Canadian Standby Power Study of Consumer Electronics and Appliances

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ABSTRACT

Standby power is defined as electricity consumed by appliances while switched off or not performing their primary function(s). While the amount of power is typically small (0.5 to 10 watts), the number of devices is large making standby power a significant issue for national agencies and electric utilities. Industry experts estimate that in OECD countries, 4% to 10% of residential electricity consumption can be attributed to standby power.

To develop programmatic approaches to address standby power in Canada, NRCan and BC Hydro measured standby power consumption in a broad spectrum of consumer electronics and appliances. New off-the-shelf consumer electronics, appliances and office equipment were measured in five Canadian retail stores – from major merchandise retailers to specialized high-end equipment stores. Over 850 products were tested in 2007, making this the largest retail-market study of standby power in North America.

Test results show that there can be wide variations in standby power consumption for certain products and data shows that savings of approximately 75% exist for some products by adopting existing commercially-available technologies.

This paper discusses the average and range of standby power use of products in four product categories – major appliances (white goods), minor home appliances, home entertainment products and office equipment. Those results are combined with market data to conservatively estimate standby power consumption in a typical household and for all of Canada. The paper concludes with discussion of a major electric utility's interests and national policy instruments available to reduce Canadian standby power consumption.

Introduction

Natural Resources Canada (NRCan) and the British Columbia Hydro and Power Authority (BC Hydro) are both concerned about the level of standby power consumed in Canada. The objective of this study was to collect data on commercially available products to quantify standby power consumption in Canada, and help develop policy initiatives and market transformation programs to reduce wasteful standby power. The study methodology was designed to be replicated either by other organizations interested in performing a similar survey or to be repeated in Canada to establish a trend of standby power consumption in products on the market in Canada. This paper presents a summary of the study and its findings; the full report is available from NRCan (NRCan 2008a).

Standby power consumption was first identified as a distinct problem about 15 years ago (Meier et al.1992; Sandberg 1993). At that time, certain appliances, most notably televisions and Videocassette Recorders (VCRs), consumed small amounts of power when switched off to

maintain auxiliary capabilities, such as receiving a remote control signal or powering a clock. Today, a wide range of products and appliances incorporate consumer-oriented features that consume standby power. This consumption is generally related to one of three auxiliary functions:

i) performing a continuous function (e.g., powering a built-in clock or other continuous display);
ii) monitoring environmental status (e.g., hard-wired smoke alarms, home security systems, occupancy sensors); or
iii) maintaining a 'ready' state for on-demand use, such as responding to wireless signals (e.g., televisions switched on with a remote control).

For some products however, standby power consumption can be excessive for the auxiliary function offered. Or, in other cases the standby power may serve no useful function and simply constitutes a waste of energy (e.g., an external power supply plugged into a wall socket but not connected to the consumer product).

Experts have estimated that in Organisation for Economic Co-operation and Development (OECD) countries, between 4% and 10% of annual residential electricity consumption is consumed in standby mode. In Australia, standby power was found to represent around 90W of continuous power per household (Harrington, L. 2007). BC Hydro has estimated that standby power is second only to inefficient lighting in the amount of electricity savings that could be saved through regulation.

Standby Power Study Methodology

This study was designed around the measurement of standby power consumption of new, off-the-shelf, consumer electronics, appliances and office equipment found on display in five Canadian retail outlets.[1] These stores were located in the Toronto and Vancouver areas, and ranged from general merchandise to specialized high-end equipment stores. In order to harmonize with international efforts on standby power, a test methodology was developed that was largely consistent with an Australian study undertaken by Energy Efficient Strategies (AGO 2007). Test methods were developed for each of the products based on the measurement techniques followed in the Australian study, and are detailed in the Standby Navigator Guidebook (NRCan 2007).

A testing team was dispatched to each store to measure the standby power consumption of the products on display. Each team of two technicians had a mobile cart with a testing meter, an interface box for the power meter, and a computer to log the results. The testing meter used was a Yokogawa WT210[2], which has a high degree of accuracy at low power measurements. To facilitate in-store data collection, NRCan and their retained consultants, Navigant Consulting, Inc. (NCI) developed a database program in Microsoft Access® called "Standby Navigator."

