Standby and Baseload in New Zealand Houses: A Nationwide Statistically Representative Study

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ABSTRACT

For the first time, a nationwide statistically representative study of standby and baseload energy consumption has been completed in New Zealand. This is based on the data collected for the Household Energy End-use Project (HEEP).

The baseload of a house is the typical lowest power consumption when everything that is usually switched off is off, and was on average (112±4) W. This baseload represents the upper limit for the standby power consumption.

Standby power consumption was estimated at (57±4) W, heated towel rail use at (21±2) W, and faulty refrigeration appliances (compressors always on) at (15±10) W. Some appliances with standby, and some small continuous loads that are known to be excluded, make up another (11±4) W leaving (8±12) W unaccounted. This represents a very nearly complete inventory of standby power consumption for New Zealand houses. It is unlikely that any major standby appliances are left unaccounted.

Introduction

Standby power is drawn by an appliance when it is not in operation but is connected to the mains. This can range from zero (e.g. a non-electronic clothes dryer) to 20 W or more (e.g. a television). These power levels may seem trivial (1 W continuous power is approximately 9 kWh per year), but since most households have many such appliances, the actual energy consumption is usually a significant fraction of the total energy consumption of a household.

Standby mode is defined in the NZ standard (AS/NZ62301:2005, 2) as:

The lowest power consumption mode which cannot be switched off (influenced) by the user and may persist for an indefinite time when an appliance is connected to the main electricity supply and used in accordance with the manufacturer's instructions.

The **standby power** is defined as the average power measured in **standby mode**.

The baseload power of a house is defined in this paper as the typical lowest power consumption of the entire house when there is no active occupant demand and all cycling appliances (e.g. refrigeration) are in off-cycle. It includes the standby power of appliances (e.g. microwave ovens, VCRs, multiple TVs, video games, dishwashers etc), plus any appliances that operate continuously (e.g. heated towel rails, clocks, etc).

The baseload is important for two major reasons: first, it defines the lowest continuous power demand that must be met by a utility grid, and so has a large part to play in the utility load factor; and secondly, it includes a group of appliances that have the potential for demand reductions.

Early estimates of standby and baseload power consumption from the Household Energy End-use Project (HEEP) have been instrumental in raising awareness of this important energy use in Australasia (Camilleri et al. 1999). Since then, standby power consumption reduction has been used as an energy conservation measure during power crises, and has been included in the joint Australian/New Zealand Minimum Energy Performance Standards (MEPS) for appliances.

The HEEP monitoring is now complete so that full, comprehensive and nationally representative estimates of standby and baseload power consumption can be prepared. This is a world first, as no other country in the world has undertaken a study comparable to HEEP that could provide such estimates. Most other studies are non-random, with limited geographical or demographic coverage, or are based on spot measurements taken of new appliances often still in the retail store.

Review

Awareness of standby power began with articles in *Home Energy Magazine*. Meier (1993a) reported that utility bills during vacations were often almost as high as occupied periods due to the appliances that remain on, including electronic appliances. Sandberg (1993) published the results of a survey of some new appliances in Sweden, finding that most of them drew power when switched off – and described this as "leaking electricity". Meier (1993b) immediately reported these findings to a wider audience in *Home Energy Magazine* and noted that the phenomenon was an international one. The (now unsurprising) result that some appliances consumed more power in standby mode than in use was first revealed by Sandberg (1994). The secret of standby power was out.

Meier and Huber (1997) introduced their 1 W plan at the 1997 IEA conference as a long-term target for the maximum standby power of electronic appliances. Meier, Huber and Rosen (1998) subsequently took a detailed look at the underlying technical issues and found that most standby functions could be performed with 1 W or less of power, lending weight to their 1 W plan. The IEA convened a series of workshops and formally adopted the 1 W plan in 1999, proposing that the standby power of all new devices should be below 1 W by 2010 and calling on member countries to harmonise policy and regulation in this area (IEA 2005).

Studies of standby power have been conducted in a number of countries and have been compiled in a variety of review papers (Lebot, Meier and Anglade 2000; Meier 2001). Estimates per house at the time ranged from 20-60 W (Lebot, Meier and Anglade 2000) to 32-125 W (Bertoldi et al. 2002). It takes a lot of effort to track down all the appliances in a house, so many studies may have under-estimated standby.

