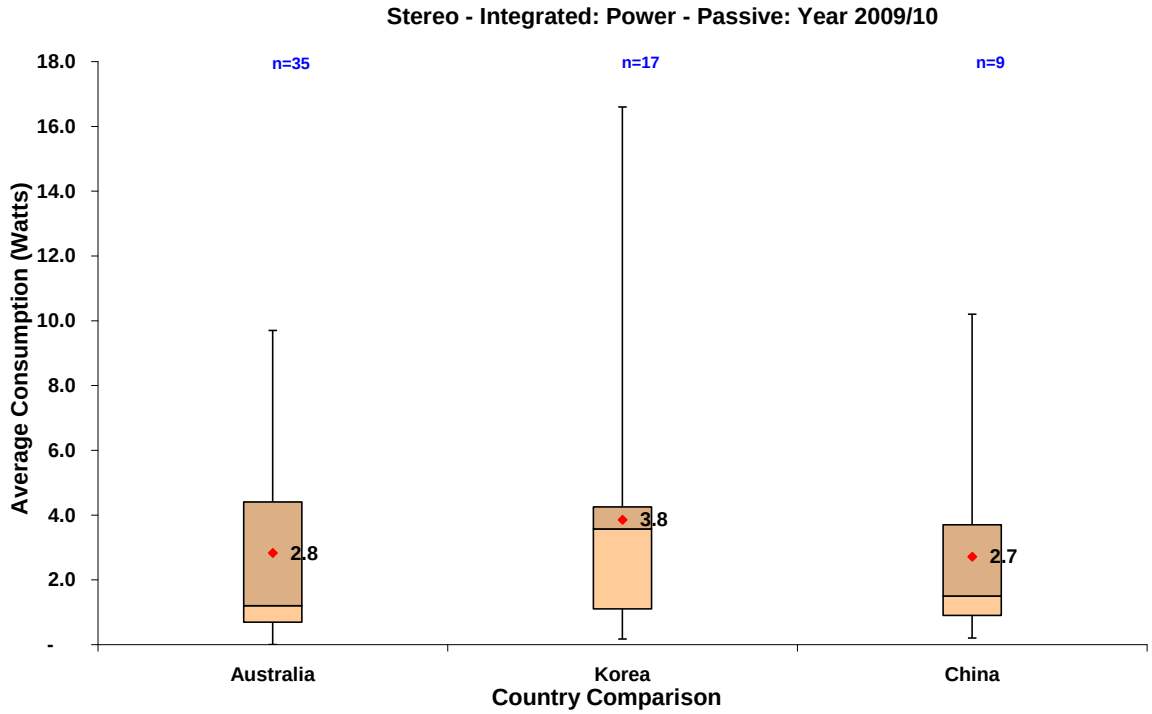
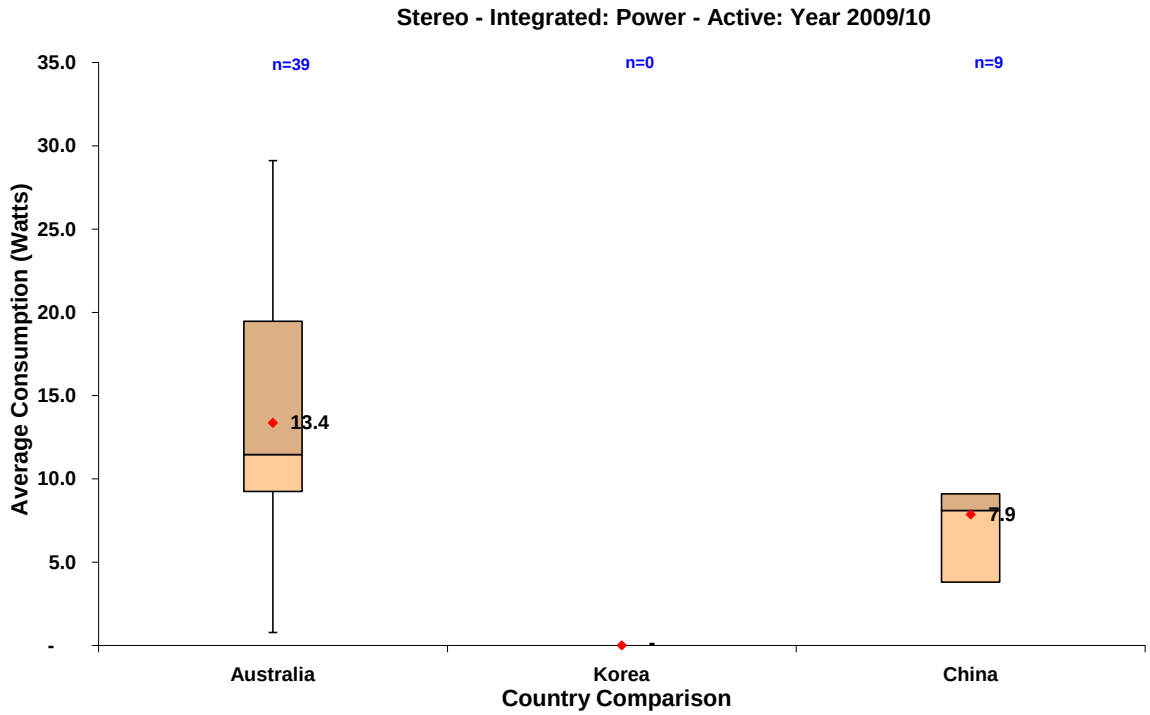


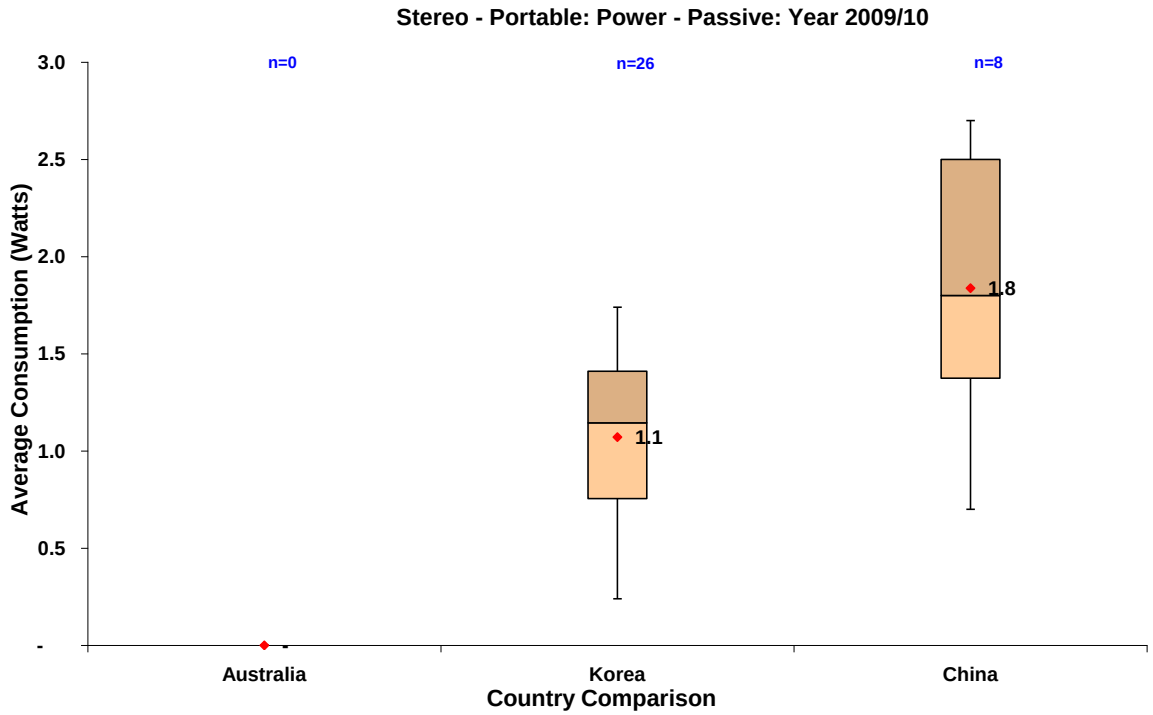
Figure 13 2009/10 International Comparison Stereo - Integrated Active Mode



Portable Stereos

Korea and China recorded data for portable stereos however none were found in Australian stores in 2009/10. Figure 14 presents the consumption results for this product in passive standby showing that nearly all the Korean models consumed less than the majority of the Chinese product. The range of consumption in the Korean portable stereos was quite compact with the average consumption approaching 1 watt (1.1w).

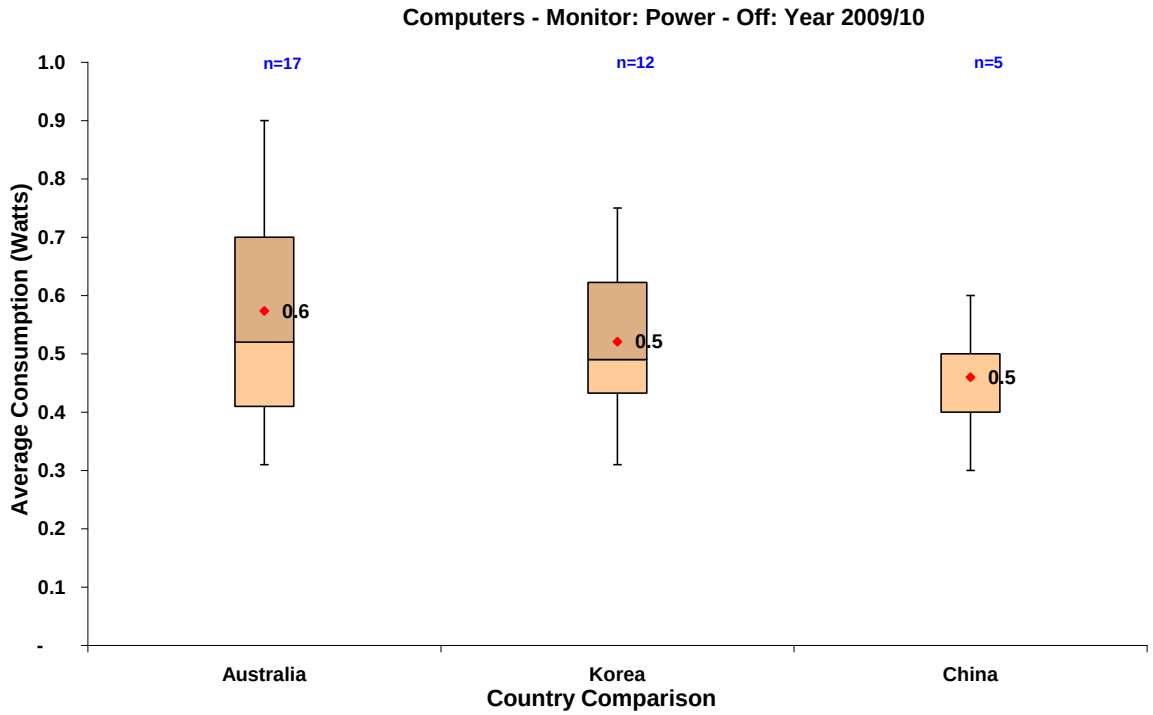
Figure 14 2009/10 International Comparison Stereo - Portable Passive Mode



Computer Monitors

Computer monitor data was collected in all three countries. As shown in Figure 15 results for most countries were similar, with average standby at around 0.5 watts. No monitor was found to have standby above 1 watt. There were at least 10 different brands included in the study.

Figure 15 2009/10 International Comparison Computer Monitor Off Mode



Multi-Function Devices (MFDs)

Multifunction devices have become the dominant print product with few stores stocking products with print only capability. Figure 16 presents off mode data for multi function devices measured in Australia, China and Korea. The Korean results were compact with a low average consumption of 0.3 watts; however it should be noted that all bar two models were from the one manufacturer.

Active standby consumption for multi function devices is shown in Figure 17. Again the Korean data is at much lower active standby levels than the other countries. The Australian data has one outlining model – the only laser MFD. However removing this from the data leave the average consumption above five watts.