[1] For products with external power supplies, the Team also measured the power consumption of the external power supply when it is connected to mains power, but not connected to the consumer product. This mode is generally referred to as "Disconnected EPS Mode."

[2] Yokogawa presents the WT210 meter as having an accuracy of ±0.1% of reading & 0.1% of range for measurements taken at 60 Hz. The lowest range for the meter is 5 mA, which is 0.6 W at 120 V. Therefore, power measurements in this range have an accuracy of ±0.1% of reading & 0.6 mW.

Standby Navigator has a variety of input fields to capture product information, power rating, and power measurements. For mobility around the product displays, two extension cords were used, one for the computer and meter, and one for the products being tested.

For most products, standby power stabilized in less than one minute of connecting the device to the mains power supply. The power meter was programmed to calculate a continuously-updating average of 32 samples over eight seconds, updating every 0.25 seconds. The average measurement allowed for the cancellation of radiated electrical noise generated by other nearby electrical products. If necessary, the team would extend the period of time gathering the reading for up to a few minutes until the recorded power consumption stabilized. However, if after a few minutes the power reading still did not stabilize, then the team took an approximate reading, which was noted as being 'unstable.' Each team recorded one measurement per product and repeated the measurement if the reading was unusual for the product, such as being much higher or lower than was expected. A two-person testing team with this setup and software was able to measure approximately 60 products during an eight hour working day.

The approach followed in these retail stores differs from the controlled laboratory setup and longer testing times required by IEC 62301, the international standard for the measurement of standby power for household electrical appliances. NRCan and BC Hydro recognized the value in conducting shorter, yet reasonably accurate measurements. All parties understood that these measurements would not meet certification or compliance requirements, but instead provided a snapshot of the performance of products sold in 2007. This approach is consistent with that followed by researchers in Australia, where over 7,000 products have been tested in stores (Harrington, L. 2007). It is important to note that the measurement technique followed in this study would not identify products with internal timers or short duration functions that power down the product after several minutes of sitting idle (i.e., sleep modes).

Another consideration when interpreting the data is that the protocol was designed to reflect standby power consumption when a typical user attempts to put the product in its lowest power-consuming mode. Many of the products tested had a soft-off switch, which puts the product into its lowest power-consuming mode, while still connected (electrically) to the main electricity supply. Some products tested had a 120 volt AC hard-off switch that disconnects the device (electrically) from the main electricity supply. For products with a soft-off switch, standby power was measured with the soft-off switch set to 'off.' For products with both types of switches, power consumption was recorded with the soft-off set to 'off' and the hard-off set to 'on' so that the product was in the lowest power consuming mode. If a product only had a hard-off switch, as was the case with some fax machines, clothes washing machines, and toaster ovens, power consumption was recorded as zero watts. Other methodologies might have considered power consumption by a product with only a hard-off switch as "off mode" rather than standby mode. However, in this study, this power was considered to be standby power to best reflect power consumption when a user attempts to power down a product.

Types of Standby Power

There are a number of operational modes that characterize the functionality (and power consumption) of household equipment. Several modes exist between full-power mode where the product is performing its primary function(s) and off mode where the product is turned off and using no power. This study however focuses on just two modes for the range of products tested

– standby mode and disconnected external power supply (EPS) mode (if applicable). The definitions for these two terms appear below:

- Standby Mode – the product or appliance is connected to a mains power source and offers one or both of the following user oriented or protective functions which may persist for an indefinite time: 1) to facilitate the activation of other modes by remote switch (including remote control), internal sensor or timer; and 2) continuous function information or status displays (e.g., clocks) and sensor-based functions (IEC 2007).
- Disconnected EPS Mode – for consumer products that have a separate external power supply (EPS), this mode occurs when the external power supply is connected to the main electricity supply but the output is not connected to the consumer product. This is mainly applicable only to mobile products that are intended for normal use when disconnected, such as mobile phones.

The results presented in this paper focus on the standby mode power measurements captured for more than 850 consumer electronics, appliances and office equipment.