Most reported papers were case studies of a small number of non-randomly selected houses and most also did not measure the standby of all appliances in the houses. To our knowledge the Jyukankyo Research Institute in Japan (Nakagami, Tanaka and Murakoshi 1997) and ADEME in France (Sidler 2000) have conducted the only studies of whole-house standby power consumption. Only the latter study measured a large number of houses, but as they do not appear to have been randomly selected this is not nationally statistically representative.

The pervasive nature of standby power means that every appliance in a house needs to be measured to assess the standby power consumption, and some studies have examined only a limited range of appliances. In general, studies are becoming more comprehensive in appliance coverage.

The Household Energy End-Use Project (HEEP)

HEEP is a nationwide study of energy use and temperatures in New Zealand houses. Monitoring began in 1999 and was completed for 398 houses in mid-2005, with each house monitored for about one year.

The study used a random selection of all New Zealand houses and is statistically representative. The sampling design was for a random selection of houses from the major cities and towns with a population of more than ~50,000 (representing about half the population), then cluster samples of 9 or 10 houses in each of 19 small geographical areas (small towns, rural areas) chosen on a random basis to represent the rest of the country. This strategy was used, as monitoring a random selection of households outside of the major cities and towns would have been too difficult and expensive.

This methodology was carefully designed and implemented to ensure that the sample was representative of the New Zealand population. Special care was taken in the household selection process to avoid bias caused by households choosing not to participate in the survey. Overall, 24% of households approached agreed to participate in the study. The sampling methodology is described in Isaacs et al. (2005:10-16).

All fuels were monitored (electricity, reticulated gas, LPG, solid fuel, oil and solar water heating). Major circuit loads (total electricity, hot water) were monitored in all houses. Other circuit loads (stove, lights, fixed gas and electric heaters etc) were monitored in 100 houses, as well as individual appliances (2-3 randomly selected appliances per house rotated on a monthly basis). All solid fuel burners, portable LPG heaters, solid fuel hot water connections and solar water heaters were monitored. Indoor temperatures were also measured (~3 per house). The installation includes a detailed occupant survey, house plans and audit details, and inventory of all electrical appliances.

Data

Data on standby power comes from three sources within HEEP: **end-use data** – 10 minute monitored energy data from individual appliances; **power measurements** – spot measurements of the standby power carried out with a power meter at the time of the house installation; and **survey** – an occupant survey recording the appliance count and usage. By combining information from these three sources, a complete picture of household standby and baseload power consumption can be constructed.

The monitored end-use data is the most detailed and provides information, not only on the standby power level, but also on how long the appliance spends in standby mode. This information is hard to gather in any other way. There were 1,026 appliances monitored by this method.

Spot power measurements were carried out in all the HEEP houses by an auditor working through the house and recording every electrical appliance. A total of 11,891 appliances were surveyed. The information recorded included: type, make, model, serial number, label information, measured power consumption, measured standby power and the standby status (whether the appliance was in standby mode at the time of the audit).

How much information was recorded depended on the type of appliance, with appliances such as whiteware and entertainment equipment having all information recorded and minor appliances like blenders etc only having their presence recorded. Irrespective of the appliance type, if an appliance was found to be plugged in and switched on, a standby power reading was taken and the state recorded. This allowed some information about what percentage of minor appliances (such as chargers) are left in standby mode, and is a valuable complement to the end-use data. Standby power measurements were made on a total of 5,656 appliances.

Survey data was recorded for the major appliance types in all 398 houses, including their number and usage (e.g. constant, daily etc). Some additional information was collected for heating appliances, such as their type and which rooms they heated.