Figure 16 2009/10 International Comparison Multi Function Device Off Mode

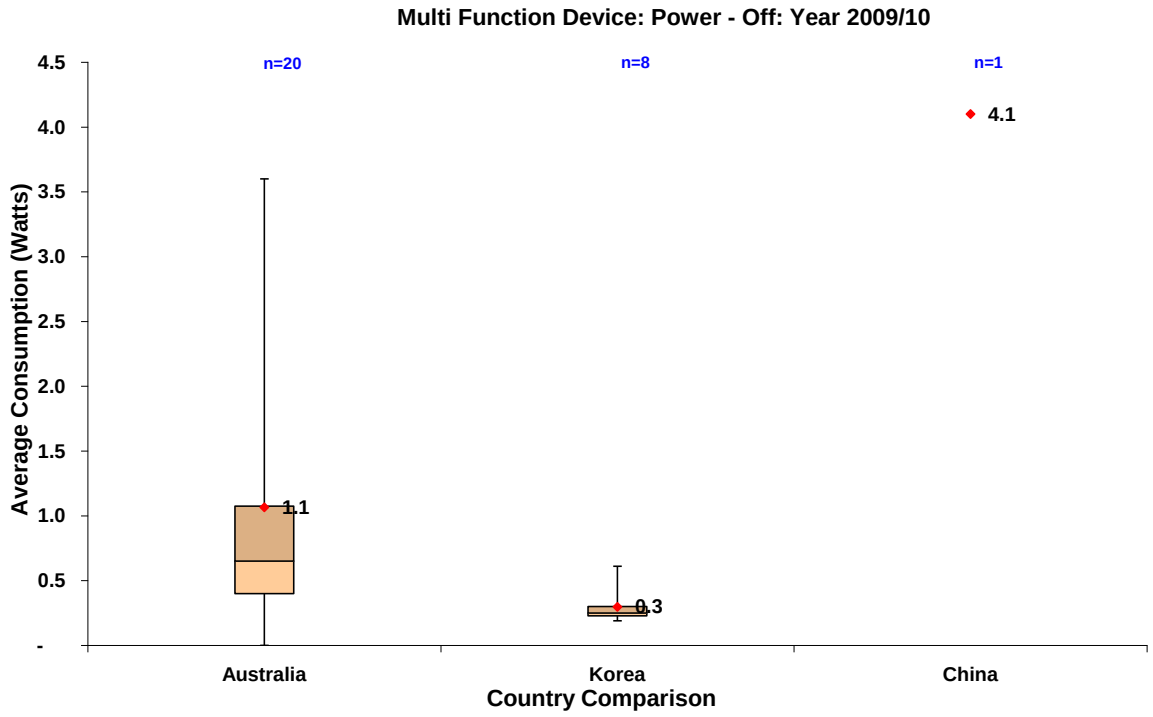
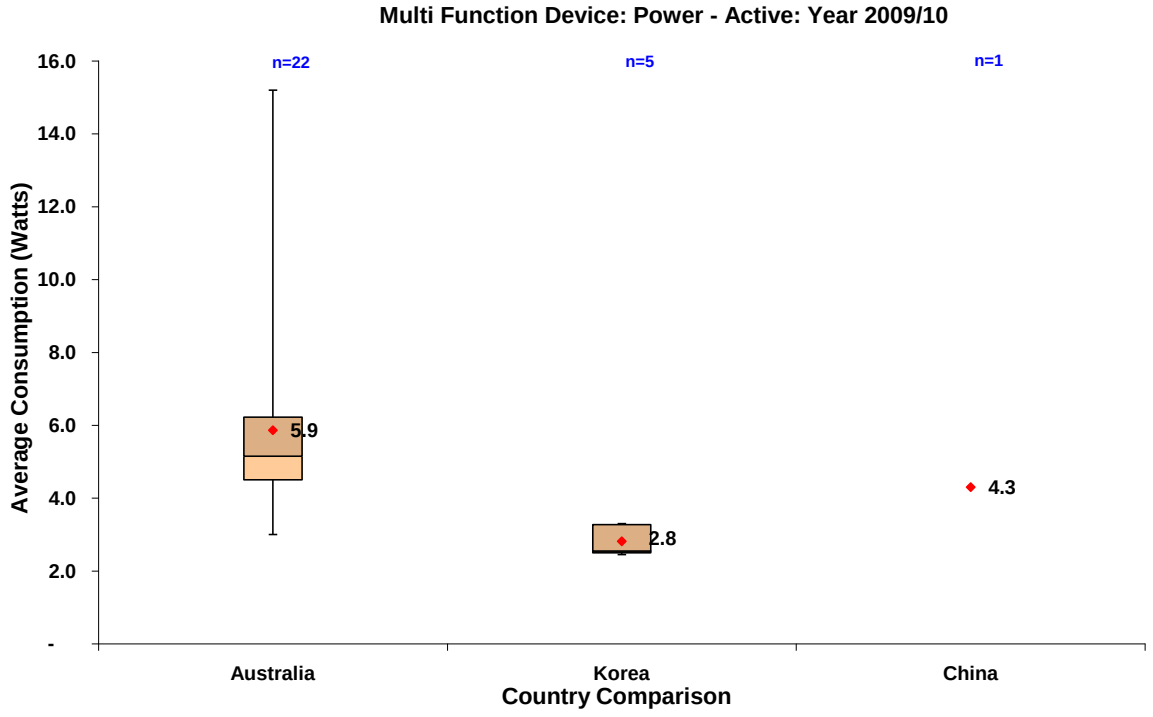


Figure 17 2009/10 International Comparison Multi Function Device Active Mode

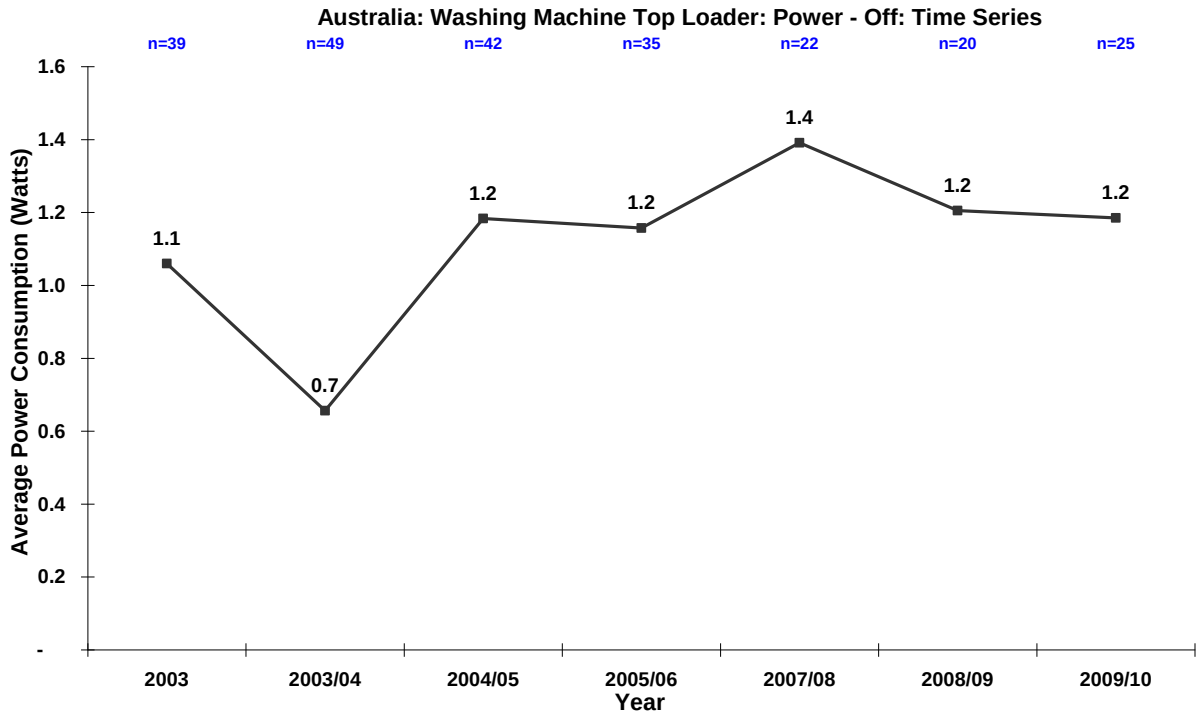


Product Trends in Australia & Korea

Clothes Washers – Top Loaders

Average consumption for top loading washing machines in Australia has been stable for the last five years with no significant increase in off or active mode consumption during this time. These results are presented in Figure 18 and Figure 19. No washing machines were surveyed in 2006/07 year. Figure 18 also presents the off mode data for Korean top loading washing machines. While the decreases in consumption are too small to have statistical significance, the downward trend line is a positive sign.

Figure 18 Australian & Korean Time Series Data – Washing Machine Top Loader Off Mode



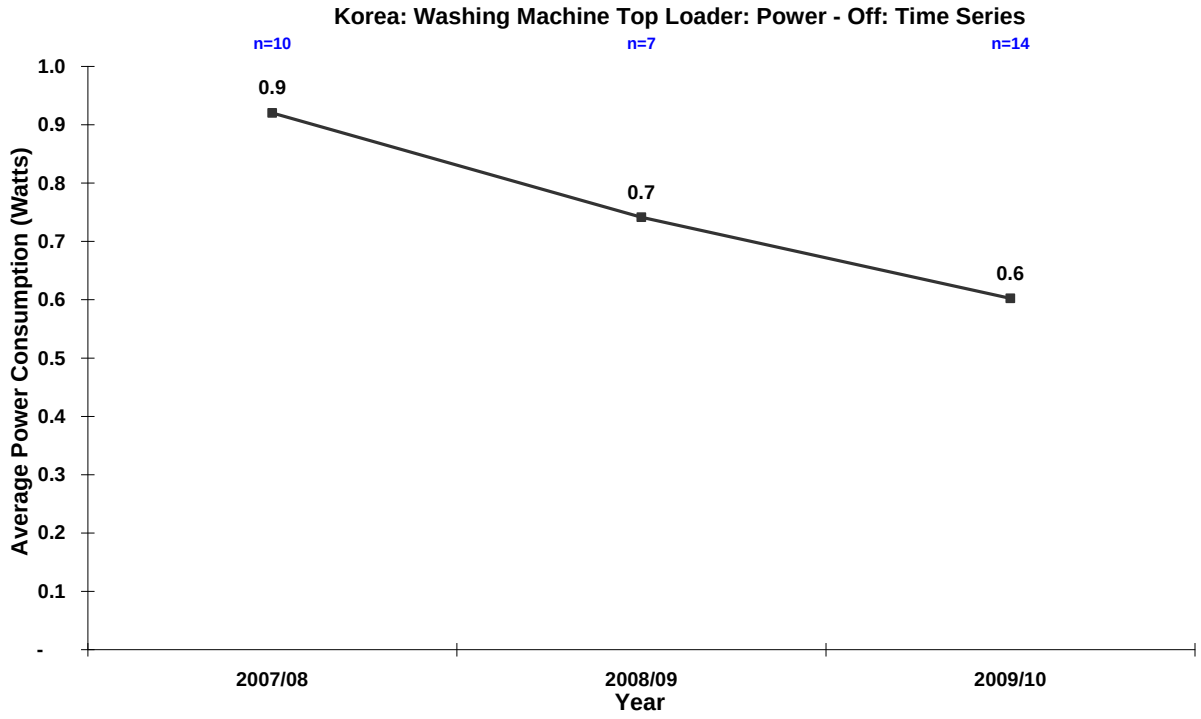
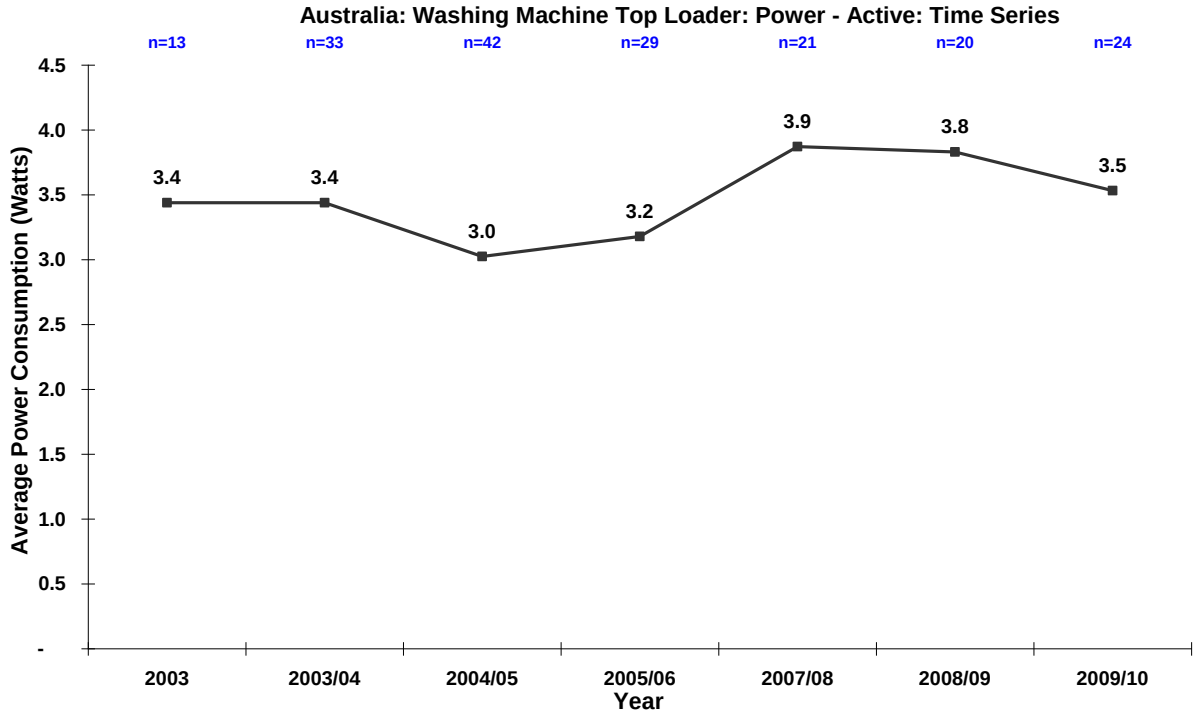


Figure 19 Australian Time Series Data – Washing Machine Top Loader Active Mode



Clothes Washers – Front Loaders

Off mode consumption for front loading clothes washers in Australia has averaged at less than 1 watt for the last eight years. Average active mode has remained stable at around 3.5 watts. No washing machines were surveyed in 2006/07 year. The results for off mode are presented in Figure 20, while Figure 21 represents active standby mode.