In-Store Measurements Study Findings

Power measurements were recorded for all products in standby mode[3]. Table 1 lists all the products tested in four general categories of consumer products, and the number of models in each category that were measured for standby power consumption. Of the 884 products tested, nearly all were different models (i.e., different products, manufacturers and models). For those models that were found and tested in more than one store, the average difference between measurements was approximately 0.1 watt, which may be due to voltage variations or production variations.

[3] The study measured products in other "standby modes" with higher power consumption, although only the lowest power consuming data is presented here.

Table 1. Consumer Products Tested and Analyzed in this Study

Product Description	# tested	Product Description	# tested
Major Appliances	*52 total*	*Minor Home Appliances*	*111 total*
Air Conditioner	3	Clock Radio	32
Clothes Washing Machine	11	Coffee Maker	35
Microwave Oven	38	Toaster Oven	44
Home Entertainment	*409 total*	*Office Equipment*	*312 total*
Digital Photoframe	9	Answering Machine	2
DVD Player	71	Computer Monitors	78
DVD Player-Portable	14	Computer Speakers	20
Home Theatre Components	43	Cordless Phone	36
Integrated Stereos	39	Desktop Computer	40
Portable Stereo	21	Fax Machine	6
Set-top Box	7	Laptop Computers	59
Television	198	Multi-Function Device	42
VCR	2	Printer	29
Video Game Console	5	**Total Products Tested**	**884 total**

Table 2 presents the power consumption measured for all the products tested. The table presents the number of units tested in a category, the average standby power consumption measured for those units, the median value (i.e., the 50th percentile), and the highest and lowest standby power wattage measured. Table 2 also presents a column showing the percentage of the products tested within each category which had standby power consumption of 1 watt or less. Four categories — air conditioners, answering machines, set-top boxes, and VCRs — did not have any units tested with standby power less than 1 watt.

Table 2. Standby Power Measurements for the Products Tested in 2007

Product Category	Models Tested	Standby Power Measurements				% Tested with <1 watt
		Average (W)	Median (W)	High (W)	Low (W)	
Air Conditioner	3	1.19	1.20	1.26	1.12	0%
Answering Machine	2	1.96	1.96	2.30	1.62	0%
Clock Radio	32	2.44	2.03	9.53	0.21	9%
Clothes Washing Machine	11	1.71	0.98	4.77	0.00[4]	55%
Coffee Maker	35	0.94	0.86	2.44	0.00	57%
Computer Monitors	78	0.74	0.62	5.65	0.15	90%
Computer Speakers	20	4.24	3.18	16.07	0.92	5%
Cordless Phone	36	1.12	1.03	3.10	0.24	44%
Desktop Computer	40	2.53	2.33	5.87	0.97	3%
Digital Photoframe	9	1.28	0.91	4.74	0.13	67%
DVD Player	71	4.00	1.90	18.53	0.00	37%
DVD Player-Portable	14	1.06	0.48	5.70	0.27	71%
Fax Machine	6	2.53	2.34	4.68	0.00	17%
Home Theatre Components	43	1.32	0.64	12.57	0.00	72%
Integrated Stereos	39	6.67	2.74	27.63	0.18	26%
Laptop Computers	59	1.25	1.01	12.76	0.39	47%
Microwave Oven	38	2.08	2.06	4.02	0.88	3%
Multi-Function Device	42	8.41	6.33	25.70	0.14	12%
Portable Stereo	21	1.24	1.14	2.83	0.42	33%
Printer	29	5.81	4.18	27.40	0.30	21%
Set-top Box	7	22.73	26.70	41.13	6.55	0%
Television	198	2.01	0.52	47.80	0.01	81%
Toaster Oven	44	0.30	0.00	2.39	0.00	84%
VCR	2	4.49	4.49	6.67	2.30	0%
Video Game Console	5	1.63	1.40	2.45	0.64	20%