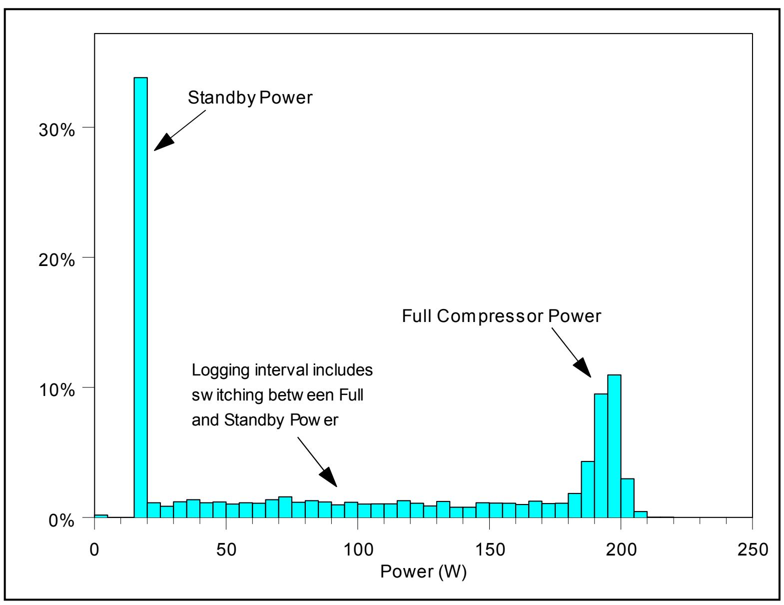
Methodology

The methodologies for estimating standby losses and baseload from monitored electricity data were first described in the HEEP Year 5 report (Stoecklein et al. 2001), and are outlined here.

Standby Estimation

The analysis method for calculating the standby power and losses is based on the frequency distribution of the appliance power consumption. For example a fridge compressor is on for most of the time, and when the compressor switches off the fridge has a standby power of about 17 W.

Figure 1. Fridge Power Use Histogram



The frequency distribution for such a fridge is given in Figure 1. This histogram has two strong peaks: one at about 190 W corresponding to full compressor power; and another at about 17 W corresponding to the standby power. Power uses in between these peaks are the fridge switching on or off some time during the 10 minute sampling interval, so an intermediate power use is recorded.

The method for calculating the standby power is to find the standby power peak. Mathematically, the standby power is the **mode** of the distribution, which is defined as the value that occurs most often. For some appliances, the most common value is larger than the standby power as they rarely switch to standby. In these cases, the modal value of the data values less than the mean power is taken. Once the standby power is known, the standby energy can be calculated. This is the energy consumed when the appliance is in standby mode, not when 'on' (in use) or disconnected from the mains. This distinction is important as some appliances, such as televisions, are not always left in standby mode.

Baseload Estimation

The baseload of a house is the typical lowest power consumption when everything that is usually switched off is off. It is made up of the standby power of appliances, off-cycle power consumption of refrigeration appliances, continuous loads like heated towel rails, and other appliances that are always on (including faulty refrigeration appliances).

The estimation of baseload is analogous to the estimation of standby load, as the baseload can be thought of as the standby power load of the entire house. Estimation is more complex, because there are a large number of appliances switching on and off during the course of a day, so that the total power may only be rarely at baseload level and there is not usually a clear and distinct mode of low power. It may perhaps occur in the middle of the night, when everyone is asleep and all possible appliances are switched to off or standby. Note that overnight space heating is uncommon in New Zealand houses, and even if using electricity it would usually be thermostat controlled, so would be excluded from the baseload estimate.

To find the house baseload, the minimum monitored power for each individual day is evaluated and a histogram created. The baseload is expected to be the most commonly occurring daily minima, which should be at the low power end of the histogram. Calculating the mode generally gives a good estimate of the baseload, which was confirmed by visual inspection of 10 minute resolution plots of the total electricity for a number of houses. In households with many refrigeration appliances (or other fast switching automated appliances) the histogram of daily minima may not be so easy to interpret, as it is rare for all of the fast switching appliances to be off concurrently. In such cases, a good baseload estimate cannot be made as there is no distinct modal value.

For the HEEP sample households this rarely occurred, as the 10 minute monitoring interval was short enough to ensure that these fast switching appliances were usually resolved. Longer monitoring periods of 15 or 30 minutes increases the number of cases where the baseload cannot be properly estimated, and at 30 minutes most modern refrigeration appliances would never stay switched off for an entire monitoring interval.

The 10 minute monitoring interval was chosen as a sensible compromise of logger capacity, time resolution and time between downloads. Monthly downloads were done and the lowest capacity logger configuration at the start of the full-scale monitoring was about 40 days at 10 minute resolution. In the pilot study 15 minute resolution was used and the cycling of some refrigeration appliances could not be resolved. Several different types and versions of data logger have been used in HEEP and a lot of energy data was collected at 1 or 2 minute resolution, but aggregated to 10 minutes in pre-processing to match the monitoring interval of the temperature loggers. The storage capacity of the later BRANZ-made data loggers is much larger than the first versions. However, the 10 minute resolution and monthly download cycles were maintained throughout the project, although in some cases 4 channels of data could be monitored on a single logger where previously 2 or 4 loggers would have been required. To resolve fast cycling appliances, the monitoring interval must be less then the length of the off-cycle and the on-cycle so that there are always monitoring intervals where the appliance is fully off and fully on.