Figure 20 Australian Time Series Data – Washing Machine Front Loader Off Mode

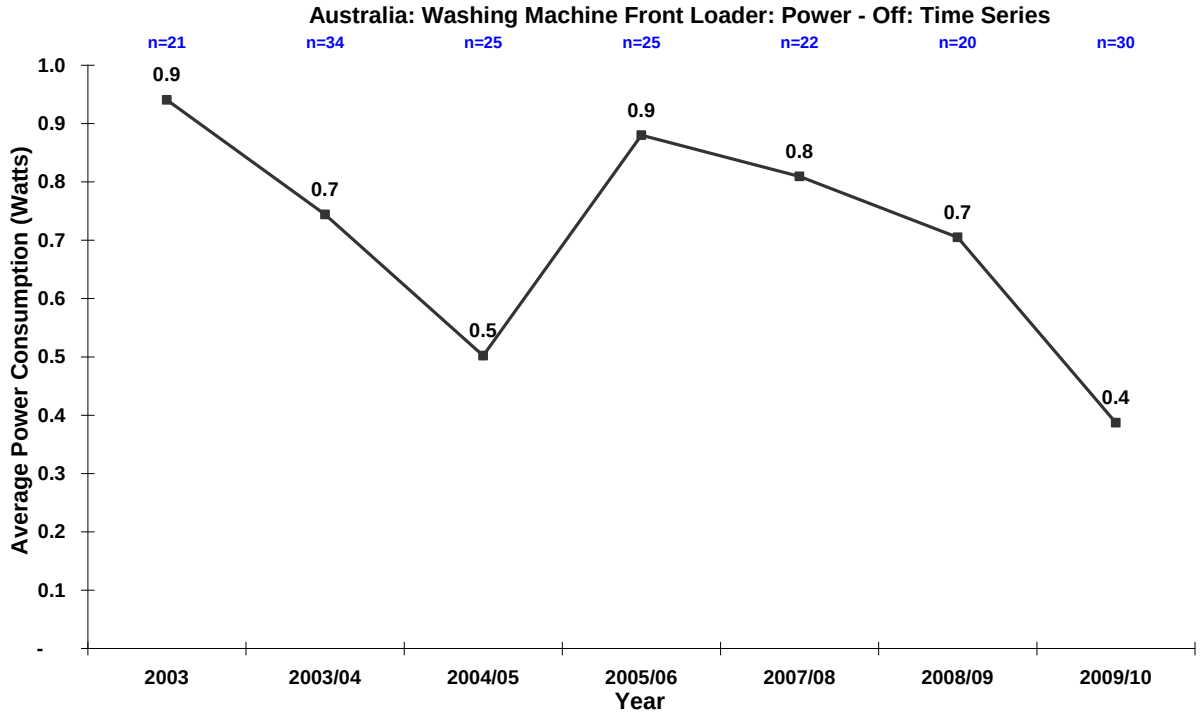
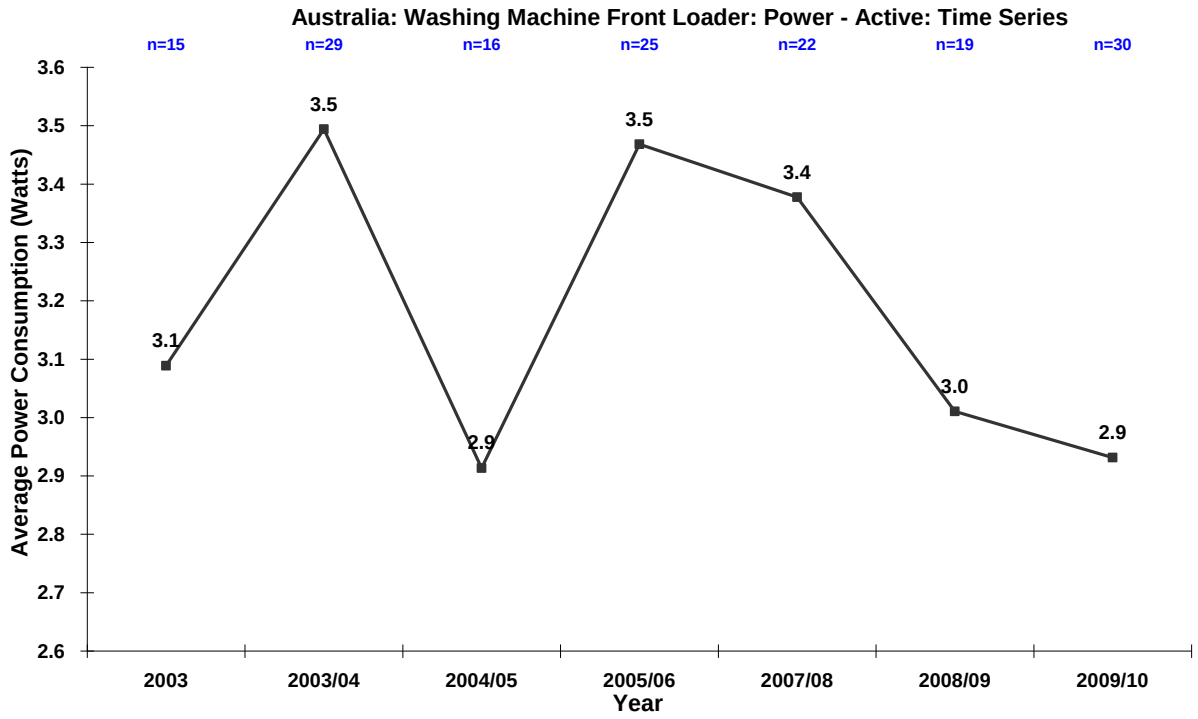


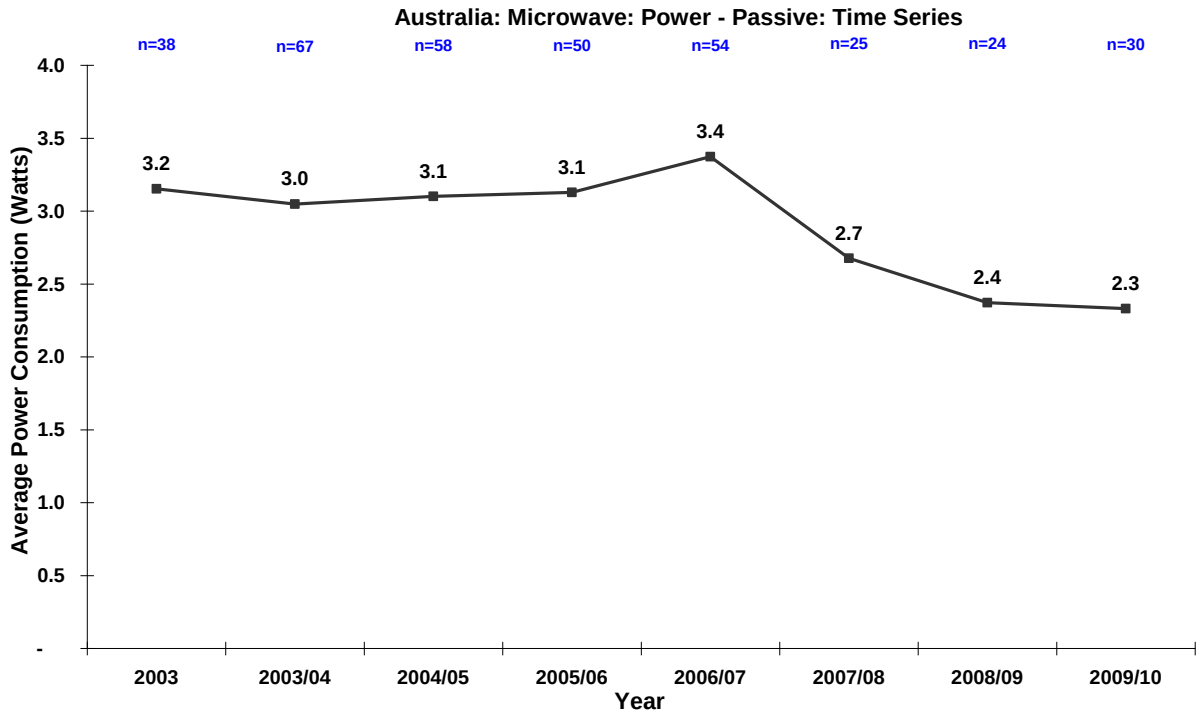
Figure 21 Australian Time Series Data – Washing Machine Front Loader Active Mode

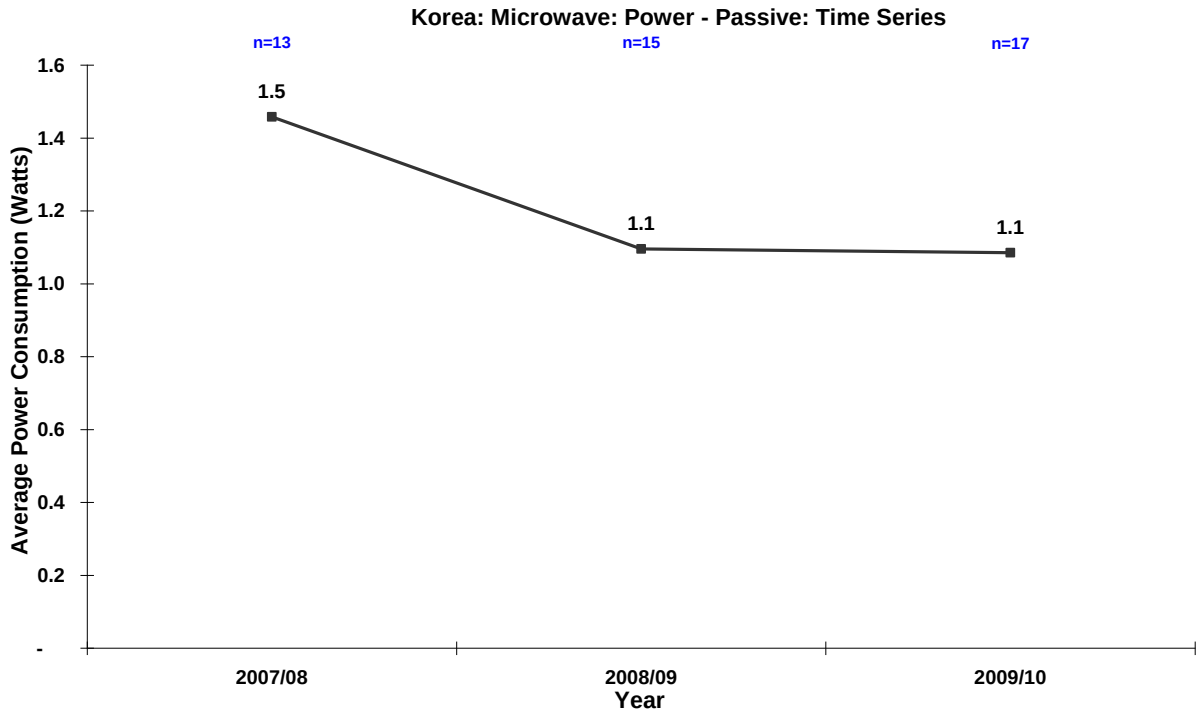


Microwaves

As shown in Figure 22 passive standby for microwave ovens had remained stable since 2003/04. However the last two surveys recorded a statistically significant decrease in consumption which may be indicative of a downward trend. Interestingly, while the Korean models consume half that of their Australian counterparts, the trend lines are almost identical for the last three years.

