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## Too Much Time Costs Money

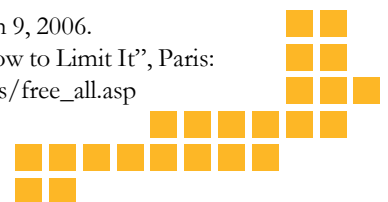
In today's kitchens the old clock on the wall has been replaced by the many clocks on many appliances. The digital message from your microwave may include not only the time but an exhortation to "enjoy your meal". Ranges, coffee makers, CD players/radios, toaster ovens and even some refrigerators all have digital displays. Likewise, VCRs, DVDs, and stereos are frequently always on and have active digital displays in this "on but inactive" mode. Digital cable boxes, televisions and video game consoles are almost always connected to a power source and utilize power to maintain "remote ready" status. This power, consumed when a device is waiting to perform a function, is termed "standby power" and the convenience of knowing the time at every turn and having a flash start to a video experience, costs.

With rising energy prices, a sharper focus on energy efficiency issues, and a wider concern about greenhouse gas emissions, this issue has received more prominence in the last decade.<sup>1</sup> While individual appliance standby power consumption can appear trivial, it is at the national and global level that the economic and environmental implications of this category of power consumption become clearer. In international studies, standby power usage has been estimated to range from 3% to 13% of total residential electricity consumption.<sup>2</sup> Consumer awareness, technological advances, and equipment standards can all contribute to reductions in standby power use. However to do so effectively requires continued monitoring of standby power consumption.

In this newsletter we present a summary of the Centre's latest research on standby power consumption of appliances and electronic equipment models currently available in Canada. The information will be used to estimate a typical household's total standby power consumption as appliance use and technologies change, to identify the aspects of standby power usage that warrant greater attention, and to direct policy and consumer education initiatives.

<sup>1</sup> See "Pulling the plug on standby power", *The Economist*, March 9, 2006.

<sup>2</sup> See "Things that Go Blip in the Night: Standby Power and How to Limit It", Paris: OECD/IEA, 2001. [http://www.iea.org/Textbase/publications/free\\_all.asp](http://www.iea.org/Textbase/publications/free_all.asp)



# Standby Power Energy Use of Common Household Appliances

Nigel Fish, David Ryan, & Donna White

One of the first steps in determining how to reduce energy consumption is to understand how energy is currently being utilized. Various household appliances, such as microwaves, VCR's, DVD players, digital cable boxes, video game consoles, and other such electronic devices, are almost always connected to a power source and utilizing power to maintain a 'stand-by' mode. The primary purpose of this project was to assess the standby power energy use of common household appliances available on the current market in Canada.

The analysis in the report is based on measurements of power consumed by a number of different appliances in various modes of operation. To this end we were graciously provided access to undertake these measurements by several appliance retailers. The main focus of the report is on two modes of operation - *off/standby* and *on & idle* - although additional measurements are also provided for other modes that are available for particular appliances. In many cases power measurements were found to vary widely across modes of operation for any particular appliance, and different types of appliances even in the same general category were found to have quite different power requirements in the same mode of operation.

Within the group of home audio appliances, compact stereos appear to draw the most power when in the *off/standby* mode, with most other equipment drawing less than 2W on average (Figure 1). In the *on & idle* mode, amplifier/receivers, subwoofers, and again compact stereos, draw the most power on average. In terms of home video equipment, in the *off* mode the appliances that draw the most power on average are LCD (Liquid Crystal Display) rear projection televisions, cable boxes and DLP (Digital Light Processing) televisions. In the *on & idle* mode, plasma televisions, DLP televisions, LCD rear projection televisions, and LCD flat panel televisions all draw in excess of 100W on average, while CRT (Cathode Ray Tube) televisions – whether or not in combination with VCRs and DVD players – were found to draw on average between 50W and 100W in this mode.

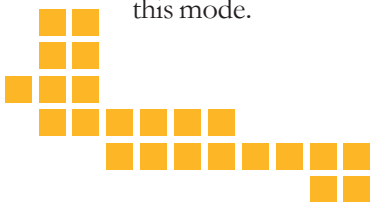
In the home office equipment category, desktop and laptop computers draw the most power in the *off/standby* mode, but this is less than 4W on average. Older printers also have larger power requirements in this mode, but printers manufactured since 2001 do not appear to share this characteristic. In the *on & idle* mode, desktop computers have by far the largest average power requirements (over 85W), with printers, CRT monitors, and laptop computers also using relatively large amounts of power (between 18W and 37W) on average.