Results

Standby Power and Energy

The standby power and energy for all appliances measured are given in Table 5 (see Appendix One) and grouped into categories. Several different numbers are reported:

- **standby power** – the power consumption in standby mode
- **standby energy** – the energy consumption in standby taking into account the amount of time spent in standby mode (annual average power over 8,760 hours)
- **standby energy per house** – standby energy multiplied by the average number of appliances per house (annual average power over 8,760 hours).

Table 1. Top Five Appliances by Standby Power and Energy

Appliance ranked by standby power	Standby power (W)	Appliance ranked by use of standby energy	Standby energy (W)
1. Fridge-freezer	15.0	1. VCR	9.0
2. Television set-top box	13.3	2. Television	6.3
3. Refrigerator (single temperature)	10.6	3. Stereo	6.2
4. Video cassette recorder (VCR)	9.4	4. Combination fridge-freezer	4.7
5. Instantaneous gas water heater	9.0	5. Computer (CPU & monitor)	4.4

The five highest standby power appliances and the five highest standby energy appliances are listed in Table 1. These account for nearly half of the total household standby energy consumption. Note that three of the top five are 'home entertainment'. These appliances have high standby power consumption, as they are common and in standby for long time periods.

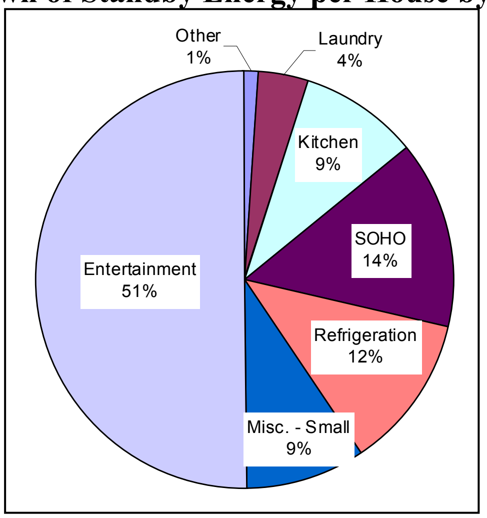
Table 2 shows the average energy use per house for standby is (57±4) W continuous i.e. the average New Zealand house is spending around $NZ90 ($US60) per year (at 18.7 c/kWh) just keeping these appliances powered-up waiting to be used.

Despite the prevalence of small chargers for cellular phones and other portable devices their actual standby energy consumption is small with less than 0.5 W average continuous power per house. About half the cell-phone chargers found were plugged in and on standby, as were about one-third of all other chargers. Generally cell-phone chargers only seem to be plugged in when required, and the more sophisticated types have a very low standby when they are not actively charging (~0.1 W). Older New Zealand houses (pre-1970s) often have a limited number of power outlets per room, and it is common to have only one outlet per room. This might contribute to these devices not being plugged in continuously.

Table 2. Standby Energy per House by Appliance Group

Appliance	Standby power (W)	Standby energy (W)	Standby energy per house (W)
Entertainment	56.3	39.5	27.9
Garage	8.1	2.2	0.5
Kitchen	11.3	8.5	5.1
Laundry	4.1	2.5	2.2
Miscellaneous	35.8	28.1	5.9
Refrigeration	27.4	10.6	6.9
Home office	25.2	16.9	7.5
Space conditioning	9.3	8.5	1.1
Grand total	**173**	**113**	**57±4**

Figure 2. Breakdown of Standby Energy per House by Appliance Group



It is important to note that as the market penetration of appliances increase or decrease, the importance of their standby energy use changes. For example, VCRs are being replaced by DVD players/recorders. If each VCR is replaced by a more efficient, lower standby power DVD player then the national standby power demand of this appliance group will fall. However, if DVD players/recorders achieve a greater market penetration than VCRs, or they have similar standby power, then the overall impact may be unchanged or possibly even result in an increase in standby power demand.