Figure 22 Australian & Korean Time Series Data – Microwave Passive Mode



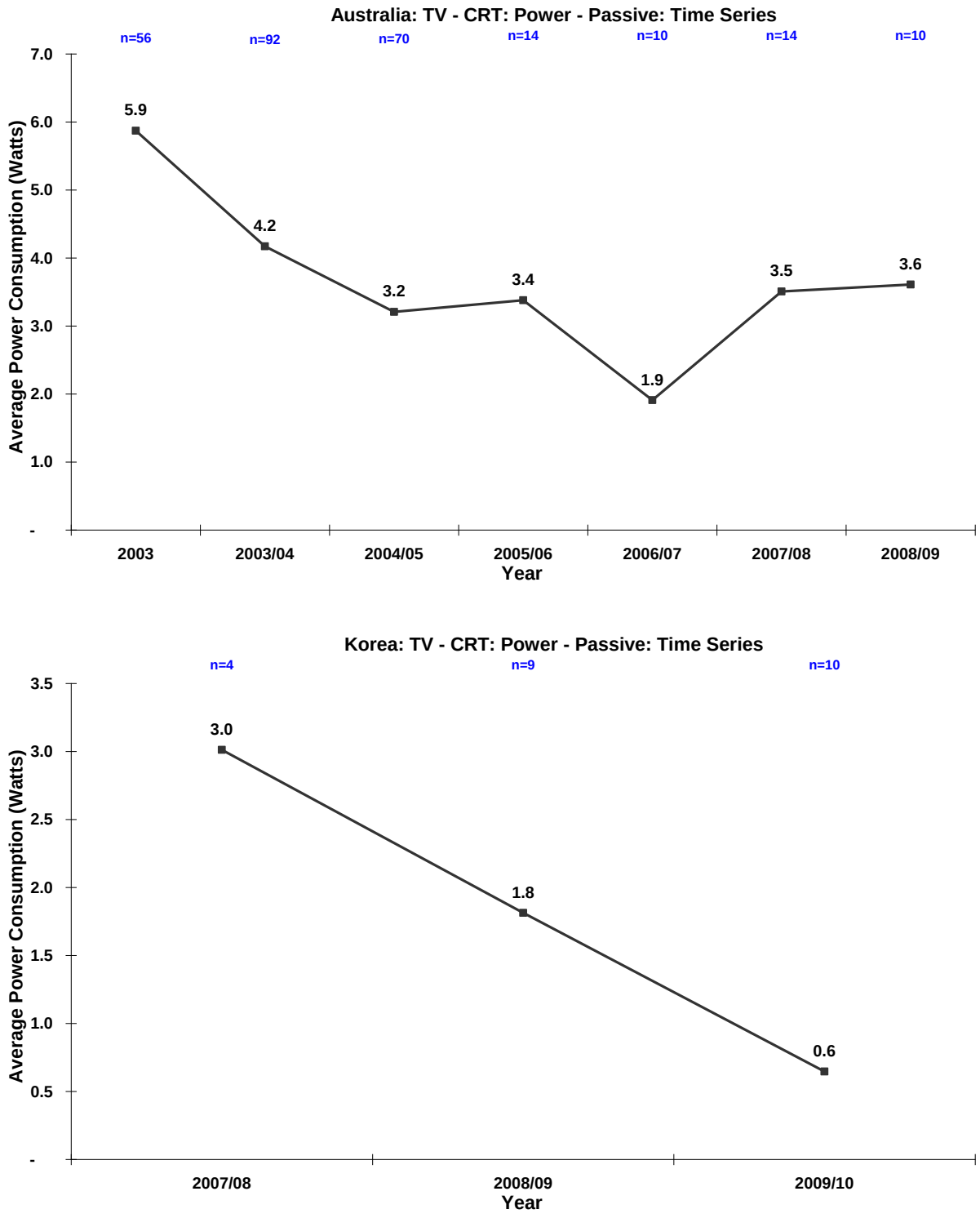


Televisions – CRT

Average passive standby consumption for CRT televisions reduced significantly in 2004/05 from around 4.2 watts to 3.2 watts. Data collected in 2006/07 also indicated another decrease in average consumption however recent data has shown levels remain stable at around 3.5 watts. Six CRT televisions were measured in Australian retail stores in 2009/10,

however only one could be put into passive standby. That model consumed 3.7 watts. Conversely the average passive standby data for Korea has dropped dramatically over the last three years from 3 watts to 0.6 watts. These results are presented in Figure 23.

Figure 23 Australian and Korean Time Series Data – CRT TV Passive Mode



Televisions – LCD

Average consumption for LCD televisions has dropped significantly over the past five years to be close to zero. As demonstrated in Figure 24 average consumption for last four years has been below 0.2 watts with this year's average recorded as zero.

After taking a significant drop in average consumption in 2004/05 the passive mode for LCD has been at around 2 watts. A quick glance at the results would indicate that the decline recorded last year was perhaps a sampling anomaly with the 2009/10 average returning to previous consumption levels. However, this year's average is distorted by one extreme outlying result which when removed would see the average fall below 1 watt (0.8) instead of 1.7 watts. These results are shown in Figure 25 along with Korean data for the last 3 years. In Korea's case there is a clear downward trend with average passive standby in 2007/08 measured at 1.2 watts falling to 0.2 watts in 2009/10.

Figure 24 Australian Time Series Data – LCD TV Off Mode

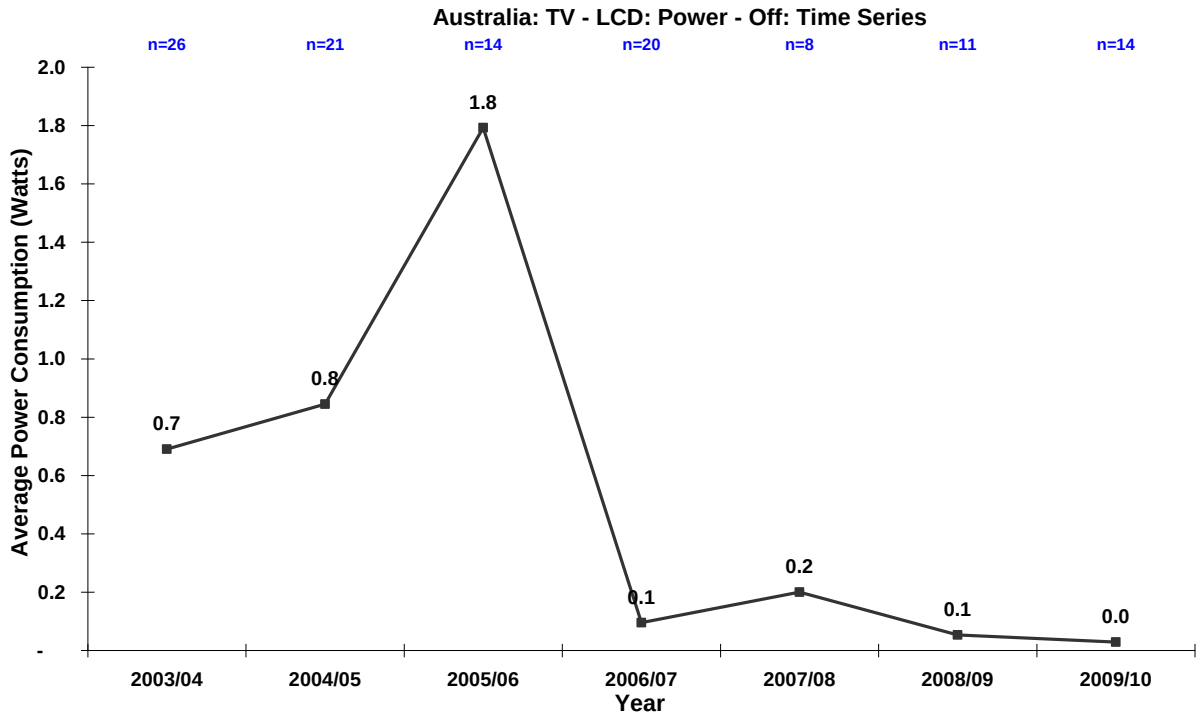
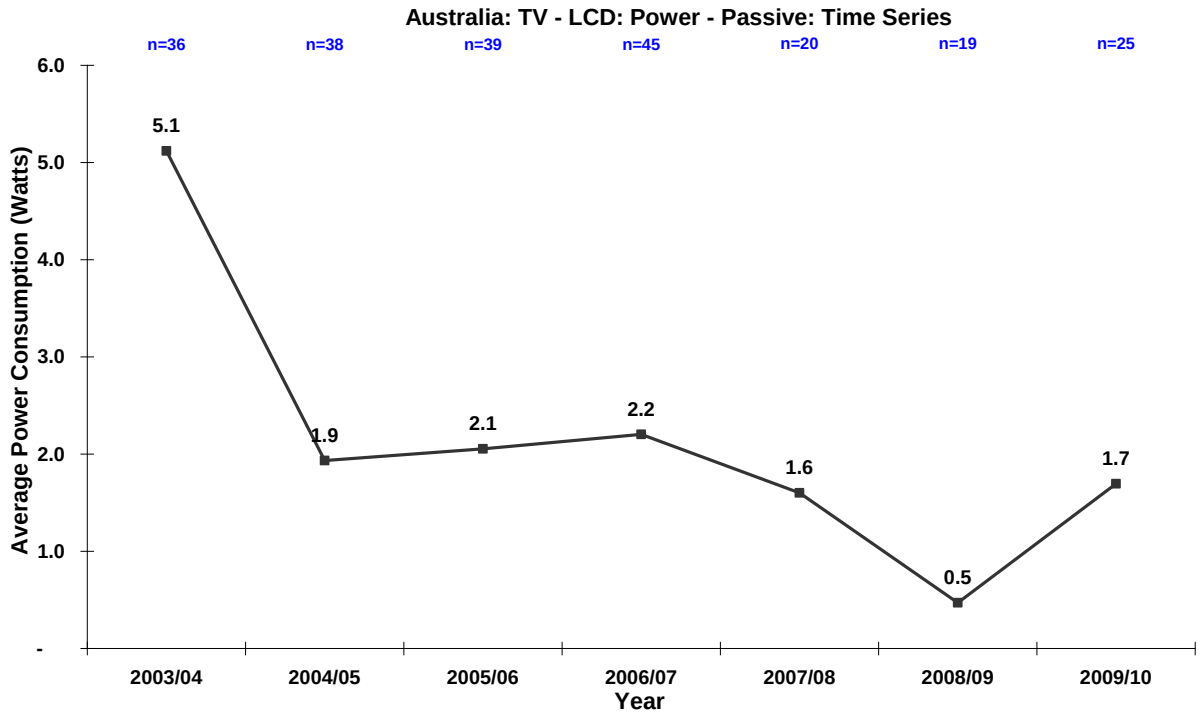
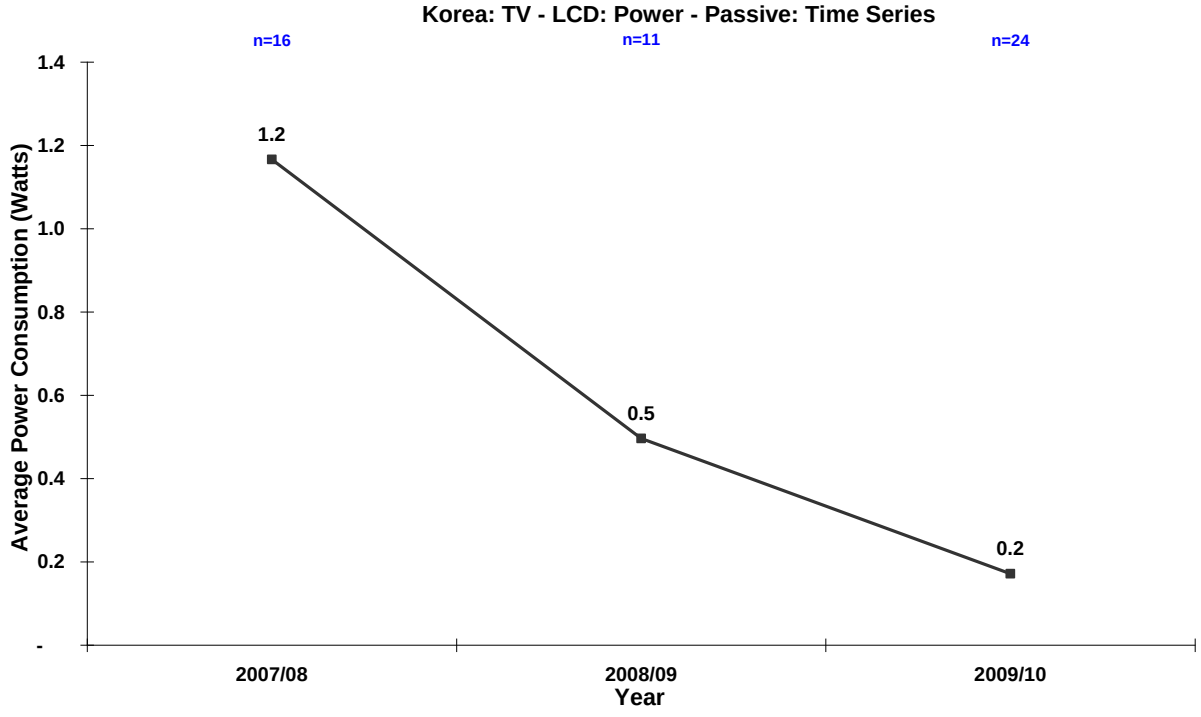