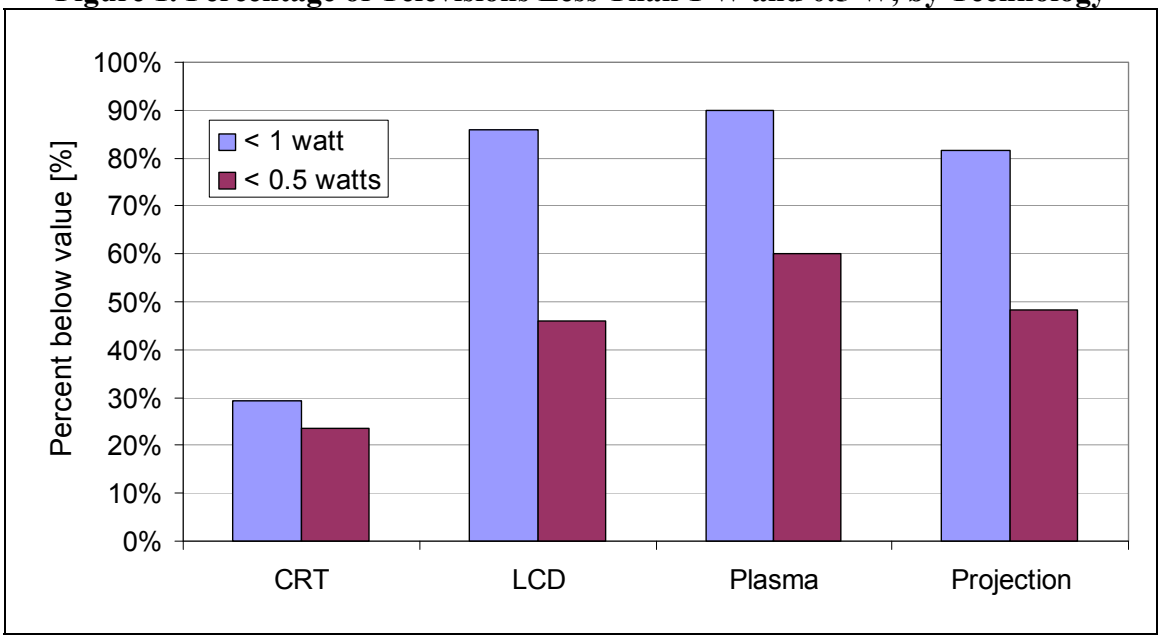
Among the products tested, televisions were found to have the widest range of standby power, from 0.01 to 47.80 watts. Some of the products in this study with the highest standby power were found to be televisions, DVD players, multi-function devices, and set-top boxes. . If these products have short-duration functions, such as downloading electrical program guides, then their long-term standby power may be lower than the levels measured. Toasters, monitors, and coffee makers were the only products with average power less than 1 watt. Many of the coffee makers and toasters only had activation switches to brew coffee or toast, in which case the measured standby power was recorded as 0 watts when they were not brewing or toasting. The average standby power for toasters was measured as 0.30 watts, which partly reflects that 37 of the 44 toasters tested consumed no power in standby mode. Televisions and DVD players stood out as products with strong potential for energy savings because of their wide range of power consumption. Both product categories had products that consumed less than 0.1 watts of standby power and other products that consumed more than 10 watts – a difference of more than 2 magnitudes.

Televisions were the most common product measured in the survey, accounting for 198 of the 884 measured products. For this reason, a more detailed examination of the distribution in standby power consumption was conducted. Specifically, televisions were analyzed for the

[4] The study methodology considers products that only have a hard-off switch as having zero watts of standby power (see Section 1.1 Standby Power Study Methodology).

ability to meet a requirement to limit standby power to 1 W or 0.5 W. Figure 1 shows the percentage of televisions with standby power below 1 W and 0.5 W for the four different TV technology types: cathode ray tube (CRT), liquid crystal display (LCD), plasma, and rear projection. For the CRT televisions less than 30% consume less than 1 W, and about 25% consume less than 0.5 W. The other three technology types have many more low-power models. More than 80% of LCD, plasma, and rear projection TVs are below 1 W and more than 45% could meet a 0.5 W standby power regulation if it were implemented today.