If appliances were shifted to only 1 W standby, with 4 W standby for set-top boxes and 5 W for refrigeration appliances, this would reduce the standby load to roughly 21 W per house – a reduction of more than 60% (Cogan et al. 2006). Most of this reduction would come from entertainment appliances.

Baseload

The average baseload demand is (112±4) W. The baseload usually has a poor power factor, as it consists of various motors and inductive loads of small transformers. In a few HEEP houses the monitoring equipment also recorded reactive power, and the power factor of the baseload was typically 0.5-0.7. Reductions in baseload and standby therefore have a larger impact on utility load then the simple power consumption.

Heated Towel Rails

A heated towel rail is a tubular metal towel holder with an electric heating wire which is used to warm up towels in cold bathrooms and to dry off damp towels in cold and damp weather. 42% of New Zealand households have one or more heated towel rails, with an average of 1.3 per house that have them. They are more common in newer houses and most newly built houses have one or more installed during construction.

The HEEP survey questionnaire recorded the number of heated towel rails and usage category (e.g. constant, daily etc.), and for the first 128 houses also the occupant self-reported hours of use. These hours of use were used to find the average hours of use for each usage category.

The average power rating of heated towel rails is also needed. This is not usually known by the occupants, and often no label is visible, and with fixed wiring it is not possible to undertake a power measurement. From the limited measurements of labels that were recorded, the average was (70±10) W.

The hours of use per week for each category can then be used to estimate the total energy consumption. Combining the number of heated towel rails with the usage and average power rating gives the average power use per house for heated towel rails of (21±2) W. Table 3 shows the 95% confidence interval (CI) is 17 to 25 W. For the 1.4 million households this is (30±3) MW, which is almost all continuous load.

Table 3. Heated Towel Rail Average Power Use

	Average (W)	95% CI (W)
Per house	21±2	17-25
Per house with heated towel rails	50±4	42-59
Per house that uses heated towel rails	62±5	53-72

About half of heated towel rails are used constantly, and as the average is only 0.6 per house, most of the energy is used in a small fraction of houses.

A single heated towel rail used constantly consumes about 700 kWh per annum, which can easily add 10% to the electricity bill. Reductions of energy use are readily achievable, for example by installing a timer switch.

In the UK, about 15% of houses have a heated towel rail (AMA Research 2003) and their electricity consumption could be as high as those in New Zealand.

Other Standby and Baseload

Some other small standby loads that were not monitored could be from the stove (notably the clock), fixed wired sensor lights, security systems and the electrical safety Residual Current Devices (RCD) now required on all new lighting and plug circuits in New Zealand. The RCD load might account for 3-5 W. RCDs are known as Ground Fault Circuit Interrupters (GFCI) in the USA.

Some lights may be left on overnight, and these have been estimated from the lighting circuit monitoring at (7±3) W (Cogan et al. 2006).

HEEP analysis (to be published in the upcoming HEEP Year 10 report) has found that faulty refrigeration appliances consumed on average (15±10) W of continuous load per house.

16% of refrigeration appliances were found to be faulty with the compressor staying on for long periods of time (days to weeks) or continuously.

Conclusions

Table 4 provides an overview of New Zealand household standby and baseload, which totals (112±4) W continuous, equivalent to an annual cost of approximately $NZ150 (~$US100) per year. The 95% confidence interval is from 104 W to 121 W. Assuming 1.4 million houses, this is equivalent to about 160 MW of continuous load, or about 10% of the total average residential power demand.

Table 4. New Zealand Standby and Baseload

Use	Load (W)
Standby	57±4
Heated towel rails	21±2
Faulty refrigeration	15±10
Minor loads	4±1
Lights left on	7±3
Remainder	8±12
Total	**112±4**

Standby power consumption is estimated at (57±4) W, heated towel rail use at (21±2) W, and faulty refrigeration appliances at (15±10) W. Minor loads are (4±1) W and lights that are always on are a further (7±3) W, leaving unaccounted only (8±12) W which is not statistically different from zero. We can conclude that this therefore represents a complete inventory of standby power consumption for New Zealand houses.

References

AMA Research. 2003. *Bathroom Market – UK 2003*. Available online: http://www.amaresearch.co.uk/BathroomMarket03s.html. AMA Research Ltd, UK.