Figure 25 Australian & Korean Time Series Data – LCD TV Passive Mode

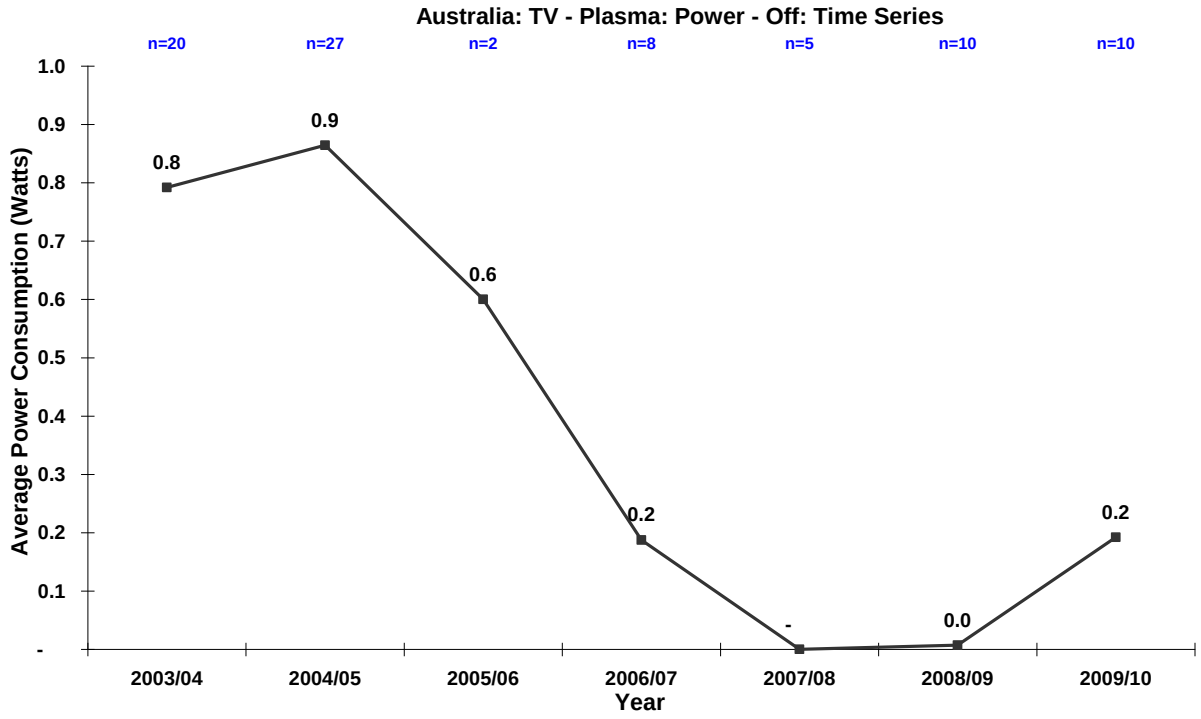




Televisions – Plasma

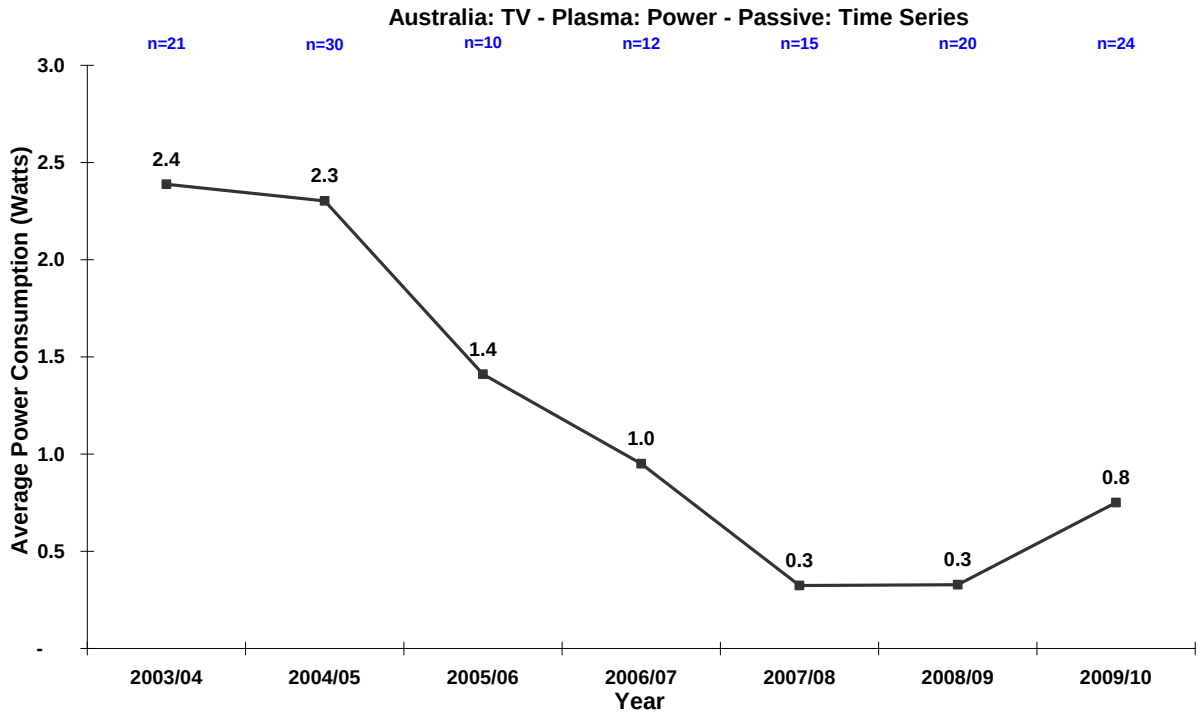
Average off mode consumption for plasma televisions has been below 0.3 watts for the past four years. Approximately 50% of models found in stores in 2009/10 had an off mode. These results are shown in Figure 26.

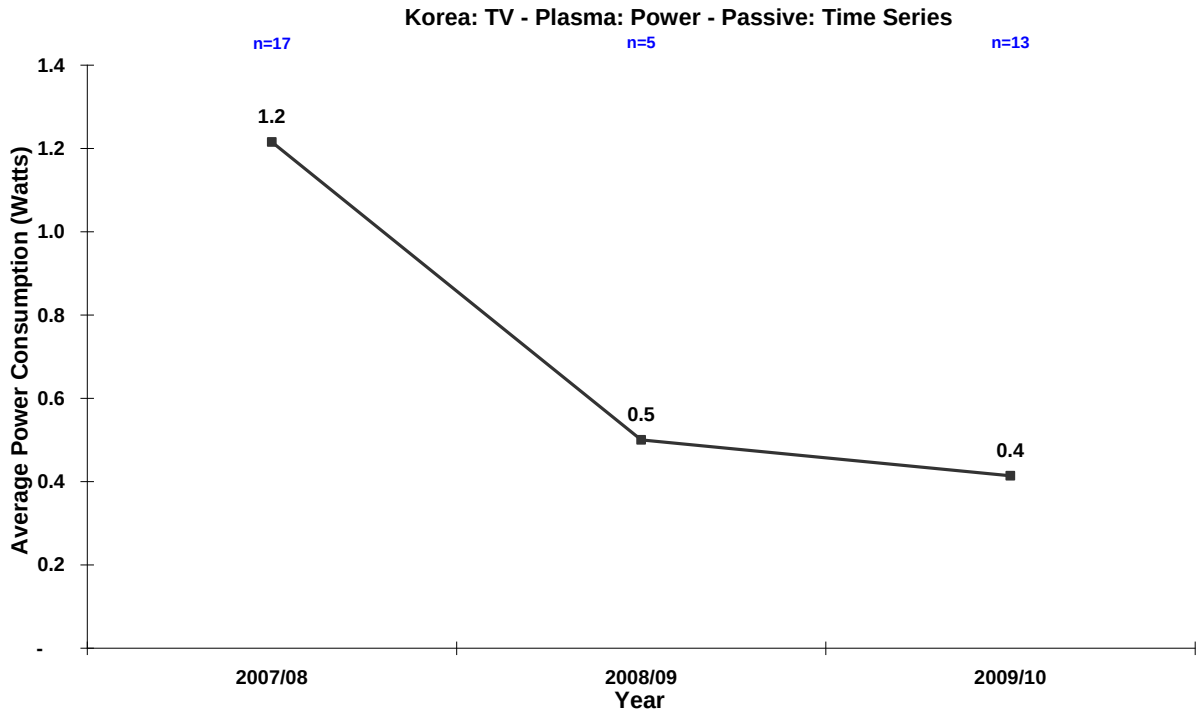
Figure 26 Australian Time Series Data – Plasma TV Off Mode



Passive standby consumption in plasma televisions has been below 1 watt for the last three years. As shown in Figure 27 it would appear that the low of 0.3 watts has not been maintained with the 2009/10 average being 0.8 watts. However once again there is one outlying result of 13.2 watts which when removed bring the average to 0.2 watts. With the exception of three readings all passive standby consumption was below half a watt. This is similar result with the Korean time series data which has seen average passive consumption drop from just above 1 watt three years ago to below half a watt in 2009/10.

Figure 27 Australian & Korean Time Series Data – Plasma TV Passive Mode





DVD Players

The time series data for DVD players in passive standby mode is shown in Figure 28. This chart demonstrates that after a slow and steady decrease in average consumption the last two

years have seen a slight increase. This increase is not statistically significant and is quite small (0.3W) but indicates a stabilising of the downward trend.

In the area of active standby average consumption in 2009/10 was the lowest ever at 7.4 watts. If this result is mimicked in next year's survey this may indicate the first real downward movement in this mode. These results are shown in Figure 29.

