Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.
Assessment of Standby Power Utilisation in New Zealand

Inge Flinte

A thesis submitted for the degree of Masters of Technology in Energy Management from Massey University, Palmerston North.

May, 2003
Resubmitted November 2004
Abstract

"Standby Power" refers to 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.

Standby Power is currently a global problem in the developed world and is estimated to be responsible for 1.5% of total electricity consumption. It contributes 0.6% (68 million tons) of CO₂ emissions from the electricity sector. At the present time, standby power is a relatively new concept with very few statistics available on the standby power consumption in New Zealand.

To date New Zealand has not considered standby power to be important. While almost all first world countries are introducing legislation and making active movements toward reducing standby power in new appliances, New Zealand has yet to take action. There is a growing awareness of standby power in New Zealand that has gained some media coverage. However from this study it is clear that although 89% of surveyed consumers had heard of standby power, the general consumer was unaware of the extent to which standby power is emitted through appliances and the amount of power and money it consumes nationally per year. In the midst of a power crisis (at the time of writing, June, 2003), New Zealand has the capability to reduce power consumption by 10%, by turning all appliances off onto standby. Unfortunately, the lack of consumer education in regard to the extent of wastage in standby power in the average New Zealand household inhibits this saving from being made.

The possible future directions for New Zealand as a result of this study are as follows.

- Legislation needs to be put into place in New Zealand to encourage manufacturers to reduce standby power consumption of new appliances. This will help to bring New Zealand manufacturers up to standard with places like the USA, Europe, Australia, Japan and China, who are already taking active steps to reduce standby power. Legislation in other countries has shown that mandatory legislation is hard to police. A campaign educating the consumer on energy labelling and the cost of standby power teamed with a voluntary manufacturers’ scheme to lower standby power consumption (using the worldwide energy star label) would be potentially effective. Previous studies
have called for a worldwide standardised standby power labelling scheme. This scheme is seen as being necessary as many New Zealand products are being manufactured overseas. The following changes need to take place to take an active approach to reducing standby power wastage:

- Research into the standby consumption of the commercial and industrial sectors within New Zealand.
- Improvements in energy labelling. Consumer education and awareness campaign with regard to energy labelling, needs to take place on a public arena. Energy labels need to be simplified so the average New Zealander can understand the energy emitted through standby power on market appliances and the amount that standby power costs both on a nation wide scale and to the individual consumer.
Acknowledgements

There are a number of people that contributed to my Masters Thesis that I would like to thank for their special help in what was a challenging and stimulating experience.

Firstly, I would like to acknowledge the generous financial help NZFRST gave me with their scholarship which enabled me to achieve this project. Fisher and Paykel Appliances and EECA provided me continual support, both financially and practically and their help was an integral to the carrying out and completion of this project. I greatly appreciated the generous EECA provided me with funding through their Bright Enterprise Scheme. I would like to thank Mr Richard Butler and Mr Bill Currie, managers at Fisher and Paykel for their informative interviews and for the time and equipment they lent me in allowing me to carry out tests at their site. Their help was invaluable. A further acknowledgement is in order for Farmers Trading Co, Dunedin, New Zealand Bond and Bonds and Smith City for their patience in letting me test within their sites.

The Massey University Centre for Energy Research provided me with the financial assistance to carry out this Masters Thesis through Massey University. I only hope that this thesis lives up to their expectations and provides them with vital research on which to base further investigation.

I would like to acknowledge and thank Professor Ralph Sims for his advice, direction and thoughtful ideas which were always tastefully worded and inspirational. His knowledge and supervision guided this research and helped me through some difficult interpretation in the drafting and final processes of this thesis.

Finally, I would like to acknowledge and thank all my family and friends for their support during the time of completing this thesis and throughout the course of my degree. Abigail Claridge was invaluable in her help with the fine tuning of this project and in the final presentation.
## 1.0 Introduction