AS/NZS 62301:2005. *Household Electrical Appliances – Measurement of Standby Power.* Wellington, New Zealand: Standards New Zealand.

Bertoldi, P., B. Aebischer, C. Edlington, C. Hershberg, B. Lebot, J. Lin, T. Marker, A. Meier, H. Nakagami, Y. Shibata, H. Siderius and C. Webber. 2002. "Standby Power Use: How Big is the Problem? What Policies and Technical Solutions Can Address It?" In *Proceedings of the ACEEE 2002 Summer Study on Energy Efficiency Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Camilleri, M., N. Isaacs, A. Pollard, A. Stoecklein, J. Tries, J. Jowett, G. Fitzgerald, T. Jamieson and F. Pool. 1999. *Energy Use in New Zealand Households: Report on Year 3 of the Household Energy End Use Project*. Wellington, New Zealand: Energy Efficiency and Conservation Authority.

Cogan, D., M. Camilleri, N. Isaacs and L. French. 2006. *National Database of Household Appliances – Understanding Baseload and Standby Power Use*. Paper to be presented at the 4th International Conference on Energy Efficiency in Domestic Appliances and Lighting (EEDAL'06), 21-23 June 2006, London, UK.

[IEA] International Energy Agency. 2005. *Standby Power Use and the IEA "1-Watt Plan" – IEA Fact Sheet*. Paris, France: International Energy Agency.

Isaacs, N., M. Camilleri, L. French, A. Pollard, K. Saville-Smith, R. Fraser and P. Rossouw P. 2005. *Energy Use in New Zealand Households: Report on the Year 9 Analysis for the Household Energy End-use Project*. Wellington, New Zealand: BRANZ Ltd.

Lebot B., A. Meier and A. Anglade. 2000. "Global Implications of Standby Power Use." In *Proceedings from the 2000 Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Meier A. 1993a. "What Stays on When You Go Out". *Home Energy Magazine Online (Jul/Aug)*. Available online: http://homeenergy.org/archive/hem.dis.anl.gov/eehem/93/930711.html.

Meier A. 1993b. "Leaking Electricity". *Home Energy Magazine Online (Nov/Dec)*. Available online: http://homeenergy.org/archive/hem.dis.anl.gov/eehem/93/931112.html.

Meier A. 2001. "A Worldwide Review of Standby Power Use in Homes". In *Proceedings of the International Symposium on Highly Efficient Use of Energy and Reduction of its Environmental Impact* 123-26. Osaka, Japan.

Meier, A. and W. Huber. 1997. "Results from the Investigation on Leaking Electricity in the USA". In *Proceedings of the First International Conference on Energy Efficiency in Household Appliances*. Florence, Italy.

Meier A, W. Huber and K. Rosen. 1998. "Reducing Leaking Electricity to 1 Watt". In *Proceedings from the 1998 Summer Study on Energy Efficiency in Buildings.* Washington, D.C.: American Council for an Energy-Efficient Economy.

Nakagami, H., A. Tanaka and C. Murakoshi. 1997. *Standby Electricity Consumption in Japanese Houses*. Jyukanko Research Institute, Japan.

Sandberg, E. 1993. "Electronic Home Equipment–Leaking Electricity." In *Proceedings of the 1993 ECEEE Summer Study,* 373-75. Paris, France: European Council for an Energy Efficient Economy.

Sandberg, E. 1994. *Domestic Electronic Equipment: Substantial Power Consumption in Standby Mode. Domestic Electronic Equipment: Uses Most Electricity While Not Being Used!* Sweden: AIB Installationskonsult AB, for Olf Molinder, NUTEK.

Sidler, O. 2000. *Campagne de mesures sur le fonctionnement en veille des appareils domestiques*. Sophia-Antipolis, France: ADEME.

Stoecklein, A., A. Pollard, M. Camilleri, L. Amitrano, N. Isaacs, F. Pool and S. Clark. 2001. *Energy Use in New Zealand Households: Report on the Year 5 Analysis for the Household Energy End-use Project*. Wellington, New Zealand: BRANZ Ltd.