Figure 28 Australian Time Series Data – DVD Player Passive Mode

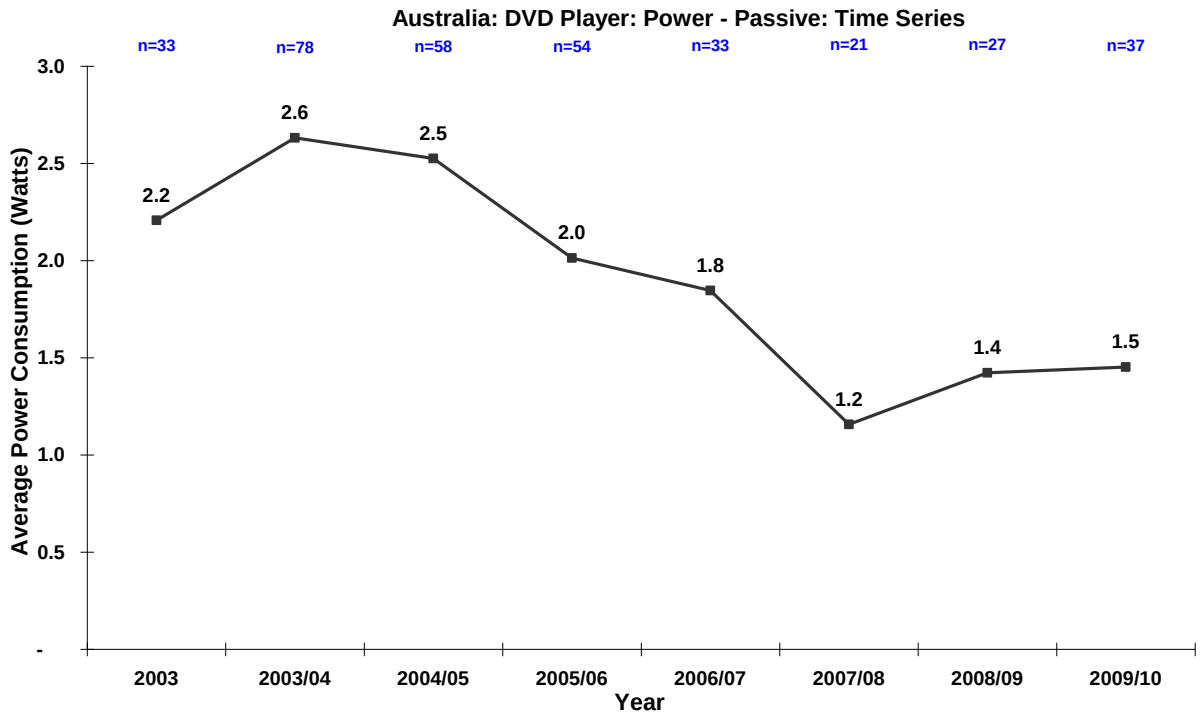
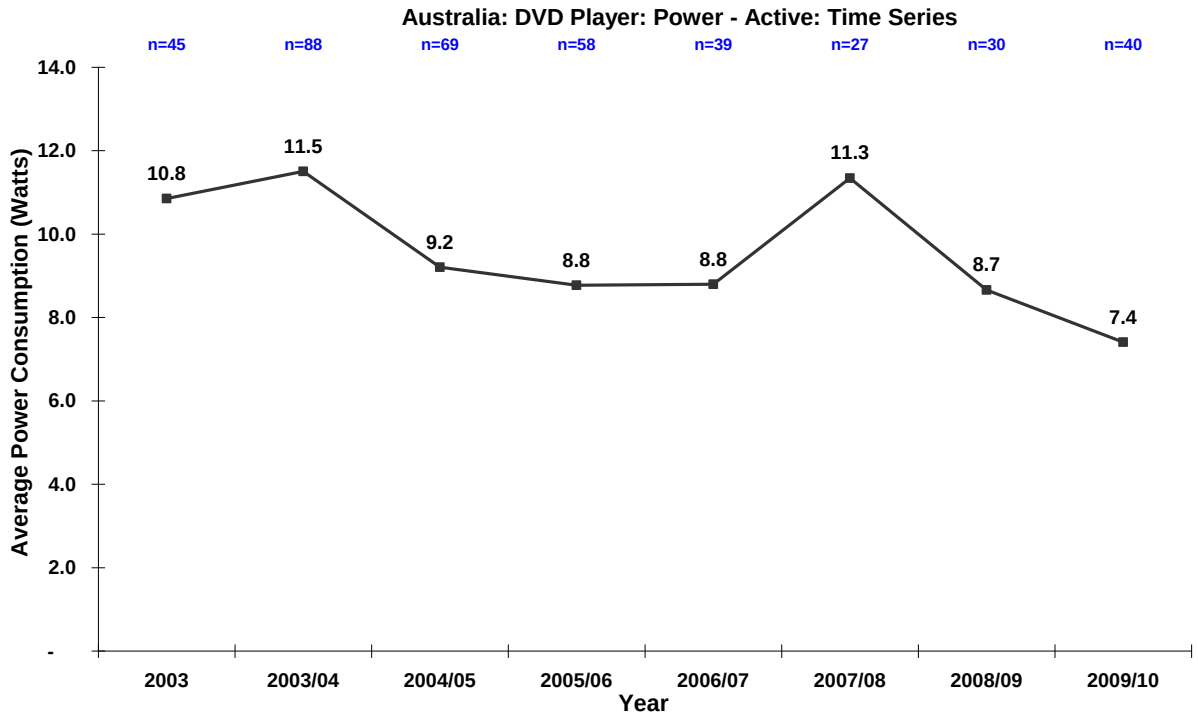


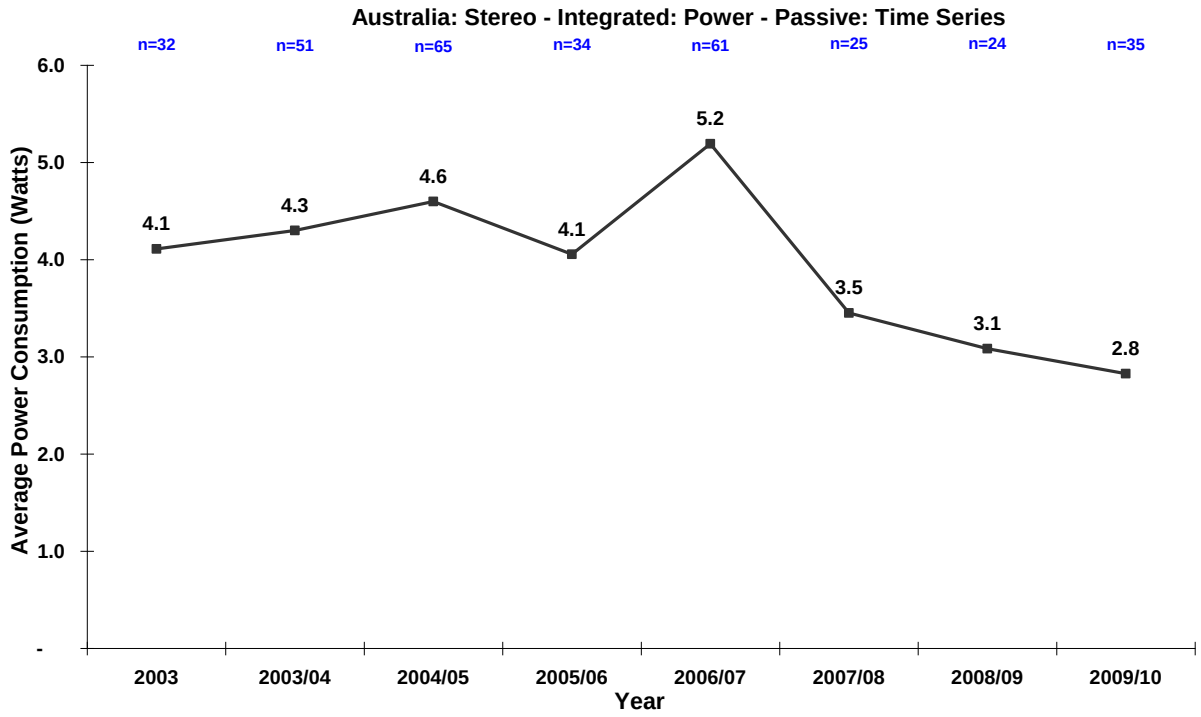
Figure 29 Australian Time Series Data – DVD Player Active Mode



Integrated Stereos

The time series data for integrated stereos is shown in Figure 30 and Figure 31. The Australian data shows three successive years of decline indicating a downward trend for stereos in passive standby. The Korean data over the last three years has varied and will need more data to ascertain if the significant drop of passive standby consumption in 2009/10 is of consequence. Australian integrated stereo's average active mode consumption returned to the 2007/08 level of around 13 watts, which is a promising indication that there may also be an overall reduction in consumption in active mode as well. Again future survey results will need to confirm this as a trend.

Figure 30 Australian & Korean Time Series Data – Integrated Stereo Passive Mode



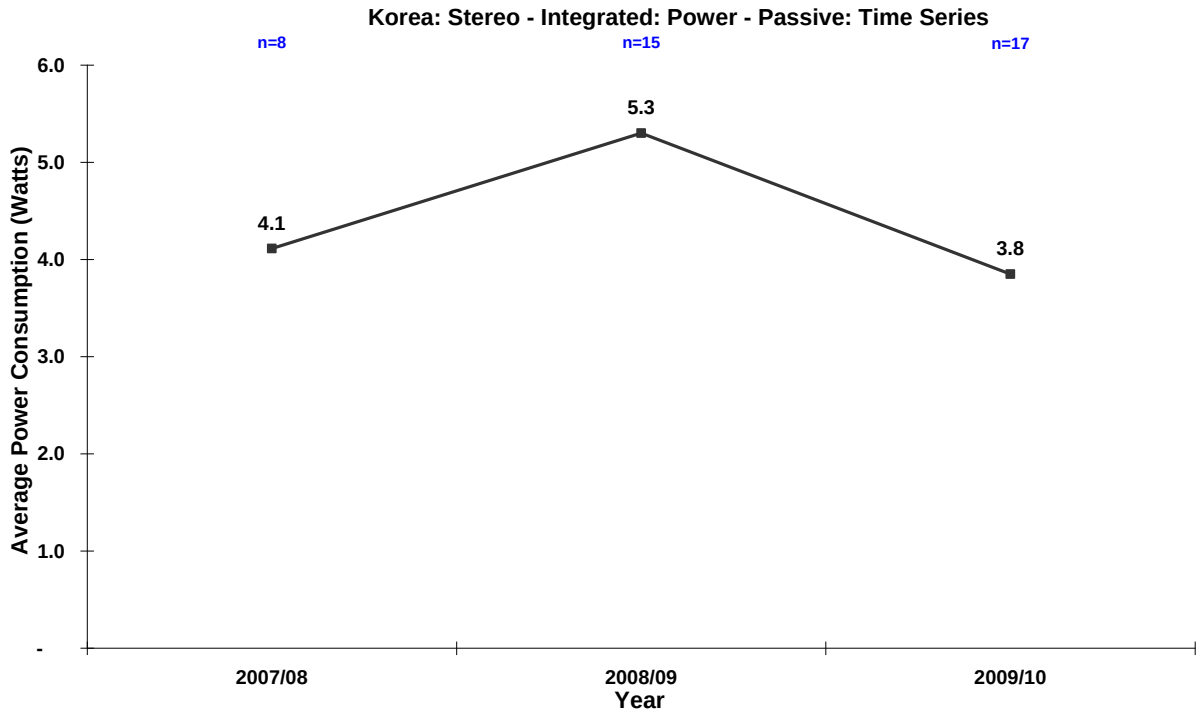
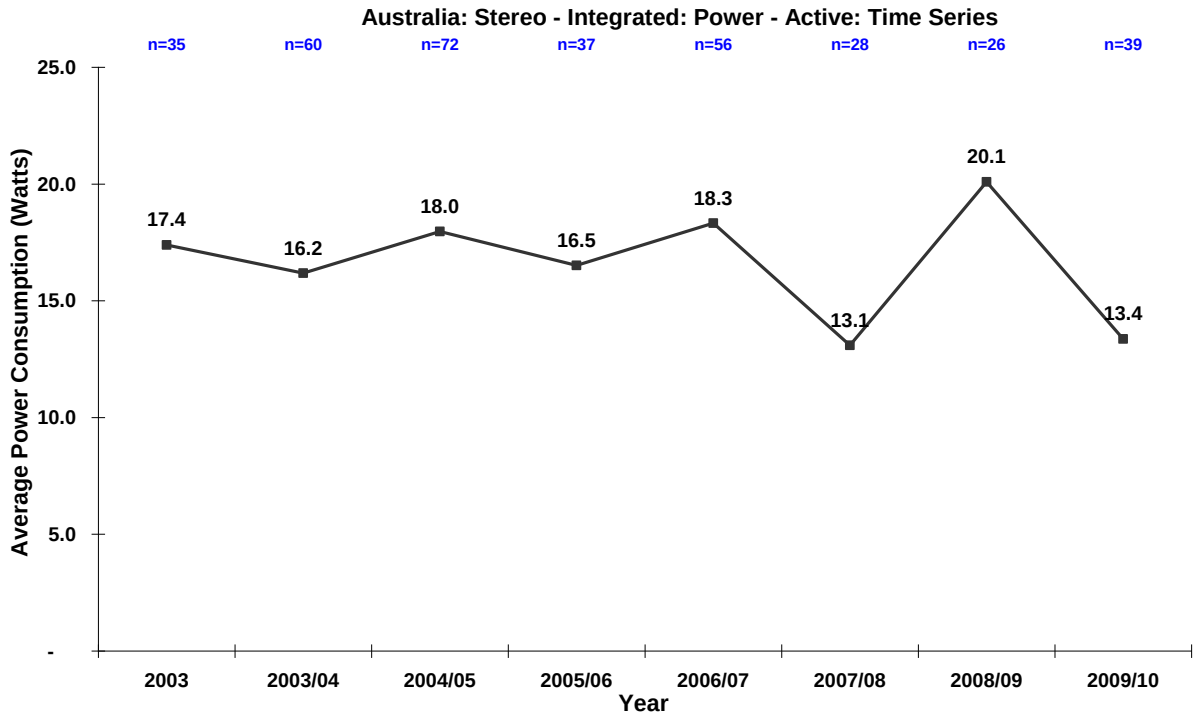