1.1 Introduction

1.2 Standby Power Definition

1.3 Project Aim

1.4 List of Project Objectives

## 2.0 Literature review

2.1 Objectives of the Literature Review

2.2 Standby Power Measurement

2.2.1 Whole House Measurement

2.2.2 Bottom up Studies

2.2.3 New Product Measurements

2.3 Residential

2.3.1 Australia

2.3.2 New Zealand

2.3.3 USA

2.3.4 Europe and France

2.3.5 Japan

2.3.6 China

2.4 Commercial

2.5 Standby Trends

2.6 Policies and practical steps to combat standby power

2.6.1 Mandatory Certification Programs

2.6.2 Voluntary Certification Programs

2.6.3 Mandatory Efficiency Standards

2.7 Technical solutions

2.7.1 Power Switch Placement

2.7.2 Power Supplies

2.7.3 Power Management

2.7.4 Visual Displays, Lower Power Components

2.8 Recommendations

2.8.2 Viewing Standby Power from an Alternative Angle
3.0 Methodology

3.1 Introduction

3.2 Aims

3.3 Project Tasks and Output
   3.3.1 New Product Measurement Survey
   3.3.2 Appliance Behavioural Survey

3.4 New Product Measurement Survey
   3.4.1 Aims and Objectives
   3.4.2 Approach
   3.4.3 Preparation and Equipment
   3.4.4 Problems Encountered in Data Collection

3.5 Appliance and Behavioural Survey
   3.5.1 Aims and Objectives
   3.5.2 Approach

3.6 Interviews with Fisher and Paykel Staff
   3.6.1 Aims and Objectives

4.0 Results

4.1 Overview

4.2 Washing machines

4.3 Clothes dryers

4.4 Dishwashers

4.5 Ovens

4.6 Microwaves

4.7 Televisions

4.8 Video Cassette Recorders (VCRs)

4.9 Digital Versatile Discs Players (DVDs)

4.10 Stereo equipment

4.11 Personal Computers and Monitors

4.12 Home Theatres

4.13 Consumer Survey
   4.13.1 Aims
   4.13.2 Appliance features
   4.13.3 Turn off behaviour
   4.13.4 Energy Labelling
   4.13.5 Consumer knowledge of Standby Power

4.14 Manufacturers Opinion
Tables

Table 2.1: Results from 21 whole-house studies from around the world.
Table 2.2: Results from the 8 bottom up studies that have been carried out to date
Table 2.3: Australian survey results of a range of appliances showing appliance load, standby load, off load, saturation per household, market share, average units per household and average age of appliances.
Table 2.4: Standby power of appliances in America.
Table 2.5: Results of a survey of the standby power modes found in household appliances in 178 individual French households showing maximum, minimum and average loads for the number of appliances measured in a range of categories.
Table 2.6: Comparisons of standby consumption averages in Japan between household appliances used in new products in the market between 1999 and 2000.
Table 2.7: European code of conduct standby power targets.
Table 2.8: Appliances turned off at the wall by consumers when appliance is not in use.
Table 2.9: Appliances turned off at the wall by consumers when appliance is not in use

Figures

Figure 2.1: LG home networking plan.
Figure 2.2: Common power switch designs of appliances with standby power features.
Figure 4.1: Percentage of households with washing machines (household economic survey)
Figure 4.2: Standby power measurement for new washing machines (off-mode, 2002)
Figure 4.3: Standby power measurements for new washing machines (active-mode, 2002).
Figure 4.4: Percentage of households with clothes driers.
Figure 4.5: Standby measurements for new clothes driers (off-mode, 2002).
Figure 4.6: Distribution of low power modes in clothes driers (2002).
Figure 4.7: Percentage of households with dishwashing machines.
Figure 4.8: Standby power measurements for new dishwashers (off-mode, 2002).
Figure 4.9: Percentage of households with electric ranges or wall ovens.
Figure 4.10: Standby measurements of new ovens and ranges (off-mode, 2002).
Figure 4.11: Percentage of households with electric ranges of microwave ovens.
Figure 4.12: Standby power measurement for new microwaves (passive standby mode, 2002).
Figure 4.13: Percentage of houses with colour televisions.
Figure 4.14: Standby power of new televisions (off mode).
Figure 4.15: Standby power of new televisions (standby mode).
Figure 4.16: Percentage of households with video recorders.
Figure 4.17: Standby power of new video players (passive standby mode, 2002).
Figure 4.18: Standby power of DVD players (Off-mode and passive standby mode, 2002).
Figure 4.19: Standby power of new stereos (passive standby mode, 2002).
Figure 4.20: Standby power of new portable stereos (off-mode, 2002).
Figure 4.21: Standby power of new computers (off-mode, 2002).
Figure 4.22: Standby power of new monitors (off-mode, 2002).
Figure 4.23: Distribution of low power modes in new home theatres (2003)
Figure 4.24: Important factors taken into account when purchasing a new product