Figure 1. Percentage of Televisions Less Than 1 W and 0.5 W, by Technology



Factors such as price and screen size were also considered as possible influences on standby power consumption for televisions; however, it was found that televisions of all screen sizes and technologies had models with less than 0.5 W of standby power consumption. The models with the lowest power consumption (less than 0.1 W) all had screens bigger than 26 inches and were generally sold for more than C$1000. However, the televisions with the highest consumption (more than 10 W), also all cost more than C$1000 and had screens larger than 26 inches diagonal. This contrast, even at large screen size, indicates that televisions have the potential to consume very little standby power. This study found no correlation between standby power consumption and product price.

National Standby Power Consumption

In addition to studying standby power, a secondary goal of this study was to create a minimum estimate of standby power consumption in Canada. Combining the in-store standby power test data with market data (including shipments and household saturation studies), to estimate standby energy consumption including: (1) all products sold in 2007, (2) a typical Canadian household, and (3) Canada as a whole.

The equation for energy consumed in standby power is:

$$E_{standby} = P_{standby} \times t_{standby} \times n_{products}$$

where, $E_{standby}$ is the total energy consumed in standby mode, $P_{standby}$ is the power consumed by a product in standby mode, $t_{standby}$ is the time a product spends in standby mode, and $n_{products}$ is the number of products consuming standby power. In this analysis, all of the inputs for $P_{standby}$ were based on the in-store measurements, and therefore represent products sold in 2007. The study gathered standby power data in the lowest power consuming mode, which aligns with the goal of a minimum estimate of energy consumed in standby mode. In practice, some consumers leave their products in this mode or a higher power consuming mode (leading to an underestimate of standby power consumption), while others unplug or completely turn off their products (leading to an overestimate). It is expected that most consumers are unaware of standby power consumption, thus are of the former type and, consequently, that it is valid to consider the calculations as minimum estimates.

Data estimating the time a product spends in standby came from the NRCan Study of Household Energy Use (SHEU) (NRCan 2003) and NCI estimates when no other data was available.[5] [6] The SHEU data was generally presented in terms of time in use per week. Time in standby mode was calculated by assuming that all time not in use was in standby mode. Again, this assumption is probably true for most, but not all, consumers and should still yield valid minimum estimates of standby power consumption. Data on the number of products per household came from SHEU and the NPD Group[7], which both surveyed Canadian household penetration for different products, with NCI estimates when no data was available.[8] [9] [10]

The majority of 2007 sales estimates came from the NPD Group (NPD Group 2008) and Electro-Federation Canada (EFC) for most products. Sales estimates for set-top boxes and fax machines came from the US-based Consumer Electronics Association (CEA) and Appliance Magazine, respectively. For the 2007 sales data, NRCan and NCI scaled the data to the Canadian market and sometimes chose between different sources of sales estimates. The NPD data is based on tracked point-of-sale purchases. NPD estimates that their point-of-sale data generally reflects approximately 85% of the market. If no Canadian shipment estimate was available, data from the CEA or Appliance Magazine was used, scaling it 1:10 to reflect the ratio of the size of the Canadian and US markets.

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[5] SHEU time-in-use data included room air conditioners, clothes washing machines, desktop computers, DVD players, portable DVD players, integrated stereos, laptop computers, microwave ovens, computer monitors, portable stereos, set-top boxes, computer speakers, televisions, and VCRs.

[6] NCI estimates of time in use included answering machines, clock radios, coffee makers, cordless phones, digital photo frames, fax machines, home theatre components, multi-function devices, printers, toaster ovens, and video game consoles.

[7] NDP Group is a global market research company

[8] SHEU product-per-household data included room air conditioners, answering machines, clothes washing machines, cordless phones, integrated stereos, microwave ovens, portable stereos, set-top boxes, VCRs, and video game consoles.

[9] NPD product-per-household data included desktop computers, DVD players, portable DVD players, home theatre components, laptop computers, computer monitors, multi-function devices, printers, computer speakers, and televisions.

[10] NCI estimates of products per household include clock ratios, coffee makers, digital photo frames, fax machines, and toaster ovens.

To estimate standby power consumption in a typical household, NRCan and NCI used data from studies conducted by SHEU and NPD on product penetration in Canadian households. These studies were linearly scaled to the approximately 12 million Canadian households for estimating national residential standby power consumption.