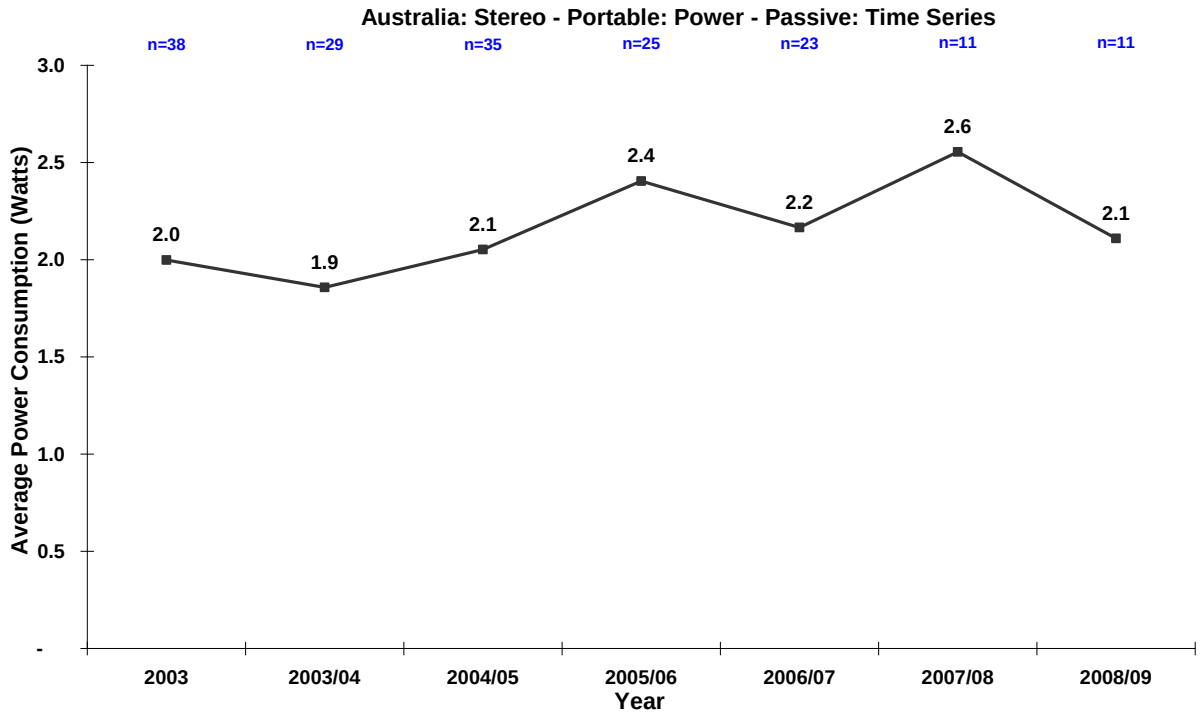
Figure 31 Australian Time Series Data – Integrated Stereo Active Mode

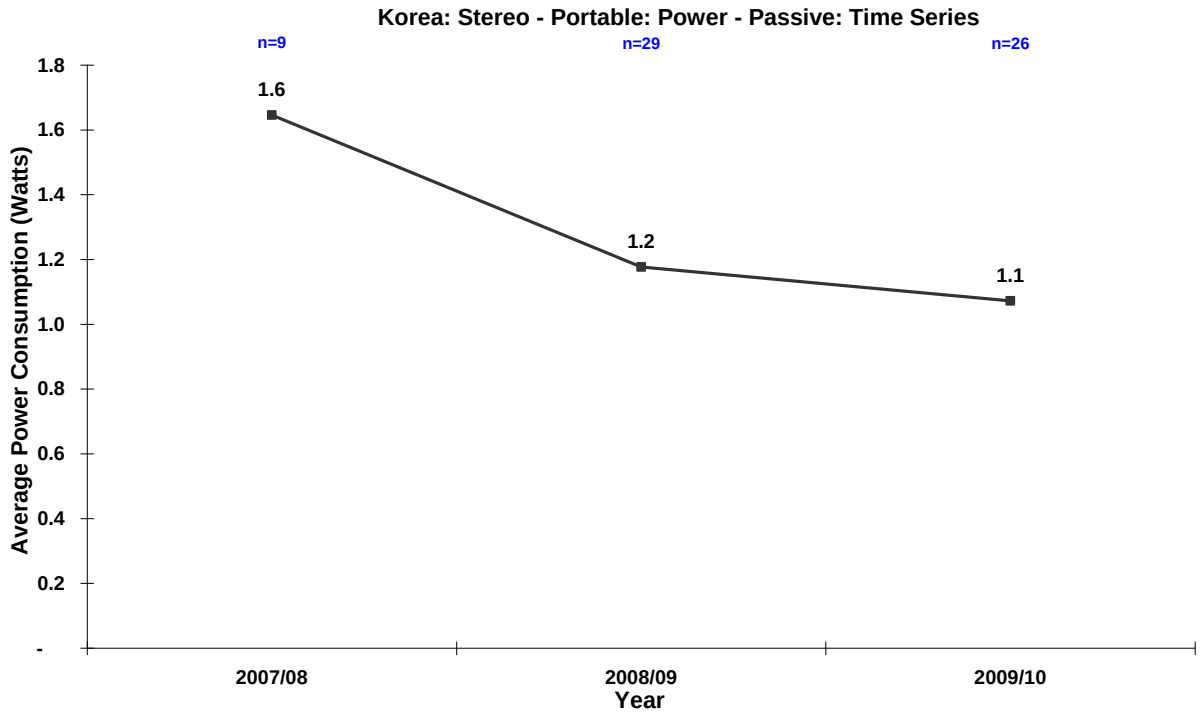


Portable Stereos

No portable stereos were measured in Australian stores in 2009/10. The stores visited in this survey had largely replaced this product with speakers for MP3 players. Figure 32 shows passive consumption for Australian products prior to 2009/10 and the Korean data for portable stereos for the last three years. In contrast little change has occurred in Australian models; however the Korean portable stereos appear to be trending downward approaching 1 watt in passive standby.

Figure 32 Australian & Korean Time Series Data – Portable Stereo Passive Mode

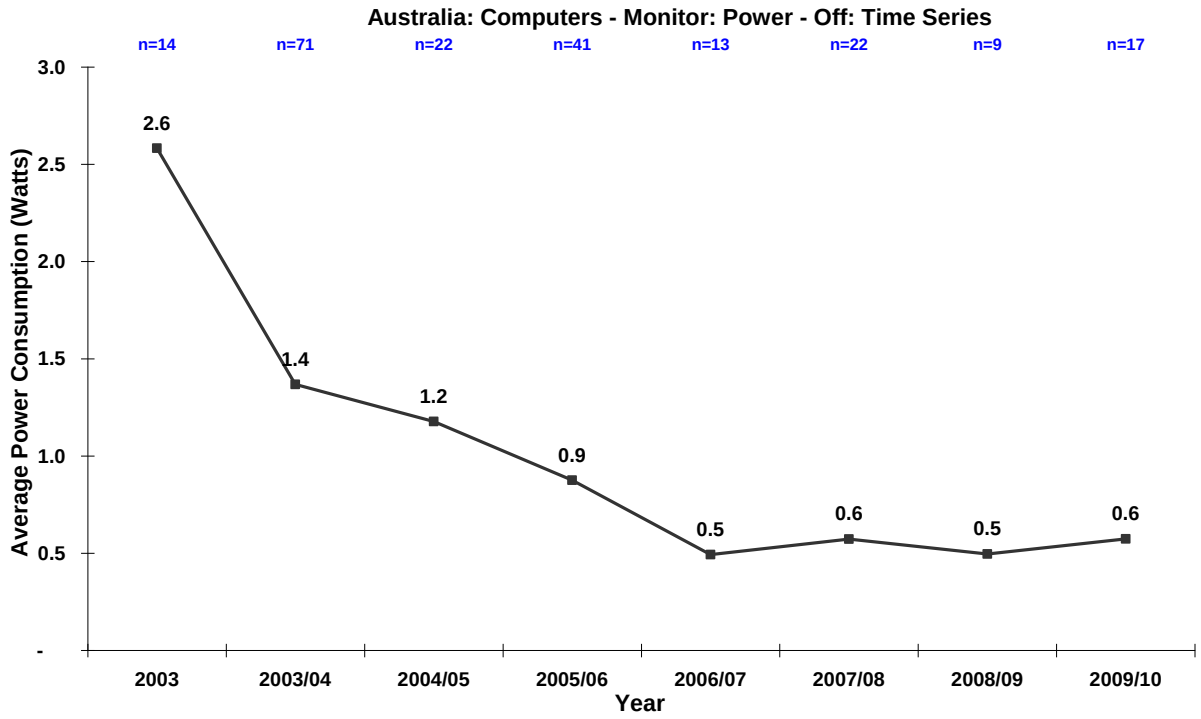


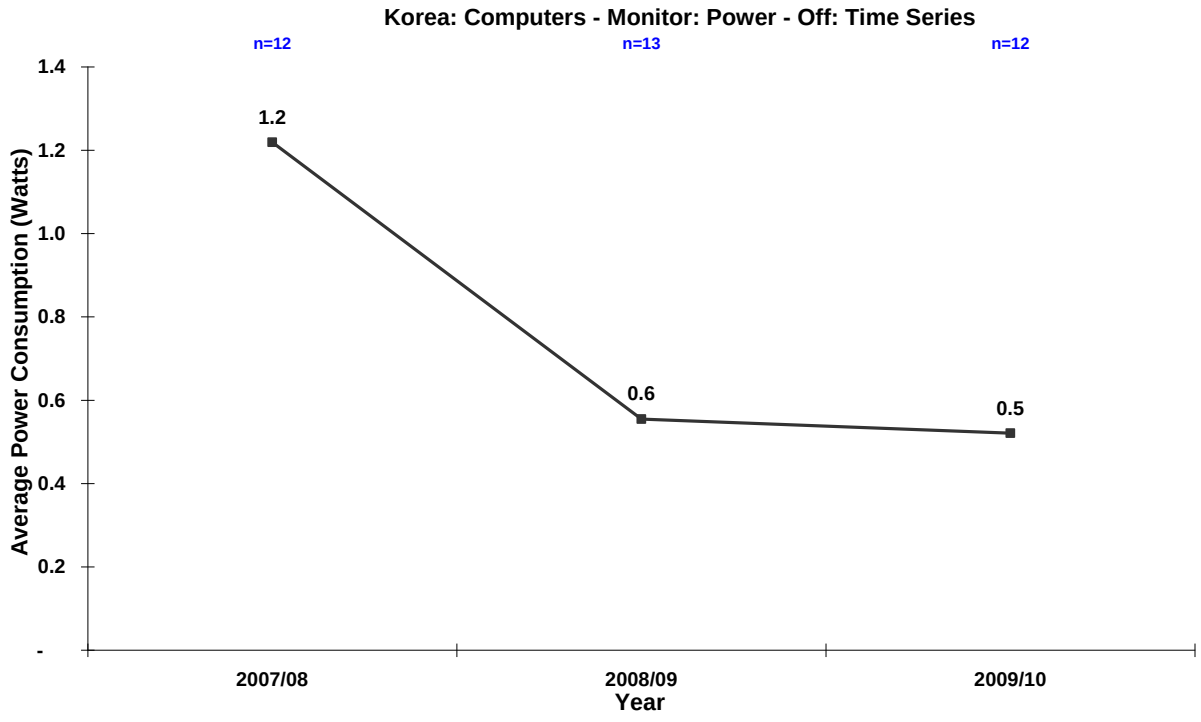


Computer Monitors

Figure 33 shows the average consumption of Computer Monitors appears to be stable at around half a watt in both Australia and Korea. All monitors measured are LCD with CRT monitors no longer being seen in stores.