Apart from refrigerators for which a number of measurement issues could not be resolved in a retail setting, kitchen appliances, in the *off* mode, used on average less than 2W of power. Unfortunately, for many kitchen appliances there was no well-defined *on & idle* mode, so that standby power comparisons are difficult to make for this group.

Comparisons across the different appliance groups indicate that home video equipment generally draws the most power in the *off* mode, - particularly LCD rear-projection televisions, DLP televisions, and cable boxes, although compact stereos also draw in excess of 5W in this mode. In the *on & idle* mode, the highest average power usage is again observed for televisions, especially plasma, DLP, and LCD televisions. This suggests that possibly the largest return in terms of efforts to reduce standby power consumption could be achieved with televisions, particularly those left in the *on & idle* mode.

Overall, the standby power measurements reported in the study indicate that – depending of course on household behaviour in terms of the modes in which appliances are “operated” – households could save considerable amounts of energy by disconnecting appliances rather than having them operate in various standby or idle modes. Of course it would be necessary for household members to know that they should do this, and to this end there appears to be a very limited amount of information that is publicly available. In addition, not everyone can get their children to reprogram the DVD and VCR each time they want to use it.

Manufacturer specification sheets provided at the time of the appliance purchase (and often available



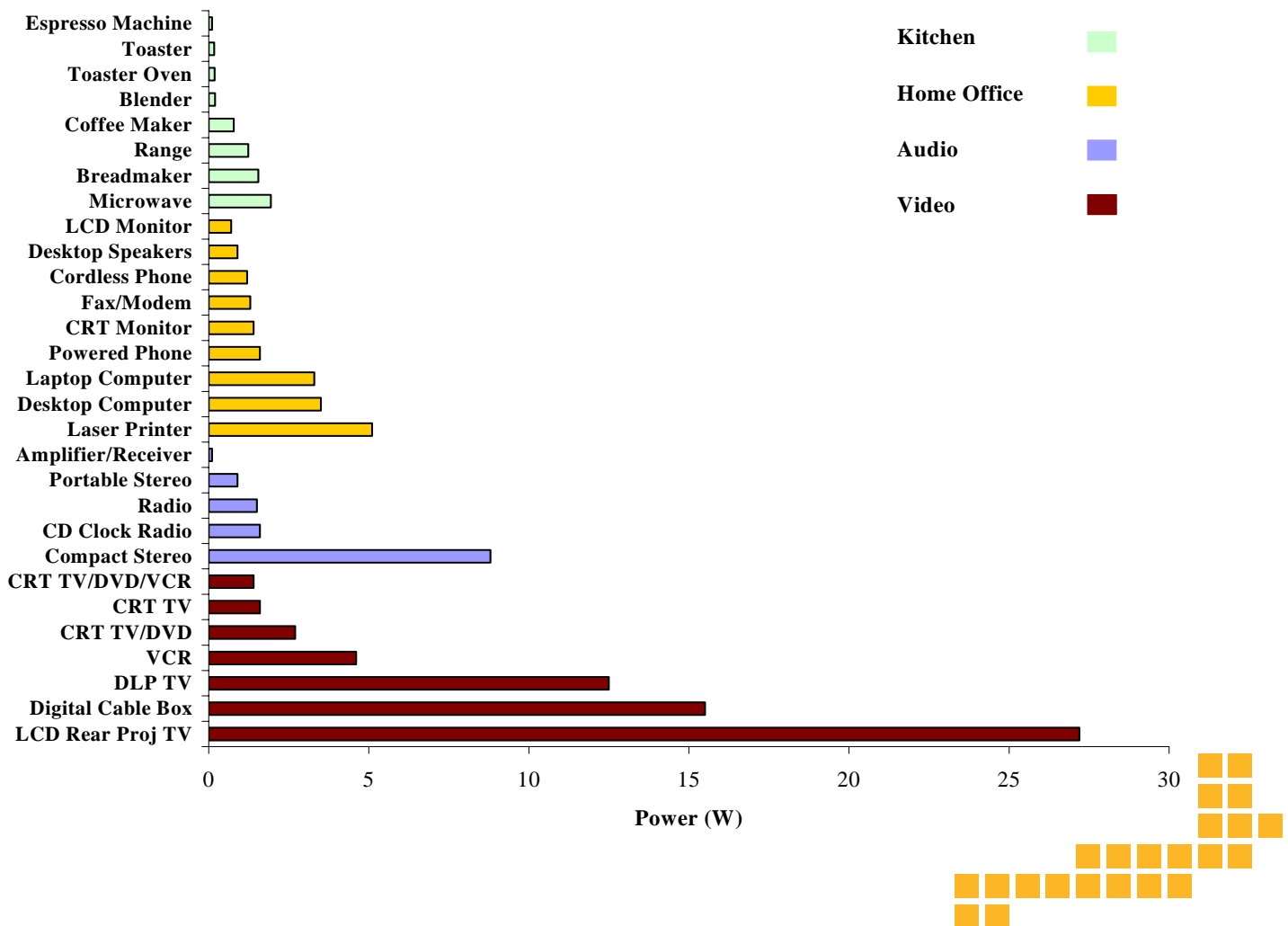


from manufacturer web sites) typically indicate the rated power consumption in some modes, but usually not in all modes. For example, in terms of the audio equipment that was metered, only one manufacturer routinely supplied both a rated standby and “full power on” power consumption value in their equipment specifications. In any event, it might be expected that these specification sheets would only be given a cursory review by consumers, likely only at or shortly after the time of purchase, and that they would most likely not be available later as reminders of the amount of energy being consumed by the appliance in various modes of operation. Overall, this suggests that it might be useful to provide consumers with (a) better information about the power usage of appliances in various modes, (b) reminders over time about the consequences in terms of energy use concerning the modes in which their appliances are utilized, and (c) a source where they could

readily assess the likely power usage of their appliances in various modes of operation.

The standby power measurements reported in the study help provide a benchmark measure of the amount of power that is consumed by a variety of appliances when these appliances are waiting/standing by to perform a function. Of course, knowing the average power requirements of appliances in particular modes only partially helps determine the standby energy requirements of a typical household. Another key piece of information concerns the usage patterns of these appliances – that is, the extent to which specific types of appliances are operated in particular modes. Combining information of this type – and typical household holdings of appliances – with the standby power requirements of each appliance will help determine the total amount of energy that is utilized for standby purposes, and the importance of addressing this issue in a wider Canadian context.