Minimum Estimates of Standby Power Consumption

This study evaluated two cases: (1) total energy consumption using the average standby power consumption for the product and (2) energy savings using the 'low standby power' estimate for those same products. The 'low standby power' estimate is the simple average standby power for all models measured during the in-store survey that were found to consume less than 1 watt of standby power. Four product categories did not have any products with standby power less than 1 W – air conditioners, answering machines, set-top boxes, and VCRs. For these products, the low standby power used was the lowest standby power measured. The purpose of determining a low standby power estimate is to show the potential energy savings for all products from using commercially available technology.

Table 3 presents the standby power consumption of products sold in 2007, which was estimated by multiplying the measured standby power data, the 2007 sales data and the estimated time each of these products spends in standby mode. An underpinning assumption embedded in this calculation is that all products are evaluated as if they were sold on January 1st, 2007 and were in use throughout the year. Table 3 also shows that approximately 75% of the standby power could be saved if all of those products sold in 2007 were 'low standby power' models (i.e., <1 watt). The 'low estimate' and 'high estimate' scenarios represent the range of hours that products were found to be in standby mode by the aforementioned market studies.

Table 3. Estimated Energy Consumed in Standby Mode by Products Sold in 2007

Scenario	Low Estimate	High Estimate
Standby power estimate of products sold in 2007, based on products tested in 2007	885 GWh	917 GWh
Savings estimate if all products sold in 2007 were 'low standby power' (i.e., <1W)	675 GWh (76% savings)	701 GWh (76% savings)

The study also prepared an estimate of the average standby power consumed by a typical Canadian household. However, because this study did not involve metering of consumer products installed in Canadian households, this estimate should not be treated as a highly accurate estimate, but rather a conservative approximation, which is likely to understate the actual standby power consumed. The reason for this is because this calculation presumes that the installed base of consumer products has standby power consumption levels equivalent to those of the products sold in 2007 (i.e., the same standby power consumption as new models measured during the in-store survey). Table 4 presents the range of standby power consumption for the three different cases in terms of watts (instantaneous), kilowatt-hours over a twelve month period and the associated cost of that energy (assuming $0.092 per kilowatt-hour (NRCan 2008b)). In addition, Table 4 presents the energy savings that would accrue if all of products in Canada were 'low standby power.' It should be noted that this is a conservative estimate as is only covers products that were measured by this study and does not cover power consumption estimates for other modes of standby power (i.e. active). Neither do these estimates take into account the stock

of existing appliances currently in Canadian homes. Stock determination was beyond the scope of this study.

Table 4. Estimated Standby Power Consumption of a Canadian Household with Appliances Purchased in 2007

Scenario	Low Estimate			High Estimate		
	W	kWh/yr	$CDN	W	kWh/yr	$CDN
Household average, assuming installed base is represented by products tested in 2007	56	425	$39.06	63	483	$44.45
Household savings if installed base were all 'low standby power' models (i.e., <1W)	41	309	$28.44	46	355	$32.70

Next, the study estimated the standby power consumption for all of Canada by scaling the values presented in Table 4 to the approximately 12 million Canadian households. Table 5 presents this estimate of the annual standby energy (i.e., electricity) consumption in Canada. The proportion of electricity consumption that standby represents with respect to all Canadian residential electricity consumption (approximately 150 TWh (NRCan 2008c)) is also presented. As above, the 'low estimate' and 'high estimate' scenarios represent the range of hours that products were found to be in standby mode in market studies.

Table 5. Residential Electricity Consumed in Standby Mode and as Percent of Total with Appliances Purchased in 2007

Scenario	Low Estimate		High Estimate	
National estimate, assuming installed base is represented by products tested in 2007	5.09 TWh/yr	3.4%	5.80 TWh/yr	3.9%
National savings if installed base were all 2007 'low standby power' models (i.e., <1W)	3.71 TWh/yr	2.5%	4.26 TWh/yr	2.8%

Finally, the study calculates the national electricity savings and greenhouse gas (GHG) emissions reduction that would be associated with the savings presented in Table 5. The electricity savings is based on the average cost of energy ($0.092/kWh). Total GHG reduction is based on marginal GHG emission factor due to reductions in electricity use of 0.466 Mt of CO2e per TWh. Thus, as summarized in Table 6, Canadian consumers have the potential to save from $341M to $392M per year in electricity cost and from 1.73 to 1.99 Mt of CO2e by switching to products with low standby power.