Figure 33 Australian & Korea Time Series Data – Computer Monitor Off Mode





Printers – Laser and Inkjet

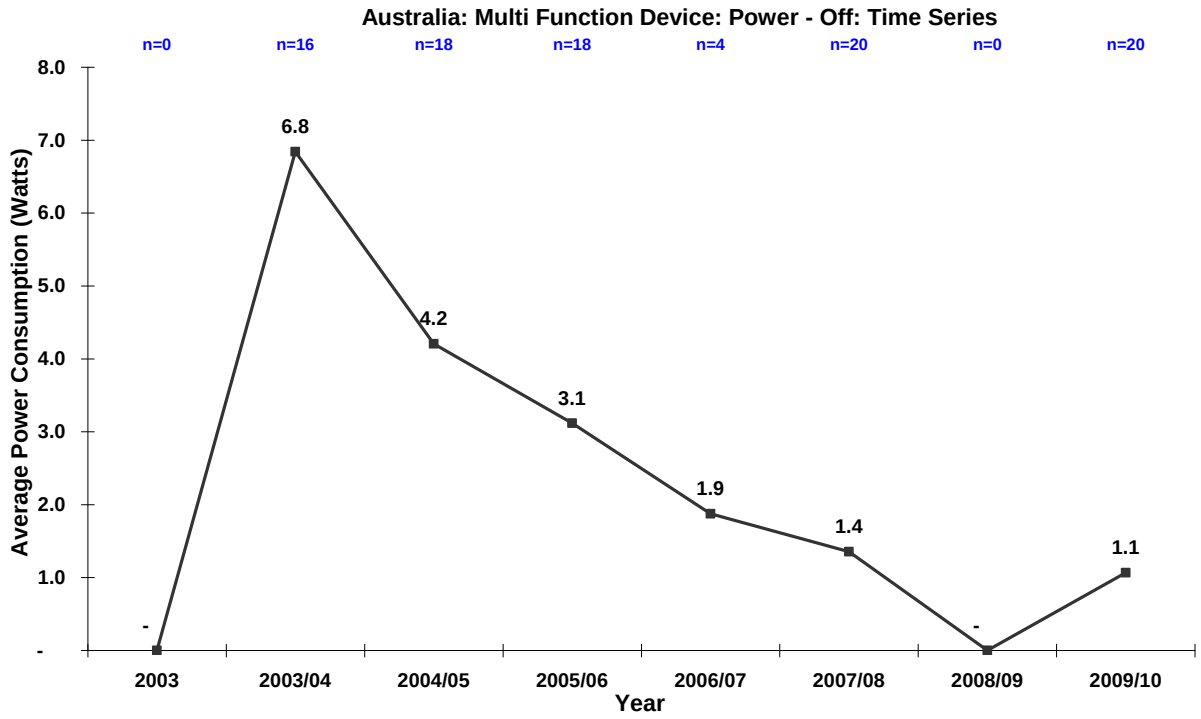
There is no new data for laser or inkjet printers as these have not been found in the stores. Multifunction devices are now the dominant product sold.

Multi-Function Devices (MFDs)

Multi function devices (MFDs) have become the dominant printing device found in stores over the last few survey periods. In 2008/09 now models were available for testing in the retail outlets. As demonstrated in Figure 34, average off mode consumption for multifunction devices has steadily declined from 6.8 watts in 2003/04 to 1.1 watts in 2009/10.

Figure 35 also shows that average active power consumption for multifunction devices appears to have a decreasing trend dropping from around 9 watts to 5.5 watts in 2007/08 and maintaining this level at 5.9 watts in 2009/10. It should be noted that two major brands of MFD can no longer be tested in stores as their models come with external power supplies (EPS) that are usually not displayed with the MFD.

Figure 34 Australian Time Series Data – Multi Function Device Off Mode



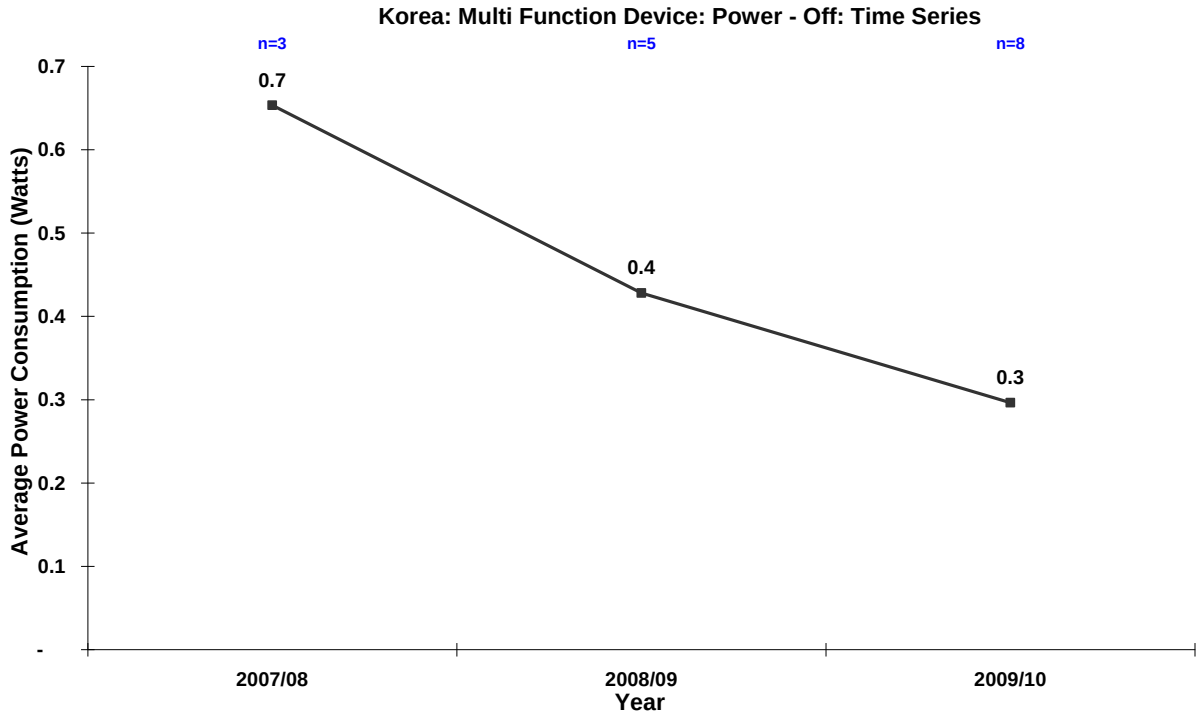
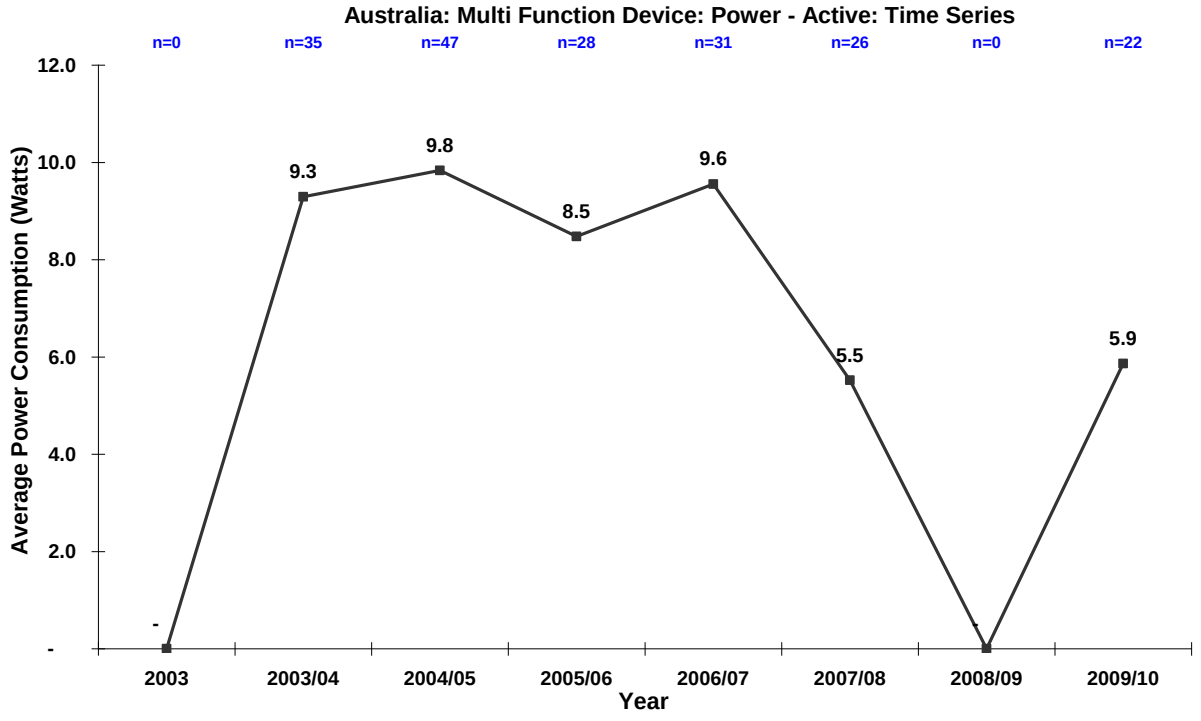


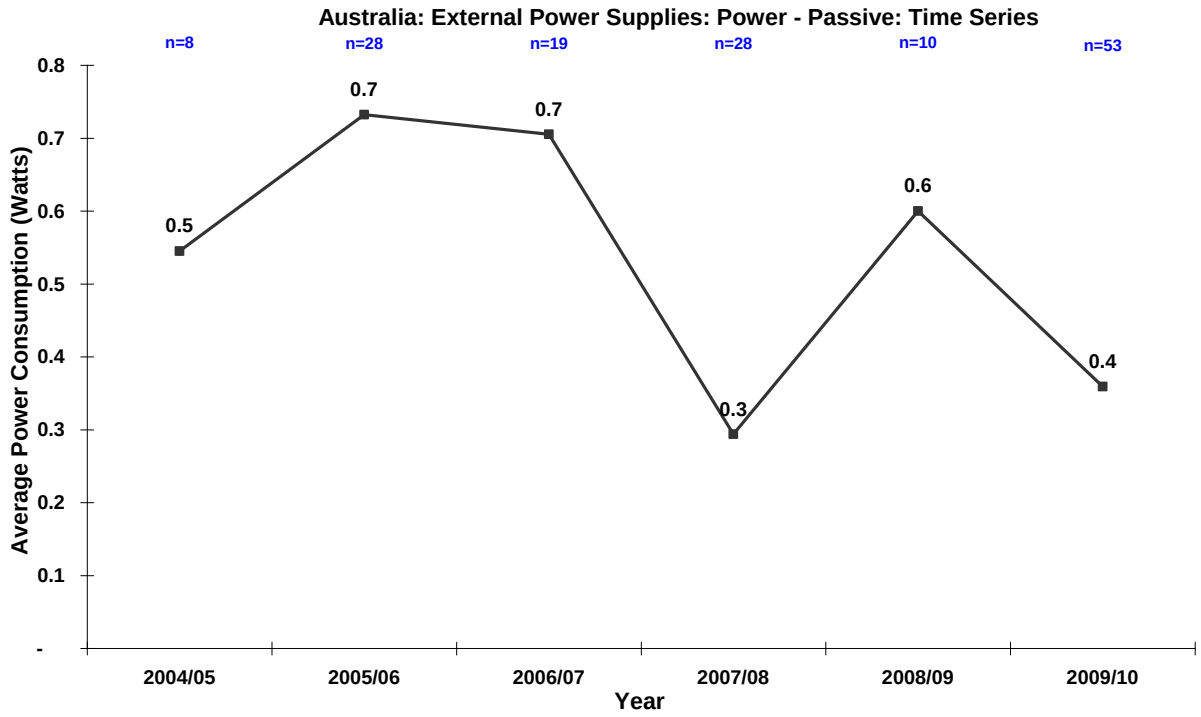
Figure 35 Australian Time Series Data – Multi Function Device Active Mode



External Power Supplies (EPS)

EPS consumption has been less than 1 watt for the past six years. In 2009/10 the average consumption was 0.4 watts. The results for this product are presented in Figure 36

Figure 36 Australian Time Series Data - External Power Supplies Passive Mode



Appendix A

Basket of 29 Secondary Products

- Clothes dryers
- Dishwashers
- Clothes washer/dryer combination units
- Air conditioners
- Instantaneous (non storage) gas water heaters (with electronic ignition)
- Microwave ovens – manual timer
- Televisions – rear projection
- Set top boxes (including variations – digital/analogue tuners, hard drive)
- DVD recorders without hard drive (digital/analogue tuner)
- DVD recorders with hard drive (digital/analogue tuner)
- DVD/VCR combinations
- Video Cassette Recorders
- Audio visual receivers (home theatre)
- Subwoofers
- Computers (off mode only)
- Computer speakers
- Network switches (including hubs)
- Routers
- DSL or ADSL modems
- Scanners
- Facsimiles (fax machines)
- Photocopiers – black and white (categorise by copy speed)
- Photocopiers – colour (categorise by copy speed)
- Rice cookers
- Telephone answering machines
- Cordless phones – primary base station
- Cordless phones – secondary base station
- Cordless phones – with answering machine

Other Products Measured

- Breadmakers
- Computers - Home Theatre Box
- Cook tops (Hob), Ovens and Stoves (upright Cooker)
- Digital Photo Frames
- Espresso Machines
- Fans
- Game Consoles
- Hand-held Vacs
- Heaters - Electric Portable
- Heaters - Gas
- Assorted Home Entertainment products
- Home Theatre Systems
- Juicers
- Range Hoods
- Shredders
- Slow Cookers
- Speakers
- Toasters
- Treadmills
- Typewriters
- Variety of small bench top Kitchen appliances
- Wine Chillers