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Appendix One

Table 5. Standby Power and Energy for all Measured Appliances

Group	Appliance	Standby power (W)	Standby energy (W)	Appliances per house (count)	Standby energy per house (W)
Entertainment	Audio component*	3.5	2.2	0.40	0.9
	TV set-top box	13.3	11.8	0.41	4.3
	DVD player*	3.5	1.9	0.10	0.2
	Games console	5.2	3.8	0.21	0.1
	Miscellaneous*	5.1	3.2	0.10	0.3
	Radio*	1.7	0.7	0.43	0.3
	Radio cassette*	1.7	0.7	0.38	0.3
	Stereo	7.1	4.6	1.35	6.2
	Television	5.2	3.1	2.10	6.3
	VCR	9.4	7.5	1.13	9.0
Garage	Door opener*	2.6	1.8	0.18	0.3
	Power tool*	4.7	0.2	0.78	0.2
	Weedeater*	0.8	0.2	0.03	0.0
Kitchen	Breadmaker	2.8	2.5	0.24	0.8
	Coffee maker	0.0	0.0	0.30	0.0
	Crockpot	0.0	0.0	0.17	0.0
	Dishwasher	1.6	1.2	0.41	0.5
	Electric grill*	0.0	0.0	0.07	0.0
	Electric oven*	0.0	0.0	0.10	0.0
	Extractor fan*	0.0	0.0	0.07	0.0
	Food processor*	0.6	0.0	0.40	0.0
	Frying pan	0.5	0.4	0.29	0.0
	Jug	1.1	0.8	0.98	0.8
	Microwave	3.6	3.1	0.90	2.8
	Mini-oven*	0.0	0.0	0.13	0.0
	Mixer*	0.1	0.0	0.41	0.0
	Rangehood*	0.4	0.2	0.33	0.1
	Small appliance*	0.1	0.0	0.76	0.0
	Toaster	0.1	0.1	0.84	0.1
	Waste disposal	0.4	0.1	0.10	0.0
	Wastemaster*	0.0	0.0	0.10	0.0
Laundry	Dryer	1.0	0.6	0.64	0.4
	Iron	0.0	0.0	0.71	0.0

Group	Appliance	Standby power (W)	Standby energy (W)	Appliances per house (count)	Standby energy per house (W)
	Washing machine	3.1	1.9	0.98	1.8
Miscellaneous	Alarm clock*	1.6	1.1	1.13	1.2
	Burglar alarm*	2.3	1.0	0.12	0.1
	Cell-phone charger*	1.2	0.6	0.26	0.2
	Charger*	1.6	0.5	0.25	0.1
	Cordless phone*	2.0	1.5	0.74	1.1
	Electric blanket	0.0	0.0	0.80	0.0
	Electric organ*	4.1	2.9	0.06	0.2
	Hairdryer*	0.0	0.0	0.34	0.0
	Instant gas water heater*	9.0	11.3	0.03	0.3
	Intercom*	1.5	1.9	0.01	0.0
	Lamp	1.1	0.8	2.52	2.0
	Misc appliance*	1.3	0.4	0.19	0.1
	Misc gear*	2.9	1.9	0.06	0.1
	Misc personal*	0.9	0.3	0.31	0.1
	Sewing machine	0.1	0.0	0.30	0.1
	Shaver*	1.1	0.6	0.06	0.0
	Spa pool	1.1	1.3	0.03	0.0
	Toothbrush*	1.3	0.7	0.08	0.1
	Vacuum	0.5	0.2	0.97	0.2
	Waterbed	2.2	0.9	0.04	0.0
Refrigeration	Freezer	1.8	0.7	0.68	0.5
	Fridge	10.6	4.6	0.66	1.7
	Fridge-freezer	15.0	5.3	0.65	4.7
Home office	Answerphone*	3.4	2.7	0.10	0.3
	Computer	7.6	4.1	0.85	4.4
	Monitor*	2.1	1.8	0.12	0.2
	Fax machine*	5.2	3.3	0.25	0.8
	PC peripherals*	3.6	2.8	0.33	0.9
	Printer*	3.3	2.1	0.42	0.9
Space Conditioning	Air conditioner	0.0	0.0	0.06	0.1
	Dehumidifier	2.1	0.7	0.22	0.2
	Fan	0.1	0.1	0.58	0.1
	Heater	0.4	0.2	1.51	0.3
	LPG heater (fan) *	5.0	6.3	0.01	0.1
	Air fresheners*	1.7	1.2	0.21	0.3

Note: Appliances marked * were measured with spot measurements