Table 6. Economic and Environmental Cost of Standby Power in Canada

Scenario	Low Estimate		High Estimate	
National estimate, assuming installed base is represented by products tested in 2007	C$469M	-	C$533M	-
National savings if installed base were all 2007 'low standby power' models (i.e., <1W)	C$341M	1.73 Mt CO_2e	C$392M	1.99 Mt CO_2e

It should be noted that this study did not evaluate the increased consumer cost associated with incorporating the technologies to achieve 'low standby power' (i.e., <1 watt), which may off-set some portion of those electricity cost savings. NRCan and BC Hydro intend to study this issue further, to arrive at a national net present value estimate that takes into account costs and benefits associated with reducing standby power consumption. It should be noted however that that initial analysis for televisions did not find a correlation between standby power and product cost.

BC Hydro Interpretation and Proposed Actions

BC Hydro is one of North America's leading providers of clean, renewable energy, and the largest electric utility in British Columbia, serving 1.7 million customers, or approximately 95 per cent of the province's population. Since 1989, through its Power Smart program, BC Hydro has been promoting the efficient use of electricity and to date, saved approximately 4,300 GWh/year or enough to power 430,000 BC homes. More recently, BC Hydro's 2006 Integrated Electricity Plan found that demand side management (DSM) is the lowest cost available resource to meet growing electricity demand, and imposes the least environmental impact.

The utility recognizes that it plays an important role in the classic model of market transformation to accelerate the energy efficiency of products. For many years BC Hydro has worked with government and standards associations to identify products that have good energy savings opportunities and develop the more stringent energy efficiency standards that are often needed. As energy efficient products come to market, BC Hydro uses its strong Power Smart brand to promote those products through incentives and marketing campaigns. Such voluntary programs lead to consumer buy-in and allow the government to capitalize on the product-adoption momentum with the introduction of mandatory regulation requiring a more stringent level of efficiency.

In 2007, the provincial government released the BC Energy Plan, establishing several Energy Conservation & Efficiency Policies, including an ambitious conservation target to acquire 50 per cent of BC Hydro's projected electricity demand by 2020 through conservation. In determining how this goal will be met, BC Hydro has concluded that approximately one-third of its electricity growth can be met with an aggressive codes and standards strategy. Internal analysis has identified standby power savings as the second largest energy saving opportunity available to the utility and could account for as much as 15% of those savings.

Participation in this in-store measurement study has provided BC Hydro with several important pieces of information including the following:

- the magnitude of the standby power issue;
- verification that some manufacturers have designed energy efficiency into their products while others have not; and
- confirmation that regulation is the most effective method of controlling standby power losses.

The nature of standby power loss does not lend itself to a classical marketing program. In comparing an efficient unit to an inefficient one, the energy savings are too small for BC Hydro to justify promotion or incentive support and for the customer savings are too small to be noticeable on their electric bill. Therefore, BC Hydro strongly advocates a national or North American wide approach that would regulate maximum standby power levels.

Federal Policy Options and Opportunities

NRCan administers Canada's Energy Efficiency Act (EEAct) and regulations (EER). The regulations establish minimum energy performance standards which work with market transformation programs and initiatives such as ENERGY STAR to increase the availability and use of more energy-efficient technologies. NRCan monitors the market for opportunities to achieve energy savings and given the steady increase in the sale and ownership of home electronic products that consume power in standby mode, NRCan has identified standby as a priority end use area.

In addition to the In-store study, NRCan also commissioned a phone survey among 2,200 Canadians to better understand their level of awareness on standby power. The study found that approximately 60 percent have heard of standby power, though only half of those surveyed were aware of what standby power meant. The survey also showed that a small number of respondents had heard of other terms to describe standby power such as phantom power, leaking electricity and vampire loads. Approximately 85 percent of those surveyed believed that reducing standby power should be a priority for the Government of Canada and that they would pay more for a product that consumes less standby power. Although environmental impact was not the top-most concern among consumers of household electronics or appliances, ENERGY STAR qualification was cited as one of the most important of the nine factors tested in the survey. The survey also showed that most respondents use power bars to plug in both home entertainment equipment and home office equipment, although most do this for surge protection rather than to facilitate turning off the equipment when it is not in use.