**Figure 1: Average Standby Power Consumption (W)**





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## STUDENT RESEARCH

This summer, **Ronggui Lui**, an economics graduate student, continues his work for the Centre on a project that involves investigating methods for disaggregating aggregate household energy consumption using only survey data. In addition, **Jevan Cherniwchan**, who has just completed his undergraduate degree in economics and is about to pursue graduate studies, is assisting on modelling and analyzing the energy savings associated with the use (and misuse) of programmable thermostats. Fresh from his work on standby power measurements reported in this newsletter, **Nigel Fish** is investigating the potential savings in standby power usage associated with office equipment replacement.

Several other students are working on CBEEDAC projects that form part of the requirements of various economics graduate programs. **Alan Wesley** continues to investigate the potential energy savings of Compact Fluorescent Lights in a project that forms part of the Economics Masters Program requirements. **Samuel Gamtessa** is modelling residential retrofit behaviour as part of his doctoral studies, while **Junaid Jahangir**, who has successfully completed his doctoral candidacy exam, is currently working towards completing his thesis on aspects of electricity market restructuring and its effects on consumers.

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## BUILDING BYTES

The Australian Greenhouse Office, with support from the Asia Pacific Economic Cooperation and the International Energy Agency, are hosting an international conference on standby power in Canberra, 6-7 November 2006. The Conference will seek to develop an internationally consistent model to address excessive standby power consumption.

The Australian government's standby power policy initiative is detailed at <http://tandby2006.energyrating.gov.au/standby2006-program.pdf>, including background material on standby power consumption and individual product profiles for standby consumption.

In the United States, Lawrence Berkely National Laboratory maintains a website of research and background information on standby power consumption and measurement at <http://standby.lbl.gov/>

The International Electrotechnical Commission (IEC) standard detailing the method for measuring standby power consumption for domestic appliances IEC 62301 Household Electrical Appliances - Measurement of Standby Power was published in June 2005. The standard can be previewed (or purchased) at <http://www.iec.ch/>.

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## BUILDING SERVICES

CBEEDAC has the expertise to provide services to the building sector in the area of data storage and analysis. For more information regarding these services, on becoming a sponsor of CBEEDAC, or about the services provided by other Data and Analysis Centres contact CBEEDAC or see our Web site ([www.ualberta.ca/~cbeedac](http://www.ualberta.ca/~cbeedac)).

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If you house and/or collect data that could become a valuable addition to Canada's Building Energy End Use information system please consider contacting the Centre with your data information.

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