As a result of this and other studies NRCan has decided to use a number of policy instruments to reduce standby power consumption listed below.

Establish Minimum Energy Performance Standards for New Products

Canada is in the process of examining Minimum Energy Performance Standards (MEPS) for products that exhibit the most potential for energy savings including; compact audio, TV, DVD, printers and multifunction devices. MEPS for digital television adaptors, battery chargers and external power supplies will be considered for active power as well.

Propose Changes to Canada's *Energy Efficiency Act*

Changes to the EEAct would be required to implement a "horizontal" standard that applies broadly to classes of products that could be defined by their common energy using characteristic e.g. in standby mode. The in-store study demonstrates the breadth of technologies that use standby. Although the least efficient could be targeted by product specific standards the issue may be most effectively addressed by a horizontal standard that applies to all products currently used throughout homes and businesses as well as those products to be introduced into the market.

Integrate Standby into MEPS for Currently Regulated Products

Canada is changing the Terms of Reference (TOR) for technical committees responsible for the development of national consensus standards to include standby power consumption measurements. The new TOR will ensure that committees address standby power consumption as defined and tested in IEC 62301. The inclusion of standby power and how it is used will be determined on a product-by-product basis. Canada's recently proposed amendment to the EER includes MEPS for dishwashers to incorporate standby power as well as a reporting requirement for standby electricity consumption of residential gas furnaces.

Provide Continued Support for the ENERGY STAR Program.

ENERGY STAR is an international endorsement labelling program for energy-efficient equipment. NRCan signed on as the administrator of the ENERGY STAR program in Canada in 2001 and endorses most ENERGY STAR product categories, including consumer electronics and office equipment. Many ENERGY STAR technical specifications include minimum standby criteria, further encouraging manufacturers to innovate and incorporate low-power standby modes into their products. ENERGY STAR is considered to be the major tool for addressing standby power consumption, specifically in non-regulated products such as home electronics and office equipment, for government and corporate procurement.

Encourage Government Procurement of Products with Low Standby Power.

Canada's Treasury Board approved the Policy on Green Procurement, effective April 1, 2006. It is the objective of this policy to integrate environmental performance considerations into the procurement decision-making process. ENERGY STAR qualification became mandatory for computers in early 2007. ENERGY STAR is also specifically referenced as a point–rated requirement (as opposed to a mandatory requirement) for copiers, and fax and multi-function devices, and is mandatory for printers.

Continue Working with the Canadian Standby Power Advisory Committee (SPAC).

In March 2007 NRCan invited representatives from various government agencies, utilities, non-profit organizations and industry to discuss the growing issue of standby power consumption in Canada. SPAC was formed as a result of this first meeting, to give stakeholders a forum to engage in concerted activities to set the stage for and supplement Canada's regulatory

efforts, help reduce peak and overall power demands and reduce GHG emissions. The results of these studies will be used by SPAC members as they work cooperatively to develop strategies that will supplement regulation and build consumer awareness and action. SPAC will look for opportunities to affect change and gain power savings ahead of regulations by addressing existing stock (which will be in place until 2020+), changing consumer behaviour and targeting reductions in standby power for equipment that is not regulated.

Continue to Raise Public Awareness of Standby Power Consumption

Standby power consumption lends itself to the attention of very high levels of political decision makers as it is easily characterized as "energy waste". This is evidenced in the international sphere with commitments regarding standby power consumption by the G 8 + at various fora. Domestically, in Canada, relevant Ministers often feature it in their speeches regarding environmental objectives and recognize the need for coordinated international action. These efforts a complemented at a program level by governments and utilities by information campaigns utilizing various media. Given the awareness levels noted above the efforts seem to have been meeting with some success.

It is hoped, that through the comprehensive approach noted above, the apparent growth in standby power consumption can be managed and the significant gains realized by other efficiency improvements preserved.

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